THE INFLUENCE OF INFORMATION AND PRODUCT LABELS ON CONSUMER PREFERENCES AND WILLINGNESS TO PAY FOR PECANS

by

SHARON P. KANE

(Under the Direction of Gregory Colson)

ABSTRACT

Pecans, with a $560 million U.S. agricultural production value, remain a largely unexamined area of consumer preferences, willingness to pay (WTP) for attributes, or valuations of mandatory country of origin (COO) labeling requirements. Recent approval of a Federal Marketing Order (FMO) for the U.S. pecan industry highlights the importance of consumer valuation as stakeholders pursue avenues to address marketing and consistency-of-standards challenges in this sector. Key to investigating consumer valuations are product labels, on which vital information is conveyed by producers and manufacturers to consumers at point of sale. Clear and effective labels not only allow consumers to align their preferences with available options, but hold potential economic gains when product information garners a price premium for desired attributes.

Employing choice experiments and random *n*th price experimental auctions in a series of research sessions with adult consumers in two Southeastern U.S. cities, this study assesses how consumers respond to product attributes and label details in different information contexts for purchases of shelled pecan halves. From the data collected in the research sessions, we address the following: 1) consumers' willingness to pay for select initiatives proposed in conjunction

with the FMO regarding pecan attributes, 2) directly eliciting the consumers' value of obtaining information about attributes vs. WTP for particular attributes in pecan purchases under alternative labeling scenarios, and 3) the influence of consumer risk and ambiguity attitudes on consumer preferences for single or mixed country of origin products.

Findings indicate that, in choice experiments, consumer ethnocentric tendencies and purchasing patterns play a role in defining differences among consumer taste preferences and WTP, while efforts to educate consumers about attributes are essential. Overall, despite significant taste heterogeneity, consumers generally are most willing to pay a premium for pecans of U.S. origin over other attributes, though there is some evidence from the experimental auctions that the value of origin information diminishes in a more complex information environment. However, in the presence of risk or ambiguity regarding knowledge of product provenance, consumers prefer mixed origin over any risk of obtaining the single origin product from their lowest ranked preference country.

INDEX WORDS: value of information, willingness to pay, experimental auctions, consumer preferences for pecans

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Introduction

The United States is the world's largest producer of pecans, a native North American tree nut (Wood, Payne, and Grauke 1990, Wells 2017) that represents a production value of over $560 million, with approximately 80 percent of the utilized pecan production and dollar value originating from three states – led by Georgia, followed by New Mexico and Texas (USDA 2016b). Pecans comprise about four percent of U.S. tree nut production (in-shell basis) and just under eight percent of production value, in a category for which almonds command more than two-thirds of the $7.7 billion total tree nut production value (USDA 2016a). According to the United States Department of Agriculture Outlook, U.S. pecan production is expected to increase three percent to over 262 million pounds for the 2016/17 marketing season (USDA 2017).

In 2016, a Federal Marketing Order (FMO) for the 15-state pecan production region[1] of the U.S. was approved and codified into regulation with the goal of benefitting those who grow, buy, process, and eat pecans (American Pecan Board 2016). Initiated as industry-driven agreements, FMOs are individually tailored to promote an industry and cooperatively address its customized needs, ultimately becoming binding regulation after approval by producers and the Secretary of Agriculture (USDA). The 2016 FMO was obtained by the pecan industry citing

[1] The FMO covers pecans grown in Alabama, Arizona, Arkansas, California, Florida, Georgia, Kansas, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, and Texas. Any financing required to carry out directives of the FMO are handled through assessments on the handlers of pecans grown in these states and locally managed, under USDA oversight, by the American Pecan Council which is assembled as a result of the order. (USDA 2016) For more detail, see the final rule, effective August 5, 2016 (Federal Register 2016).

challenges that include supply concerns, prices, market disruption, and lack of uniform quality, container, and packaging standards (American Pecan Board 2017). The final rule encompasses several actions to be undertaken to address these issues, including collection of industry data on production, inventory, and supply, authorization of funding for research on health and nutrition aspects of pecans and improved technology, as well as recommendations for uniform grade, size, quality, and container standards (Federal Register 2016).

Within the final ruling, there is documentation of the economic benefits to the growers and handlers, based on generic results that agricultural product promotion stimulates demand and ultimately translates into higher prices for producers (Federal Register 2016). However, within the literature there is no direct evidence demonstrating just how consumers might respond to potential actions prescribed by the pecan FMO being implemented in the marketplace, particularly with respect to grade, size and quality standards or health and nutrition characteristics.

In general, pecans are largely an understudied commodity in terms of consumer preferences. The primary emphasis of available research includes a focus on native versus improved pecan varieties (Palma, Collart, and Chammoun 2015), pecan consumer demographics, consumption frequency, purchase patterns and overall tree nut nutrition knowledge (Lillywhite, Simonsen, and Heerema 2014, Lombardini, Waliczek, and Zajicek 2008), festival attendees preferences among three tree nuts (Gold, Cernusca, and Godsey 2004), quality perception (Park and Florkowski 1999) and factors affecting retail outlet selection in purchasing pecans (Florkowski, You, and Huang 1999).

Further unexplored is how consumers might respond to country-of-origin (COO) labeling policies related to pecans. The mandatory point-of-purchase COO labeling for beef and pork has

recently been discontinued in the U.S., yet the requirement for pecans and other "covered commodities" remains in place as a regulatory policy with the aim of better-informing consumers (USDA). True to the stated intent of the regulation, some studies have found that COO labeling may help to mitigate the search costs for consumers who prefer domestic food products and functions as a solution to asymmetric information (Lusk et al. 2006). However, geographic information may also be perceived as a quality or food safety marker (Lim et al. 2013, Lewis and Grebitus 2016), a way to connect with or support one's region or locality (Boys and Blank 2016) reflect consumer ethnocentrism (Lusk et al. 2006, Lewis and Grebitus 2016, Klain et al. 2014), represent a freedom-of-speech issue (Tushnet 2015) or provide other signals about the product (Lusk and Briggeman 2009). Though the consumer decision-making process can be complex (Lusk et al. 2006, Deselnicu et al. 2013, Costanigro et al. 2014) and most studies are context-or product-specific, there is limited evidence that consumers generally favor labeling identifying the country of origin (Lim et al. 2013), but any such substantiation for pecan purchases requires further exploration.

In order to evaluate how pecan consumers might respond to potential FMO recommendations and COO labeling, we examine adult consumer preferences for shelled pecan halves with organic, geographic origin, freshness, grade, size and health/nutrition attributes via in-person choice experiments in two Southeastern U.S. cities. The product characteristics selected for the choice experiments were modeled after the FMO framework in order to address current and future challenges for the pecan industry and fill the gap in the literature with improved knowledge of consumer preferences for pecans.

In the remainder of the paper, we detail the choice experiment design, experimental procedures, and sampling strategy. Following key sample statistics, estimates of consumer

preferences and willingness to pay for pecan attributes are presented employing two alternative econometric specifications - mixed logit and latent class models. Finally, we conclude with a discussion of the implications of the results for the potential of the FMO recommendations to increase pecan demand.

Research Design/Data Collection

Recruitment

Consumer recruitment took place in two communities in Georgia—Griffin, and Athens—with the research sessions occurring at University of Georgia research facilities. For the Griffin sessions, consumers were recruited in the summer of 2016 from the Sensory Evaluation and Consumer Lab (University of Georgia Griffin campus) database of adults in the general public, with 240 agreeing to participate at the time of recruitment. Participants were recruited and pre-screened for tree nut allergies[2] using an online survey for the one-hour sessions. Following the screener check, participants were contacted and chose from offered sessions, with several being held over a three-day period at different time slots with a target of approximately twenty participants per session. Each person was reminded once, by either email or phone, the day before the scheduled research would take place. A total of 218 participants showed up for sessions held on the campus in Griffin.

A flyer with recruitment information was posted in locations throughout Athens, containing an email to contact for additional information and scheduling. Upon receipt of the email, we sent additional information to responders via an online survey, which included pre-screening for tree nut allergies and selection of an offered time slot for research sessions over a three-day period. Each person was reminded once by email the day before the scheduled research

[2] Though there would be no consumption of pecan products on-site, research was restricted only to those without nut allergies in an abundance of caution for the well-being of participants and this method was how the IRB approved the study.

would take place. A total of 75 people participated in the research sessions in Athens. In both locations, each group of interested respondents was informed that they would take part in research about consumer preferences for tree nuts and given a participation fee of $50 upon arrival for a research session. Each participant was given a questionnaire that included basic demographics (gender, education, age, race, and income), pecan consumption and buying habits, awareness of mandatory country of original laws with respect to pecans, label reading behavior with common purchases, and questions that allow a calculation of their ethnocentrism as outlined in Klain et al. (2014).[3] The ethnocentrism measure—a 1 to 5 scale with higher indicating more—addresses the contention that differences in consumer valuation by country of origin are driven merely by consumer protectionism preferences. Across the 15 sessions held over a two-week period, 293 participants completed the study, close to meeting the goal of 300 respondents.

Choice Experiment Design

Under the objective of illuminating consumer preferences and willingness to pay within the constructs of potential new standards, exact combinations of these product attributes do not currently exist in the marketplace. Therefore, we create hypothetical combinations to question respondents and maintain ethical standards of research design (Colson et al. 2016).

The choice experiment portion of the study uses a balanced orthogonal design with NGENE software producing 2 blocks of 8 choice sets each. Each choice set offers the respondent two selections from which to purchase an 8 oz. bag of shelled pecan halves with different attributes and prices (see Figure 1.1 for an example of the choice set question, similar to

[3] We used the same method as Klain et al. (2014), which involved shortening the CETSCALE found in Shimp and Sharma (1987) from a set of 17 Likert-scaled question down to three questions. Their test of the original measure led to choosing the three that had the highest factor loadings in the general ethnocentrism scale, leading to development of a 3-question based average. This average was calculated based on the respondent's answer to three questions where each individuals' responses ranged from "strongly agree" to "strongly disagree" on a five-point Likert-scale. The exact language in the three questions as quoted from Klain were: "Americans should not buy foreign products, because this hurts American business and causes unemployment," "It is not right to purchase foreign products because it puts Americans out of jobs," and "A real American should always buy American made products."

Lusk, Roosen, and Fox 2003). Another selection is to choose not to purchase either option resulting in three alternatives within each of the 8 sets. Following (Lim et al. 2013) and others, one of the three choices is the "would-not-buy" option. Unlike some product purchases, for a bag of shelled pecans, this is a reasonable alternative with little possibility for misinterpretation (McFadden 2015) given likely familiarity with pecans among participants, making for a more realistic purchasing environment in which the respondent can choose neither option (Hensher 2010).

The selections within the choice sets consist of seven overall categories: price, organic production, country of origin, expiration date, size, grade, and health or nutrition claim, with more detailed choices within the expiration, size, grade, and health or nutrition categories. A summary of the attributes and levels are presented in Table 1.1. The approximate retail price of an 8-ounce bag of shelled pecans (not organically produced) at a retail outlet was $5.99 at the time the data was collected.[4] Other categories include country of origin selection (The United States or Mexico), whether the product was organically produced, and how far in the future the product would expire (3, 6, or 12 months). All other attributes in the choice sets are based on FMO objectives regarding size, grade, and health or nutrition claims as outlined in the introduction of this report.

Table 1.1: Choice experiment category descriptions

Pecan Attributes	**Pecan Levels**
Price	$2.25, $5.00, $8.50
Organic	No, Yes
Expiration Date	3 months, 6 months, 12 months
Country of Origin	Mexico, United States
Size	None indicated, Small, Large, Extra Large, Jumbo, Mammoth
Grade	None indicated, Standard, Choice, Fancy
Health/Nutrient Claim	None indicated, Heart Health, Naturally High in Antioxidants

[4] Research sessions took place in July and August of 2016. Organic shelled pecans in 8 oz. bags are not commonly found in area brick-and-mortar grocery stores. For perspective on the size of the organic pecan market, USDA *2014 Organic Survey* reports only 1.5% of total pecan production in 2014 was organic.

The following questions represent different descriptions for the purchase of an 8 oz. bag of pecan halves. Please check the option which you would be most likely to purchase.

Product Attribute	**Option A**	**Option B**	**Option C**
Price	$2.25	$5.00	Neither A nor B is preferred
Organic	Yes	No	
Expiration Date	6 Months	3 Months	
Country of Origin	U.S.A.	Mexico	
Size	Jumbo Halves	Small Halves	
Grade	Choice	Standard	
Health/Nutrient Claim		Heart Healthy	
I would choose…	☐	☐	☐

Figure 1.1: Example of choice set question

Summary Statistics

Basic summary statistics of participant sample are shown in Table 1.2. Nearly two-thirds of the sample are female (61.8%) and most participants are between 18 and 34 years of age, but participant ages range from 18 to 77. Marital status, racial/ethnic distribution, and income and education levels closely reflect those from the region in which they live. Participants are asked about how often they consume pecans, ranging from very rarely to very often, with the largest response being "sometimes" at 45%. Just over one-third (34%) answered either often or very often, with the Griffin research participants more often than those at the Athens site (38% vs. 23%).

