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Willingness-to-Pay for an Educational Label: The Zamorano University Brand

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Abstract

Using a discrete choice experiment, we analyze consumer preferences and willingness-to-pay (WTP) for milk products with differing quality attributes. In doing so, in-person surveys were administered in three retail stores located in Honduras. The main attribute analyzed was the "educational component", which was used to indicate the participation of Zamorano University students in milk production and processing, where the revenue from the commercialization of the products is reinvested in the education of future low-income students with strong academic and professional potential. In general, consumers are willing to pay a price premium for milk products carrying the education label. Moreover, respondents preferred natural milk with low-fat content. Consumers also expressed price premiums for bottled milk products and a medium shelf life compared to milk packaged in plastic bags or shelf life longer than sixteen days, perhaps because of a perception of lack of freshness.

Keywords: choice experiment, Latin America, lognormal price, milk, willingness-to-pay

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Introduction

Due to technological innovations in the agricultural sector, the productivity and quality of food has significantly increased. As a result, consumer's attention towards specialty food products, which provide an extensive array of physical and credence attributes, has increased. The growing interest of consumers in particular food attributes has driven farmers to target specific production lines in order to supply various differentiated products (Canavari, Nocella and Scarpa 2005). Organic and locally grown products and those with health and quality claims are among the most influential in individual's purchasing decisions (Lusk and Briggeman 2009).

Many developing nations, particularly in Latin America, lag behind in the supply of these specialty foods mainly due to infrastructural challenges and institutional constraints in the value chain (Trienekens 2011). However, the increasing number of supermarkets in the 1990's has caused consumer preferences towards specialty food products to evolve in Latin America (Reardon et al. 2003). Retail food companies have shifted their marketing and promotional campaigns towards differentiated attributes, brand recognition, and positioning of food products in general.

Since the mid-1980s, Zamorano, a private international University located in Honduras and a leader in the agricultural sector in Latin America, has produced and commercialized a wide variety of food products including dairy, horticultural, and meat products. Unlike other agricultural universities, this institution is characterized by the methodology of "learning by doing". Under this methodology students participate directly in every step of the value chain from inputs to product distribution and commercialization in real markets. In order to gather a better understanding of the motivation behind this study, it is appropriate to give a brief overview of Zamorano University and its educational mission and contribution to society.

Zamorano University

The Pan-American School of Agriculture, Zamorano, is a private university located in the Yeguare Valley, about 30 kilometers from the capital of Honduras, Tegucigalpa. Since its foundation in 1942, Zamorano has been characterized for its multicultural student body population, which represents twenty-one Latin American countries and various social strata. Offering four agriculture-related majors, Zamorano is mainly focused on agricultural education. Zamorano offers specializations in four majors: 1) Agribusiness Management; 2) Food Science and Technology; 3) Agricultural Sciences and Production; and 4) Environment and Development. The campus is home to more than 1000 resident students for eleven months of the year. An area of 200,000 m^2 is set aside for student dormitories. The daily routines for students attending Zamorano, including a requirement to wear uniforms—to signal equality among all students, daily responsibilities, discipline, and academic requirements, are designed to encourage hard work and a leadership attitude that characterizes the institution.

The university's mission is based on four pillars: Academic Excellence, Learning by Doing, Pan Americanism, and Values and Character. However, the "learning by doing" philosophy is what fundamentally differentiates Zamorano from other universities. The "learning by doing" methodology consists of participation in practical work in the sense that students implement their scientific and business knowledge in a real world context. Zamorano's campus consists of

agricultural fields, agro-industrial plants, specialized laboratories, and research centers where students do their field work. The university enterprises, where students learn by doing, are classified into three main areas: *agriculture* (horticulture, orchards, forestry, grains and seed), *animal science* (beef cattle, swine production, agricultural machinery, and irrigation), and *food processing plants* (dairy and meat products, animal feeds, seed production, fruit and horticultural products, and sawmill). Moreover, a *marketing and sales* unit is available on-site, in which students actively interact with customers in a real market setting.

