



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

# Consumers' Interest in Alternative Food Delivery Systems: Results from a Consumer Survey in New Jersey

Ferdaus Hossain and Adesoji O. Adelaja

Changes in consumer demographic composition, information technology, labor force participation, and time demands of the workplace have created demand as well as opportunities for the food retailing industry to deliver food using new alternative methods. Using a logit analysis, this study analyzes consumers' interest in patronizing four alternative food delivery mechanisms by examining the impacts of various socioeconomic and preference variables on consumers' interest in using these services. Data for the study was obtained via surveys conducted at various locations in New Jersey to gather information on consumers' socioeconomic conditions and their interest in using four different methods of accessing food. Empirical results suggest that younger consumers, individuals with at least college education, and households having a larger food budget are more likely to use these services. Interest in convenience contributes positively while concern over product quality, diversity, and prices negatively affect consumers' interest in using one or more of these services. Gender, employment and marital statuses, and driving distance to nearest supermarket have effects on consumers' interest level for some, but not all, of the alternative food delivery methods analyzed.

## Introduction

A paradigm shift is underway in food marketing and distribution, from traditional in-store shopping toward alternative food delivery systems (AFDSs). These alternative systems include on-line shopping, telephone ordering, home-delivery services, and pick-up or drive-through services at supermarkets. Supermarket share of total food expenditure has been decreasing due largely to the opportunity cost of shopping. On the other hand, sales of fast food and home-delivered food have been increasing steadily. The shift toward alternative mechanisms for accessing food is a response to changing socioeconomic factors, rapid changes in information technology, and changes in consumers' tastes and lifestyles, among other things. For instance, many consumers today feel that they are time-starved as a consequence of the following factors: rising female labor-force participation; more single-parent households; multiple job holdings; longer work hours; and increased job related stress (Kirschling and Linne-man, 1997). It is, therefore, no surprise that con-

venience is perhaps the most important factor driving consumers' choice among alternative means of accessing food.

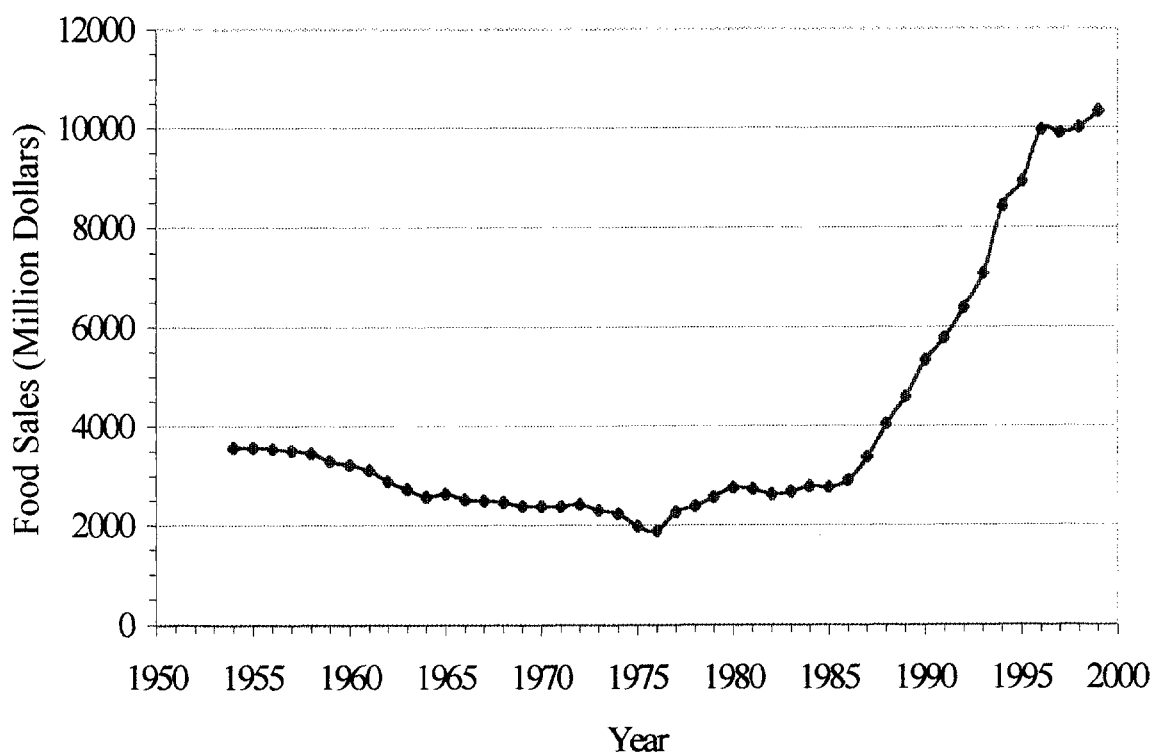
In response to these changes, companies such as Peapod, Netgrocers, WebVan, and HouseCalls Online now offer Internet-based ordering and delivery services. Others, such as Welsh Farms, offer home delivery of staples. Even supermarkets are now expanding their prepared food, food court, and home meal-replacement activities and devoting more floor space to these activities to meet growing demand for convenient meal solutions. Although the use of the Internet as a vehicle for accessing food is recent phenomenon, use of home delivery and mail order is not new to American consumers. USDA historical data on food expenditure using home delivery and mail order dates back to 1954.<sup>1</sup> The historical trend of food expenditure on home delivery and mail order is presented in Figure 1. Compared to 1954, the volume of sales through this method showed a declining trend until 1976. During the 1977 through 1987 period, the trend reversed and returned to a level near that of 1954. Food sales via this method have registered consistent and marked increase since 1988: Total food expenditure on home delivery and mail order increased from \$3.38 billion in 1987 to \$10.34 billion in 1999. Such growth in sales using home delivery and mail order is clearly reflective of consumers' demand for convenience in accessing food.

---

The authors are, respectively, assistant professor and professor, Department of Agricultural, Food and Resource Economics, Cook College, Rutgers University. Adesoji Adelaja is also dean/director of research, Cook College and the New Jersey Agricultural Experiment Station, and director, Food Policy Institute, Rutgers University. The research was partially supported by the Food Policy Institute, Rutgers University.

---

<sup>1</sup> Data on food expenditure using home delivery and mail order can be accessed at <<http://www.ers.usda.gov/briefing/food-mark/expend/data/history/homefood.htm>>.



**Figure 1. History of U.S. Food Sales Through Home Delivery and Mail Order.**

Source: USDA (2000).

The above discussion suggests that food distribution systems in the United States must find new and innovative ways of delivering food to consumers—such as home delivery, online ordering and delivery, and mail order in an efficient and cost-effective manner. According to estimates by supermarket operators, companies that do not offer home shopping services could be “frozen out of” 16.5 billion in annual sales (Kirshling, Linnemann, and Kochersperger, 1995). Industry experts believe that Internet shopping will reach 10 percent of food sales in 10 years (Kinsey, 1998). According to another study, it is projected that 15–20 million households will be using “consumer direct”<sup>2</sup> by the year 2007, with sales estimated at \$85 billion (Orler and Friedman, 1998). Home shopping—for years an almost invisible component of the grocery business—is entering a new phase, and supermarkets that have always safely

ignored it could face severe bottom-line consequences if they do not give it proper attention (Kirschling, Linnemann, and Kochersperger, 1995). If supermarkets that are not involved in home delivery lose 4 percent of their customers, they could lose 58 percent of operating profits before taxes (Clowes, 1996).

