A Structural Econometric Model of Consumer Demand at Pick-Your-Own Fruit Operations

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Abstract

This paper develops a fully structural econometric consumer demand model for goods which have time and monetary costs, and where time spent obtaining the goods also enters into the utility function. The model is used to analyze customers' decision to buy pick-your-own versus pre-harvested fruit at North Carolina pick-your-own fruit operations. The empirical application distinguishes the double effect of time as a resource constraint and also providing utility. Elasticity estimates show that strawberries sold at pick-your-own operations are price elastic, with pick-your-own fruit being less price elastic than pre-harvested fruit.

Keywords*:* Structural econometric model, demand analysis, Pick-Your-Own fruit.

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Introduction

Traditional economic models of consumer behavior assume that the demand for goods is originated from an optimization problem where consumers are maximizing utility from the consumption of goods subject to a budget constraint. The effect of time in the utility function and as a resource constraint (time constraint) has not been explored previously in the context of the demand for goods. The simultaneous considerations of these aspects have mainly been restricted to the areas of environmental and transportation economics.

This paper develops a fully structural econometric consumer demand model for goods which have time and monetary costs, and where time spent obtaining the goods also enters into the utility function. The theoretical model is used to analyze the economic behavior of customers visiting pick-your-own (PYO) fruit operations. PYO operations are farms where customers harvest their product from farmers' fields. PYO farms constitute a marketing alternative that allows farmers to sell their product directly to the consumer. A better understanding of the way these markets work can help farmers participating in PYO to make more informed production and marketing decisions.

Importance of Direct Marketing in the U.S. Agriculture

Even though the food sector in the United States is moving towards consolidation which implies bigger farms and store outlets, farmers' direct marketing alternatives are also growing in importance. Direct marketing alternatives for farmers include PYO operations, farmers' markets, farm stands and roadside stands. More recently, internet marketing and niche markets have also appeared as direct marketing alternatives for farmers.

The main factors affecting the increase in importance of direct marketing are the consumer's growing interest in fresh products and farm recreation, and the difficult financial situation of small farmers that is compelling them to look for alternatives to market their products. Given the limited availability of data, it is difficult to quantify the importance of direct marketing and PYO marketing in particular. Results from the US

Census of Agriculture indicate that the value of agricultural products sold directly to individuals for human consumption more than doubled from 1992 to 2002, going from $404 million to $812 million. The number of farms selling products directly to the consumer also increased in the same period from 86,432 to 116,733 farms (USDA, 2002 Census of Agriculture).

A problem when trying to assess the importance of direct marketing is that the data provided by the USDA Census of Agriculture is not consistent with data obtained at the state level. For example, for New York, the USDA 2002 Census of Agriculture reports that 4,651 farmers participate in direct marketing and the value on direct sales is estimated at around $ 60 million. On the other hand, the New York Agricultural Statistical Service (NYASS, 2002) reports 6,667 farmers participating in direct marketing and a value of $ 230 million for direct sales from which around $ 60 million correspond to PYO marketing.

An alternative assessment of the economic importance of direct marketing can be obtained by using the information reported by consumers about expenditures on farm products. The 2000 National Survey on Recreation and the Environment (NSRE) is one of the few nationwide surveys that include information about Americans visiting farms (Barry and Hellerstein, 2004). In the survey, out of the 25,010 NSRE respondents 7,820 reported visiting a farm. Extrapolated to the U.S. population, this result indicates that 62 million Americans visited farms one or more times in 2000. About 20% of the individuals interviewed about farm recreation reported buying agricultural products, which represents around 12 million customers. With an average number of 10 farm trips per year and an average of $ 28 in expenditures in farm products per trip, this represents a market of more than 3 billon dollars per year.

Literature on the Demand for Pick-Your-Own Fruit

Our literature review identified 12 studies carried out in the U.S. during the last 20 years focusing on the demand for pick-your-own fruit. The main objectives of these studies have been: 1) To characterize the type of customers visiting PYO operations, and 2) To study the motivations and shopping behavior of customers to PYO farms. With regard to the type of customers visiting the operations, these studies have consistently found that customers visiting PYO farms have higher income and education than the average of the population. The majority of customers come from a radius of around 20-25 miles. During the 80's the average age was about 35-45 years, but in the last surveys the average age is around 50 years. Finally, most of the shoppers are females, but couples and children are very often part of the shopping parties.

The majority of the studies only report the results of the surveys. The literature review only identified one study exploring the links between customers' characteristics and motivations (Ott et al., 1988) and one study quantifying the effect of customers' characteristics and motivations and the decision to visit the operation (Govindasamy and Nayga, 1997). Even though four of the studies analyze the effect of socioeconomic characteristics on the amount of fruit purchased (Toensmeyer and Ladzinski, 1983; Ott et al., 1988; Safley et al. 1999; Safley et al., 2001), only one of these studies intends to quantify the effects (Ott et al., 1988).

Theoretical Framework

A microeconomic model of fruit demand at pick-your-own operations must be able to explain the type of fruit chosen by the household, and explain the quantity of fruit purchased. Therefore, a discrete/continuous choice model seems to be appropriate for this situation. This framework allows modeling the choice between different types of a good and the quantity of the good to buy. Dubin and McFadden (1984) used this framework to study the demand for appliance and the demand for electricity. Chintagunta (1993) and Chiang (1991) analyzed purchased incidence, brand choice and purchase quantity decisions of households.

The structural econometric model of consumer behavior proposed in this study is an extension of Hanemanns' (1984) work on discrete/continuous choice modeling. This model of choice assumes a random utility. The model arises when one assumes that although a utility function is deterministic for the consumer, it also contains elements that are unobservable to the investigator. The utility of the consumer is defined over the quantity of the goods, the time spent obtaining the goods and their perceived characteristics. The utility function is defined over two goods. The first good is available in R alternative forms which can represent different brands or varieties of a product. The second good is a numeraire. The utility function has the following form:

$$u(x, z, o, q, T, \psi, b, s, \varepsilon) \tag{1}$$

where $\psi = [\psi_1, \psi_2, \ldots, \psi_R]$ is a R-dimensional vector and ψ_i represents the consumer's evaluation of quality for the ith alternative, $x = [x_1, x_2, \ldots, x_R]$ is a R-dimensional vector and x_i represents the quantity of the ith variety of the first good, z represents the quantity of a good numeraire, *o* represents the quantity of a time numeraire, $T = [T_1, T_2, \ldots, T_R]$ is a R-dimensional vector and T_i represents the times spent obtaining the ith variety. It is assumed that $b_i = [b_{i1}, b_{i2}, \ldots, b_{iK}]$ is a *k*-dimensional vector defining *k* different dimensions of quality, where b_{i1} is the amount of the kth characteristic associated with a unit of consumption of variety i. The R-dimensional vector $\varepsilon = [\varepsilon_1, \varepsilon_2, \ldots, \varepsilon_R]$ is a random vector representing the unobservable characteristics of the consumer and/or attributes of the commodities. Finally, $s = [s_1, s_2, \ldots, s_L]$ is a L-dimensional vector with observed characteristics of the consumer.