Consumers are also queried regarding their awareness of mandatory country-of-origin (COO) labeling for pecans and their purchasing patterns. Only 22.6% indicate that they know COO labeling exists for pecans. As defined in Klain et al. (2014), we average responses to generate each respondents' overall ethnocentrism score. Unlike the Klain findings, our participants are, on average, less ethnocentric than not with an average score of 2.7 (2.4 in Athens, 2.8 in Griffin), slightly less than the midpoint of the size point scale.

Label Information

The questionnaire provides further details about the consumers' characteristics related to purchasing preferences (Table 1.3.). About 63% indicate that they either always (26.4%) or often (37.0%) read food package labels. More than 4 out of 5 say that they either always (57.9%) or often (24.3%) look for expiration dates, while less than one-half of that amount (32.9%) report always or often looking for the country of origin on labels. Slightly less than twenty percent purchase organic foods either always (6.9%) or often (12%).

Consumer-reported Diet and Health

Respondents are asked to rate the healthiness of their diet and their overall health on a 1 to 10 scale, with 1 being the least healthy and 10 the most. Respondents tend more towards believing both their diet and their overall health are more healthy than unhealthy, with the median response for both questions at seven. The mean response for diet is 6.4 and health at 7.0.

Table 1.2: Sample descriptive statistics (n=289)

Variable	Description	Sample Percent/Mean
Gender	Female	61.8%
Age	18-34 years	42.9%
	35-44 years	15.2%
	45-54 years	21.5%
	55-64 years	18.0%
	65 years +	2.4%
Marital Status	Married	47.1%
	Single	41.9%
	Divorced/Widowed	8.3%
	Other	2.8%
Race	African-American	13.8%
	Asian-American	5.5%
	Caucasian	72.2%
	Hispanic/Latino	2.4%
	Other	6.2%
Income	Less than $25,000	25.5%
	$25,000 to $99,999	58.3%
	More than $100,000	16.2%
Education	Bachelor's or higher	37.6%
Eat pecans	Very Often	10.0%
	Often	24.4%
	Sometimes	45.0%
	Rarely	15.5%
	Very Rarely	5.2%
Knowledge of COO	Yes	22.6%
	No	55.8%
	Don't Know/Not sure	21.6%
Ethnocentrism	1=low, 5 = high (mean)	2.7

Table 1.3: Consumer label-reading frequency and organic purchasing

	Percent of Participants				
	Always	Often	Sometimes	Rarely	Never
Read Nutrition Labels	26.4%	37.0%	28.1%	5.1%	3.4%
Look for Expiration Dates on Labels	57.9%	24.3%	13.4%	3.1%	1.4%
Look for Country of Origin on Labels	12.3%	20.6%	31.2%	25.3%	10.6%
Purchase Organic Foods	6.9%	12.0%	34.7%	28.2%	18.2%

Research Method: Mixed Logit, Latent Class Logit, and WTP

Given their recognition as the essential method to study discrete choice data, we utilize the logit family of models (Hensher and Greene 2003). Specifically, because consumers are likely heterogeneous across tastes and preferences (Wedel and Kamakura 2000), we employ the mixed logit and latent class logit models in order to capture any potential unobserved differences (Wedel and Kamakura 2000, Boxall and Adamowicz 2002, Greene and Hensher 2003, Kafle, Swallow, and Smith 2015). Each model possesses specific merits for applicability (Greene and Hensher 2003).

Random utility theory (McFadden 1974) provides the economic framework for the empirical analysis from the perspective of consumer utility maximization under both methods. Within this context, we begin with the utility function (U_{ijt}) of consumer i for alternative j in choice set t:

$$U_{ijt} = \mathbf{x}_{ijt}\boldsymbol{\beta} + \varepsilon_{ijt},$$

where $\mathbf{x}_{ijt}$ is a vector of the attributes of alternative j in choice t, ε_{ijt} is the error term, and $\boldsymbol{\beta}$ is to be estimated. Under the assumption of a utility maximizing agent, with each choice set t the consumer chooses the alternative yielding the greatest utility. As demonstrated by McFadden (1974), with the error term independent and identically distributed (iid) extreme value (Hole

2007), the resulting choice probability in the logit context is denoted by consumer i choosing alternative j in choice situation t:

$$P_{ijt} = \frac{\exp(\mathbf{x}_{ijt}\boldsymbol{\beta})}{\sum_{k=1}^{J}\exp(\mathbf{x}_{ikt}\boldsymbol{\beta})}.$$

Mixed Logit Model

Building upon this framework, the mixed logit model extends the basic Logit model to allow the estimated parameters, $\boldsymbol{\beta}$, to be random instead of fixed, which enables heterogeneous taste preferences of the consumers to be incorporated (Hole 2007b). The estimated random $\boldsymbol{\beta}$ has a distribution of $\boldsymbol{\beta} \sim \mathrm{h}(\boldsymbol{\theta} + \mathbf{v}, \boldsymbol{\Omega})$ which allows researchers the flexibility to apply to the random parameters h(.) any appropriate probability distribution. The $\boldsymbol{\beta}$ includes $\boldsymbol{\theta}$ as the estimated mean value and $\mathbf{v}$, the iid error, with $\boldsymbol{\Omega}$ representing the covariance matrix of the parameters. The attributes can be specified for correlation between them, then $\mathrm{h}(.)$ becomes a joint probability density function with non-zero off-diagonal elements of $\boldsymbol{\Omega}$ reflecting those correlations. The notation for this choice probability under a mixed logit model assuming joint distribution is:

$$P_{ijt} = \frac{\exp(\mathbf{x}_{ijt}\boldsymbol{\beta})}{\sum_{k=1}^{J}\exp(\mathbf{x}_{ikt}\boldsymbol{\beta})}\mathrm{h}(\boldsymbol{\beta})\mathrm{d}(\boldsymbol{\beta})$$

which can be estimated using simulated maximum likelihood methods (Train 2003). The Halton draws, which offer a stable set of parameter estimates (Hensher and Greene 2003) were employed at 500 draws per iteration in the simulated maximum likelihood estimator.

As in Lim, et al. (2013), we separate the utility function into observable (V_{ijt}) and error components, with observable specified in the following manner:

$$V_{ijt} = \alpha' c_{ijt} + \boldsymbol{\beta}_i' \mathbf{x}_{ijt}.$$

In this specification, the price of the product (c_{ijt}) is a scalar and has a fixed parameter α to ensure a meaningful estimated price coefficient (Lim et al. 2013, Meijer and Rouwendal 2006). The $\mathbf{x}_{ijt}$ are the attributes of alternative *j* faced by individual *i* in choice scenario *t*. The estimated parameters in β are random and specified to have a normal distribution with correlated attributes.

Latent Class Model

Similar to the mixed logit model, the latent class model allows for heterogeneity in consumer tastes but relaxes the necessity to specify any distribution function across individuals (Greene and Hensher 2003). This extension to the methodology asserts that consumer behavior depends on both recognizable attributes and latent heterogeneity that is not observable. These latent subgroups are implicitly separated into a set of Q classes, which may or may not be known to the consumers themselves, but is not known within the research context. This choice probability of individual *i* choosing alternative *j* in the choice set *t* and given class *q* is (Lim, et al, 2013):

$$P_{it|q}(j=1) = \frac{\exp\left(\alpha' c_{ijt} + \mathbf{x}'_{it,j}\boldsymbol{\beta_q}\right)}{\sum_{j=1}^{J}\exp(\alpha' c_{ijt} + \mathbf{x}''_{it,j}\boldsymbol{\beta_q})}.$$

The scalar c_{ijt} signifies the price and $\mathbf{x}'_{ijt}$ the observed characteristic of alternative *j* and selection *t* within the choice menu. In contrast to the mixed logit, the latent class model estimates Q sets of parameters – the $\boldsymbol{\beta_q}$ – that describe the distinctive preferences of those within each particular class. The formulation of the model to assign class membership probability, as described in Greene and Hensher (2003) the following form:

$$H_{iq} = \frac{\exp\left(\mathbf{z}'_i\boldsymbol{\lambda_q}\right)}{\sum_{q=1}^{Q}\exp(\mathbf{z}'_i\boldsymbol{\lambda_q})}$$

where $\mathbf{z}_i$ contains the characteristics of the individual *i* that are observable and used to

characterize the membership to which each belongs, including age, female, frequent or moderate purchaser of pecans, household size, income, consumer ethnocentricity, frequent or moderate purchaser of organic products. The $\boldsymbol{\lambda_q}$ vector contains the estimated parameter on $\mathbf{z}_i$, with only Q-1 sets of estimates, due to normalization of the Q^{th} parameter to zero for model identification (Greene 2008). Based on H_{iq}, this method calculates the portion of respondents from the sample that belong to each class and uses a maximum likelihood procedure to produce parameter estimates.

The selection of the number of classes (Q) cannot be obtained by a specific parametric statistical test (Swait 1994), though there are some common information criteria used to determine the number of classes, such as the minimum of the Bayesian Information Criterion (BIC) or Akaike's Information Criterion (AIC) (Pacifico and Yoo 2013, Lim et al. 2013). Advocated in Green and Hensher (2003) to avoid inconsistency, we "tested down" from a larger number of classes to a smaller number. Our information criteria indicated the best fit for a three-class model.

Findings and Discussion

Mixed Logit Model

Parameter estimates from the mixed logit model are presented in Table 1.4 along with estimates of average consumer willingness-to-pay (WTP) calculated as the ratio of an attribute coefficient and the price coefficient $WTP_k = -\frac{\beta_k}{\alpha_{price}}$. In this study, standard errors for the WTP estimates are produced using the Krinsky and Robb (1986) parametric bootstrap procedure and 1,000 replications (Hole 2007a). We find significant preference heterogeneity across respondents in most categories, with the exception of those for expiration dates and antioxidant content.

Coefficient and average WTP estimates from the mixed logit model align in part with expectations, but also reveal some findings that may be counter to the ambitions of the pecan FMO. Consistent with theoretical expectations, the estimated coefficient for the price and the would-not-buy options are negative and significant, indicating that consumers prefer lower prices. As has been found in studies of other commodities, the estimated coefficient for organic is positive and indicates that consumers on average are willing to pay a sizable premium of $2.53 per 8 oz. for organic pecans. Although production of organic pecans is still quite small in the U.S. and faces significant challenges from pests and tree diseases in addition to lacking supply chain and processing infrastructure, the choice experiment indicates that there is a potential premium available in the market place if the supply hurdles can be surmounted. Similarly, we find that consumers are willing to pay a substantial premium ($3.47) for domestic U.S. pecans relative to imported pecans from Mexico. This echoes findings from Palma, Collart, and Chammoun (2015) and lends support for continued documentation of country-of-origin labeling for informing consumers of pecan geographic origin.

Looking at the coefficient and WTP estimates for different size and grade categories, it appears that there may be a lack of understanding of group distinctions by consumers. For the different size labels, consumers are willing to pay a premium for Extra Large and Jumbo, but not for Mammoth, the largest pecan size category. Further, the estimated premium for Extra Large ($2.91) is greater than for Jumbo ($1.55). This suggests that either (a) consumers prefer pecans that are not too small (e.g., Small or Large sizes) and not too big (e.g., Mammoth sizes) or (b) that consumers are unfamiliar with precisely what pecan size is specified by these labels. Combining this finding with the estimates for grades tends to suggest it is the latter – consumers are unfamiliar with the grade and size terminology. Looking at grades, a positive WTP is estimated for Standard ($0.80) and Fancy ($1.93), but not for the intermediate grade of Choice.

Overall, these results suggest that simply implementing industry-wide uniform size and grade standards for pecans is incomplete without accompanying efforts to inform consumers in order to yield the intended consequences of the pecan FMO. As DeVuyst, Lusk, and DeVuyst (2014) found with respect to the USDA beef quality grading system, effectively communicating quality definitions is critical to ensuring consumer satisfaction and maintaining or increasing product demand.

A further remarkable result, although not necessarily conflicting as above, is the estimated willingness to pay for pecans with different expiration dates. The estimated coefficients and average willingness to pay for the two longer considered expiration dates (6 and 12 months) are both positive, indicating that consumers prefer products with a longer expiration date than the base category of 3 months. However, the estimated WTP is greater for the 6-month expiration ($1.82) compared to the 12-month expiration ($1.07). While it might be expected that consumers would prefer the flexibility from more time to consume a food product it is unclear

from previous research from other food categories, particularly unprocessed foods like pecans, how consumers perceive long expiration dates approaching one year. As a whole, the results indicate that any efforts under the pecan FMO to implement different ranges of expiration dates on pecan packaging is valued by consumers, but consideration of the longevity (from a marketing perspective) may be warranted.

Finally, looking at the coefficients and average willingness to pay for the two proposed health and nutrition claims, a clear superiority of the Heart Healthy over the Naturally High in Antioxidants claim is found. On average consumers are willing to pay $2.22 more for an 8 oz. bag of pecans with the Heart Healthy claim, but no significant result is found for the High in Antioxidants claim. Since pecans fall under the American Heart Association's (AHA) Heart-Check Certification Program (www.heartcheckmark.org) and are eligible to use their widely recognized heart healthy label, the results indicate this is a profitable marketing direction.