Although home delivery and online food shopping has increased in recent years and industry experts believe that the sector will continue to experience significant growth in the future, many Internet retailers—both in food and non-food industries—are finding that significant hurdles must be overcome in order to be successful. Increasingly, retailers are failing in their quest to satisfy the customers while remaining profitable at the same time. Recent closures of E-commerce companies—like Cybershop, toy retailer Toysmart, Internet fashion retailer Boo.com—and financial troubles of pioneer online grocer Peapod highlight some of the underlying problems in the expansion of the online grocery business. Traditional first-mover advantage did not assure success and profitability for Peapod. Among other things, high operating cost, increasing competition from other

<sup>2</sup> The consumer Direct is a cooperative comprised of diverse companies and grocery stores. It defines “consumer direct” as a “full-service channel that helps consumers simplify their lives by providing groceries and related products without going to a land-based store, usually aided by a personal computer or other automated ordering system” (Orler and Friedman, 1998).

online grocers, small profit margin, a pure Internet-based business model, and the costs of attracting customers are some of the challenges facing the online grocery business. Considering the losses incurred by Peapod (a \$28.5 million loss on revenue of \$73.1 million in 1999), some industry experts have expressed concern over the future of the online grocery business (Salkever, 2000a, 2000b). A recent article published in *Internet Retailer* quotes Alice Richter, of business consulting company KPMG Peat Marwick, to suggest that survival in this sector involves the continued targeting of high-income customers; the combination of groceries with deliveries of other services, such as dry cleaning and other errands (similar to what Streamline has done in Orange County, California); and the combination of online shopping with brick-and-mortar stores. Other companies in this industry must learn from Peapod's experience and streamline their businesses in order to be successful in this emerging industry.

Despite recent developments in food retailing and huge growth potential for AFDSs, academic research has not fully explored the issue. Given that fundamental changes have been taking place in the food retailing industry, it is extremely important to understand the evolution of this industry and to identify the factors that are driving the ongoing changes. The present study contributes to a better understanding of consumers' attitudes toward and interest in the AFDSs by identifying factors that determine consumers' choice among alternative methods of accessing food. Instead of focusing on online shopping via the Internet, we model consumers' level of interest in four AFDSs: (1) home delivery of prepared meals; (2) home delivery of a full line of groceries; (3) drive-through pick-up; and (4) neighborhood truck delivery of vegetables and meat products. Some or all of these services could involve ordering online or by telephone or fax.

Such an analysis is important to the food industry in that it can guide the design of appropriate AFDSs for those consumer segments that are most likely to use them. The Consumer Direct Cooperative (CDC) identifies six potential consumer groups (Orler and Friedman, 1998):

(1) *shopping avoiders*—individuals who simply dislike going to grocery stores and would consider any available alternative to avoid grocery shopping;

- (2) *necessity users*—individuals who are limited in their ability to go to the grocery stores;
- (3) *new technologists*—young consumers very familiar with technology;
- (4) *time-starved consumers*—individuals willing to pay for services that will give them more time to do other activities;
- (5) *responsible consumers*—those who feel that it is their responsibility to do a good job in grocery shopping; and
- (6) *traditional shoppers*—individuals who enjoy grocery shopping and avoid technology.

Of the above six consumer groups, all but the traditional shoppers are likely users of the AFDSs analyzed in this study.

With the growing population of educated, time-starved, technology-savvy customers, AFDSs are expected to grow steadily in the years to come. Thus, the objective of this study is to identify the factors that explain consumers' interest level in the four subject AFDSs and to quantitatively develop a profile of the likely users of these food delivery methods.

## Methodology

A survey instrument was developed to gather information on consumers' sociodemographic characteristics, their shopping habits and priorities, and their interest in using the services. One section of the survey instrument focused on the socioeconomic characteristics of the respondents. Questions in this section included age, gender, ethnicity, education, income, family size, employment status and work habits, and home access to fax machines, personal computers, and the Internet. Another section of the survey dealt with consumers' shopping habits and priorities—such as frequency of shopping, distance traveled to grocery stores, average food budget, etc. Respondents were also asked to rank, from 1 (least important) to 5 (most important), the importance of various considerations in choosing their food stores. These include selection and freshness of products, low prices, quality of service, convenience (that is, proximity to home or workplace), location (proximity to other stores of interest), store ap-

pearance (that is, ambience), and wait in the checkout line.

In another section of the survey, consumers were asked to reveal their level of interest in the four different AFDSs on a scale of 1 to 5, with 1 representing no interest and 5 representing very interested.<sup>3</sup> They also expressed their preferences regarding preferred payment methods, frequency and timing of home delivery, and interest in specific commodities for home delivery service. Two groups of customers were used to gather all relevant information. The first group of respondents was selected at random at Kings Supermarket (in various locations in New Jersey) and was invited to complete the questionnaire. Specifically, consumers were surveyed at five different locations in New Jersey. Each store was visited three times (twice during weekends and once during weekdays) and at two different time periods (mornings and afternoons). A reasonable balance was maintained with respect to the number of surveys completed at each store and the time periods. The second set of questionnaires was mailed to customers of Parmalat-Welch Farm, a company that is well-known in the tri-state area as a supplier of ice cream and other dairy and specialty dairy products. Welch Farms currently offers home delivery of specialty products in New Jersey. About 200 customers of Kings Supermarket completed the survey, and about 500 more customers of Welch Farms were contacted by mail survey (350 were returned). Of the completed/returned questionnaires, about 400 were usable for analysis.

### Model Specification

The objective of the study is to identify the factors that explain consumers' interest in AFDSs and to develop a profile of the likely users of these services. Specifically, a logit model is used to estimate the impacts of various socioeconomic and preference variables on the probability that a consumer is highly interested in a particular alternative

<sup>3</sup> Our study focuses only on measuring consumers' interest in using AFDSs; however, interest alone does not automatically translate into actual use of these services. Costs associated with these services are also important determinants of growth in these services. Another of our ongoing studies addresses the issue of how interest in these services changes when questions about cost and other factors are included. As such, the results of the study discussed in this paper should be interpreted in proper context.

food delivery method. The logit model—a model that is commonly used in situations with a binary dependent variable—is selected because the asymptotic characteristic of the model constrains the predicted probabilities between 0 and 1. Since the data represent individual, rather than group, observations, the standard choice of estimation method is the maximum likelihood (ML) method (Gujarati, 1992). Among the strengths of the ML estimator are consistent and asymptotically efficient parameter estimates (Pindyck and Rubinfeld, 1997).

The empirical model assumes that the probability of observing a high interest level (in a particular AFDS),  $P_i$ , depends on a vector of independent variables ( $X_{ij}$ ) associated with consumer  $i$  and variable  $j$ , and a vector of unknown parameters  $\beta$ :

$$(1) \quad P_i = F Z_i = F \beta X_i = 1 / [1 + \exp - Z_i],$$

where

$F(Z_i)$  = the value of logistic cumulative density function associated with each possible value of the underlying index  $Z_i$ , and

$P_i$  = the probability that an individual reveals high interest level in the particular alternative food delivery method, given the independent variables  $X_i$ s.