The consumer's problem is to choose *x, z* and *o* to maximize utility subject to a budget constraint and a time constraint:

$$\sum_{i=1}^{R} p_i x_i + z = y, \tag{2}$$

$$\sum_{i=1}^{R} T_i(x_i) + o + T_w = T \tag{3}$$

In equation (2) *y* is income and in equation (3) T_w represents the number of hours worked and *o* the time numeraire. Total income can be assumed to be the product of the wage rate *w* and the number of hours worked,

$$y = T_w w, \tag{4}$$

and the total amount of time required to obtain each variety can be assumed to be a linear function of the amount obtained:

$$T_i = t_i x_i \tag{5}$$

Using these assumptions, the two constraints can be merged into a single constraint:

$$\sum_{i=1}^{R} \pi_i x_i + q = I \qquad (6)$$

where $\pi_i = p_i + wt_i$, $q = z + wo$ and $I = y + wT$. Equation (6) indicates that time is valued at the wage rate. An explicit assumption made in the previous derivations is that the number of hours worked is flexible. For more general cases, previous studies on the two linear consumer problem have shown that even if that is not the case, time has a monetary value (Larson and Shaikh, 2001; Hanemann, 2004). Representing the time monetary value by θ, the two constraints can be merged into a single constraint:

$$\sum_{i=1}^{R} \pi_i x_i + k = I \qquad (7)$$

where $\pi_i = p_i + \theta t_i$, $k = z + \theta o$ and $I = y + \theta T$.

In order to devise a structural econometric model of brand choice, specific assumptions regarding the functional form of the direct utility function and the distribution of the errors are necessary. The following utility model can be used:

$$\begin{aligned} u(x,z,T,\psi,b,s,\varepsilon) &= u^*(\textstyle\sum x_j, k + \sum \psi_j(b_j,s,\varepsilon_j)x_j + \xi T_j) \\ &= u^*(\textstyle\sum x_j, k + \sum (\psi_j(b_j,s,\varepsilon_j) + \xi t_j)x_j) \end{aligned} \qquad (8)$$

where u* is a bivariate utility function. In this model the different varieties are perfect substitutes. Maximization of (8) subject to (7) leads to a corner solution where only one of the brands is selected. Equation (8) extends Hanemann's perfect substitution model to include the time spent obtaining the i^{th} variety in the utility function. In this model ξ is a parameter that measures the effect of time on the utility function.

Given that a consumer has selected brand j, her conditional direct utility function is $\bar{u}_j(x_j, \psi_j, t_j, q) = \bar{u}_j(x_j, k + (\psi_j + \xi t_j))$. Then, it can be shown (see Appendix 1) that the conditional ordinary demand functions and indirect utility functions associated with $\bar{u}_j$ have the form:

$$\bar{x}_j(\pi_j, \psi_j, t_j, I) = \bar{x}_j(\pi_j - \psi_j - \xi t_j, I), \qquad (9)$$

$$\bar{v}_j(\pi_j, \psi_j, t_j, I) = \bar{v}_j(\pi_j - \psi_j - \xi t_j, I). \qquad (10)$$

Since $\bar{v}_j$ is decreasing in its first argument, it follows from (10) that the single brand selected is the one for which $\pi_j - \psi_j - \xi t_j$ is lowest. In equation form, alternative j would be preferred to alternative i if:

$$\pi_j - \psi_j - \xi t_j < \pi_i - \psi_i - \xi t_i,\ \forall i = 1,...,R \text{ and } i \neq j. \tag{11}$$

The function ψ_j can be seen as an index of the overall quality of the jth brand which depends on the quality characteristics of the brand b_j, the characteristics of the individual, and the error term ε_j. The following form can be assumed:

$$\psi_j(b_j, s, \varepsilon_j) = \alpha_j + \gamma' b_j + \varphi_l' s + \varepsilon_j, \tag{12}$$

where α_j, γ and φ are parameters.

By substituting (12) into (11), and rearranging terms we can rewrite the condition specifying the choice of the j[th] alternative as:

$$\alpha_j + \gamma' b_j + \varphi_l' s + \xi t_j - \pi_j + \varepsilon_j > \alpha_i + \gamma' b_i + \varphi_l' s + \xi t_i - \pi_i + \varepsilon_i \tag{13}$$

If we denote $\Pr_j$ as the probability of selecting variety j, and make $\lambda_j = \alpha_j + \gamma' b_j + \varphi_l' s + \xi t_j - \pi_j$ then,

$$\Pr_j = \Pr ob(\varepsilon_i < \varepsilon_j + \lambda_j - \lambda_i) \tag{14}$$

The functional form of $\Pr_j$ depends on the assumption regarding the distribution of the ε_j's. If the ε_j's are assumed to be multivariate normal with mean zero and some covariance $\Sigma \equiv \{ \sigma_{ij} \}$, then $\Pr_j$ follows a R-1 multivariate probit model. Denote the R dimensional multivariate normal density of the ε_j's by $\varphi_T(.;\mu, \Sigma)$ and the corresponding c.d.f. by $\Phi_T(.;\mu, \Sigma)$. In this study only two brands (types of goods) are considered, therefore the choice probability for the two goods case takes the following form:

$$\Pr_j = \Phi_1(\bar{\lambda}_j - \bar{\lambda}_i; 0,1) \quad j=1,2 ; i=1,2 \tag{15}$$

where $\bar{\lambda}_j = \lambda_j / w_{ij}^{1/2}, \bar{\lambda}_i = \lambda_i / w_{ij}^{1/2}$, $w_{ji} = \sigma_j^2 + \sigma_i^2 - 2\sigma_{ij}$.