Table 1.4: Mixed logit model parameter estimates and consumer WTP[a]

	Mixed Logit Model				
	Parameter Estimates		Willingness to Pay Estimates		
	Est. Coef.	S.E.	Est. Coef.	S.E.	C.I. (95%)
Price	-0.59***	(0.05)			
Organic	1.50***	(0.23)	$2.53***	(0.44)	($1.93, $3.06)
Expires in 6 mo.	1.03***	(0.22)	$1.82***	(0.47)	($1.19, $2.38)
Expires in 12 mo.	0.61***	(0.14)	$1.07***	(0.31)	($0.64, $1.45)
Country of Origin	2.09***	(0.19)	$3.47***	(0.44)	($2.98, $4.09)
Size – Small	-0.45	(0.32)	-$0.65	(0.70)	($-1.63, $0.33)
Size – Large	0.21	(0.27)	$0.50	(0.59)	($-0.35, $1.28)
Size – Extra Large	1.62***	(0.32)	$2.91***	(0.60)	($1.94, $3.94)
Size – Jumbo	0.91***	(0.28)	$1.55**	(0.65)	($0.69, $2.54)
Size – Mammoth	0.17	(0.28)	$0.32	(0.82)	($-0.61, $1.19)
Grade – Standard	0.50**	(0.25)	$0.80*	(0.46)	($-0.09, $1.56)
Grade – Choice	0.01	(0.21)	-$0.12	(0.40)	($-0.71, $0.53)
Grade – Fancy	1.15***	(0.19)	$1.93***	(0.37)	($1.43, $2.50)
Heart Healthy	1.29***	(0.16)	$2.22***	(0.37)	($1.73, $2.70)
Naturally High in Antioxidants	0.04	(0.22)	$0.11	(0.44)	($-0.67, $0.81)
Would-not-buy	-1.11***	(0.29)	-$2.04***	(0.80)	($-3.19, $-1.20)
SD					
Organic	-0.80***	(0.16)			
Expires in 6 mo.	0.07	(0.65)			
Expires in 12 mo.	-0.01	(0.28)			
Country of Origin	-1.49***	(0.17)			
Size – Small	0.83**	(0.38)			
Size – Large	0.37	(0.36)			
Size – Extra Large	-1.13***	(0.29)			
Size – Jumbo	0.48	(0.45)			
Size – Mammoth	2.28***	(0.44)			
Grade – Standard	0.97***	(0.31)			
Grade – Choice	-0.19	(0.33)			
Grade – Fancy	-0.31	(0.33)			
Heart Healthy	-1.09***	(0.19)			
Naturally High in Antioxidants	-0.09	(0.28)			
Would-not-buy	2.48***	(0.23)			
N	6,999		6,999		

Standard errors in parentheses. Omitted category for expiration variable is in comparison to expiration three months in the future, size categories in comparison to none on the label, grade in comparison to no grade listing, and health claims in comparison to none on the label. [a]Calculations are based on WTP for an 8-oz bag of pecan halves in terms of U.S. dollars.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Latent Class Model

The parameter estimates from the latent class model are presented in Table 1.55. As with the mixed logit model, we present coefficient and average willingness-to-pay (Table 1.6) for the different product attributes. For each set of estimates by class, the estimated price coefficients for the class are significant and negative, consistent with the theory that consumers have downward sloping demand curves. Each group possesses differing price sensitivities as well, with the estimated coefficient much larger in magnitude for classes one and three.

Latent Class One

Latent class one, with a share of about 22 percent of consumers, is the only segment for which the would-not-buy option is positive and significant, meaning that respondents in this group value option 3 (no purchase) over the other choices. Despite this result, there are some attributes that they prefer with respect to pecan purchases. This group prefers organic production, expiration in 6 or 12 months over expiring in 3 months, jumbo size, U.S. pecans over Mexico, fancy grade, and heart-healthy labeling over none. We find that consumers with higher ethnocentricity scores, higher income, and frequent organic purchasers were more likely to be in class one compared to class three, though the income effect is quite small.

Latent Class Two

Latent class two, about one-third of respondents, demonstrates its own distinct preference pattern. This group does prefer to make a purchase over choosing not to purchase. However, similar to class one, this group also prefers organic production, U.S. pecans, fancy grade and heart-healthy attributes. In contrast to class one, this group does not show any preference for the freshness attributes and values size classification preferring mammoth over small. Consumers with higher ethnocentricity scores, frequent and moderate purchasers of pecans who regularly

purchase organic products are much more likely to be in class two.

Latent Class Three

The last group – comprising 45 percent of consumers – reveals yet another set of preferences. Notably, this group is not willing to pay a premium for organic pecans. Like the other two segments, there is a strong preference for U.S. pecans over those from Mexico, fancy grade, and heart-healthy attributes, but their only preference in terms of freshness is for those expiring 12 months in the future. Differing from the other segments, they favor all of the larger size classifications and uniquely showed a significant desire for the naturally high in antioxidants attribute. Previous studies have suggested that, despite general knowledge about the nutritional properties of tree nuts (Pawlak et al., 2009; Lombardini et al, 2008), food consumers may be unaware of the antioxidant properties of pecans (Lillywhite, 2014).

Latent Class – Consumer Willingness to Pay

Similar to the mixed logit findings, the latent class analysis results highlight some of the differences in the variation of WTP across individual segments with respect to attribute preferences. Overall, the WTP estimates for U.S. over Mexico pecans, fancy-grade, and heart-healthy claims reflect positive consumer interest in these characteristics across the groups. The organic, expiration, size and grade classifications vary in significance across the three segments and segment three is the only one with a significant preference for the antioxidant attribute.

Though significantly valuable to all of the segmented groups, the range across the groups of WTP for U.S. pecans over t is from $2.21/ 8 oz. bag to $6.11. The fancy grade classification is positive and significant across all of the groups as well, with a range of $1.23 to $4.07/ 8 oz. bag. The last of the characteristics with positive and significant results amongst all class memberships

includes the valuation for the heart-healthy attribute ranging from $1.26 to $5.42/8 oz. package. Only group three demonstrates a preference for both heart healthy and antioxidant claims.

Across the groups, results reveal that only segments one and two value the organically produced pecan (and only two shows positive utility from purchasing pecans) and on average class two will pay a premium of $5.66/8 oz. for organic compared to class one with $3.44/8 oz. Consumers with higher ethnocentricity scores, frequent and moderate purchasers of pecans who commonly purchase organic products are much more likely to be in class two.

Only consumers in class one place a high value on both longer-term expiration date options (6 and 12 months) over the short-term of 3 months at just over $2.00/8 oz. bag for each, yet of all the size characteristics, only the jumbo distinction appears important. In contrast, class two places no premium on the longer-term expiration dates but values the mammoth size category ($3.49/8 oz.) with a distinct discount on the small size ($5.61/8 oz.). Class three—the largest group— are only concerned about the longest-term expiration category (12 months) over the 3-month with a WTP premium of $1.31/8 oz. and most highly value all of the larger size classifications except mammoth.

Conclusion

Long-discussed issues in the pecan industry have resulted in the recently approved FMO as a way to resolve challenges such as marketing and uniformity of standards with the goal of ultimately increasing consumer demand. In order to assess how consumers may respond to forthcoming initiatives in the pecan FMO and offer strategy prioritization insights to the pecan industry, this study assesses consumer response to the FMO marketing strategies. Mixed logit and latent class methods reveal significant taste heterogeneity across many of the attributes, but with overall strong preferences towards U.S. origin, organic, larger size (but not too large), a

designated fancy grade and heart healthy claims. However, we find evidence that consumer response to proposed size and grade designations may not align with expectations for price premiums in the absence of efforts to educate consumers. Despite these general results, consumers are most willing to pay for the U.S. pecans, the geographic origin attribute that is currently required on all pecans sold at retail outlets. We also find that consumer ethnocentric tendencies, income, and pecan and organic product purchasing frequency play a role in defining differences among consumer taste preferences and willingness to pay.

These findings can assist pecan industry decision-makers in developing recommendations for the industry by anticipating the consumer response to those actions and understanding that they are not one-size-fits-all. The assumption that marketing and promotional efforts will generate increased demand can only be accomplished by both educating consumers on product attributes and ensuring consumer expectations for pecan quality are fulfilled. Assessing consumer preferences in the changing environment following issuance of an FMO requires an ongoing effort and commitment from the industry to obtain desired results.

Table 1.5: Latent class model parameter estimates

	Class 1		Class 2		Class 3	
	Est. Coef.	S.E.	Est. Coef.	S.E.	Est. Coef.	S.E.
Price	-0.45***	(0.09)	-0.23***	(0.06)	-0.57***	(0.07)
Organic	1.54***	(0.43)	1.44***	(0.35)	0.24	(0.43)
Expires in 6 mo.	0.98***	(0.33)	0.34	(0.42)	0.51	(0.44)
Expires in 12 mo.	1.05***	(0.36)	0.11	(0.18)	0.74***	(0.22)
Country of Origin	1.95***	(0.34)	1.45***	(0.20)	1.27***	(0.22)
Size – Small	-0.23	(0.61)	-1.49***	(0.57)	0.31	(0.48)
Size – Large	0.25	(0.41)	-0.31	(0.71)	0.76*	(0.45)
Size – Extra Large	0.43	(1.18)	0.84	(0.63)	1.09*	(0.62)
Size – Jumbo	0.90*	(0.50)	-0.33	(0.44)	1.47***	(0.44)
Size – Mammoth	-0.11	(0.53)	0.82***	(0.30)	0.10	(0.55)
Grade – Standard	0.23	(0.50)	0.88	(0.54)	-0.31	(0.38)
Grade – Choice	-0.50	(0.33)	0.19	(0.45)	0.31	(0.37)
Grade – Fancy	0.96**	(0.37)	0.96***	(0.26)	0.69**	(0.33)
Heart Healthy	0.75***	(0.29)	1.27***	(0.21)	0.88***	(0.22)
High in Antioxidants	-0.04	(0.36)	-0.18	(0.41)	0.75*	(0.42)
Would-not-buy	2.04***	(0.51)	-1.18*	(0.60)	-1.64***	(0.48)
Latent Segment Parameter Estimates h(.)						
Constant	-2.18**	(1.04)	-4.17***	(1.12)	-	
Age	0.01	(0.02)	0.01	(0.02)	-	
Female	0.14	(0.42)	0.45	(0.39)	-	
Income	0.00**	(0.00)	0.00*	(0.00)	-	
Household size	-0.11	(0.13)	0.14	(0.10)	-	
Ethnocentricity	0.54**	(0.25)	0.78***	(0.25)	-	
Frequent pecan purchaser	0.77	(0.56)	1.04*	(0.58)	-	
Moderate pecan purchaser	0.35	(0.51)	1.19**	(0.54)	-	
Frequent organic purchaser	0.95*	(0.55)	1.15**	(0.53)		
Moderate organic purchaser	-0.16	(0.46)	0.06	(0.42)		
Class Probability	0.22		0.33		0.45	
LL	-1576.4					

Standard errors in parentheses. Omitted category for expiration variable is in comparison to expiration three months in the future, size categories in comparison to none on the label, grade in comparison to no grade listing, and health claims in comparison to none on the label. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.6:. Latent class model estimates of consumer WTP

	Latent Class 1		Latent Class 2		Latent Class 3	
Would-not-buy option	$5.10	***	-$5.30	**	-$2.28	***
	($1.64, $10.51)		(-$13.87, -$0.68)		(-$5.03, -$0.45)	
Organic	$3.44	***	$5.66	***	$0.77	
	($1.25, $5.62)		($3.72, $8.00)		(-$1.39, $2.23)	
Expiration: 6 months	$2.29	***	$1.15		$1.28	
	($0.77, $4.11)		(-$2.63, $4.99)		(-$0.82, $2.76)	
Expiration: 12 months	$2.45	***	$0.49		$1.31	***
	($0.69, $4.88)		(-$1.40, $1.76)		($0.46, $2.17)	
Country of origin	$4.77	***	$6.11	***	$2.21	***
	($2.12, $8.92)		($4.19, $10.65)		($1.35, $3.11)	
Size: Small	-$1.01		-$5.61	***	$0.55	
	(-$4.15, $2.73)		(-$11.45, -$0.97)		(-$1.13, $2.87)	
Size: Large	$0.18		-$0.39		$1.20	*
	(-$1.93, $2.56)		(-$7.26, $6.41)		(-$0.40, $3.38)	
Size: X Large	$0.33		$4.12		$1.79	*
	(-$7.14, $5.31)		(-$1.78, $8.76)		(-$0.40, $3.61)	
Size: Jumbo	$1.60	*	-$0.41		$2.37	***
	(-$0.86, $4.95)		(-$4.11, $4.29)		($0.78, $4.74)	
Size: Mammoth	-$0.20		$3.49	***	-$0.04	
	(-$3.07, $2.46)		($0.81, $8.51)		(-$1.96, $1.78)	
Grade: Standard	$0.97		$3.51	*	-$0.43	
	(-$2.12, $3.41)		(-$1.00, $7.79)		(-$2.15, $0.80)	
Grade: Choice	-$1.00		$1.16		$0.47	
	(-$2.99, $0.82)		(-$2.67, $5.63)		(-$0.69, $1.84)	
Grade: Fancy	$2.36	**	$4.07	***	$1.23	**
	($0.51, $4.23)		($2.50, $6.28)		($0.12, $ 2.29)	
Heart Healthy	$1.75	***	$5.42	***	$1.26	***
	($0.52, $3.17)		($3.45, $9.65)		($0.24, $2.74)	
High in Antioxidants	$0.08		-$1.01		$1.39	*
	(-$2.16, $1.90)		(-$4.64, $3.64)		(-$0.07, $3.17)	