In the above equation,  $\beta X_i$  is a linear combination of the independent variables so that

$$(2) \quad Z_i = \log [P_i / 1 - P_i] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n + \varepsilon_i, \quad i = 1, 2, \dots, n,$$

where

$Z_i$  = unobserved index level or the log odds of choice for the  $i$ th observation;

$i$  = observations;

$\beta$  = parameters to be estimated; and

$\varepsilon$  = random error or disturbance term.

The dependent variable  $Z_i$  in equation (2) is the logarithm of the probability that a particular choice will be made. The estimated parameters of equation (1) do not directly represent the marginal effects of the independent variables on  $P_i$ . For a

continuous variable, the marginal effect on the probability  $P_i$  that the dependent variable ( $y$ ) takes the value  $y_i = 1$  is given by

$$(3) \partial P_i / \partial x_{ij} = [\beta_j \exp - \beta X_i] / [1 + \exp - \beta X_i]^2.$$

However, if the independent variables are also qualitative or discrete in nature as is the case for most of the independent variables used in the model,  $\partial P_i / \partial x_{ij}$  does not exist. In such cases, the marginal effect of a discrete independent variable is obtained by evaluating  $P_i$  at alternative values of  $x_{ij}$ . Marginal effects of such variables are determined as:

$$(4) \partial P_i / \partial x_{ij} = P_{y_i: x_{ij}} - P_{y_i: x_{ij}} = 0.$$

In empirical analysis, the following model is used to predict the probability that an individual would reveal high interest in using one of the alternative food delivery methods:

$$(5) \text{Interest} = \beta_0 + \beta_1 \text{Intoth} + \beta_2 \text{fdbgt2} + \beta_3 \text{fdbgt3} + \beta_4 \text{Dis} + \beta_5 \text{Sel} + \beta_6 \text{Frsh} + \beta_7 \text{Pr} + \beta_8 \text{Qlty} + \beta_9 \text{Conv} + \beta_{10} \text{Appr} + \beta_{11} \text{Wait} + \beta_{12} \text{Fsz} + \beta_{13} \text{Alt35} + \beta_{14} \text{A35-45} + \beta_{15} \text{Gndr} + \beta_{16} \text{Mar} + \beta_{17} \text{Emp} + \beta_{18} \text{Ilt50} + \beta_{19} \text{I50-100} + \beta_{20} \text{College} + \beta_{21} \text{Grad} + \beta_{22} \text{Prmshop} + \epsilon,$$

where

Interest = 1 if the consumer reveals a high interest level in the particular alternative food delivery method and 0 otherwise;

Intoth = level of interest in receiving other food items via the delivery service (this variable is excluded from models for home delivery of full grocery line and drive-through pick-up service)<sup>4</sup>;

- Fdbgt1 = 1 if the household spends less than \$200 per month on food and 0 otherwise;
- Fdbgt2 = 1 if the household spends between \$200 and \$400 per month on food and 0 otherwise;
- Fdbgt3 = 1 if the household spends more than \$400 per month on food and 0 otherwise;
- Dis = Average driving distance to the usual grocery shopping site;
- Sel = 1 if the respondent assigns high importance to the selection of products in choosing a food store and 0 otherwise;
- Frsh = 1 if the consumer attaches high importance to the freshness of products in choosing a food store and 0 otherwise;
- Pr = 1 if the consumer attaches high importance to low prices of products in choosing a food store and 0 otherwise;
- Qlty = 1 if the consumer attaches high importance to the quality of service in choosing a food store and 0 otherwise;
- Conv = 1 if the consumer attaches high importance to the convenience of location in choosing a food store and 0 otherwise;
- Appr = 1 if the consumer attaches high importance to the store appearance in choosing a food store and 0 otherwise;
- Wait = 1 if the consumer attaches high importance to the wait at the checkout line in choosing a food store and 0 otherwise;
- Fsz = number of members in the family;
- Alt35 = 1 if the individual respondent is less than 35 years of age and 0 otherwise;
- A35-45 = 1 if the individual respondent is between 35 and 45 years of age and 0 otherwise;
- Agt45 = 1 if the individual respondent is above 45 years of age and 0 otherwise;

<sup>4</sup> Home delivery of full grocery line includes all items, and therefore, interest in home delivery of other items (that is, variable *Intoth*) is not included as an explanatory variable. Similarly, drive-through pick-up service does not involve home delivery, and consequently, interest in home delivery of specific items is not relevant for this model.

Gndr =	1 if the individual respondent is female and 0 otherwise;
Mar =	1 if the individual respondent is married and 0 otherwise;
Emp =	1 if the individual respondent is employed and 0 otherwise;
Ilt50 =	1 if the (annual) income is less than \$50,000 and 0 otherwise;
I50-100 =	1 if the (annual) income is between \$50,000 and \$100,000 and 0 otherwise;
Igt100 =	1 if the (annual) income is above \$100,000 and 0 otherwise;
School =	1 if the respondent holds a high school diploma or less and 0 otherwise;
College =	1 if the respondent holds an associate or a four-year college diploma and 0 otherwise;
Grad =	1 if the respondent holds a graduate degree (M.S. or Ph.D.) and 0 otherwise; and
Prmshop =	1 if the respondent is the primary shopper for household and 0 otherwise.

### Data Description and Summary Statistics

The dependent variable is the level of interest in each of the four alternative models. As described earlier, consumers were asked to express their interest on a scale of 1 (implying not interested) to 5 (indicating very interested). On the basis of survey responses, a binary dependent variable, *Interest*, was created as follows: The variable *Interest* was assigned a value of 1 if the level of interest was 4 or 5 and 0 if the interest level was 3 or below. Approximately 53 percent of the responses fell into the category 1, and the remaining 47 percent fell into category 0; however, when asked about their interest level in using the four alternative delivery systems for specific products, there were noticeable differences in response. The distribution of re-

spondents' interest level for different product categories and delivery mechanisms is summarized in Table 1.

More than 50 percent of respondents expressed high interest in obtaining milk and other dairy products, irrespective of the delivery mechanism. Similarly, more than one-half of the respondents indicated high interest in receiving fresh produce in cases of three of the four delivery methods, with home delivery of prepared meals being the exception. In the contexts of home delivery of full grocery line and drive-through pick-up service, more than 50 percent of the surveyed individuals expressed high interest level in obtaining canned goods, soda and other drinks, dry goods, and frozen food. More than one-half of the survey participants revealed high interest in seafood in the contexts of home delivery of prepared meals and neighborhood truck-delivery service. High interest in obtaining meat and poultry products via neighborhood truck delivery method was expressed by more than one-half of the respondents; the same is true about prepared meals via drive-through pick-up service. High interest in newspaper delivery was expressed by less than one-half of the survey participants, irrespective of the delivery method used. This may be due to the fact that households already have the option of newspaper delivery and, hence, may not see the particular value of receiving this item through any of the four delivery mechanisms outlined in the survey.

The independent variables in the model included demographic and other economic variables, which are dummy or indicator variables in most cases. Descriptive statistics on the explanatory variables used in the analysis are presented in Table 2. The following are specific variables included in the model:

- *Intoth*: This variable represents consumers' interest in obtaining various individual items to be delivered along with home delivery of prepared meals or neighborhood truck delivery of vegetables and meat products. Included among these items are products such as soda, newspapers and magazines, milk and staples, seafood, etc. Consumers' stated levels of interest (on a scale of 1 to 5) for each of these items are added to compute the variable *Intoth*.