In order to develop formulas for the probabilities of the continuous choices, a specific functional form for the indirect utility function (10) needs to be selected. The following model can be used (Hanemann, 1984):

$$\bar{v}_j(\pi_j, \psi_j, t_j, I) = -\frac{e^{-\eta I}}{\eta} + \frac{\kappa}{\rho} e^{-\rho(\pi_j - \psi_j - \xi t_j)}, \kappa > 0, \eta \neq 0. \tag{16}$$

Using Roy's identity, the associated demand function to (14) is then:

$$\bar{x}_j(\pi_j, \psi_j, t_j, I) = \kappa e^{-\rho(\pi_j - \psi_j - \xi t_j) + \eta I} \tag{17}$$

or using the definition of the λ_j's:

$$\bar{x}_j(\pi_j, \psi_j, t_j, I) = \kappa e^{\rho \lambda_j + \eta I} e^{\rho \varepsilon_j} \tag{18}$$

Given the distributional assumption about the errors, the density of $\bar{x}_j$, $f_{x_j|\varepsilon \in A_j}(x)$ can be derived. The conditional mean quantity of brand j demanded can be obtained by integrating the density of $\bar{x}_j$ or from (18) using the mean and generating functions of a truncated normal distribution. For estimation purposes it is more convenient to work with the mean of the conditional distribution of $\ln(x_j)$:

$$\begin{aligned} E\{\ln(x_j) \mid \varepsilon \in A_j\} &= \ln \kappa + \rho \lambda_j + \eta I + \rho E\{\varepsilon_j \mid \varepsilon \in A_j\} \\ &= \ln \kappa + \rho \lambda_j + \eta I - \rho \rho_j [\phi_1(\bar{\lambda}_j - \bar{\lambda}_i; 0,1) / \Phi_1(\bar{\lambda}_j - \bar{\lambda}_i; 0,1)] \end{aligned} \tag{19}$$

where $\rho_j = Cov(\varepsilon_j, \varepsilon_j - \varepsilon_i) = (\sigma_j^2 - \sigma_{ji}) / w_{ji}$.

The density of the unconditional demand functions can be written as follows:

$$f_{x_j}(x) = \begin{cases} 1 - \Pr_j, & \mathrm{x} = 0 \\ \Pr_j f_{x_j|\varepsilon \in A_j}(x), & x > 0 \end{cases} \tag{20}$$

The mean of the unconditional demand functions is then:

$$\begin{aligned} E[x_j] &= \Pr ob(x_j = 0) E[x_j \mid x_j = 0] + \Pr ob(x_j > 0) E[x_j \mid x_j > 0] \\ &= (1 - \Pr_j) 0 + \Pr_j E[x_j \mid \varepsilon \in A_j] \\ &= \Pr_j \theta e^{\rho \lambda_j + \eta I} E\{e^{\rho \varepsilon_j} \mid \varepsilon \in A_j\} \\ &= \Pr_j \theta e^{\rho \lambda_j + \eta I} e^{\rho^2 \sigma_j^2 / 2} [\Phi_1(\bar{\lambda}_j - \bar{\lambda}_i - \rho \rho_j; 0,1) / \Phi_1(\bar{\lambda}_j - \bar{\lambda}_i; 0,1)] \end{aligned} \tag{21}$$

Equation (21) shows that the mean unconditional demand function for the i^{th} type is the product of the probability of buying that type times the mean of the conditional demand function. This equation can also be used to calculate marginal effects of the explanatory variables on the mean unconditional quantity demanded.

Data and Estimation Procedures

Data

This data is from a consumer survey conducted by the North Carolina Strawberry Association in cooperation with the North Carolina Department of Agriculture and Consumer Services, and the Department of Agricultural and Resource Economics at N.C. State University. The survey was conducted at direct market strawberry operations throughout the state during the spring of 1999. Each operation offered customers two options for buying strawberries: they could either pick their own strawberries (PYOS) for the growers' field or they could buy pre-picked strawberries (PPS) at the grower's fruit stand. The survey was divided into two segments. The first segment was administered when the consumer arrived to the direct market operation and the second, when the consumer left the operation. A total of 1701 customers were interviewed.

In our sample, most of the customers purchased one brand but there were a few that behaved differently. In the survey, out of 1,701 observations, 2 customers did not buy any type of fruit and 18 bought two types of fruit. Given the small proportion of customers buying both types of fruit or none of them, we drop these observations for the analysis and use the model where the customers only choose one type of fruit.

The Income Variable (*y*). Both surveys reported income in intervals (discrete) form rather than continuous form. The income variable falls only in a certain interval, with both end intervals being open-ended. Transforming the data from discrete to continuous saves degrees of freedom in the estimation and facilitates the interpretation of the coefficients. A procedure developed by Stewart (1983) can be used to transform the variables. This method assigns each observation its conditional expectation:

$$E(I_i \mid A_{k-1} < I \leq A_k, x_i) = x_i\beta + \sigma\left[\frac{\phi(Z_{k-1}) - \phi(Z_k)}{\Phi(Z_{k-1}) - \Phi(Z_k)}\right], \qquad (22)$$

where I_i is the natural logarithm of unobserved income for the i^{th} household, x_i and β are both kx1 vectors representing regressors and unknown parameters respectively, A_k and A_{k-1} are the natural logarithms of the boundary values for the k^{th} interval, $Z_k = (A_k - x_i\beta)/\sigma$, σ is the standard deviation, and Φ and ϕ are the normal cumulative and normal probability density functions. Parameter estimates for β and σ can be obtained by using maximum likelihood estimation procedures. Expressions for the log-likelihood functions of this model can be found in Bhat (1994). The vector of regressors, x_i, included in the income models for the strawberry customers and the results of the estimation of the models are displayed in Appendix 2.

Opportunity Cost of Time Variable (*θt*).The opportunity cost of time variables was constructed by multiplying the per minute wage times minutes per pound spent in the operation(***θt=k.w.t)***. To calculate the per minute wages it was assumed a total of 1,800 hours of work per year. Therefore, the parameter estimated in the probit model is the proportion of the wage at which people values time.