As a result of the learning by doing methodology, a significant portion of agribusiness products are manufactured by students under the supervision of faculty and staff. The educational value chain process describes the full range of activities which are required to bring a product or service from conception, through the different phases of production, delivery to consumers, and disposal after use.

Zamorano offers a wide variety of food products, available in the university's retail store and in twenty-four grocery stores located around the country. The University's enterprises price their products independently using mainly costs of production and a markup system. The markup is intended to cover production costs and to guarantee a revenue target set by the enterprise. Furthermore, the markup varies depending on the type of product. For example, in the case of white, fluid milk (which is sold in bulk) the markup ranges from 5% to 10% depending on its standardization level. The University does not suggest a retail price, but rather sets a wholesale price to retailers, who determine the final store prices for each product.

The dairy industry constitutes one of the most successful units among all production enterprises. On average, this unit generates over $1.3 million of revenue annually. The dairy enterprise sells approximately fifteen dairy products to retailers including, but not limited to, cheese, ice cream, yogurt, and milk (with white, fluid milk holding the highest sales volume). In addition, five of those products have been recently developed (chocolate milk in half-liter bags, 2% fat milk in half liter bags, basil zamodelfia cheese, garlic zamodelfia cheese, curd). The profits generated by the university enterprises are designated to provide scholarships for economically disadvantaged students with strong academic and professional potential. Around 68% of Zamorano students receive financial assistance. This, in turn, serves the noble purpose of training future agricultural leaders who contribute to the development of their home countries. This fact raises an interesting question as to whether consumers are willing to support food produced by students with the knowledge that the revenues generated from such products will be reinvested in the education of low-income students from all over Latin America.

The main objective of this study is to analyze the effect of an educational component on willingness-to-pay for Zamorano food products. The term "educational component" is used to indicate the students' direct participation in the production, manufacturing, and processing of food. Specific objectives include: 1) evaluating willingness-to-pay (WTP) for milk products containing the educational component (Zamorano brand), and 2) analyzing sociodemographic characteristics of target markets. To achieve this purpose, in-person surveys were administered at three retail stores in Tegucigalpa, Honduras. White pasteurized milk was used as the reference product since fluid milk presents the highest sale's volume among all dairy products commercialized by Zamorano.

Methodology

Data and Experimental Design

The data were collected using in-person surveys administered in three retail grocery stores located in Tegucigalpa, Honduras. A total of 200 responses were collected in June and July 2014. Subjects were randomly selected among primary shoppers who were present in the market at the time of the study. Since Zamorano students are not allowed to leave the campus on weekdays, participants were regular shoppers (students in the sample are not Zamorano students). Table 1 shows some demographic characteristics of the sample and the Honduran population according to the Honduran National Statistics Institute (INE 2012). The sample is somewhat different from the general Honduran population, since the target population was primary grocery shoppers. The grocery stores where the study was conducted were selected based on the availability of products manufactured by Zamorano University and locations with high diversity of sociodemographic characteristics of grocery shoppers.

Grocery shoppers were approached randomly (every certain number of pass-byers) and asked if they were willing to participate in the study. In total, 10% of consumers refused to participate mainly due to time constraints. No personal identifiers were used, and participation was voluntary. The average time to complete the survey was 12 minutes.

The experiment had two stages. In the first stage, participants were asked to provide general information regarding their demographic and behavioral characteristics (Table 1). In the second stage, a discrete choice experiment (DCE) was conducted to elicit consumer preferences for milk attributes. The DCE consisted of 12 choice sets. In each choice set, subjects were asked to choose between two alternatives and an opt-out no purchase option. A sample choice set is presented in Figure 1. The alternatives in each choice set represent a combination of milk attributes, closely resembling a real-life purchasing condition. Moreover, the opt-out option was included to mimic a more realistic shopping situation.