**Table 1. Distribution of Stated Interest Level in Alternative Food Delivery Systems by Product Type.**

Delivery Method	Level of Interest of Respondents				
	5	4	3	2	1
<i>Home Delivery of Full Line of Grocery</i>					
	-----percent-----				
Prepared Meals	38.3	10.8	19.5	6.1	25.3
Fresh Produce	48.2	16.8	12.4	2.9	19.7
Canned Goods	50.5	11.4	15.0	2.9	20.1
Meat and Poultry	39.1	11.5	18.3	5.7	25.4
Milk	72.7	8.4	10.5	0.7	7.6
Dairy Products	62.0	10.9	12.7	2.2	12.3
Soda & Drinks	49.8	14.1	12.3	4.8	19.0
Dry Goods	50.5	12.8	16.1	3.3	17.2
Newspaper	34.0	5.4	8.9	1.9	49.8
Frozen Food	44.6	16.4	15.0	5.0	18.9
Seafood	38.2	2.2	19.1	4.5	36.0
<i>Home Delivery of Prepared Meals</i>					
Prepared Meals	—	—	—	—	—
Fresh Produce	35.5	13.2	18.9	7.5	24.9
Canned Goods	20.1	5.6	12.9	10.8	50.6
Meat and Poultry	28.2	13.5	18.9	5.4	34.0
Milk	74.7	4.5	9.8	0.0	10.9
Dairy Products	60.8	9.4	13.2	3.0	13.6
Soda & Drinks	27.7	12.5	18.4	5.9	35.5
Dry Goods	23.3	8.0	21.7	8.4	38.6
Newspaper	27.1	7.3	9.3	5.3	51.0
Frozen Food	22.1	12.6	19.8	7.1	38.3
Seafood	58.8	5.9	13.2	2.9	19.1
<i>Drive-Through Pick-Up Service</i>					
Prepared Meals	41.6	15.6	15.6	2.5	24.7
Fresh Produce	41.2	17.9	12.0	6.9	22.0
Canned Goods	43.8	15.2	12.4	4.9	23.7
Meat and Poultry	31.5	12.6	19.2	7.3	29.4
Milk	62.7	8.4	10.8	1.7	16.4
Dairy Products	59.4	13.4	12.0	2.1	13.1
Soda & Drinks	52.1	20.4	9.6	3.9	13.9
Dry Goods	43.3	17.3	13.0	4.2	22.2
Newspaper	36.5	7.4	10.7	3.0	42.4
Frozen Food	38.0	15.5	11.6	6.7	28.2
Seafood	41.9	5.8	8.1	7.0	37.2
<i>Neighborhood Truck Delivery</i>					
Prepared Meals	35.4	10.3	15.7	5.8	32.7
Fresh Produce	59.9	15.5	15.5	2.6	6.5
Canned Goods	24.5	6.4	22.3	8.2	38.6
Meat and Poultry	44.9	15.3	19.5	2.1	18.2
Milk	64.3	9.0	13.1	0.5	13.1
Dairy Products	55.9	11.3	17.1	3.6	12.2
Soda & Drinks	29.1	10.5	16.8	7.7	35.9
Dry Goods	29.3	6.3	21.6	6.3	36.5
Newspaper	25.5	2.4	9.0	3.3	59.9
Frozen Food	33.8	10.8	22.1	3.6	29.7
Seafood	64.3	0.0	21.4	0.0	14.3



**Table 2. Descriptive Statistics of Variables.<sup>a</sup>**

Variable	Description of Variable	Mean	Standard Deviation
Intoth	Level of interest in receiving other items via home delivery	28.54	14.14
Fdbgt1*	1 = (monthly) food budget less than \$200; 0 = otherwise	0.33	0.47
Fdbgt2	1 = food budget between \$200 to \$400; 0 = otherwise	0.44	0.50
Fdbgt3	1 = food budget greater than \$400; 0 = otherwise	0.23	0.42
Dis	Average driving distance to commonly used supermarket	4.27	4.38
Sel	1 = product selection is highly important in choosing a place to shop; 0 = otherwise	0.77	0.42
Frsh	1 = product freshness is highly important in choosing a place to shop; 0 = otherwise	0.85	0.35
Pr	1 = low product prices are highly important in choosing a place to shop; 0 = otherwise	0.58	0.49
Qty	1 = service quality is highly important in choosing a place to shop; 0 = otherwise	0.78	0.41
Appr	1 = store appearance is highly important in choosing a place to shop; 0 = otherwise	0.66	0.47
Conv	1 = convenience of location (near home/work) is highly important in choosing a place to shop; 0 = otherwise	0.67	0.47
Wait	1 = wait in checkout line is highly important in choosing a place to shop; 0 = otherwise	0.64	0.48
Fsz	Number of people in the household	3.68	1.22
Alt35	1 = age below 35 years; 0 = otherwise	0.25	0.44
A35-45	1 = age between 35 and 45 years; 0 = otherwise	0.41	0.49
Agt45*	1 = age greater than 5 years; 0 = otherwise	0.34	0.47
Mar	1 = married; 0 = otherwise	0.81	0.39
Gndr	1 = female; 0 otherwise	0.79	0.4
Emp	1 = employed; 0 = otherwise	0.67	0.47
Ilt50	1 = income below \$35,000; 0 = otherwise	0.16	0.26
I50-100	1 = income between \$50,000 and \$100,000; 0 = otherwise	0.40	0.49
Igt100*	1 = income greater than \$100,000; 0 = otherwise	0.44	0.50
School*	1 = education up to high school; 0 = otherwise	0.27	0.44
College	1 = associate or four-year college degree; 0 = otherwise	0.49	0.50
Grad	1 = graduate degree; 0 = otherwise	0.24	0.43
Prmshop	1 = primary shopper; 0 = otherwise	0.87	0.34

<sup>a</sup> An asterisk denotes that the variable was dropped during estimation to avoid the dummy variable trap. The variable *Intoth* was used for the home delivery of prepared meals and neighborhood truck delivery (of vegetables and meat products) models only.