Estimation Procedures

Estimation of the parameters of the discrete/continuous choice model can be carried out by using maximum likelihood estimation procedures. A simpler two step estimation procedure which yields consistent parameters estimates can also be used. In a first step, the parameters of Pr_j are estimated using maximum likelihood estimation on the probit model of discrete choice. This model yields consistent estimates of the λ_j's and w_{ij}. Using these estimates and equation (19) the rest of the parameters of the continuous choice can be recovered using regression analysis. Using (20) the following regression models can be estimated:

$$\ln(x_j) = \ln\kappa + \rho\lambda_j + \eta I - \rho\rho_j[\phi_1(\overline{\lambda}_j - \overline{\lambda}_i;0,1)/\Phi_1(\overline{\lambda}_j - \overline{\lambda}_i;0,1)] \qquad (23)$$

Using (23) consistent estimates of κ, ρ and η can be obtained using OLS or nonlinear least squares, depending on the functional form selected for κ. The continuous choice model can also be made a function of the socioeconomic characteristics of the individuals by making the parameter κ depend on these characteristics. Since $\kappa>0$, an appropriate choice for the parameters is $\kappa=\exp(\iota'\omega)$ where ι is a vector of parameters and ω is a vector of socioeconomic characteristics of the individuals.

The approach outlined would be possible if the times spent picking the fruit were observed for the entire sample; however, because of the selectivity problem the procedure to recover the parameters is more complex. The following section explains in detail the procedure used to estimate the parameters of the choice probability and the continuous choice.

Estimation of the Parameters of the Discrete Choice Probability (Pr_j)

In the analysis only the times spent picking the fruit were considered. The times spent buying the fruit were assumed fixed for each operation and were not considered in the analysis. Therefore, the hypothetical likelihood function contribution for person n choosing variety two (PYO fruit) that could be formed if the picking times (t_2) were observed for the whole sample is given by

$$\Pr_{2n} = \Phi_1(\bar{\lambda}_{2n} - \bar{\lambda}_{1n}; 0,1) \tag{24}$$

where $\bar{\lambda}_{2n} - \bar{\lambda}_{1n} = (\bar{\alpha}_2 - \bar{\alpha}_1) + \bar{\gamma}'(b_{2n} - b_{2n}) + \bar{\varphi}_l ' s_n + \bar{\xi}(t_2) - (1/w_{12}^{1/2})(\pi_{2n} - p_1)$,

and the hypothetical contribution of person n choosing variety one would be:

$$\Pr_{1n} = 1 - \Pr_{2n} = 1 - \Phi_1(\bar{\lambda}_{1n} - \bar{\lambda}_{2n}; 0,1) \tag{25}$$

However, since picking times are only observed if the PYO variety is chosen, the likelihood expressions cannot be formed. Given that times enter the $\bar{\lambda}_{2n} - \bar{\lambda}_{1n}$ function in a linear form, the most convenient specification for t_2 is a linear regression model:

$$t_2 = X\beta_2 + u_2 \tag{26}$$

where the X is a vector of explanatory variables, β_2 are parameter vectors and $u_2 \sim N(0, \sigma_2^2)$ is a random disturbance. Previous studies where prices have been missing have assumed that the mean of the distribution of prices is a function of household characteristics, arguing that price represents quality differences caused by heterogeneous commodity aggregation and the household characteristics are a proxy for household preferences over unobservable quality characteristics (e.g., Davis and Wohlgenant, 1993). In this study, times spent picking the fruit can also be assumed to be a function of the households' characteristics but also make the time equations a function of the characteristics of the farm. If u_2 and $r = \varepsilon_2 - \varepsilon_1$ are mutually dependent, together they form a bivariate normal distribution with mean vector zero and covariance matrix

$$\Sigma = \begin{pmatrix} \sigma_1{}^2 & \sigma_{12} \\ \sigma_{21} & \sigma_2{}^2 \end{pmatrix}$$

This system of equations is similar to the binary choice model with limited dependent variables shown in Lee (1979). This author proposes the following multi-step approach to obtain estimates of the choice probability Pr_j. In the first stage, obtain a reduced form for the binary choice by substituting the time equations t_2 into the choice equation. The above model can be written as:

$$I_t = 1 \text{ iff } X\Pi\sigma_\Pi^{-1} > [(\varepsilon_2 - \varepsilon_1) + (\xi - \theta)(t_2)]\sigma_\Pi^{-1} \quad (28)$$

$$I_t = 0 \text{ iff } X\Pi\sigma_\Pi^{-1} < [(\varepsilon_2 - \varepsilon_1) + (\xi - \theta)(t_2)]\sigma_\Pi^{-1} \quad (29)$$

Where *XΠ* represents the reduced form of $\overline{\lambda}_{2n} - \overline{\lambda}_{1n}$, I_t defines the choice of PYO fruit (variety 2) and σ_Π is the variance of $(\varepsilon_2 - \varepsilon_1) + (\xi - \theta)(t_2)$. Therefore the parameters *Π* can be estimated consistently by probit analysis.

To estimate the parameters β_2 in the time equations, the estimated *Π* is used to form the appropriate inverse Mill's ratios to correct for selectivity bias in the time equation. The following equations has to be estimated:

$$t_2 = X\beta_2 - \sigma_{\Pi u_2} \frac{\phi_1(X\hat{\Pi}\sigma_\Pi^{-1})}{1 - \Phi_1(X\hat{\Pi}\sigma_\Pi^{-1})} + \eta_2 \quad (30)$$

where η_i is a disturbance and $\sigma_{\Pi u_i}$ is the covariance between u_2 and $[(\varepsilon_2 - \varepsilon_1) + (\xi - \theta)(t_2)]\sigma_\Pi^{-1}$. To obtain the structural parameters from the discrete choice probability Pr_2, predicted times $\hat{t}_2 = X\hat{\beta}_2$ are used in (25) instead of the t_2 values to estimate the second stage probit model. As shown in Lee (1979) these two stage probit estimates are consistent. However, the asymptotic covariance matrix is complicated. A simpler approach is to use bootstrapping to obtain an asymptotic covariance matrix of the estimator (Greene, 2003). The bootstrapping approach utilized in this study is outlined in the next section.