Product Attributes Description and Hypotheses

The first step in designing the DCE was the selection of the most relevant milk attributes and attribute levels. The attribute levels were then combined to form realistic milk products. The milk attributes selected for the DCE were: 1) educational component, which indicates the student's participation in milk production and processing; 2) packaging, which refers to the type of package in which the product is presented to consumers; 3) natural, which refers to milk that has not been altered with artificial ingredients or additives; 4) fat content, which indicates the fat content of milk after pasteurization and standardization; 5) shelf life, which indicates the optimal period of consumption after processing as indicated by the expiration date; and 6) price, in the local currency (Lempiras) per one-liter of milk. The price ranged from $0.75 to $1.25; although the price may seem low, it is significant for the study population since average monthly income in Honduras is about $210 per household. A detailed description of the milk attributes and corresponding attribute levels is presented in Table 1. The definitions presented in Table 1 were included in the survey to ensure participants were familiar with each attribute definition.

The price coefficient was restricted to be negative indicating that consumers prefer low prices. The coefficients for natural and low-fat content are expected to be positive due to a general perception of the products being healthier with those attributes. It is also hypothesized that the coefficients for bottled milk and longer shelf-life would be positive due to consumer preferences towards more convenient and functional products. A positive effect is also expected for the educational component attribute.

Suppose that options A and B are available for sale in this store today. Which one would you choose?

1	Option A	Option B	Option C
Educational Component	No	Yes	None of the products
Packaging	Plastic bag	Bottle	
Natural	Yes	No	
Fat content	Whole	Skimmed	
Shelf life	10 - 16 days	>16 days	
Price ($)	1.25	0.75	
I would choose (please mark only one option)	☐	☐	☐

Figure 1. A Choice Set Sample

With a total of six product attributes, three with two levels (2^3) and three with three levels (3^3), there are 216 possible product feature combinations. In order to reduce the number of choices respondents have to make, an orthogonal fractional factorial design was generated using the %ChoicEff macro in SAS 9.3 with a modified Fedorov algorithm similar to the Optex procedure (Kuhfeld 2013). The resulting design consisted of 12 choice sets or scenarios with a relative D-efficiency of 87.69%. The order of the choice sets was randomized to account for potential ordering effects. The complete choice experiment is available upon request.

The choice experiment conducted in this study was hypothetical since there were no economic consequences to respondents and the exchange of money for actual products was not feasible (Harrison 2006). This could have induced "hypothetical bias". Hypothetical bias is the difference between hypothetical and non-hypothetical WTP estimates (List and Gallet 2001; Murphy et al. 2005). A number of methods have been suggested to reduce or mitigate the presence of hypothetical bias (Lusk and Schroeder 2004). A commonly used method is employing a cheap talk script, in which participants are informed about the hypothetical bias problem prior to the experiment (Lusk 2003). The implementation of cheap talk was useful in this study since all surveys were administered in-person at retail stores and the experimenter had the opportunity to interact directly with participants. In order to reduce hypothetical bias, the following cheap talk statement was included in the instructions prior to the DCE: "*It is important that you make your selections as if you were actually facing these choices in your retail purchase decisions.*" A hypothetical DCE was used in the study for two main reasons. First, some of the product feature combinations were not currently available in retail markets. Second, due to budget and time constraints, a hypothetical method was the most feasible approach.

Table 1. Milk Attributes and Attribute Levels Evaluated in Choice Experiment

Attributes	Description	Attribute Levels
Educational Component	Students were involved in milk processing as part of their learning process, where the main objective is to obtain technical knowledge. This process was made under the proper professional supervision. The revenue generated by the commercialization of this product will be reinvested in college education of low-income students with strong academic potential.	Yes No
Packaging	Package in which the product is presented to consumers.	Bottle Plastic bag
Natural	Milk is 100% natural if it does not contain artificial flavors, added color, or synthetic substances[a].	Yes No
Fat content	Natural milk fat after pasteurization and standardization.	Whole (2% fat) Low-fat (1% fat) Skimmed milk (<1% fat)
Shelf life	Period that the milk is available for sale after the processing. No health problems caused by the milk consumption are guaranteed during this period.	<10 days 10 - 16 days >16 days
Price	Amount of money a person is willing to pay for a liter of milk.	L. 15 ($0.75)[b] L. 20 ($1.00) L. 25 ($1.25)

Source. [a] FDA, 2015.
[b] Currency used in the CE was lempiras. Prices converted to U.S. dollars are shown in parenthesis.