- **Food Budget:** This variable denotes average household food expenditure per month. The respondents are categorized into three groups according to the size of their food budget, and three dummy variables are defined to represent these groups as follows: (1) less than \$200 (*Fdbgt1*); (2) between \$200 and \$400 (*Fdbgt2*); and (3) more than \$400 (*Fdbgt3*). Thirty-three percent of the respondents belong to group 1; 44 percent belong to group 2; and the remaining 23 percent belong to group 3. No a priori assumption is made regarding the likely effect of the food budget on consumers' level of interest in using the AFDSs.
- **Age:** Three age groups are identified as follows: (1) less than 35 years (*Alt35*); (2) between 35 and 45 years (*A35-45*); and (3) more than 45 years (*Agt45*). Twenty-five percent of the respondents belong to category 1; 41 percent belong to category 2; and the remaining 34 percent belong to category 3.
- **Gender:** The dummy variable *Gndr* is assigned a value of 1 if the respondent is female and 0 otherwise. Seventy-nine percent of the respondents are female while the remaining 21 percent are male. No a priori assumption is made regarding the effect of gender on the dependent variable.
- **Education:** Three different levels of education are identified, and accordingly, three dummy variables are defined as: (1) high school diploma or less (*School*); (2) associate degree and four-year college degree (*College*); and (3) graduate degree (*Grad*). Twenty-seven percent of the respondents have education up to a high school diploma; 49 percent hold an associate or four-year college degree; and 24 percent hold a graduate degree. A priori, it is expected that consumers with higher education are likely to be more interested in using one or more of the AFDSs.
- **Employment:** The dummy variable *Emp* is assigned a value of 1 if the respondent is employed and 0 otherwise. A priori, it is expected that employed consumers are more likely to use one or more of the AFDSs.
- **Income:** Three different (annual) income levels are identified, and accordingly, three dummy variables are defined as follows: (1) less than \$50,000 (*Ill50*); (2) between \$50,000 and \$100,000 (*I50-100*); and (3) more than \$100,000 (*Igt100*). Sixteen percent of the respondents have income below \$50,000; 40 percent have income between \$50,000 and \$100,000; and the remaining 44 percent have income greater than \$100,000. It is generally expected that consumers with higher incomes are likely to be more interested in using one or more of the services.
- **Family Size:** Family size is defined as the number of members in the family.
- **Marital Status:** A dummy variable *Mar* is defined by assigning a value of 1 if the respondent is married and 0 otherwise. Eighty-one percent of the respondents are married.
- **Distance:** The variable *Dis* represents the distance (in miles) of the respondent's home and the supermarket where s/he usually goes for grocery shopping. It is expected that the longer the driving distance, the more likely that the individual will have high interest in using the AFDSs.
- **Product Selection:** The dummy variable *Sel* is assigned a value of 1 if the consumer ranked the importance of product selection as 4 or 5 and 0 otherwise. A priori, the effect of this variable on the dependent variable could be either positive or negative.
- **Product Freshness:** The dummy variable *Frsh* is assigned a value of 1 if the respondent ranked the importance of product freshness as 4 or 5 and 0 otherwise. No assumption is made on the likely impact of this variable on the dependent variable.
- **Low Prices:** The dummy variable *Pr* is assigned a value of 1 if the consumer ranked the importance of low prices as 4 or 5 and 0 otherwise. It is expected that those attaching high importance to low prices are less likely to be interested in the AFDSs since these services are expected to be associated with some costs.

- *Service Quality*: The dummy variable *Ser* is assigned a value of 1 if the consumer ranked the importance of service quality as 4 or 5 and 0 otherwise. No assumption is made about the direction of the impact of this variable on the dependent variable.
- *Convenience*: The dummy variable *Conv* is assigned a value of 1 if the consumer ranked the importance of convenience (that is, proximity to home or workplace) as 4 or 5 and 0 otherwise. It is expected that those attaching high importance to convenience are likely to be interested in the AFDSs.
- *Appearance*: The dummy variable *Appr* is assigned a value of 1 if the consumer ranked the importance of store appearance (ambience factor) as 4 or 5 and 0 otherwise. No assumption is made about the likely impact of this variable.
- *Waiting*: The dummy variable *Wait* is assigned a value of 1 if the consumer ranked the importance of the wait in the checkout line as 4 or 5 and 0 otherwise. It is expected that those attaching high importance to the wait in the checkout line are more likely to be interested in using the AFDSs.

In addition to the variables described above, we found in our sample that, among the married couples, 69 percent of respondents both held jobs. Only 31 percent of these households had one spouse working. Sixteen percent of all respondents were single but working full-time, and only 3 percent of all survey participants were retired. On the average (over all respondents), individuals worked 4.77 days a week, and the average workday was 10.3 hours. Among all respondents, 5.3 percent reported food shopping once a month; 11.3 percent reported a bi-weekly food shopping pattern; and 35.8 percent of the households shopped for food only once a week. About 36.4 percent of the respondents reported food shopping 2 to 3 days a week while 10.59 percent reported shopping more than three times a week. About 79 percent of the survey participants reported having a personal computer at home; 68 percent reported having Internet access; and 49 percent of the households reported having a fax machine.

Initially, during the estimation stage, variables such as the following were included as exploratory variables: location of the store (that is, proximity to other stores); ethnic origin of the respondent; home access to fax machine, personal computers, and the Internet; frequency of shopping; and whether one spouse worked outside the home. However, these variables were found to be statistically insignificant in all models and, consequently, were dropped from the final analysis.

A significant portion of survey participants are patrons of Parmalat-Welsh Farm Company and use the company's home delivery service for ice cream and specialty dairy products. So, it was reasonable to expect that consumers with prior experience with home delivery of food items would respond differently than those without similar prior experience. Therefore, we initially estimated the model with data from the two separate groups; however, we did not find meaningful differences in the results from the two estimated models. Also, sample sizes were rather small. We then decided to pool the two samples, estimating the model that included a dummy variable to account for the potential effects of prior exposure to home delivery system on our model estimates and results. The coefficient of the dummy variable was found to be statistically insignificant. A likelihood ratio test led us to the same conclusion; therefore, the dummy variable was excluded in the estimation of the final model.

### Model Estimation, Results, and Discussion

The logistic model was estimated, using the econometric software *LIMDEP*, to explain and predict consumers' levels of interest in using the four AFDSs. The estimated model coefficients, the associated t-ratios, and the marginal impacts of the variables on the dependent variable are reported in Tables 3 through 6. These tables also report the estimated log likelihood functions of the unrestricted and restricted (that is, all slope coefficients are 0) models, McFadden's  $R^2$ , and prediction success.

#### *Home Delivery of Prepared Meals*

Results of model estimation for home delivery of prepared meals are reported in Table 3. Coefficients of food budgets higher than \$400; interest in the home delivery of other items; age

**Table 3. Home Delivery of Prepared Meals.<sup>a</sup>**

Variable	Coefficient	t-ratio	Marginal Effect
Constant	-2.57	-3.18	
Fdbgt2	0.399	1.30	na
Fdbgt3*	0.898	2.32	0.200
Intoth*	0.089	7.24	0.020
Dis	-0.033	-1.08	na
Sel	0.351	0.74	na
Frsh*	-1.360	-2.33	-0.302
Pr	-0.114	-0.47	na
Qty*	1.198	2.58	0.266
Conv*	0.835	2.78	0.186
Appr*	-0.772	-2.26	-0.172
Wait*	0.831	2.46	0.185
Fsz*	-0.344	-2.90	-0.077
Alt35**	0.618	1.82	0.137
A35-45	0.148	0.47	na
Gndr	0.048	0.14	na
Mar**	-0.634	-1.72	-0.141
Emp	0.347	1.23	na
Ht50	0.032	0.07	na
I50-100	0.023	0.08	na
College	0.304	0.98	na
Grad*	0.833	2.16	0.185
Prmshop	-0.285	-0.63	na
LL			-200.44
Restricted LL			-268.50
Chi-Square (22)			136.13
No. of Obs			405
McFadden's R <sup>2</sup>			0.21

Actual	Predicted		TOTAL
	0	1	
0	216	36	252
1	57	96	153
Total	273	132	405

<sup>a</sup> LL denotes the log likelihood function. Single and double asterisks denote that the variable is significant at the 5% and 10% level, respectively. Marginal effects are calculated only for variables that are statistically significant. na denotes that the variable is statistically insignificant, and consequently, marginal effect is not calculated. Marginal effects are calculated at mean values of the explanatory variables *Intoth*, *Dis*, and *Fsz*.