Estimation of the Parameters of the Continuous Choice

Estimation of the parameters of the continuous choice in equation (23) can be achieved by writing the two demand equations as one and estimating the parameters in the pooled sample. This approach allows for testing the equality of the parameters between the two equations. Using this approach, equation (22) can be rewritten as:

$$\ln(x) = \delta_1 \ln\kappa + \delta_2 \ln\kappa + \rho(\delta_2\lambda_2 + \delta_1\lambda_1) + \eta I - 0.5\rho(\chi_2\delta_2 + \chi_1\delta_1) + \eta_x \qquad (32)$$

where the $\delta_i's$ are dummies indicating that the i[th] alternative has been selected, $\chi_1 = \phi_1(\overline{\lambda}_2 - \overline{\lambda}_1;0,1)/\Phi_1(\overline{\lambda}_2 - \overline{\lambda}_1;0,1)$, $\chi_2 = \phi_1(\overline{\lambda}_2 - \overline{\lambda}_1;0,1)/(1-\Phi_1(\overline{\lambda}_2 - \overline{\lambda}_1;0,1))$, η_x is an error term. χ_1 and χ_2 are the terms used to correct for the selection bias. λ_2 and λ_1 are replaced by the predicted values calculated using the estimated parameters of the discrete choice probabilities Pr_1 and Pr_2 which are known to be consistent. However, since the parameters of the socio-demographic characteristics in the probit model represent only differences in marginal utilities (i.e., these parameters can not be identified) only the parameters related to price, opportunity cost of time and time were used to identify the parameter ρ. The parameters corresponding to the socio-demographic characteristics in the continuous choice model can then be interpreted as reduced form parameters comprising of the effect of these variables in the continuous choice through κ, and their effect on the discrete choice through the $\lambda_i's$.

As in other sample selection models, the errors η_x in the continuous choice equation are heteroskedastic. To take into account this problem and the use of imputed regressors in the estimation of the continuous choice equation, the asymptotic covariance matrix of the parameters was approximated using a non-parametric bootstrapping procedure as outlined by Wooldridge (2002, p.379).

The bootstrapping procedure is as follows. Let $S=\{w_1, w_2,\ldots,w_N\}$ denote the sample used for estimation purposes and $\hat{\theta}$ the estimated parameter. At each bootstrap iteration, *b*, a random sample of size N is drawn with replacement from the original sample. Denote the sample at iteration *b* as $S^{(b)}=\{w_1^{(b)}, w_2^{(b)},\ldots,w_N^{(b)}\}$. This bootstrap sample is used to obtain the $\hat{\theta}^{(b)}$ MLE estimates (in the case of the probit model) and OLS estimates (in the case of the continuous choice model). The procedure has to be iterated B times, to obtain $\hat{\theta}^{(b)}$, b=1,2,…,B. The sample variance of the $\hat{\theta}^{(b)}$'s was used to obtain standard errors for $\hat{\theta}$, the parameter estimates of the original sample. A total of B=1000 replications were used in the procedure.

Results

Slightly more than half of the customers (51%) bought pre-picked-strawberries (PPS), while 49% bought pick-your-own strawberries (PYOS). On average, PPS customers paid 52 cents more than PYOS customers. However, PPS customers spent only one third of the time that PYOS customers spent. Around 70% of the buyers were repeat customers. The average customer traveled 17 miles, and was 51 years old. About half of the customers lived in rural areas (52%). Females shopping alone made up the largest population of shoppers followed by males shopping alone, couples, and females with children. A more detailed description of the characteristics of the households visiting North Carolina strawberry operations obtained from this survey can be found in Safley et al. (1999).

Discrete Choice Model

The structural parameters of the discrete choice are shown in Table 2. The reduced form parameters of the discrete choice and the parameters of the time equations are shown in Appendix 3, but we only focus our discussion on the structural parameters. Conventional standard errors and the standard errors obtained using bootstrapping are presented for both models. For the marginal effects only bootstrapping standard errors are shown.

Table 2 only presents the results corresponding to the decision to buy PYOS. Because of the way in which prices enter into the equations, these parameters are equal in sign and magnitude for both equations. The rest of the parameters are equal in absolute value but with different signs for both alternatives.

The parameters of the main economic variables (price, opportunity cost of time and time) in the discrete choice model all have the expected signs. Following the structural econometric discrete choice model, the ratio of the opportunity cost of time parameter and the price parameter represents the proportion of the wage at which consumers value their time. The estimated value is around 4% which is lower than the values of around 10-30% commonly reported in the literature (Phaneuf and Smith, 2004, p. 29). With an average wage of 50 cents per minute this transforms to an opportunity cost value of 2.2 cents per minute or $1.32/hour for the average household. However, this value varies depending on the working status of the household members. Each additional member in the household working more than 40 hours per week increases the household's opportunity cost of time by 0.7% of the wage, each additional member in the household working less than 40 hours per week decreases the household's opportunity cost of time by around 1.3% of the wage. Finally each additional member in the household which is retired decreases the household's opportunity cost of time in 0.3%.

For the time variable, a quadratic effect was included in the empirical specification of the discrete choice model. The estimation results indicate that the utility obtained by picking strawberries increases as the time increases, reaches a maximum at 5.79 minutes/lb and then decreases with further increases in time. At the average time spent by the households picking strawberries (3.31 minutes/lb), the monetary value of the benefit obtained from picking strawberries is about 0.10 cents per minute or $6/hour. Therefore, there is, in general, a positive effect of time in the discrete choice decision.

In the probit model, the coefficients are not the marginal effects. Expressions for the marginal effects and standard errors in this model can be found in Greene (2003). Marginal effects of parameters corresponding to dummy variables are easier to interpret and compare than those corresponding to continuous variables. The marginal effects of these parameters are the effects in relation to an individual with characteristics of the dummy variables not included in the model (Central region, currently living in the rural area and visiting during the weekend). Relative to this type of customer, a customer in the Central Region and one in the Eastern region are, respectively, -73% and -11% less likely to buy PYOS. This indicates a very important effect of location in the decision to buy PYOS or PPS. This effect might be capturing characteristics of the individuals living in that area and also of the farms located in that region. Unfortunately, the characteristics of the operations were not considered in the survey. Relative to the baseline customer, people living in urban areas are 5% more likely to buy PYOS and people visiting during the weekday are 7% more likely to buy PYOS.

The marginal effects of the continuous variables represent the change in the probability of choosing an alternative for a one unit change in the variable. Each additional female in the shopping party increases the probability that the household will buy PYOS by about 8% and each additional child in the household increases the probability of buying PYOS by 5%. The effect of income is very small. A $10,000 increase in income increases the probability of buying PYOS in only 2%. The marginal effects of the other continuous variables included in the model are not economically important.