Econometric Model

The theoretical framework of the choice experiment is given by the Random Utility Theory (RUT) (McFadden 1974) and the Characteristics Valuation Theory (Lancaster 1966). The RUT assumes that the decision maker behaves rationally and has perfect discrimination capabilities. In this context, the analyst has incomplete information and, therefore, uncertainty must be taken into consideration. On the other hand, Lancaster's theory posed that products are not the direct object that provide utility to the decision maker. Instead, it is the characteristics and attributes of the products that give real value to consumers making them ultimately responsible for determining the final purchase decision. In each choice set, respondents had to choose between two milk products and a "none of the products" option included to account for cases in which the

subject was not interested in either product. Let the i^{th} individual's utility of choosing alternative *j* in choice set *t* be given by

$$(1) \qquad U_{ijt} = V(x_{ijt}) + \varepsilon_{ijt}$$

where $V(x_{ij})$ is the systematic part of the utility function determined by the milk attributes, and ε_{ij} is the stochastic unobserved part that captures the uncertainty (McFadden 1974). The stochastic error, ε_{ijt}, is assumed to be independent and identically distributed (i.i.d.) over all individuals, alternatives, and choice sets (Revelt and Train 1998). Assuming a density function f_ε for the error term induces a density function for *U* (Hanemann 1984). Since each individual faces twelve choice sets *t*, each consisting of three alternatives, equation (1) describes a panel data model where the cross-sectional element is individual *i* and the time-series element is the *t* choice sets. A respondent will choose alternative *j*, if that alternative maximizes the utility among all available alternatives in the choice set C_j.

Previous experimental studies have found that individuals often exhibit heterogeneous preferences and that choices made by the same respondent are likely to be correlated (Train 2009). Preference heterogeneity and within-cluster correlations can be addressed by estimating a Random Parameters or Mixed Logit model (RPL). The RPL model accounts for unobserved individual heterogeneity in tastes and preferences by allowing the parameters to vary across respondents, following a specified distribution (Revelt and Train 1998). The functional form of the utility function for alternative *j* can be specified as

$$(2) \qquad U_{ijt} = \alpha' P_{ijt} + \beta_i' x_{ijt} + \delta_{i4t} + \varepsilon_{ijt}$$

where P_{ijt} is the price of alternative *j* for individual *i*, and β_i is an unobserved vector of individual-specific coefficients to be estimated. β_i varies within the population with density $f(\beta|\theta)$, in which θ represents the mean and standard deviation of all the βs determined by the survey sample. Also, x_{ijt} refers to a vector of observed milk attributes of alternative *j* in choice set *t*, and δ represents a no-purchase alternative specific constant. In this model, price constitutes a random parameter restricted to be negative. There are usually convergence issues when trying to restrict the price parameter to be negative; however, the approach proposed by Hensher and Greene (2003) facilitates convergence by specifying the distribution of the negative of price into a lognormal distribution. The intuitive reasoning is that the positive (lognormal) coefficient of a negative variable is indeed negative.

To use Maximum Likelihood Estimation, the probability of each individual's sequence of selections must be specified. Let the subscript *j(i,t)* indicate the alternative chosen by individual *i* in choice set *t*. The unconditional probability of a subject's observed series of choices is the conditional probability integrated over the distribution of β, given by

$$(3) \qquad \mathrm{P}_i(\theta^*) = \int \prod_{t=1}^{T} \left(\frac{\exp(\beta_i' x_{ij(i,t)t}}{\sum_{j=j}^{J} \exp(\beta_i' x_{ijt})} \right) f(\beta_i|\theta^*) d\beta_i$$
$$= \int S_i(\beta_i)\, f(\beta_i|\theta^*) d\beta_i$$

where θ^* are the true parameters of the distribution of β_i. The unconditional probability is then a weighted average of a product of logit models evaluated at different values of β, with the weights given by the density of f. The log-likelihood for the model can be written as

$$(4) \quad \mathrm{LL}(\theta^*) = \sum_{i=1}^{N} ln\mathrm{P}_i(\theta^*)$$

Since equation 4 cannot be solved analytically, it must be approximated numerically using simulated Maximum Likelihood methods. The simulated log-likelihood is then given by

$$(5) \quad \mathrm{SLL}(\theta^*) = \sum_{i=1}^{N} \ln\left\{\frac{1}{D}\sum_{d=1}^{D} S_i(\beta^d)\right\}$$

where d refers to the number of replications used in the simulation and β^d is the d^{th} draw from $f(\beta_i|\theta^*)$. In this application, the Random Parameters model was estimated using 500 Halton draws (Greene 2012).