Confidence intervals in parentheses. Omitted category for expiration variable is in comparison to expiration three months in the future, size categories in comparison to none on the label, grade in comparison to no grade listing, and health claims in comparison to none on the label. Calculations are based on WTP for an 8-oz bag of pecan halves in terms of U.S. dollars.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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CHAPTER 2: USING EXPERIMENTAL AUCTIONS TO DIRECTLY MEASURE THE VALUE OF INFORMATION IN PECAN PURCHASES

Introduction

Product labels serve a variety of roles critical to both producers and consumers. For producers, labels are a mechanism for a statement of quality (Kiesel, McCluskey, and Villas-Boas 2011), product differentiation, or cost-effective access to niche markets and are a key avenue for obtaining a price premium in crowded and competitive markets (Deselnicu et al. 2013, Bramley, Biénabe, and Kirsten 2009). If labels are "credible, truthful, and understandable" to consumers, they can deliver essential details about products that they can't verify for themselves (Kuchler et al. 2017), lessening any potential information asymmetries that could result in market failure (Akerlof 1970). Labels may also serve to promote or define other objectives, such as social or environmental causes, that are valued by the consumer (Golan et al. 2001). Effective labeling makes for better-informed consumers and promotes a closer alignment of available choices with preferences to maximize utility (Lusk et al. 2006, Kiesel, McCluskey, and Villas-Boas 2011, Kuchler et al. 2017), with potential economic benefits for reconciling consumer misconceptions (McFadden and Huffman 2017).[1]

In the context of food products, there is an enormous literature exploring consumer preferences and willingness to pay (WTP) for products with different attributes signaled by front- or back-of-package labels. Frequently explored labels that have consumer, producer, and

[1] Though this section is focused on producers and consumers, third-party organizations and governments also have a role in the significance of labels in the market, both affecting and reflecting producer and consumer desires. See (Golan et al. 2001) for background and (Kuchler et al. 2017) for a current review of thirty years of government intervention in labeling.

policy implications include consumer WTP for country of origin (Loureiro and Umberger 2003, 2005, 2007, Ehmke 2006, Lim et al. 2013, Mabiso et al. 2005, Lim et al. 2014, Gao, Schroeder, and Yu 2010, Lewis and Grebitus 2016), genetically modified foods (Lusk et al. 2005, Dannenberg 2009, Colson and Rousu 2013), and organic (Loureiro and Hine 2002, Yue and Tong 2009, Olesen et al. 2010, Van Loo et al. 2011). A significantly smaller literature focuses explicitly on the value of information (VOI) – the difficult task of measuring the benefits (Golan et al. 2001) consumers derive from the information itself conveyed by a label or information dissemination campaign (Klain et al. 2014). Examples of VOI studies include estimates of the value of nutritional label information (Teisl, Bockstael, and Levy 2001), value of mandatory labeling policy for organic and cloned milk (Brooks and Lusk 2010), VOI under different genetically modified (GM) food labeling contexts (Hu, Veeman, and Adamowicz 2005) and the value of third-party information dissemination for food products that might be GM (Rousu et al. 2007) or comparing natural and organic claims (McFadden and Huffman 2017). Loureiro and Umberger (2007) measure the U.S. consumer VOI for country of origin labeling, traceback systems, food safety-related labeling programs, and product tenderness for beef ribeye steaks. Klain et al. (2014), analyzing fresh beef and pork products in the context of mandatory country of origin labeling, proposes a method to directly measure consumer VOI using experimental methods, built upon the foundation and more indirect methods of Foster and Just (1989) and Leggett (2002). Their proposed direct method involves explicitly asking consumers how much they value knowing country of origin information versus not knowing, even if the specific location is unidentified.

With few exceptions, the aforementioned studies have a common feature – the VOI is estimated primarily for a single product attribute or labeling context absent other characteristics

listed on the label. For example, in the Rousu et al. (2007) study, they estimate the value of GM information by comparing experimental auction bids on a plain-labeled product (e.g., 5 lb. Russet Potatoes) and a product with a single additional label statement ("*This product is made using genetic modification (GM).*"). On average, their bidders discount GM labeled products by 14% relative to those with a plain label. Participants place an additional value of about 2% of the purchase price for knowing verifiable information about the food products that could be GM. Similarly, Klain et al. (2014) explores the value of country of origin information by comparing a plain-labeled meat product with a meat product bearing the country of origin. In this case the average direct VOI estimate of "knowing vs. not knowing" the country of origin information is $1.37 per steak, or about $0.69 per pound of meat purchased.

In this study we discuss and present evidence that these approaches to assessing the VOI may not deliver the appropriate valuation estimates needed for policy decisions for a simple reason – the value of information is not independent, rather it depends upon the entire information environment. That is, the value of information regarding a single product attribute is conditional on the other known attributes (e.g., other label signals) for that product. For products with voluntarily provided information by producers/manufacturers or mandatory information required under regulatory policies, estimates of the VOI may be under- or over-estimated when evaluated in a sterile environment where these informational elements are stripped away.

To illustrate, consider an extreme example of the value of country of origin (COO) information. Comparing consumer values between a plain-labeled product and an otherwise equivalent product with the addition of COO information, previous studies have shown that the average consumer has a non-trivial positive value for this information (e.g., $1.37/per steak or chop in Klain et al. (2014)). However, consider the same exercise, but suppose both products are

required to bear an additional piece of information entirely unrelated to COO –"*Death from Within: Certified to contain a lethal level of cyanide*". Presumably, if research participants notice the label (a questionable assumption as shown in Noussair, Robin, and Ruffieux (2002)), the value for the product with or without COO information will be zero and as a result the value of COO information in this setting will no longer be positive, but zero. Although extreme, this example illustrates that the value of information is not independent of the entire information environment. Further complicating the issue, as we explore in this study, it is not clear in even simple cases whether estimates of the VOI of a particular product attribute are over- or under-estimated when other product information is stripped away in the research experiment environment. To illustrate this issue, consider the same exercise to estimate the value of COO information, but instead of cyanide warnings, suppose the two products also bear an organic label. A priori, we have no strong intuition as to why consumers would value country of origin information the same when considering two products with or without organic information. Nor is it clear whether consumers value COO information less when considering organic products (perhaps because knowing the products satisfied organic standards reduces the value of origin information) or the value of COO information is greater because consumers do not have faith in the compliance with organic standards for products originating from certain origins.

To explore the relationship between the value of information for a product attribute when considered in isolation against a richer information environment, we present evidence from a series of experimental auctions modeled after the recent methodological developments of Klain et al. (2014). In the experiments we consider the value of country of origin information in a plain-label setting and iterative settings where additional voluntary information is provided on the label (organic information and expiration dates). Our commodity focus is pecans, a product

with a recent policy emphasis surrounding the 2016 approval of a Federal Marketing Order (FMO) for the 15-state U.S. pecan production region.[2] Initiated as industry-driven agreements, FMOs are individually tailored to promote an industry and cooperatively address its customized needs, ultimately becoming binding regulation after approval by producers and the Secretary of Agriculture (USDA). The 2016 FMO was obtained by the pecan industry citing challenges that include supply concerns, prices, market disruption, and lack of uniform quality, container, and packaging standards (American Pecan Board 2017). The final rule encompasses several actions to be undertaken to address these issues, including collection of industry data on production, inventory, and supply, authorization of funding for research on health and nutrition aspects of pecans and improved technology, as well as recommendations for uniform grade, size, quality, and container standards (Federal Register 2016).

In general, pecans are largely an understudied commodity in terms of consumer valuation. The primary emphasis of available research includes a focus on native versus improved pecan varieties (Palma, Collart, and Chammoun 2015), pecan consumer demographics, consumption frequency, purchase patterns and overall tree nut nutrition knowledge (Lillywhite, Simonsen, and Heerema 2014, Lombardini, Waliczek, and Zajicek 2008), festival attendees preferences among three tree nuts (Gold, Cernusca, and Godsey 2004), quality perception (Park and Florkowski 1999) and factors affecting retail outlet selection in purchasing pecans (Florkowski, You, and Huang 1999).

[2] The FMO covers pecans grown in Alabama, Arizona, Arkansas, California, Florida, Georgia, Kansas, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, and Texas. Any financing required to carry out directives of the FMO are handled through assessments on the handlers of pecans grown in these states and locally managed, under USDA oversight, by the American Pecan Council which is assembled as a result of the order. (USDA 2016) For more detail, see the final rule, effective August 5, 2016 (Federal Register 2016).

Further unexplored is how consumers might respond to country of origin (COO) labeling information related to pecans. The mandatory point-of-purchase COO labeling for beef and pork has recently been discontinued in the U.S. following legal challenges, yet the requirement for pecans and other "covered commodities" sold at retail remain in place as a regulatory policy with the aim of better-informing consumers (USDA). True to the stated intent of the regulation, some studies have found that COO labeling may help to mitigate the search costs for consumers who prefer domestic food products and functions as a solution to asymmetric information (Lusk et al. 2006). However, this information may also be perceived as a quality or food safety marker (Lim et al. 2013, Lewis and Grebitus 2016), a way to connect with or support one's region or locality (Boys and Blank 2016) reflect consumer ethnocentrism (Lusk et al. 2006, Lewis and Grebitus 2016, Klain et al. 2014), represent a freedom-of-speech issue (Tushnet 2015) or provide other signals about the product (Lusk and Briggeman 2009). Though the consumer decision-making process can be complex (Lusk et al. 2006, Deselnicu et al. 2013, Costanigro et al. 2014) and most studies are context-or product-specific, there is limited evidence that consumers generally favor labeling identifying the country of origin (Lim et al. 2013), but any such substantiation for pecan purchases requires further exploration.

In the remainder of the paper, we detail the recruitment and data collection, research experiment design, experimental procedures, and direct VOI approach. Following , estimates of consumer VOI are presented employing alternative econometric specifications. Finally, we conclude with a discussion of results and implications.

Methods and Procedures

Recruitment and Data Collection

Consumer recruitment took place in two communities in Georgia—Griffin, and Athens—with the research sessions occurring at University of Georgia research facilities. For the Griffin sessions, consumers were recruited in the summer of 2016 from the Sensory Evaluation and Consumer Lab (University of Georgia Griffin campus) database of adults in the general public. Participants were recruited and pre-screened for tree nut allergies[3] using an online survey for the one-hour sessions. Following the screener check, participants were contacted and chose from offered sessions, with several being held over a three-day period at different time slots with a target of approximately twenty participants per session. Each person was reminded once, by either email or phone, the day before the scheduled research would take place.

A flyer with recruitment information was posted in locations throughout Athens, containing an email to contact for additional information and scheduling. Upon receipt of the email, we sent additional information to responders via an online survey, which included pre-screening for tree nut allergies and selection of an offered time slot for research sessions over a three-day period. Each person was reminded once by email the day before the scheduled research would take place. In both locations, each group of interested respondents was informed that they would take part in research about consumer preferences for tree nuts and given a participation fee of $50 upon arrival for a research session. Each participant was given a questionnaire that included basic demographics (gender, education, age, race, and income), pecan consumption and buying habits, awareness of mandatory country of original laws with respect to pecans, label reading behavior with common purchases, and questions that allow a calculation of an

[3] Though there would be no consumption of pecan products on-site, research was restricted only to those without nut allergies in an abundance of caution for the well-being of participants and this method was how the IRB approved the study.

ethnocentrism measure as outlined in Klain et al. (2014).[4] The ethnocentrism measure—a 1 to 5 scale with higher indicating more—addresses the contention that differences in consumer valuation by country of origin are driven merely by consumer protectionism preferences.

Table 2.1: Summary Statistics (N=164)

Variable	Description	Sample Mean	Std. Deviation
Gender	1 = Female	0.62	0.49
Age	Participant's age	39.5	14.0
Income	Household Income ($ 1,000 s)	57.4	40.6
Education	Years of schooling	14.3	2.60
Household Size	Number of persons	3.30	1.50
Consumer Ethnocentrism	1= low; 5= high	2.70	0.97
Eat pecans	1 = Very often/often/sometimes	0.82	0.38
Look for COO on food labels	1 = Always or often	0.31	0.46
Aware of mandatory pecan COO label	1 = Yes	0.17	0.37
Read nutrition labels on food	1 = Always or often	0.62	0.49
Look for food expiration labels	1 = Always or often	0.85	0.36
Purchase organic foods	1=Often or very often	0.18	0.38

The core component of each session is an experimental auction to directly measure consumers' value of information. The methodology, which is detailed in the following section and in figure 2.1, is based upon the approach proposed by Klain et al. (2014) with two key modifications. First, instead of using multiple price lists to elicit ranges of consumers' value for information, we utilized experimental auctions to elicit a direct estimate of WTP. Second, to assess the impact of different information sets, we include multiple product options across bidding rounds instead of a single one-shot decision.