Continuous Choice Results

The results of the estimation of the parameters of the conditional continuous choice equations, that is the mean quantity demanded conditional on having previously selected a type of fruit, are shown on Table 3. Following the structural econometric model, the parameter ρ which measures the effect of price in the quantity demanded, is estimated in 0.157. This parameter corresponds to the marginal effect of the adjusted price on the natural log of the conditional quantity demanded. The rest of the parameters can be interpreted as the marginal effect of the variables on the natural log of the conditional quantity demanded. When comparing the effects of the socio-demographic characteristics on the discrete choice and the continuous choice it can be seen that even though some variables increase the probability of buying one type of fruit, their effect on the conditional quantity demanded can have the opposite effect. For example, even though the number of females in the shopping party decreases the probability of buying PPS, this variable increases the conditional quantity demanded of both types of fruit. This is an interesting feature of this model since it allows analyzing the effects of the variables on both the discrete choice and the continuous choice separately. This information might be important if for example the marketing efforts are directed to obtain more customers interested in one type of fruit or customers who are likely to buy more fruit.

The marginal effects of the variables on the unconditional demands are presented in Tables 4 and 5. These marginal effects were obtained using equation (21). From this expression, it can be seen that these marginal effects can also be decomposed into the effects corresponding to the discrete choice and the effects corresponding to the conditional quantity demanded.

Price, time, location of the operations, number of males and females in the shopping party and number of children in the household are the more important determinants of the quantity demanded of PYOS. As in the case of the probit model, the marginal effects of the dummy variables are the effects in relation to an individual with characteristics of the dummy variables not included in the model (Central region, currently living in the rural area and visiting during the weekend). Relative to this type of customer, customers in the Western region demand 5 fewer pounds of PYOS. Each additional male or female in the shopping party increases the quantity demanded of PYOS by 1.2 pounds. Each additional child in the household increases the demand for PYOS by 0.7 pounds. The effect of prices can be analyzed using the elasticity estimates (Table 7). The own price elasticity of PYOS is estimated in -1.30. The cross price elasticity is 1.90. The overall effect of time in the demand for PYOS is positive but small with an estimated elasticity value of 0.2.

Price, location of the operations, location of residence, the variable indicating if the visit was done during the weekday, the number of members in the household and the numbers of members in the shopping party are the important determinants of the quantity demanded of PPS. Relative to the baseline customer, customers in the Western region demand 7 more pounds of PPS and customers living in the Eastern region demand 1 fewer pounds of PPS. Customers visiting the operations during the weekdays demand 1 fewer pounds of PPS. The own price elasticity of PPS is estimated to be -2.98. The cross price elasticity is 1.79.

Previous studies estimating elasticities for strawberries have also found that this fruit is very sensitive to changes in prices. Richards and Patterson (1999) estimate a price elasticity of -2.8 for this commodity. Carter et al. (2005) report elasticities between -1.2 and -2.7. These authors argue that the price elasticity of strawberries varies over the course of a season, being more elastic during May and June. The surveys for this study were conducted during April and May, which also explains the high elasticity values found.

As we expected the own price elasticities for PPS are much higher than the own price elasticity for PYOS. This result has to do with the fact that strawberries at the store are closer substitutes for PPS than PYOS. Therefore, even though the time effects were found to be very small, the differences in price elasticities seem to be capturing the intrinsic differences between buying pre-harvested fruit versus picking the fruit from the field.

Summary and Conclusions

This paper developed a fully structural econometric consumer demand model for goods which have time and monetary costs, and where time spent obtaining the goods also enters into the utility function. The assumed framework allows for obtaining closed form solutions for the probability that the person will choose every alternative and the demand function for the continuous good. The derived demand functions and indirect utility functions differentiate the effect of time as a resource constraint forming the full price of the good and the effect of time in the utility function.

The model was used to analyze customers' decision to buy pick-your-own versus pre harvested fruit at North Carolina pick-your-own fruit operations. The empirical application distinguishes the double effect of time as a resource constraint and also providing utility. However, the effect of time is found to be relatively small compared to the price effect.

Elasticity estimates show that strawberries sold at pick-your-own operations are price elastic, with PYOS being less price elastic than PPS. This information has implications for the pricing policies used by farmers engaged in PYO marketing. For example, at the observed priced levels, farmers could increase revenue by reducing prices. The effect of the socio-demographic characteristics of the individuals could also be used for the design of marketing strategies.

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Table 1. Means and Standard Deviations of Variables of the Sample of Strawberry Customers

Variable	Pick-your-own strawberries (PYOS) customers	Pre-picked strawberries (PPS) customers	All customers
Number of customers	502	511	1013
Price of PPS $/lb	1.39 (0.27)	1.39 (0.27)	1.39 (0.27)
Price of PYOS $/lb	0.87 (0.10)	0.87 (0.10)	0.87 (0.10)
Time PPS min/lb	-	1.69 (3.20)	-
Time PYOS min/lb	4.64 (4.61)	-	-
Amount purchased lb	10.88 (8.93)	7.34 (6.48)	9.07 (7.97)
New customers	0.37 (0.48)	0.25 (0.43)	0.30 (0.46)
Age	48.89 (16.25)	53.47 (15.92)	51.22 (16.24)
Miles traveled	14.34 (47.47)	19.52 (50.52)	16.98 (49.09)
Number of members in household working more than 40 hours	1.11 (1.12)	1.09 (1.09)	1.10 (1.10)
Number of members in household working less than 40 hours	0.37 (1.37)	0.18 (0.46)	0.27 (1.01)
Retired people in household	0.48 (0.78)	0.61 (0.96)	0.55 (0.88)
Current residence in urban area	0.50 (0.50)	0.46 (0.50)	0.48 (0.50)
Residence of parents in urban area	0.38 (0.48)	0.37 (0.48)	0.37 (0.48)
Eastern region	0.25 (0.43)	0.52 (0.50)	0.39 (0.49)
Central Region	0.37 (0.48)	0.11 (0.32)	0.24 (0.43)
Western Region	0.38 (0.49)	0.36 (0.48)	0.24 (0.43)
Visit during weekdays	0.76 (0.43)	0.74 (0.44)	0.75 (0.45)
Income	53,690 (30,650)	56,898 (32,512)	55,456 (31,645)

Table 2. Maximum Likelihood Estimation of Structural Parameters of Discrete Choice (Probability of buying Pick-your-own Strawberries)