Willingness-to-Pay Estimates

The marginal rate of substitution between price and other attributes was calculated in order to estimate willingness-to-pay for each attribute. That is, how much would the price have to change for respondents to be indifferent between qualitative variables (Lusk, Roosen, and Fox 2003), which is denoted as $WTP = -2\left(\frac{\beta_k}{\beta_p}\right)$. β_k is the coefficient for each attribute k determined in the regression model and β_p is the coefficient on price or the marginal utility of money. The ratio is multiplied by 2 because of the use of effects coding. Effects coding consists of using a -1 for the base category to avoid confounding effects with the opt-out no-product alternative. Since price and all the other milk attributes are not a single coefficient estimate, but each one represents a distribution of coefficients, the range of willingness-to-pay values was calculated using the delta method for a 95% upper and lower bound intervals. The Delta method uses a Taylor's approximation series to calculate the variance and standard errors of the ratio of parameter estimates. In this method, β represents a probability distribution in which the parameters are estimated with some uncertainty level. Please refer to Bliemer and Rose (2013) for a complete mathematical derivation of the ratios using the Delta method.

Results and Discussion

In analyzing the demographics of the survey sample (Table 2), over 65% of participants were females, and around 78% were aged 24-years or older. The sample was composed mostly of individuals with at least some college education (84%). Additionally, about 74% of participants reported a monthly household income of more than $750.

The random parameter logit estimates are presented in Table 3. The data consists of 12 choice sets × 3 alternatives × 200 participants for a total of 7,200 observations. The opt-out no-product constant is negative and significant, indicating respondents were more inclined to choose one of the milk products over the option of not making a purchase.

Table 2. Demographic Characteristics of Experiment Participants (n=200)

Variable	Category	Sample		Honduran[a] Population	
		Mean	**Percent**	**Mean**	**Percent**
Age (years)	Under 18		0.0		43.7
	18 - 24		22.0		12.1
	Above 24		78.0		44.2
Education	Elementary Diploma or Less		2.5		71.6
	High School Diploma		14.0		23.2
	Bachelor's Degree or some College		83.5		5.2
Gender	Female		64.5		51.2
	Male		35.5		48.8
Monthly Household Income ($)		$825.70		$210[b]	
	250 or less		6.0		
	250 - 750		20.0		
	More than 750		74.0		

Source. [a] Honduran National Statistics Institute (INE), 2012.
[b] Monthly household income at Distrito Central has been converted to U.S. dollars.

The educational component shows a positive and statistically significant effect. Recall that the educational component was defined as students participating directly in the milk production and manufacturing process under professional supervision, and that the income generated from the product sales would be reinvested in the education of low-income students. The positive effect of the educational component indicates that consumers are willing to support education by purchasing products manufactured by students and intended to enhance learning opportunities. Moreover, milk packaged in a bottle was preferred over milk packaged in a plastic bag. This effect can be explained by consumer concern for more convenient and ergonomic food packaging (Schifferstein 2010).

Additionally, results show a preference for natural, low fat, and skimmed milk. These results can be explained by increased consumer interest in healthy food products and quality. Regarding product durability, respondents show a preference for milk with a medium shelf-life (10–16 days) compared to a low shelf-life (less than 10 days). However, the higher shelf-life (more than 16 days) coefficient was not statistically significant. It is important to note that over one–fifth of the participants reported food poisoning from consuming fluid milk at least once in their lives. Thus, a possible explanation is that subjects perceive milk as a fresh but highly perishable product. Therefore, they exercise caution and a lack of trust when it comes to extended shelf-lives beyond 16 days. Furthermore, results indicate that most of the standard deviations of the random parameters were statistically significant, meaning that there exists heterogeneity in consumers' tastes and preferences for each product attribute.