Experiment Steps

[4] We used the same method as Klain et al. (2014), which involved shortening the CETSCALE found in Shimp and Sharma (1987) from a set of 17 Likert-scaled question down to three questions. Their test of the original measure led to choosing the three that had the highest factor loadings in the general ethnocentrism scale, leading to development of a 3-question based average. This average was calculated based on the respondent's answer to three questions where each individuals' responses ranged from "strongly agree" to "strongly disagree" on a five-point Likert-scale. The exact language in the three questions as quoted from Klain were: "Americans should not buy foreign products, because this hurts American business and causes unemployment," "It is not right to purchase foreign products because it puts Americans out of jobs," and "A real American should always buy American made products."

Figure 2.1 is a flowchart outlining the experiment steps for participants. For Step 1, upon arrival, the participants check in, read and sign a consent form, receive their $50 participation fee, along with a packet containing all materials required to participate in the experiment. The packet is identified only with an ID number to preserve anonymity. All responses turned in by participants contain only the ID number, with no individually identifying information. The packet includes the pre-auction questionnaire mentioned above and page-by-page instructions to follow during the one-hour session. Once seated in the lab, participants complete the basic demographics portion of the questionnaire before proceeding to the next step, led by the monitor.

For Step 2, the session monitor informs participants that they will be engaging in an auction of common food products and asked to refrain from communicating with others during the process since the bid submissions are private They receive an explanation of the type of auction to be conducted, that it is likely different than other types of auctions in which they have previously participated, there is a total of six rounds of bidding with only one that counts (is "binding"), and auction winners make an actual purchase of the one product selected. Further explanation is given to participants, with instructions and written examples, quiz and practice rounds, and precisely how the winner is chosen from the submitted bids. The auction method is the random *n*th-price auction (Lusk and Shogren 2007, Rousu et al. 2007, Colson, Huffman, and Rousu 2011)

In a random *n*th price auction, *k* bidders – for example $k = 15$ – confidentially submit their non-negative bid for the pecans under consideration on the bid sheet provided in their information packet. Once submitted, the session monitor places bids in order ranked from highest to lowest. Next, the monitor draws the "random *n*" from a uniform distribution of positive integers between 2 and *k*, for example $n=4$. This drawn "*n*th-price" becomes the *n*th

highest bid and *n*-1 individuals submitting bids higher than this win the auction, with each paying the *n*th ranked price for the object (Colson 2009), not their own submitted bid price. In our illustrative example, that would mean that the three highest bidders are the auction winners (*n* (4)-1=3) and all three pay the 4th highest price.[5]

The random *n*th price auction elicitation device was chosen because of its prevalent use in food values research (McFadden and Huffman 2017) and because it combines the advantages of both stated and revealed preference, is demand revealing (Lusk and Shogren 2007) and is incentive compatible because each participant has an incentive to bid their own private and true value of the product. To better understand the demand revealing nature of the method, we build upon the intuition of Vickrey's classic second-price auction (Vickrey 1961), where k bidders have independent private values v_k and submit sealed bids b_k with payoffs π_k. Let β denote the *n*th-highest bid from the random integer, $\in \{2, 3,\}$ and nature selects v_k and n.

$$\pi_k = \begin{cases} v_k - \beta \; if \; b_k > \beta \\ 0 \qquad if \; b_k \leq \beta \end{cases}$$

This payoff structure demonstrates how the dominant strategy for each bidder is to bid their own private value for the product, or $b_k = v_k$.

As opposed to other auctions, in which there is only one auction winner, the random *n*th price auction provides an opportunity for n-1 bidders to win the auction and purchase the product. Further, as opposed to other demand-revealing auctions (e.g. Vickrey or Becker, DeGroot, and Marschak (1964)), this method better engages the off-margin bidders with low values for the product being auctioned (Rousu et al. 2007) because they still have positive probability of being an auction winner. McFadden and Huffman (2017) find evidence of more

[5] As mentioned in Rousu et al. (2007), if there are ties present in the ranking, it can result in the number of winners being greater than n-1. This allows the advantage of these bidders receiving product at a price lower than their bid.

sincere bidding from low-value individuals under this method. Another advantageous property is use of a random endogenously determined market-clearing price (Shogren et al. 2001). The attributes of this method provide a good fit for the study objectives.

Step 3 begins with the monitor placing fictional *n*th price auction bids on a whiteboard visible to all in the front of the room, demonstrating the ranking process and how auction winners are determined. A quiz follows with answers to ensure a thorough grasp of how the auction proceeds. Participants then engage in two practice *n*th price auction rounds, first using black bean soup followed by chicken broth in order to gain experience with familiar products in a hypothetical practice round.

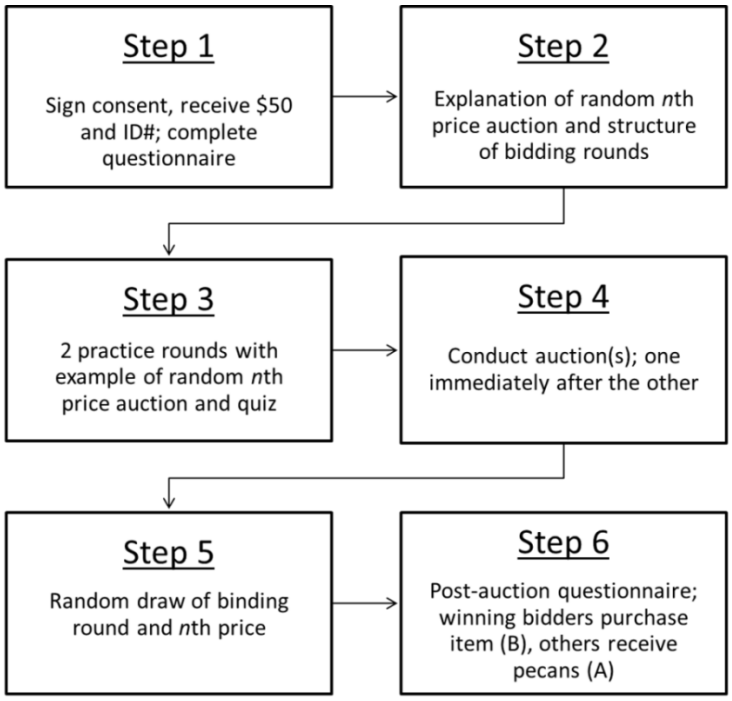

Figure 2.1: Details of experiment steps

Following the framework of Klain et al. (2014) for the direct VOI method, this step introduces practice for the choice of bidding between products in Container A and Container B (two separate opaque boxes containing the pecans up for bid) as in the actual experiment.

Specifically, participants are asked to suppose that each will receive (hypothetically, for practice rounds) a free 15 oz. can of black bean soup (or chicken broth in practice round 2) from inside of Container A (not visible) for participating in our research. Then on the practice bid sheets, each bids the highest price they are willing to pay to exchange the free can of black bean soup for one from Container B about which they have additional information. Participants are not allowed to view the product within the container, instead shown details about what information is present on the label of the product within each container, consistent with obtaining their VOI (See figure 2.2 for example of direct VOI experiment task for the practice round). For each product, monitors collect the bids, and rank in order from highest to lowest bid. From there, two random selections are made. First, a coin toss to determine which of the two rounds will be considered the binding round, followed by a random draw to select the *n*th price. Following the practice rounds, monitors answer any remaining questions about the auction procedures.

PRACTICE ROUND 1: Bid/Information Sheet

To make sure everyone is comfortable with how the n^{th} price auction works, we will have two rounds of practice bidding. Suppose that each of you will be given a free 15 oz. can of black bean soup for participating. In our first practice round, we will compare containers containing cans of black bean soup that are all of the same size. However, one container will contain different labeling information than the other.

Your free black bean soup will come from Container A. For the practice round, you will bid the highest price you are willing to pay to exchange your free black bean soup for one from Container B.

Only one of the two practice rounds will be "binding". By "binding" we mean that only one of the two practice rounds will be selected as the round where people would win goods and pay money for them (i.e. only one round "counts"). The round that is binding will be randomly selected and will be revealed after the second practice round. Since you do not know which round will be chosen, it is in your best interest to **bid your true value for the products in both practice rounds.**

Remember, this is only practice, so **no goods will be purchased** and **no money will be exchanged**.

Practice Round 1

- Option A is a can of black bean soup from Container A. Your free black bean soup is in this container.
  - The cans of soup in Container A do not have any information beyond the product name and number of ounces. You will not know any additional information about the soup in this container.

- Option B is a can of black bean soup from Container B. You can bid to pay a price to exchange your free black bean soup for one from this container.
  - The cans of black bean soup in Container B have a label indicating its information about its characteristics. Each can of soup has a label indicating whether or not it is organic, whether or not it contains gluten, or a combination of these characteristics.

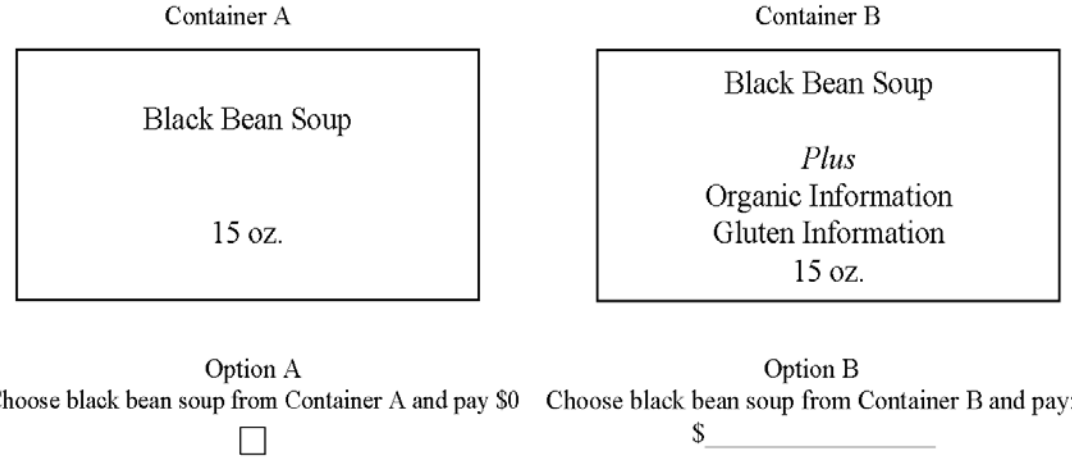

Figure 2.2: Example of practice round direct VOI experiment task

Step 4 begins the experimental auction portion of the study. The experiment entails a choice between keeping the free bag of pecans, offered to all participants, in Container A with less information or bidding to upgrade to a bag from Container B, in which there is additional information. Participants are shown a bag of pecans without labels for familiarity with the product, but not allowed to look inside the container, making bids based on signs on each displaying what is on the label of the product within. The experiment consists of six consecutive label treatments[6] in rounds of bidding, randomized in different sessions to avoid sequencing effects (Colson, Huffman, and Rousu 2011). Prior to bidding for each label treatment option, monitors place the two containers on a table, displaying Container A and B side-by-side, each clearly displaying product information but with actual pecan bags inside, not visible to participants. Container categories of information include combinations of no information, organic information, country of origin information (United States (U.S.) or Mexico), and expiration date (whether or not expiration date is on the label). For example, if faced with bidding on product from Container B that includes country of origin information, participant knows that the product contained within includes country of origin details but does not know which country in particular. In this manner, we elicit participant VOI for knowing country of origin information, but not for any particular country. See Table 2.2 for the available label treatment options in each bidding round and figure 2.3 for an example auction bidding and instruction sheet for one round. Bid sheets are collected, with no posting of bids between bidding rounds in order to avoid potential influence on subsequent bids (Corrigan and Rousu 2011).

[6] Rounds were assigned a color rather than a number for logistical ease in randomizing each auction session. Following the auction, the colors were categorized as numbers for analysis and description.

Table 2.2: Container label options for auction

Treatment/Bid #	Container A Label	Container B Label
1	None	COO
2	None	Organic
3	Organic	Organic, COO
4	Not Organic	Not Organic, COO
5	Organic, Expiration Date	Organic, COO, Expiration Date
6	Not Organic, Expiration Date	Not Organic, COO, Expiration Date

Note: Country of origin (COO) options in the script for bidders are described as product of the U.S., Mexico, or a combination of the two. The description of expiration dates did not include specific time frames, just explanation to bidders that the expiration date of the product would be on the label.

For Step 5, as practiced earlier, bids are sorted and ranked from highest to lowest and a random draw selects which round will be binding as well as the random *n*, then the winning bid ID numbers are posted on the whiteboard as auction winners, along with the *n*th price that will be paid by the *n*-1 winners.

Step 6 concludes the experiment to elicit direct VOI and all participants answer the post-auction questionnaire. Upon completion, auction winners exchange money for the bag of pecans from Container B – the binding round label treatment, while the non-winners receive their free product from Container A. All options presented in label treatments were available for auction winners, following Colson et al. (2016) and (Rousu et al. 2015) to ensure that no deceptive practices were employed.