Variable	Parameters	Std. Errors	B. Std. Errors	Marginal Effects	Std. Errors	B. Std. Errors
Intercept	-4.098***	0.707	1.022	-1.231***	0.282	0.299
Price (P_{pyo}-P_{pre})	-5.348***	0.953	1.562	-1.606***	0.380	0.444
Opportunity Cost of Time	-0.199*	0.136	0.145	-0.060*	0.054	0.041
Opportunity Cost of Time (w.t_{pyo}) x Number of members in household working > 40 h/week	-0.036	0.025	0.033	-0.011	0.010	0.010
Opportunity Cost of Time (w.t_{pyo}) x Number of members in household working < 40 h/week	0.072	0.041	0.062	0.022	0.016	0.017
Opportunity Cost of Time (w.t_{pyo}) x Number of retired people in household	0.018	0.033	0.049	0.005	0.013	0.014
Time (t_{pyo})	0.765***	0.223	0.242	0.230***	0.089	0.075
Time^2 (t_{pyo}^2)	-0.066***	0.019	0.023	-0.020***	0.007	0.007
Income ($10,000)	0.062	0.055	0.059	0.019	0.022	0.018
West	-2.419***	0.286	0.486	-0.726***	0.114	0.134
East	-0.375*	0.167	0.228	-0.113*	0.067	0.074
Number of males in the shopping party	0.131	0.115	0.149	0.039	0.046	0.046
Number of females in the shopping party	0.272***	0.082	0.088	0.082***	0.033	0.025
Number of children in the shopping party	0.078	0.026	0.205	0.023	0.011	0.060
Urban	0.166*	0.093	0.106	0.050*	0.037	0.031
Weekday visit	0.237	0.186	0.225	0.071	0.074	0.067
Miles	0.001	0.001	0.002	0.000	0.000	0.001
Number of males in the household	-0.004	0.026	0.089	-0.001	0.010	0.026
Number of females in the household	0.160*	0.103	0.121	0.048*	0.041	0.036
Number of children in household	0.168**	0.068	0.086	0.051**	0.027	0.024
Age	-0.008**	0.004	0.004	-0.002**	0.002	0.001
Ben/Lerman R^2	0.64					
Cramer R^2	0.27					

[a] Significance levels of 0.01, 0.05 and 0.10 are indicated by ***, **, and *, respectively.

Table 3. OLS Structural Parameters of Continuous Choice (Conditional Quantities Demanded)

Variable		PYOS			PPS	
	Parameter	Std. Error	Boot. Std Error	Parameter	Std. Error	Boot. Std Error
Intercept	2.372***	0.132	0.163	2.372***	0.132	0.163
Adjusted Price	-0.157**	0.067	0.079	-0.157**	0.067	0.079
Income ($10,000)	-0.012	0.010	0.010	0.010	0.009	0.008
West	0.262***	0.067	0.065	0.036	0.100	0.109
East	0.024	0.080	0.079	-0.525***	0.079	0.081
Number of males in the shopping party	0.110**	0.051	0.061	-0.062	0.042	0.050
Number of females in the shopping party	0.067**	0.020	0.034	0.067**	0.020	0.034
Number of children in the household	-0.030	0.017	0.034	0.022	0.008	0.062
Urban	-0.106***	0.043	0.042	-0.106***	0.043	0.042
Weekday visit	-0.081**	0.050	0.050	-0.081**	0.050	0.050
Miles	0.000	0.000	0.001	0.000	0.000	0.001
Number of males in the household	-0.026	0.039	0.044	0.012	0.009	0.032
Number of females in the household	-0.020	0.028	0.035	-0.020	0.028	0.035
Number of children in household	0.037*	0.020	0.028	0.037*	0.020	0.028
Age	-0.002	0.002	0.002	-0.002	0.002	0.002
R^2	0.19					
Adj. R^2	0.17					

[a] Significance levels of 0.01, 0.05 and 0.10 are indicated by ***, **, and *, respectively.

Table 4. Marginal Effects of Variables: Unconditional Demand for Pick-your-own Strawberries

Variable	Discrete Choice Effects		Conditional Mean Effects		Total Unconditional Mean Effects	
	Parameter	Boot. Std. Error	Parameter	Boot. Std. Error	Parameter	Boot. Std. Error
Price	-14.079***	3.975	-2.283**	1.337	-16.362***	4.630
Opportunity Cost of Time	-0.525**	0.360	-0.085*	0.066	-0.610*	0.417
Opportunity Cost of Time ($w.t_{pyo}$) x Number of members in household working > 40 h/week	-0.095	0.080	-0.015	0.016	-0.111	0.093
Opportunity Cost of Time ($w.t_{pyo}$) x Number of members in household working < 40 h/week	0.188	0.158	0.031	0.036	0.219	0.185
Opportunity Cost of Time ($w.t_{pyo}$) x Number of retired people in household	0.048	0.122	0.008	0.022	0.055	0.141
Time (t_{pyo})	2.015***	0.624	0.327***	0.128	2.342***	0.726
$Time^2$ (t_{pyo}^2)	-0.173***	0.059	-0.028***	0.012	-0.201***	0.068
Income ($10,000)	0.163	0.147	-0.055	0.064	0.108	0.181
West	-6.369***	1.206	0.990**	0.486	-5.378***	1.400
East	-0.987*	0.608	0.050	0.524	-0.937	0.894
Number of males in the shopping party	0.345	0.381	0.702**	0.408	1.047**	0.612
Number of females in the shopping party	0.717***	0.222	0.473**	0.233	1.190***	0.333
Number of children in the shopping party	0.206	0.514	-0.162	0.228	0.043	0.612
Urban	0.438*	0.268	-0.601**	0.288	-0.163	0.415
Weekday visit	0.624	0.609	-0.430*	0.325	0.194	0.746
Miles	0.002	0.004	0.000	0.004	0.001	0.005
Number of males in the household	-0.010	0.223	-0.157	0.311	-0.167	0.405
Number of females in the household	0.422*	0.313	-0.083	0.236	0.339	0.458
Number of children in household	0.443**	0.221	0.266*	0.186	0.709**	0.323
Age	-0.020**	0.011	-0.014*	0.011	-0.034**	0.017

Table 5. Marginal Effects of Variables: Unconditional Demand for Pre-harvested Strawberries