**Table 4. Home Delivery of Full Grocery Line.<sup>a</sup>**

Variable	Coefficient	t-ratio	Marginal Effect
Constant	0.407	0.56	
Fdbgt2*	0.862	2.95	0.215
Fdbgt3*	1.058	2.93	0.264
Dis	-0.004	-0.14	na
Sel**	-0.565	-1.83	-0.141
Frsh**	-0.660	-1.95	-0.165
Pr*	-0.603	-2.31	-0.150
Qty**	0.666	1.84	0.166
Conv*	0.618	2.15	0.154
Appr*	-0.723	-2.49	-0.180
Wait*	0.860	2.91	0.215
Fsz*	-0.376	-3.43	-0.094
Alt35*	0.627	1.99	0.156
A35-45	0.372	1.28	na
Gndr	0.347	0.99	na
Mar	0.152	0.42	na
Emp*	0.567	2.18	0.141
Ilt50	0.016	0.04	na
I50-100	0.247	0.88	na
College	-0.089	-0.31	na
Grad**	0.724	1.94	0.181
Prmshop*	-0.922	-2.10*	-0.230
LL			-219.64
Restricted LL			-273.43
Chi-Square (21)			107.57
No. of Obs			395
McFadden's R <sup>2</sup>			0.15

Actual	Predicted		TOTAL
	0	1	
0	154	52	206
1	59	130	189
Total	213	182	395

<sup>a</sup> LL denotes the log likelihood function. Single and double asterisks denote that the variable is significant at the 5% and 10% level, respectively. Marginal effects are calculated only for variables that are statistically significant. na denotes that the variable is statistically insignificant, and consequently, marginal effect is not calculated. Marginal effects are calculated at mean values of the explanatory variables *Intoth*, *Dis*, and *Fsz*.

**Table 5. Drive-Through Pick-up Service.<sup>a</sup>**

Variable	Coefficient	t-ratio	Marginal Effect
Constant	-2.255	-3.18	
Fdbgt2*	0.743	2.76	0.185
Fdbgt3*	0.709	2.11	0.176
Dis*	0.101	3.09	0.025
Sel*	-0.798	-2.15	-0.198
Frsh	0.158	0.32	na
Pr*	-0.737	-3.00	-0.183
Qty	0.452	1.21	na
Conv*	0.784	2.99	0.195
Appr*	-0.620	-2.13	-0.154
Wait*	0.927	3.47	0.231
Fsz*	0.381	3.63	0.095
Alt35	0.209	0.68	na
A35-45	-0.125	-0.46	na
Gndr	0.016	0.05	na
Mar**	-0.595	-1.73	-0.148
Emp*	0.637	2.49	0.158
Ilt50	0.007	0.02	na
I50-100	0.207	0.77	na
College	0.238	0.87	na
Grad**	0.728	2.07	0.181
Prmshop	-0.465	-1.18	na
LL			-235.23
Restricted LL			-285.63
Chi-Square (21)			100.79
No. of Obs			413
McFadden's R <sup>2</sup>			0.13

Actual	Predicted		TOTAL
	0	1	
0	131	64	195
1	59	159	218
Total	190	223	413

<sup>a</sup> LL denotes the log likelihood function. Single and double asterisks denote that the variable is significant at the 5% and 10% level, respectively. Marginal effects are calculated only for variables that are statistically significant. na denotes that the variable is statistically insignificant, and consequently, marginal effect is not calculated. Marginal effects are calculated at mean values of the explanatory variables *Intoth*, *Dis*, and *Fsz*.

**Table 6. Neighborhood Truck Delivery of Vegetable and Meat Products.<sup>a</sup>**

Variable	Coefficient	t-ratio	Marginal Effect
Constant	-5.96	-5.57	
Intoth*	0.095	8.07	0.019
Fdbgt2	0.038	0.11	na
Fdbgt3	0.637	1.53	na
Dis*	0.111	2.93	0.022
Sel*	1.74	3.16	0.350
Frsh	-0.801	-1.29	na
Pr	-0.306	-1.14	na
Qlty	-0.099	-0.23	na
Conv*	0.910	2.53	0.183
Appr*	-1.000	-3.11	-0.201
Wait	-0.437	-1.55	na
Fsz	-0.187	-1.55	na
Alt35**	-0.559	-1.75	-0.113
A35-45	-0.130	-0.39	na
Gndr*	1.389	3.03	0.279
Mar	0.632	1.44	na
Emp	0.423	1.35	na
Ilt50**	0.886	1.85	0.179
I50-100	0.218	0.63	na
College**	0.625	1.81	0.126
Grad	0.340	0.76	na
Prmshop	0.322	0.63	na
LL			-168.04
Restricted LL			-252.83
Chi-Square (22)			169.59
No. of Obs			393
McFadden's R <sup>2</sup>			0.30

Actual	Predicted		TOTAL
	0	1	
0	229	29	258
1	47	88	135
Total	276	117	393

<sup>a</sup> LL denotes the log likelihood function. Single and double asterisks denote that the variable is significant at the 5% and 10% level, respectively. Marginal effects are calculated only for variables that are statistically significant. na denotes that the variable is statistically insignificant, and consequently, marginal effect is not calculated. Marginal effects are calculated at mean values of the explanatory variables *Intoth*, *Dis*, and *Fsz*.

less than 35 years and education level beyond four-year college; family size; and marital status have statistically significant (at 10 percent or lower level) effects on consumers' interest in using this particular service. Similarly, high importance of product freshness, service quality, convenience of location, store appearance, and wait in the checkout line all have statistically significant effects. On the other hand, effects of distance, food budgets between \$200 and \$400, age group between 35 and 45 years, education with an associate or a four-year college degree, importance of product selection and low prices, income level, employment status, and respondent as primary shopper are found to be statistically insignificant.

The estimated marginal effects of the independent variables included in the model suggest that those who attach high importance to service quality, convenience of location, and wait in the checkout line are 26.6, 18.6, and 18.5 percent, respectively, more likely to have high interest in home delivery service for prepared meals. Households with food budgets higher than \$400 are 20 percent more likely to be interested in this service compared to those spending less than \$200 per month on food. Individuals below the age of 35 years are 13.7 percent more likely (compared to those above 45 years of age), and those with graduate education are 18.5 percent more likely (compared to those with education of high school diploma or less) to have high interest in this particular food delivery system. Although statistically significant, interest in the home delivery of other products has only a small marginal effect on the dependent variable. On the other hand, those attaching high importance to product freshness and store appearance are 30.2 and 17.2 percent, respectively, less likely to have high interest in the service. Also, larger households and married individuals are 7.7 and 14.1 percent, respectively, less likely to have high interest in this particular method of food delivery.

The likelihood ratio test of overall model significance (that is, all coefficients except the intercept are simultaneously 0) yields a test statistic of 136.13, which is higher than the 95 percent critical value of Chi-square distribution with appropriated degrees of freedom that suggest that the model has significant explanatory power. Estimated McFadden's  $R^2$  is 0.21. The

estimated model correctly predicts 317 of 405 sample observations, with a prediction success rate of 78 percent.