ROUND BLUE: Bid/Information Sheet

Each of you will be given a free 8 oz. bag of fresh pecan halves in addition to the $50 cash compensation you received at the beginning of our study. Remember, this money is yours to keep as compensation for your time, you do **NOT** have to use it in our study.

We will now begin the auction phase of our study. The auction will consist of 6 rounds in which you will have the opportunity to place a bid. However, only one round will be "binding" (i.e., winners of the auction will pay for their products). The binding round will be determined randomly after all bidding is completed.

For each of 6 rounds of this auction, you will compare containers containing 8 oz. bags of pecan halves that are all of the same weight and consistency. However, for each round, one container will contain different labeling information than the other.

Your free pecans will come from Container A. In each round, you will bid the highest price you are willing to pay to exchange your free pecans for one from Container B in each round. At the end of the six rounds, one round will be selected randomly as the binding round. If your round is chosen and you are a winner of the auction, then you will receive pecans from Container B and pay your bid as demonstrated in the practice round. If not, you will receive your pecans from Container A. Please note that these bids are **not** hypothetical.

Round Blue

- Option A is a bag of pecans from Container A. Your free pecans are in this container.
  - Bags of pecans in Container A do not have any information about country of origin. The pecans could be from the U.S., Mexico, or a combination of these origins but you will not know exactly where the pecans are from.

- Option B is a bag of pecans from Container B. You can bid to pay a price to exchange your free pecans for one from this container.
  - Bags of pecans in Container B have a label indicating its origin. Each bag of pecans will have a label indicating whether it is from the U.S., Mexico, or a combination of these origins.

Container A	Container B
Pecan Halves 8 oz.	Pecan Halves Plus Country of Origin 8 oz.
Option A Choose pecans from Container A and pay $0 ☐	Option B Choose pecans from Container B and pay: $_____

Figure 2.3:. Example of auction label treatment round bid sheet

Direct Value Approach

Incorporating and refining the developments of Klain et al. (2014) for directly measuring VOI or willingness to pay for information, we elicit participant bids for trading up from an endowment of an 8 oz. bag of pecans with a particular set of information in Container A to one with more information on the label in Container B. The participant's bid represents the VOI, varying across label information treatments.

Multiple regression analysis provides a manner of accounting for potentially confounding factors, including the participant's unique socioeconomic characteristics or for censoring of bids. The method theoretically holds constant the participants taste between pecans in the two containers, where the dependent variable is simply the difference between their values for pecan products in Container A and Container B – in this case the value of information between the two differently labeled products. Consistent with this approach, the participant's inverse demand equation for pecans is (Rousu et al. 2007):

$$P_i^{Container\ B-\ Container\ A} = \beta_1 + \beta_2 X_{i2} + \varepsilon_i,$$

where $P_i$is the price bid by participant i in a particular round of bidding, β_1 is the intercept, X_{i2} is a vector of explanatory variables for each individual, β_2 is a vector of coefficients, and ε_i is the error term. In this specification, the experiment design results in a bid that is the direct VOI, in terms of dollars and cents for selecting pecans from Container B over those in Container A.

Data Summary and Results

In this section we present summary statistics of auction bid prices for information across the six label treatments in bidding rounds and conduct unconditional tests of (a) whether there is a value for information in the context of pecans and (b) whether the value of information is affected by the presence of other known information on pecan labels. Table 2.3 summarizes the

mean bid for each of the six different label treatments. As can be seen in the table, participants had a positive value for information across all six treatments. For example, for label treatment 1, where participants were offered a bag of pecans with no information regarding the country of origin (COO) of the product vs. the opportunity to bid to upgrade to a bag that would reveal the COO of the pecans, consumers on average had a value of $1.37 for COO information. The lowest average value of information was measured for label treatment 3 for pecans known to be organic, but to upgrade to know the COO information ($1.32). The highest average value of information was found in label treatment 5 for organic pecans bearing an expiration date but unknown geographical origin vs. an otherwise equivalent bag of pecans with a known geographical origin ($1.61).

While on average we find a positive willingness to pay for information across all six label treatments, a significant proportion (between 55-64%) of participants submitted a zero bid depending upon the treatment, indicating they have zero (or possibly negative) value of COO information in all considered information settings.[7] While in itself this is an interesting result suggesting that COO information is of no value to the majority of consumers, it poses a challenge for statistical testing of the core question of whether the value of information is affected by the availability of other known information.

[7] Overall, of the 164 participants in this experimental auction, 49 bid zero across all label treatment options.

Table 2.3: Summary statistics of auction bid prices by label treatment options

Summary statistics by label treatment options *						
			All Bids (N=164)		**Bids > 0**	
Bid	Container A	Container B	Mean	% zeros	Mean	N
1:	None	COO	$1.37	54.9%	$3.04	74
			($2.08)		($2.12)	
2:	None	Organic	$1.46	61.0%	$3.44	64
			($2.50)		($2.97)	
3:	Organic	Organic, COO	$1.32	64.0%	$3.37	59
			($2.32)		($2.77)	
4:	Not Organic	Not Organic, COO	$1.42	58.0%	$3.11	69
			($2.45)		($2.95)	
5:	Organic, Expiration	Organic, COO, Expiration	$1.62	61.0%	$3.83	64
			($2.69)		($3.11)	
6:	Not Organic, Expiration	Not Organic, COO, Expiration	$1.61	57.0%	$3.43	71
			($2.60)		($3.00)	

*Standard deviation in parentheses.

In table 2.4, the difference in bids between label treatments is presented, summarizing all of the bids (including zeros in the mean[8]). For example, the fourth value ($0.18) is the difference between bid #5 (organic and expiration information vs. organic and expiration with COO information) and bid #1 (no information vs. COO information). While it is found, for this example, that on average consumers bid $0.18 more for COO information when both organic and expiration date information is available than when there was no other information available about the pecans (i.e., suggesting an increase in the value of origin information when organic and expiration are known), the difference is not statistically different from zero (paired t-test) at conventional significance levels. Further, for all of these bid differences, none are statistically different from zero.

[8] Though zero bids are included in these statistics, excluded are the bids from participants who bid zero for every label option.

Table 2.4: Mean bid difference between pairs of label treatments

Mean bid difference between pairs of label treatments (N = 115)*							
Bid	Container A	Container B	Bid 2	Bid 3	Bid 4	Bid 5	Bid 6
1:	None	COO	-$0.04	-$0.23	-$0.09	$0.18	$0.16
			(0.23)	(0.21)	(0.16)	(0.23)	(0.24)
2:	None	Organic		-$0.19	-$0.05	$0.22	$0.20
				(0.29)	(0.21)	(0.25)	(0.29)
3:	Organic	Organic, COO			$0.14	$0.40	$0.39
					(0.26)	(0.29)	(0.30)
4:	Not Organic	Not Organic, COO				$0.26	$0.25
						(0.21)	(0.27)
5:	Organic, Expiration	Organic, COO, Expiration					-$0.01
							(0.25)
6:	Not Organic, Expiration	Not Organic, COO, Expiration					

*Standard errors in parentheses. This difference between bids for varying label treatments excludes those who bid all zeros, since taking the difference two zero bids reveals no information about how the participant values either the item or the information contained in the label treatment. Difference is calculated using the bid on horizontal top columns minus bid on vertical left column. In our example, the summary mean bid labeled Bid 5 at $0.18 is the calculation resulting from Bid 5 – Bid 1 and the result is positive.

To gain some sense whether the lack of consistent and significant differences in bid prices between label information options is driven by the absence of a clear result or due to lower power from a small sample size, particularly due to the high percentage of zero bids, summary statistics and statistical tests are also presented for the sample of positive bids. As can be seen in table 2.3, when considering only bids greater than zero, average bid-price for all treatments is substantially higher ($3.04-$3.83 across the six label treatments), with only marginal increases in standard deviations. Table 2.5 presents the mean difference in bids between the six label treatments and statistical tests of differences from zero for the positive-only bids. First, comparing bids in rounds 2-6 with bids in round 1, a couple of results emerge. Since the average positive auction bid for bid #1 was the lowest of the six treatments, the bid difference reported in table 2.5 for treatment 1 are all positive. We find that, relatively, consumers are significantly willing to pay $0.57 (comparison of Bid 3 – Bid 1) more for COO information when no other information is available (Bid 1) compared to when organic information is available (Bid 3).

Consumers are willing to pay only $0.44 more for knowing COO information when both organic and expiration date information is available (comparison of Bid 5 – Bid 3). These results lend some support for the hypothesis that as available information increases (i.e., the expiration date is known) the value of origin information diminishes. However, for a similar comparison between the pecans which were known to be not organic (comparison of Bid 6 – Bid 4), there is no significant difference in bids when COO information is available, nor is there a clear or consistent pattern across all of the considered comparisons among treatments.

Table 2.5: Mean bid difference between pairs of label treatments for positive bids

Mean bid difference between pairs of label treatments for positive bids

Bid	Container A	Container B	Bid 2	Bid 3	Bid 4	Bid 5	Bid 6
1:	None	COO	$0.36	$0.57 **	$0.12	$1.02 ***	$0.24
			(0.32)	(0.26)	(0.24)	(0.33)	(0.15)
2:	None	Organic		$0.49	-$0.13	$0.82 ***	$0.48
				(0.45)	(0.22)	(0.30)	(0.45)
3:	Organic	Organic, COO			-$0.57	$0.44 **	-$0.30 **
					(0.34)	(0.17)	(0.13)
4:	Not Organic	Not Organic, COO				$0.73 ***	$0.04
						(0.27)	(0.16)
5:	Organic, Expiration	Organic, COO, Expiration					-$0.52
							(0.40)
6:	Not Organic, Expiration	Not Organic, COO, Expiration					

*Standard errors in parentheses. Statistical significance *<0.10, ** <0.05, *** <0.01

Overall, while the results indicate on average consumers have positive value for country of origin information, the median individual has zero value for COO information for pecans. How consumers' value COO information is affected by the presence of other known product knowledge like organic production or expiration data is simply not clear from the available data across all treatment options. While this might be partially explained by the large percentage of zero bidders, even when focusing solely on individuals with positive values for information, a sufficiently clear and robust conclusion cannot be drawn. At most the data suggests there is

some support, but not robust, that the value of country of origin information diminishes (or at least changes) when other information about pecans is available.

As one further assessment of the potential drivers of the value of COO information across different information contexts, we present a series of regressions looking at the influence of socio-demographic, shopping preferences, and ethnocentrism on bid prices. For each treatment we estimate a standard linear regression model (OLS) and a tobit model controlling for censoring of bids at zero using the entire sample, and again for the sample excluding the participants that bid only zeros across all treatments. We also estimate OLS for the difference between each bid using bid 1 as the base for comparison. As can be seen in tables 2.6-2.10, few variables are statistically significant with consistency across the models and treatments. The negative effect of household size is the most regularly occurring significant influence on VOI across the models, with awareness of mandatory pecan country of origin labeling the most significant positive one. We find some evidence of a premium for frequent consumers of pecans, regular purchasers of organic products and nutrition label readers with respect to bid 2 in the simple information context of no information vs. organic information. In the more complex environment of bid 5, VOI for knowing COO when both organic and expiration date information are available, we find that ethnocentrism is a significant factor for paying a premium under only the tobit model specification and reading nutrition labels when considering all of the bids. We do not find consistent support for our measure of ethnocentrism influencing values for COO information. We find no significant difference among individuals for demographic factors except for household size, nor among those who typically read labels or look for country of origin or expiration information. Overall, our regression analysis offers little actionable insight into the drivers of consumer's value for country of origin information.

Conclusion

Instructive and effective labels are important for producers and consumers in conveying information of vital concern and addressing objectives from both for efficient market transactions. We employ a direct value of information methodology in an experimental setting to measure how consumers value knowing information about characteristics including organic production, country of origin and expiration dates in a more complex labeling environment than typically used in examining these values.

As expected, we found that on average consumers have a positive value for knowing additional information when making a purchase between two options, but the median consumer shows no value for country of origin information in pecan purchases. However, given the large percentage of zero bidders, a clear understanding of these values did not emerge in either unconditional or conditional analyses of the consumer bids. At most, the data suggests there is some evidence that the value of country of origin information diminishes (or at least changes) when other information about pecans is available.

A similar experimental design utilizing commodities with different consumer purchasing patterns or in a field experiment setting (e.g. grocery store, farmers market) where consumers participate in their normal purchase surroundings offer potential for future research, particularly to deal with the zero-valuation issue. Despite limited results, the value of information in various label contexts remains an area of consequence for economic research.