Table 3. Random Parameters Logit Estimation Results

Variable	Parameter		Standard Error
	Means of Random Parameters		
No product [a]	-0.7191	***	0.2031
Education			
Educational component	0.8493	***	0.0879
Packaging			
Bottle	0.9535	***	0.1009
Natural	1.5423	***	0.1196
Fat content			
Whole	-0.8748	***	0.1525
Low-fat	0.3875	***	0.0971
Shelf life			
High	0.1071		0.0757
Medium	0.4185	***	0.0789
Price	-2.2180	***	0.1152
Education	**Standard Deviations of Random Parameters**		
Educational component	0.9467	***	0.0998
Packaging			
Bottle	1.2179	***	0.1015
Natural	1.2841	***	0.1100
Fat content			
Whole	2.0933	***	0.1770
Low-fat	0.917	***	0.1332
Shelf life			
High	0.0997		0.1601
Medium	0.1847		0.1425
Price	0.7027	***	0.0668
NOBS	7200		
Log-Likelihood	-1881.643		

Note. [a] The No product coefficient refers to Option C, "None of the products", in the CE.
Single (*), double (**), and triple (***) asterisks are used to denote significance at the 0.10, 0.05, and 0.01, respectively.

Willingness-to-Pay Estimates

The coefficients of the milk attributes of the choice model were used to estimate mean willingness-to-pay values (MWTP). Table 4 shows the MWTP values for each milk attribute. For reference, the average milk market price at the time of the experiment was $1.0 per liter.

On average, consumers are willing to pay a price premium of $0.04 for milk products containing the educational component. The range of the distribution of WTP for the educational component was between $0.03 and $0.05, which indicates that consumers are willing to support education by consuming products where students are part of the production and manufacturing process. Also, respondents expressed price premiums of $0.07 and $0.02 for the natural and low-fat milk products, respectively.

There were price premiums of $0.04 and $0.02 associated with bottled and medium shelf-life milk products, respectively. As discussed before, this aversion may be due to a perception of lack of freshness and general distrust of milk with expiration dates beyond 16 days and possibly an association with potential food poisoning. At this point it is important to note that those price premiums, although relatively low, are quite significant considering the generally low average monthly income of participants.

Table 4. Willingness-to-Pay Estimates for Milk Product Attributes in Honduras

Variable	Mean WTP ($)	Range WTP ($)
Educational Component	0.04	[0.03 , 0.05]
Bottle	0.04	[0.03 , 0.05]
Natural	0.07	[0.06 , 0.08]
Whole	–0.04	[–0.05 , –0.02]
Low-Fat	0.02	[0.01 , 0.03]
High Shelf Life	0.01	[0.00 , 0.01]
Medium Shelf Life	0.02	[0.01 , 0.02]

Summary and Conclusions

A discrete choice experiment was conducted to evaluate consumer preferences and willingness-to-pay for milk products with varying quality attributes. The main attribute evaluated was an "educational component" of milk products processed by Zamorano University students. The term educational component was used to indicate students' participation in milk production and processing under the supervision of faculty and staff. The revenue generated by the commercialization of such products is reinvested into the education of low-income students with strong academic and professional potential. In doing so, 200 in-person surveys were administered in three retail stores located in Tegucigalpa, Honduras. Results from the study show that consumers are willing to pay a price premium of $0.04 for milk products with the educational label. This result carries some potential implications for agribusinesses seeking to differentiate their products by supporting educational efforts not only at the elementary level but also at advanced levels.

Participants had price premiums of $0.07 and $0.02 for natural and low fat milk respectively. They also preferred bottled milk products with a medium shelf life. Although the willingness-to-pay estimates may seem low when converted to U.S. dollars, the percentage increase in willingness-to-pay is within the range of similar studies, and perhaps constitutes a reflection of the particular market environment in the study.

In conclusion, the results show that there exists a potential to provide products that go beyond satisfying basic nutritional needs by adding social value and that consumers are willing to pay price premiums for such products. However, it is important to note that other physical and credence attributes also played an important role in the perception and acceptance of such products.

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