#### *Home Delivery of Full Grocery Line*

Estimation results for the home delivery of full grocery line model are reported in Table 4, showing that coefficients of food budgets between \$200 and \$400 and that family size, age below 35 years, employment status, and graduate education for budgets above \$400 are statistically significant at 10 percent or lower level. Similarly, importance of product selection and product freshness, low prices, service quality, convenience of location, store appearance, wait in checkout line, and respondent as primary shopper have significant effects on the consumers' interest in using this model of food delivery. On the other hand, age between 35 and 45 years, gender, marital status, income level, associate or college degree level education, and distance seem to have insignificant effects on consumers' interest level in this service.

The estimated marginal effects suggest that consumers with age below 35 years are 15.6 percent more likely (compared to those above 45 years), and those with graduate education are 18.1 percent more likely (compared to those with high school diploma or less) to be interested in home delivery of full grocery line. Similarly, households with food budget between \$200 and \$400 and above \$400 are 21.5 and 26.4 percent, respectively, more likely to be interested in this service (compared to those with food budget below \$200). Employed individuals are 14.1 percent more likely while the primary shopper in the household is 23 percent less likely to be interested in this model of food delivery. Similarly, those attaching high importance to service quality, convenience of location, and wait in checkout line are 16.6, 15.4, and 21.5 percent, respectively, more likely to have high interest in this service. On the other hand, those attaching high importance to product selection, product freshness, and low prices are 14.1, 16.5, and 15 percent, respectively, less likely to be interested in using this service. Similarly, those attaching high priority to store appearance and those with larger family size are 18 and 9.4 percent, respectively, less likely to be interested in using this food delivery method.

Likelihood ratio tests of the null hypothesis that all slope coefficients are simultaneously 0 yield a test



statistic of 107.57, which clearly exceeds the 95 percent critical value of the Chi-square distribution with appropriate degrees of freedom. Estimated McFadden's  $R^2$  is 0.15. The model correctly predicts 290 of 395 observations, with a prediction success rate of 73.4 percent.

#### *Drive-Through Pick-Up Service*

The results for the drive-through pick-up model are reported in Table 5. Results show that coefficients of two food budgets, distance, family size, marital and employment statuses, and graduate education are statistically significant at 10 percent or lower level. Similarly, concern about the selection, low prices, convenience of location, store appearance, and wait in the checkout line are important determinants of consumers' level of interest in using this particular service. On the other hand, importance of product freshness, service quality, education with two-year or four-year college degree, age distribution, gender, income level, and respondent as primary shopper have statistically insignificant effects on consumers' (high) interest in using this service.

The estimated marginal effects indicate that households with food budget between \$200 and \$400 and above \$400 are 18.5 and 17.6 percent, respectively, more likely to be interested in the drive-through pick-up service compared to those with food budget below \$200. Individuals with graduate degree and those with larger family size are 18.1 and 9.5 percent, respectively, more likely to have high interest in this mode of accessing food. Similarly, consumers attaching high importance to convenience and the wait at the checkout line are 19.5 and 23.1 percent, respectively, more likely to be interested in this service. Although the coefficient of distance is statistically significant, its marginal effect on consumers' interest level is very low. On the other hand, consumer concern over selection of products, low prices, and appearance of the store are 19.8, 18.3, and 15.4 percent, respectively, less likely to be interested in using the drive-through service. Also, married individuals are 14.8 percent less likely to use this model of food delivery compared to those who are single (that is, never married, separated, or widowed).

Estimated likelihood ratio statistic for overall model significance is 100.79, which is clearly higher than the 95 percent critical value of the Chi-Square distribution with appropriate degrees of

freedom. McFadden's  $R^2$  for this model is 0.13. The model correctly predicts 290 of 413 observations, implying a prediction success rate of 70.2 percent.

#### *Neighborhood Truck Delivery of Vegetables and Meat Products*

Model estimation results for neighborhood truck delivery of vegetables and meat products are presented in Table 6. Results show that coefficients of interest in other products, distance, age below 35 years, gender, income below \$50,000, and education level with an associate or four-year college degree are statistically significant. Similarly, importance of product selection, convenience of location (of food store), and store appearance have coefficients that are statistically significant. On the other hand, coefficients of different food budgets, employment and marital statuses, income between \$50,000 and \$100,000, age between 35 and 45 years, family size, graduate education, primary shopper status, importance of product freshness, low prices, and wait in the checkout line are statistically insignificant.

Estimated marginal effects suggest that females are 27.9 percent more likely to have high interest in the neighborhood truck delivery service. Individuals with (annual) income below \$50,000 are 17.9 more likely (compared to those with income above \$100,000), and those with an associate or four-year college degree are 12.6 percent more likely (compared to those with a high school diploma or less) to be interested in using this food delivery method. Similarly, those attaching high importance to product selection and convenience of location are 35 and 18.3 percent, respectively, more likely to have high interest in this service. Although interests in other products and distance have coefficients that are statistically significant, their marginal effects are very low. On the other hand, those attaching high importance to store appearance and individuals below 35 years of age are 20.1 and 11.3 percent, respectively, less likely to be interested in using this particular model of food delivery.

Estimated likelihood ratio statistic for overall model significance is 169.59, which clearly exceeds the 95 percent critical value of the Chi-Square distribution with appropriate degrees of freedom, implying significant model explanatory power. Estimated McFadden's  $R^2$  for the model is

0.30. The model correctly predicted 317 of 393 observations, yielding a prediction success rate of 80.7 percent.

### *Discussion*

Empirical results of this study suggest that consumers' attitudes, preferences, and priorities with respect to quality of food items and convenience of obtaining them are important determinants of their interest level and, consequently, their likelihood of using alternative methods of accessing food. For example, consumers attaching high importance to low prices of products are significantly less likely to be interested in three of the four AFDSs analyzed in this study. Similarly, consumer concerns over quality and diversity of products, such as freshness and selection of products and store appearance (ambience), generally have negative effects on consumers' interest in using the AFDSs. On the other hand, convenience factors generally have positive impacts on consumer interest in using the AFDSs. For instance, consumers attaching high importance to factors such as distance, convenience of location, service quality, and wait in the checkout line are statistically more likely to be interested in using one or more of the AFDSs. This suggests that companies, in their attempts to reach their customers via alternative food delivery methods, need to address not only the convenience issue, but also the issues of quality and diversity of products and competitive prices.

Among the sociodemographic variables, younger customers (that is, those below the age of 35 years) are more likely to use the alternative channels for accessing food, except the neighborhood truck delivery method in which these individuals are less likely to be interested. The limited interest by this group in neighborhood truck delivery may relate largely to delivery time. Results suggest that no significant difference in interest in the AFDSs among individuals in age group 35 to 45 years compared to those above 45 years. Gender difference matters only in the case of neighborhood truck delivery method (where females are more interested than male customers) while marital status matters for home delivery of prepared meals and drive-through pick-up service, the effect being negative in both cases. Family size has mixed impacts: Larger households are less likely to use home delivery service for either the prepared meals or full grocery line whereas they are more likely to use drive-through pick-up service.

Individuals with higher education beyond high school are more likely to use one or more of these shopping methods, although graduate-level education seems to matter more than college-level education. Households with food budget (monthly) above \$200 seem to have high interest in using one of these services.

Results also indicate that income differences do not have significant impacts for the sample used in this study. However, it may be noted that respondents in the survey came from relatively affluent segments of the society (about one-half of the individuals participating in the survey had annual income above \$100,000), and income differences at those income levels may not be important for food consumption and for accessing decisions. The results of this study, therefore, must be interpreted in proper context.