Table 2.6: OLS estimates: All bids

	Bid (1)	Bid (2)	Bid (3)	Bid (4)	Bid (5)	Bid (6)
Female	0.181	0.019	-0.189	0.076	-0.346	0.500
	(0.337)	(0.384)	(0.422)	(0.434)	(0.454)	(0.469)
Age	0.010	-0.017	0.007	0.009	0.004	-0.001
	(0.013)	(0.014)	(0.014)	(0.012)	(0.016)	(0.019)
High Income	0.046	-0.147	-0.008	0.067	-0.397	-0.214
	(0.321)	(0.356)	(0.358)	(0.351)	(0.379)	(0.373)
Education	0.006	-0.080	0.096	-0.071	-0.074	-0.011
	(0.067)	(0.082)	(0.085)	(0.101)	(0.105)	(0.104)
Household Size	-0.234**	-0.286**	-0.106	-0.239*	-0.287*	-0.205
	(0.115)	(0.128)	(0.115)	(0.141)	(0.159)	(0.138)
Ethnocentrism	0.252	0.066	0.177	0.076	0.264	-0.002
	(0.206)	(0.208)	(0.222)	(0.209)	(0.243)	(0.220)
Eat Pecans	-0.099	0.993***	0.190	0.126	0.255	0.271
	(0.395)	(0.355)	(0.413)	(0.433)	(0.453)	(0.469)
Look for COO on food labels	-0.232	-0.423	0.078	0.116	-0.061	-0.464
	(0.405)	(0.495)	(0.491)	(0.510)	(0.592)	(0.548)
Aware of mandatory pecan COO label	0.590	1.029*	0.969	0.772	1.242	1.657*
	(0.484)	(0.607)	(0.637)	(0.718)	(0.785)	(0.930)
Read nutrition labels on food	0.335	0.725	0.172	0.487	0.830	0.916*
	(0.363)	(0.479)	(0.336)	(0.499)	(0.503)	(0.471)
Look for food expiration labels	0.074	0.427	0.065	-0.198	0.602	0.184
	(0.426)	(0.402)	(0.417)	(0.475)	(0.447)	(0.533)
Purchase organic foods	0.320	1.032*	0.760	0.247	0.201	-0.318
	(0.470)	(0.560)	(0.578)	(0.525)	(0.680)	(0.646)
Constant	0.560	2.067	-1.122	1.955	1.521	1.119
	(1.361)	(1.399)	(1.497)	(1.822)	(1.792)	(1.847)
N	159	159	159	159	159	159
adj. R-sq	0.014	0.094	0.026	0.005	0.042	0.036
F (12,146)	1.537	1.947**	0.751	1.117	1.541	1.203

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01

Table 2.7: Tobit estimates: All bids

	Bid (1)	Bid (2)	Bid (3)	Bid (4)	Bid (5)	Bid (6)
Female	0.320	-0.743	-0.994	0.221	-1.336	0.872
	(0.714)	(0.888)	(0.989)	(0.837)	(1.069)	(0.930)
Age	0.026	-0.028	0.049	0.023	0.040	0.014
	(0.028)	(0.035)	(0.039)	(0.033)	(0.043)	(0.037)
High Income	-0.070	-1.161	0.147	0.004	-1.143	-0.436
	(0.696)	(0.863)	(0.953)	(0.811)	(1.074)	(0.906)
Education	0.100	-0.111	0.263	0.048	-0.021	0.052
	(0.139)	(0.173)	(0.193)	(0.165)	(0.206)	(0.183)
Household Size	-0.490*	-0.554*	-0.143	-0.487	-0.574	-0.302
	(0.249)	(0.307)	(0.347)	(0.299)	(0.392)	(0.326)
Ethnocentrism	0.641*	0.421	0.556	0.381	1.380**	0.306
	(0.373)	(0.461)	(0.508)	(0.440)	(0.575)	(0.490)
Eat Pecans	-0.357	2.564**	1.349	0.357	-0.083	0.633
	(0.919)	(1.272)	(1.385)	(1.097)	(1.447)	(1.235)
Look for COO on food labels	-0.622	-0.687	0.255	0.667	-0.061	-0.388
	(0.813)	(0.970)	(1.087)	(0.941)	(1.187)	(1.043)
Aware of pecan COO label	0.778	1.663	1.843	0.881	2.926**	2.488**
	(0.866)	(1.032)	(1.155)	(1.008)	(1.232)	(1.097)
Read nutrition labels on food	0.504	1.830*	0.358	0.436	2.268*	1.732*
	(0.789)	(1.003)	(1.116)	(0.929)	(1.255)	(1.037)
Look for food expiration labels	0.405	0.935	0.334	-0.896	1.937	-0.032
	(0.969)	(1.229)	(1.348)	(1.091)	(1.578)	(1.242)
Purchase organic foods	0.477	2.619**	1.924	0.585	0.606	-0.653
	(0.896)	(1.027)	(1.182)	(1.028)	(1.300)	(1.159)
Constant	-3.486	-1.525	-10.373**	-2.364	-7.142	-4.030
	(2.845)	(3.676)	(4.184)	(3.344)	(4.511)	(3.786)
Sigma Constant	3.500***	4.099***	4.521***	4.031***	4.934***	4.525***
	(0.328)	(0.413)	(0.479)	(0.390)	(0.503)	(0.427)
N	159	159	159	159	159	159
LR chi2 (12)	16.495	31.788***	20.369	14.311	29.131**	14.634
p	0.170	0.001	0.060	0.281	0.004	0.262

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01

Table 2.8: OLS estimates: All bids except for all-zero across treatments

	Bid (1)	Bid (2)	Bid (3)	Bid (4)	Bid (5)	Bid (6)
Female	0.364	0.025	-0.139	0.198	-0.302	0.759
	(0.450)	(0.485)	(0.578)	(0.596)	(0.609)	(0.598)
Age	0.003	-0.032*	-0.004	0.000	-0.006	-0.011
	(0.016)	(0.018)	(0.019)	(0.016)	(0.020)	(0.024)
High Income	0.092	-0.083	0.051	0.204	-0.407	-0.197
	(0.425)	(0.492)	(0.466)	(0.454)	(0.498)	(0.501)
Education	-0.070	-0.188*	0.061	-0.182	-0.194	-0.105
	(0.086)	(0.112)	(0.111)	(0.147)	(0.142)	(0.134)
Household Size	-0.379**	-0.456**	-0.174	-0.420*	-0.501**	-0.349*
	(0.155)	(0.185)	(0.164)	(0.230)	(0.238)	(0.186)
Ethnocentrism	0.328	0.126	0.275	0.091	0.394	0.044
	(0.260)	(0.275)	(0.317)	(0.275)	(0.323)	(0.283)
Eat Pecans	-0.199	1.257**	0.151	0.193	0.172	0.305
	(0.583)	(0.496)	(0.639)	(0.627)	(0.627)	(0.655)
Look for COO on food labels	-0.246	-0.417	0.180	0.215	-0.042	-0.504
	(0.470)	(0.580)	(0.577)	(0.607)	(0.684)	(0.640)
Aware of mandatory pecan COO label	0.739	1.362**	1.220	1.019	1.668*	1.977*
	(0.565)	(0.685)	(0.819)	(0.852)	(0.907)	(1.072)
Read nutrition labels on food	0.191	0.505	-0.045	0.336	0.759	0.894
	(0.495)	(0.631)	(0.508)	(0.596)	(0.618)	(0.632)
Look for food expiration labels	0.024	0.266	-0.018	-0.445	0.732	-0.069
	(0.611)	(0.556)	(0.630)	(0.663)	(0.632)	(0.730)
Purchase organic foods	0.192	1.129*	0.821	0.107	0.130	-0.621
	(0.553)	(0.635)	(0.735)	(0.612)	(0.804)	(0.776)
Constant	2.799	5.055**	0.263	5.004*	4.427	3.836
	(1.933)	(2.165)	(2.219)	(2.936)	(2.865)	(2.646)
N	112	112	112	112	112	112
adj. R-sq	-0.015	0.106	-0.023	-0.010	0.037	0.021
F (12, 99)	1.183	2.098**	0.455	0.853	1.224	1.042

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01

Table 2.9: Tobit estimates: All bids except for all-zero across treatments

	Bid (1)	Bid (2)	Bid (3)	Bid (4)	Bid (5)	Bid (6)
Female	0.491	-0.593	-0.672	0.378	-0.836	1.169
	(0.659)	(0.823)	(0.950)	(0.794)	(0.998)	(0.881)
Age	0.007	-0.054	0.016	-0.000	0.005	-0.014
	(0.026)	(0.033)	(0.039)	(0.032)	(0.041)	(0.035)
High Income	0.076	-0.838	0.311	0.257	-0.940	-0.220
	(0.659)	(0.819)	(0.954)	(0.791)	(1.035)	(0.880)
Education	-0.044	-0.275*	0.123	-0.139	-0.215	-0.121
	(0.129)	(0.163)	(0.191)	(0.157)	(0.196)	(0.175)
Household Size	-0.596**	-0.713**	-0.267	-0.637**	-0.802**	-0.477
	(0.237)	(0.300)	(0.352)	(0.292)	(0.382)	(0.320)
Ethnocentrism	0.544	0.334	0.461	0.271	1.305**	0.203
	(0.357)	(0.448)	(0.516)	(0.435)	(0.567)	(0.480)
Eat Pecans	-0.332	2.588**	1.215	0.503	-0.310	0.739
	(0.897)	(1.261)	(1.402)	(1.095)	(1.452)	(1.238)
Look for COO on food labels	-0.514	-0.551	0.437	0.753	0.054	-0.342
	(0.722)	(0.880)	(1.028)	(0.866)	(1.086)	(0.955)
Aware of mandatory pecan COO label	0.739	1.765*	1.722	0.939	2.929**	2.396**
	(0.784)	(0.951)	(1.116)	(0.948)	(1.160)	(1.030)
Read nutrition labels on food	-0.005	0.842	-0.438	-0.200	1.546	1.035
	(0.760)	(0.972)	(1.133)	(0.919)	(1.239)	(1.025)
Look for food expiration labels	0.143	0.237	-0.016	-1.245	1.743	-0.590
	(0.934)	(1.194)	(1.367)	(1.098)	(1.530)	(1.243)
Purchase organic foods	0.112	2.300**	1.507	0.171	0.208	-1.188
	(0.806)	(0.942)	(1.128)	(0.956)	(1.200)	(1.073)
Constant	1.765	5.247	-4.077	4.023	0.310	2.837
	(2.772)	(3.655)	(4.232)	(3.345)	(4.442)	(3.792)
Sigma Constant	2.904***	3.460***	4.027***	3.460***	4.236***	3.859***
	(0.262)	(0.337)	(0.416)	(0.324)	(0.418)	(0.351)
N	112	112	112	112	112	112
LR chi2 (12)	11.521	28.670	11.100	10.374	22.363	11.347
p	0.485	0.004***	0.520	0.583	0.034**	0.499

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01

Table 2.10: OLS estimates: Bid differences*

	(1) Bid 2	(2) Bid 3	(3) Bid 4	(4) Bid 5	(5) Bid 6
Female	-0.340	-0.166	-0.503	-0.667	0.395
	(0.490)	(0.413)	(0.456)	(0.564)	(0.539)
Age	-0.035*	-0.002	-0.006	-0.009	-0.013
	(0.019)	(0.012)	(0.015)	(0.017)	(0.021)
High Income	-0.175	0.112	-0.041	-0.499	-0.289
	(0.499)	(0.258)	(0.419)	(0.473)	(0.363)
Education	-0.117	-0.112	0.132	-0.124	-0.035
	(0.093)	(0.099)	(0.110)	(0.121)	(0.122)
Household Size	-0.078	-0.041	0.204	-0.122	0.029
	(0.155)	(0.154)	(0.176)	(0.203)	(0.131)
Ethnocentrism	-0.202	-0.237	-0.053	0.066	-0.284
	(0.246)	(0.224)	(0.247)	(0.275)	(0.207)
Eat Pecans	1.456*	0.392	0.350	0.371	0.504
	(0.749)	(0.376)	(0.455)	(0.688)	(0.466)
Look for COO on food labels	-0.171	0.462	0.426	0.204	-0.258
	(0.618)	(0.400)	(0.472)	(0.532)	(0.475)
Aware of mandatory pecan COO label	0.622	0.280	0.480	0.929	1.237
	(0.573)	(0.581)	(0.634)	(0.887)	(1.056)
Read nutrition labels on food	0.314	0.145	-0.237	0.568	0.703
	(0.680)	(0.421)	(0.484)	(0.565)	(0.469)
Look for food expiration labels	0.242	-0.468	-0.041	0.708	-0.093
	(0.708)	(0.361)	(0.685)	(0.771)	(0.464)
Purchase organic foods	0.937**	-0.085	0.628	-0.063	-0.814
	(0.463)	(0.343)	(0.729)	(0.692)	(0.656)
Constant	2.256	2.205	-2.536	1.628	1.037
	(2.289)	(1.849)	(2.151)	(2.527)	(2.090)
N	112	112	112	112	112
Adjusted R2	0.067	-0.045	-0.025	-0.027	0.004
F (12, 99)	2.366***	0.726	0.707	0.611	0.992

*Each dependent variable is measured with respect to differences from Bid 1.
Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01

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CHAPTER 3: CONSUMER PREFERENCES FOR SINGLE VS. MIXED COUNTRY OF ORIGIN: EVIDENCE FROM EXPERIMENTAL AUCTIONS ON THE INFLUENCE OF RISK AND AMBIGUITY ATTITUDES

Introduction

Under the classical microeconomic theory of consumers it is assumed that consumers have well-defined preferences and *ceteris paribus*, certainty is preferred over uncertainty. In the context of food, supplying products that are from a single source or processed in a unique facility free from any commingling or cross-contamination can be costly for the food industry due to the seasonality of many ingredients and the inherent costs in ensuring the traceability and segregation of food ingredients. Providing certain ingredients or attributes poses a dilemma for both niche and multi-national players in the food industry.