Variable	Discrete Choice Effects		Conditional Mean Effects		Total Unconditional Mean Effects	
	Parameter	Boot. Std. Error	Parameter	Boot. Std. Error	Parameter	Boot. Std. Error
Price	- 9.240***	2.627	-6.391***	1.931	-15.631***	4.488
Opportunity Cost of Time	0.344*	0.236	0.215*	0.155	0.559*	0.391
Opportunity Cost of Time ($w.t_{pyo}$) x Number of members in household working > 40 h/week	0.063	0.053	0.039	0.035	0.102	0.087
Opportunity Cost of Time ($w.t_{pyo}$) x Number of members in household working < 40 h/week	-0.124	0.104	-0.077	0.069	-0.201	0.172
Opportunity Cost of Time ($w.t_{pyo}$) x Number of retired people in household	-0.031	0.080	-0.020	0.053	-0.051	0.133
Time (t_{pyo})	-1.323***	0.411	-0.825***	0.274	-2.148***	0.684
Time^2 (t_{pyo}^2)	0.114***	0.039	0.071***	0.026	0.184***	0.064
Income ($10,000)	-0.107	0.097	-0.027	0.072	-0.134	0.164
West	4.180***	0.800	2.750***	0.774	6.930***	1.454
East	0.648*	0.396	-1.691***	0.413	-1.044*	0.711
Number of males in the shopping party	-0.226	0.250	-0.387*	0.254	-0.614*	0.453
Number of females in the shopping party	-0.470***	0.143	-0.027	0.180	-0.497**	0.286
Number of children in the shopping party	-0.135	0.336	0.003	0.237	-0.132	0.479
Urban	-0.288*	0.177	-0.602***	0.214	-0.889***	0.342
Weekday visit	-0.410	0.401	-0.577**	0.327	-0.986*	0.687
Miles	-0.001	0.003	-0.001	0.003	-0.002	0.005
Number of males in the household	0.007	0.147	0.053	0.153	0.060	0.259
Number of females in the household	-0.277*	0.206	-0.254*	0.168	-0.531*	0.330
Number of children in household	-0.291**	0.145	-0.034	0.138	-0.325*	0.249
Age	0.013**	0.007	0.000	0.008	0.014	0.013

Table 6. Elasticities Estimates

Variable	Pick-your-own strawberries (PYOS)			Pre-picked strawberries (PPS)		
	Disc. Choice	Conditional Mean	Total Effect	Disc. Choice	Conditional Mean	Total Effect
Price PYOS	-1.12	-0.418	-1.30	1.10	0.69	1.79
Price PPS	1.79	0.16	1.90	-1.76	-1.21	-2.98

Appendix 1

Consider the conditional maximization problem:

$$Max\ \bar{u}_j(x_j, k+(\psi_j+\xi t_j)x_j)\quad st.\quad x_j\pi_j+k=I$$

Making y = $k+(\psi_j+\xi t_j)x_j$ substituting back into the utility function and adding and subtracting $(\psi_j+\xi t_j)x_j$ in the budget constraint we obtain:

$$Max\ \bar{u}_j(x_j, y)\quad st.\quad x_j\pi_j+k+(\psi_j+\xi t_j)x_j-(\psi_j+\xi t_j)x_j=I \text{ or}$$

$$Max\ \bar{u}_j(x_j, y)\quad st.\quad x_j[\pi_j-(\psi_j+\xi t_j)]+y=I$$

The solutions to this maximization problem have the form:

$x_j^* = x_j(\pi_j-\psi_j-\xi t_j, I)$ and y* = $(\pi_j-\psi_j-\xi t_j, I)$ and therefore (6) and (7) follow.

Appendix 2

Log-Income Equation Estimation Results (Strawberry Survey).

Variables	Coefficient	Std. error
Constant	9.478	0.203***[a]
No. of persons in household working more than 40 hours	0.090	0.022***
No.of persons in household working less than 40 hours	-0.059	0.021***
No. of persons in household retired	0.006	0.035
Age	0.569	0.081***
Age^2	-0.062	0.008***
East	-0.077	0.053*
West	0.088	0.053**
Urban residence	0.120	0.041***
σ	0.622	0.018***
Log-likelihood value	-1816.7	

[a] Significance levels of 0.01, 0.05 and 0.10 are indicated by ***, **, and *, respectively

Appendix 3

Reduced Parameters for Discrete Choice Probit Model and Auxiliary Time Equations

Variable	Discrete Choice Effects		Time PYOS		Time PPS	
	Parameter	Std. Error	Parameter	Std. Error	Parameter	Std. Error
Intercept	-2.757***[a]	0.404	2.787	4.282	0.739	1.790
Price ($P_{pyo}P_{pre}$)	-7.025***	0.639	-5.471	6.735	-10.061**	5.621
West	-2.773***	0.280	-1.084	2.345	-5.502**	2.576
Income ($10,000)	-0.012	0.017	-0.110*	0.070	-0.091***	0.039
First visit	0.153*	0.106	0.805*	0.512	-0.046	0.366
Miles Traveled	0.000	0.001	-0.001	0.002	-0.002*	0.001
Number of males in the shopping party	0.101	0.086	-0.692*	0.464	-0.146	0.285
Number of females in the shopping party	0.287***	0.089	-0.208**	0.091	0.041	0.286
Number of children in the shopping party	0.005	0.015	0.164	0.187	-0.007	0.010
Number of males in the household	0.002	0.030	0.030	0.246	-0.019*	0.012
Number of females in the household	-0.075	0.099	-1.133*	0.757	0.047	0.228
Number of children in the household	0.136***	0.051	-0.651**	0.361	-0.269*	0.209
Number of members in household working > than 40 hours/week	-0.091	0.075	0.576*	0.428	0.145	0.202
Number of members in household working < than 40 hours/week	0.170**	0.102	0.618*	0.481	-0.270	0.371
Number of retired members in household	0.039	0.072	-0.115	0.370	0.013	0.142
Age	-0.008**	0.004	0.014	0.026	-0.009	0.023
Current residence city	0.187	0.213	-0.684	0.910	-0.749*	0.468
Current residence rural/town	-0.202**	0.112	-0.366	0.409	-0.323	0.330
Parents residence city	0.077	0.133	-0.907	0.751	-0.397	0.394
Parents residence rural/town	0.216**	0.125	-0.819*	0.628	-0.557*	0.391
Weekday visit	0.231**	0.121	1.460**	0.487	0.163	0.369
Mills ratio			-0.161	1.775	-0.506	1.353
R^2			0.09		0.09	
Adj. R^2			0.04		0.04	
Loglikelihood value	-458.19					
Ben/Lerman R^2	0.63					
Cramer R^2	0.26					
% of Correctly Predicted	71%					

[a] Significance levels of 0.01, 0.05 and 0.10 are indicated by ***, **, and *, respectively