It is difficult to compare the results of this study with those of other studies since academic research is yet to fully explore the issue of consumers' willingness to use alternative mechanisms to access food. In analyzing consumers' attitudes toward a particular product or service, researchers have used alternative scaling methods in measuring consumers' attitudes and perceptions. For example, Hinson, Harrison, and Andrews (1998) use a dichotomous response (yes/no) method in analyzing consumers' attitudes toward food irradiation. Underhill and Figuero (1996) use a five-point scale in analyzing consumers' perceptions of non-conventionally grown produce, while Kreider, Gempesaw, and Bacon (1993) use a seven-point scale to study consumers' perceptions of fish and seafood products. Other researchers have used even wider scale in measuring consumers' interest and perceptions about various products. As is apparent, the subject matter of most of these studies is quite different from that of ours; therefore, using a different scale, it is difficult to compare our results to their results. However, our results may be compared with at least two previous studies focusing on consumers' willingness to use alternative mechanisms to access food. These two studies by White (1996), and Hiser, Nayga, and Capps (1999) both focus exclusively on consumers' willingness to use online shopping.

In Hiser, Nayga, and Capps' (1999) study, which uses a dichotomous response (yes/no), 34 percent of the respondents were willing to use online shopping services, and 53 percent of the

respondents revealed high interest in at least one of the four alternative food delivery mechanisms. A higher percentage of our respondents revealed high interest level than did the respondents in Hiser, Nayga, and Capps' (1999) study. This finding may be due to the fact that our delivery options are not exclusively Internet-based. In addition, average education and income levels in our sample are higher than those in the other study, and there are significant differences in life patterns between the samples in these two studies. Despite these differences in characteristics of the two samples, our results are consistent with some of the findings of Hiser et al. For instance, our findings—that younger consumers and those with college-level education or higher are more likely to have high interest in AFDSs—are similar to the findings of Hiser, Nayga, and Capps. Similarly, consistent with the above-mentioned study, we find that consumers who attach high importance to convenience and quality of services are more likely, whereas those concerned with product quality and prices are less likely, to use one or more of the alternative methods of accessing food.

White (1996) uses a three-level response system (very/somewhat unlikely, neither likely or unlikely, and somewhat/very likely) to measure consumers' interest in online shopping for specialty food and drinks (specifically, on three items—coffee, salsa, and drinks). He found that about 68 percent of the survey participants were very/somewhat unlikely to use online shopping, 11 percent were neither likely nor unlikely to use the service, and 21 percent responded as somewhat/very unlikely. However, about 58 percent of survey participants indicated willingness to use online shopping within the next six months to buy food items from at least one company. About 19 percent of the respondents expressed willingness to buy coffee online, while 29 percent and 13 percent indicated their willingness to use online shopping to purchase salsa and seafood, respectively. The percentage of respondents in that study who expressed willingness to use online shopping is lower than the percentages in Hiser, Nayga, and Capps' (1999) study and in the current study. In contrast to Hiser, Nayga and Capps' study and our study, White (1996) finds younger people to be less likely to use online shopping for food.

Hiser, Nayga, and Capps' study and our study suggest that younger individuals are more likely to use such alternative channels to access food. Such differences could be due to the fact that the data for the White (1996) study was collected in 1996, almost two years before the data was collected for Hiser, Nayga, and Capps' (1999) study and three years prior to our data collection. Since consumers' interest in alternative means of food shopping has heightened in recent years, it is not surprising that a higher percentage of respondents are willing to use online and other alternative methods of food shopping in our sample.

### **Conclusion**

As technology, demographics, and consumers' attitudes and priorities continue to change in our society, food delivery systems must respond to these changes in order to better serve customers. In order to remain competitive, companies engaged in the business of food delivery must be innovative in the ways that they can reach customers and better serve their needs. The results of this study suggest that there is considerable interest among consumers in AFDSs, as indicated by the percentage of respondents who revealed a high interest in one or more of the four different food delivery mechanisms analyzed in this study. However, convenience has to be combined with quality of products and services, and competitive pricing.

Finally, because of the small sample size, care must be taken in interpreting and generalizing the results of the study in a broader context. Nevertheless, the empirical findings are useful in identifying potential target consumers who are likely to use alternative food delivery methods. Results of the study help to identify consumers' concerns and to allow businesses to preemptively address these concerns, to improve planning and management, and to provide better customer service. The study does not address the questions of consumers' willingness to pay for these services or the cost effectiveness of the alternative food delivery mechanisms that are analyzed in this study. Future research in the area should address these and similar issues.

## References

- Clowes, M. 1996. "Frozen Finds a Home in Home Delivery." *Frozen Food Age*. 45(2).
- Gujrati, D. 1992. *Essentials of Econometrics*. New York, NY: McGraw Hill.
- Hinson, R.A., R.W. Harrison, and L. Andrews. 1998. "Impact of Socioeconomic Characteristics on Attitude Toward Food Irradiation." *Journal of Food Distribution Research*. 29(3).
- Hiser, J., R.M. Nayga, and O. Capps, Jr. 1999. "An Exploratory Analysis of Familiarity and Willingness to Use Online Food Shopping Services in a Local Market of Texas." *Journal of Food Distribution Research*. 30(1).
- Internet Retailer. 2000. "When the Bag Breaks." 10 May.
- Kinsey, J. 1998. *Supermarket Trends and Changes in Retail Food Delivery*. Agricultural Outlook Forum for Release. 24 February.
- Kirshling, P. and R.E. Linneman. 1997. "Selling the Home Shopping Option." *Supermarket Business*. February.
- Kirshling, P., R.E. Linneman, and R. Kochersperger. 1995. "Time to Get Ready for Home Shopping?" *Supermarket Business*. September.
- Kreider, C.R., C.M. Gempe III, and J.R. Bacon. 1993. "Analysis of Consumer Perception of Fish and Seafood in the Delmarva Region." *Journal of Food Distribution Research*. 25(2).
- Orler, V. and D. Friedman. 1998. *Understanding Consumer Direct*. Chicago, IL: Andersen Consulting.
- Pindyck, R. and D. Rubinfeld. 1997. *Econometric Models and Economic Forecasts*. New York, NY: McGraw Hill.
- Salkever, A. 2000a. "The E-Commerce Race to Conquer the 'Last Mile.'" *Businessweek*. 16 March. <<http://www.businessweek.com/bwdaily/dnflash/mar2000/nf00316c.htm>>.
- Salkever, A. 2000b. "Decline and Fall of E-Grocer." *Businessweek*. 8 August. <<http://www.businessweek.com/bwdaily/dnflash/mar2000/nf00317g.htm>>.
- Underhill, E.U. and E.E. Figuero. 1996. "Consumer Perception of Non-Conventionally Grown Produce." *Journal of Food Distribution Research*. 27(2).
- USDA (U.S. Department of Agriculture). 2000. <<http://www.ers.usda.gov/briefing/foodmark/data/history/homefood.htm>>.
- White, G.K. 1996. "Factors Influencing Consumers' Likelihood of Purchasing Specialty Food and Drink Products On-Line: Results of Consumer Reviews of 12 Selected Sites." *Journal of Food Distribution Research*. 27(3).