As a result, many products either (a) explicitly state that the product is from a specific origin, (b) may come from several origins, (c) processed in a facility with cross-contamination, or (d) processed in a facility with possible cross-contamination (e.g., wheat, peanuts, etc.). In this study we explore two important dimensions of consumer preferences for known vs. uncertain product origins in the context of single and mixed origin product sources.

For producers and food manufacturers of specialty food products or with process differentiation, securing premium pricing for particular consumer segments requires consumer confidence in product attributes or ingredients. Moreover, for efficient economic activity, these properties must be clearly relayed to consumers with labels that are truthful and understandable (Kuchler et al. 2017). Any handling of food products diverging from the commodity standard to

meet consumer preferences reduces savings from economies of scale in bulk handling (Hayes and Lence 2015). If multiple country sources are required in fulfilling demand, even if only occasionally as with seasonal products, similar challenges exist for meeting consumer desires with the certainty they prefer. However, multi-national sourcing offers the additional complexity of meeting country of origin regulatory requirements, which are themselves controversial, with those for mixed origin products remaining contentious (Lim et al. 2014) even after recent rulings.[1]

For products covered under U.S. Federal country of origin regulations, retailers are required to identify the country of origin, with some flexibility for format and placement as long as it is clear to the customer. Regulations most recently updated in the 2016 Consolidated Appropriations Act require customer notification on fresh and frozen fruits and vegetables, some nuts (including pecans), fish and shellfish, ginseng, and certain meats and are referred to as "covered commodities" since they are covered under the ruling. Statutorily, the statements may not use phrases for mixed origin products that include terms such as "or," "may contain," or "and/or" that suggest only the possible country of origin. The consumer must receive unambiguous origin information in order to maintain the intent of the requirements (USDA n.d.) and there are always tradeoffs in how information is presented to consumers, whether they may be confusing (Kuchler et al. 2017) or misleading (DeVuyst, Lusk, and DeVuyst 2014), or whether they even read them at all (Noussair, Robin, and Ruffieux 2002).

The specificity of the regulation increases the challenges to producers in meeting consumer demand and fulfilling preferences simultaneously. Evidence from USDA compliance surveillance reveals subpar adherence to country of origin requirements at the retail level, with

[1] See (Greene 2016) for information about the recent World Trade Organization (WTO) trade dispute on meat labeling, which also includes a history and timeline for country of origin labeling regulations.

only 29% either fully or adequately compliant, with the most frequent non-compliance found for absence of country of origin (USDA 2017). This suggests the presence of challenges making their way through the supply chain from producer to retailer, further complicating the aim of addressing the consumer's right to know.

Explorations of consumer willingness to pay for country of origin (Loureiro and Umberger 2003, 2005, 2007, Ehmke 2006, Lim et al. 2013, Mabiso et al. 2005, Lim et al. 2014, Gao, Schroeder, and Yu 2010, Lewis and Grebitus 2016) are frequent, but there is scant evidence on how policies about relaying multiple origin product information on the label are perceived by consumers and their willingness to pay for those products might be affected. Tonsor, Schroeder, and Lusk (2013) expanded the breadth of studies that typically look only at single origin labels compared to a not labeled option, with an analysis of consumer preferences for origin information on meat products that included multi-country, mandatory, and voluntary label treatment options. Their findings revealed that, in comparison to unlabeled products, consumers significantly valued the origin information but the multi-country labels were least preferred in terms of willingness to pay. Conversely, they found that consumers were indifferent to direct comparisons between *Product of North America* and *Product of United States* labels, where there was not an unlabeled choice. Tonsor, Schroeder, and Lusk (2013) were first to address alternative versions of provenance labels for meat products, noting important implications for industry costs and compliance as well as consumer valuation, but also seeking to address broader issues of rationales behind mandatory country of origin regulations and effects on both covered and exempt products. In the context of willingness to pay for the value of information, Klain et al. (2014) offers at least the possibility of multi origin meat products in a series of grocery store field experiments. Their subjects placed bids on how much they would pay to know the country

of origin or a non-specific proportion of mixed origins, not for the specific origin. Results suggest that the least preferred options were any meat products that include or may include those from Mexico.

This study examines how the presence of multiple countries on the label, in accordance with either existing mandatory rules or voluntary label placement might affect consumer values in purchasing these products. In an extension of the available literature, we further explore how consumer willingness to pay for single or mixed origin products might be influenced by their risk and ambiguity attitudes. A better understanding of consumer preferences and willingness to pay for single or mixed origin/attribute products and the relevance of certainty for those consumers is important to industry and policy-makers, regardless of whether the labeling information is mandatory and may also shed light on preferences for other multi-attribute products.

Our commodity focus is pecans, which are largely an understudied commodity in terms of consumer valuation. The primary emphasis of available research includes a focus on native versus improved pecan varieties (Palma, Collart, and Chammoun 2015), pecan consumer demographics, consumption frequency, purchase patterns and overall tree nut nutrition knowledge (Lillywhite, Simonsen, and Heerema 2014, Lombardini, Waliczek, and Zajicek 2008), festival attendees preferences among three tree nuts (Gold, Cernusca, and Godsey 2004), quality perception (Park and Florkowski 1999) and factors affecting retail outlet selection in purchasing pecans (Florkowski, You, and Huang 1999).

In the remainder of the paper, we detail the recruitment and data collection, research experiment design and experimental procedures. Following are estimates of consumer willingness to pay for label treatment options in the presence of uncertainty are presented

employing alternative econometric specifications. The final section summarizes findings and implications of experiment results.

Methods and Procedures

Recruitment and Data Collection

Consumer recruitment took place in two communities in Georgia—Griffin, and Athens—with the research sessions occurring at University of Georgia research facilities. For the Griffin sessions, consumers were recruited in the summer of 2016 from the Sensory Evaluation and Consumer Lab (University of Georgia Griffin campus) database of adults in the general public. Participants were recruited and pre-screened for tree nut allergies[2] using an online survey for the one-hour sessions. Following the screener check, participants were contacted and chose from offered sessions, with several being held over a three-day period at different time slots with a target of approximately twenty participants per session. Each person was reminded once, by either email or phone, the day before the scheduled research would take place.

A flyer with recruitment information was posted in locations throughout Athens, containing an email to contact for additional information and scheduling. Upon receipt of the email, we sent additional information to responders via an online survey, which included pre-screening for tree nut allergies and selection of an offered time slot for research sessions over a three-day period. Each person was reminded once by email the day before the scheduled research would take place. In both locations, each group of interested respondents was informed that they would take part in research about consumer preferences for tree nuts and given a participation fee of $50 upon arrival for a research session. Each participant was given a questionnaire that included basic demographics (gender, education, age, race, and income – see table 3.1 for

[2] Though there would be no consumption of pecan products on-site, research was restricted only to those without nut allergies in an abundance of caution for the well-being of participants and this method was how the IRB approved the study.

summary statistics), pecan consumption and buying habits, awareness of mandatory country of original laws with respect to pecans, label reading behavior with common purchases, and questions that allow a calculation of an ethnocentrism measure as outlined in Klain et al. (2014).[3] The ethnocentrism measure—a 1 to 5 scale with higher indicating more—addresses the contention that differences in consumer valuation by country of origin are driven merely by consumer protectionism preferences.

Table 3.1: Summary statistics (N=129)

Variable	Description	Sample Mean	Std. Deviation
Risk Aversion (CRRA coefficient)	Midpoint of CRRA range	-0.25	1.07
Ambiguity Aversion (Alpha)	Midpoint of Alpha coeff.range	0.53	0.32
Bid certainty	1-10 scale - that bid is true WTP	5.14	2.34
Gender	1 = Female	0.62	0.49
Age	Participant's age	40.3	15.9
Income	Household Income ($ 1,000s)	59.7	44.3
Education	Years of schooling	14.3	2.70
Household Size	Number of persons	2.88	1.45
Consumer Ethnocentrism	1= low; 5= high	2.73	0.94
Eat pecans	1 = Very often/often/sometimes	0.76	0.43
Look for COO on food labels	1 = Always or often	0.36	0.48
Aware of mandatory pecan COO label	1 = Yes	0.30	0.46

The primary feature of each session is an experimental auction to measure consumers' willingness to pay for pecan products, employed in order elicit a direct estimate of WTP, including the effect of different labeling options.

[3] We used the same method as Klain et al. (2014), which involved shortening the CETSCALE found in Shimp and Sharma (Shimp and Sharma 1987) from a set of 17 Likert-scaled question down to three questions. Their test of the original measure led to choosing the three that had the highest factor loadings in the general ethnocentrism scale, leading to development of a 3-question based average. This average was calculated based on the respondent's answer to three questions where each individuals' responses ranged from "strongly agree" to "strongly disagree" on a five-point Likert-scale. The exact language in the three questions as quoted from Klain were: "Americans should not buy foreign products, because this hurts American business and causes unemployment," "It is not right to purchase foreign products because it puts Americans out of jobs," and "A real American should always buy American made products."

Experiment Steps

Figure 3.1 is a flowchart outlining the experiment steps for participants. For Step 1, upon arrival, the participants check in, read and sign a consent form, receive their $50 participation fee, along with a packet containing all materials required to participate in the experiment. See Appendix A for a copy of the participant materials packet. The information is identified only with an ID number to preserve anonymity and all responses turned in by participants contain only the ID number, with no individually identifying information. The packet includes the pre-auction questionnaire mentioned above and page-by-page instructions to follow during the one-hour session. Once seated in the lab, participants complete the basic demographics portion of the questionnaire before proceeding to the next step, led by the monitor.

For Step 2, the session monitor informs participants that they will be engaging in an auction of common food products and asked to refrain from communicating with others during the process since the bid submissions are private They receive an explanation of the type of auction to be conducted, that it is likely different than other types of auctions in which they have previously participated, they will be bidding on six product options, with only one that counts (is "binding"), and auction winners make an actual purchase of the one product selected. Further explanation is given to participants, with instructions and written examples, quiz and practice rounds, and precisely how the winner is chosen from the submitted bids. The auction method is the random *n*th-price auction (Lusk and Shogren 2007, Rousu et al. 2007, Colson, Huffman, and Rousu 2011)

In a random *n*th price auction, *k* bidders – for example $k = 15$ – confidentially submit their non-negative bid for the pecans under consideration on the bid sheet provided in their information packet. Once submitted, the session monitor places bids in order ranked from

highest to lowest. Next, the monitor draws the "random *n*" from a uniform distribution of positive integers between 2 and *k*, for example *n*=4. This drawn "*n*th-price" becomes the *n*th highest bid and *n*-1 individuals submitting bids higher than this win the auction, with each paying the *n*th ranked price for the object (Colson 2009), not their own submitted bid price. In our illustrative example, that would mean that the three highest bidders are the auction winners (*n* (4)-1=3) and all three pay the 4th highest price.[4]

The random *n*th price auction elicitation device was chosen because of its prevalent use in food values research (McFadden and Huffman 2017) and because it combines the advantages of both stated and revealed preference, is demand revealing (Lusk and Shogren 2007) and is incentive compatible because each participant has an incentive to bid their own private and true value of the product. To better understand the demand revealing nature of the method, we build upon the intuition of Vickrey's classic second-price auction (Vickrey 1961), where k bidders have independent private values v_k and submit sealed bids b_k with payoffs π_k. Let β denote the *n*th-highest bid from the random integer, $\in \{2, 3,\}$ and nature selects v_k and n.

$$\pi_k = \begin{cases} v_k - \beta \; if \; b_k > \beta \\ 0 \qquad if \; b_k \leq \beta \end{cases}$$

This payoff structure demonstrates how the dominant strategy for each bidder is to bid their own private value for the product, or $b_k = v_k$.

As opposed to other auctions, in which there is only one auction winner, the random *n*th price auction provides an opportunity for n-1 bidders to win the auction and purchase the product. Further, as opposed to other demand-revealing auctions (e.g. Vickrey or Becker, DeGroot, and Marschak (1964)), this method better engages the off-margin bidders with low

[4] As mentioned in Rousu et al. (2007), if there are ties present in the ranking, it can result in the number of winners being greater than n-1. This allows the advantage of these bidders receiving product at a price lower than their bid.

values for the product being auctioned (Rousu et al. 2007) because they still have positive probability of being an auction winner. McFadden and Huffman (2017) find evidence of more sincere bidding from low-value individuals under this method. Another advantageous property is use of a random endogenously determined market-clearing price (Shogren et al. 2001). The attributes of this method provide a good fit for the study objectives.

Step 3 begins with the monitor placing fictional *n*th price auction bids on a whiteboard visible to all in the front of the room, demonstrating the ranking process and how auction winners are determined. A quiz follows with answers to ensure a thorough grasp of how the auction proceeds. Participants then engage in two practice *n*th price auction rounds, first using black bean soup followed by chicken broth in order to gain experience with familiar products in a hypothetical practice round.

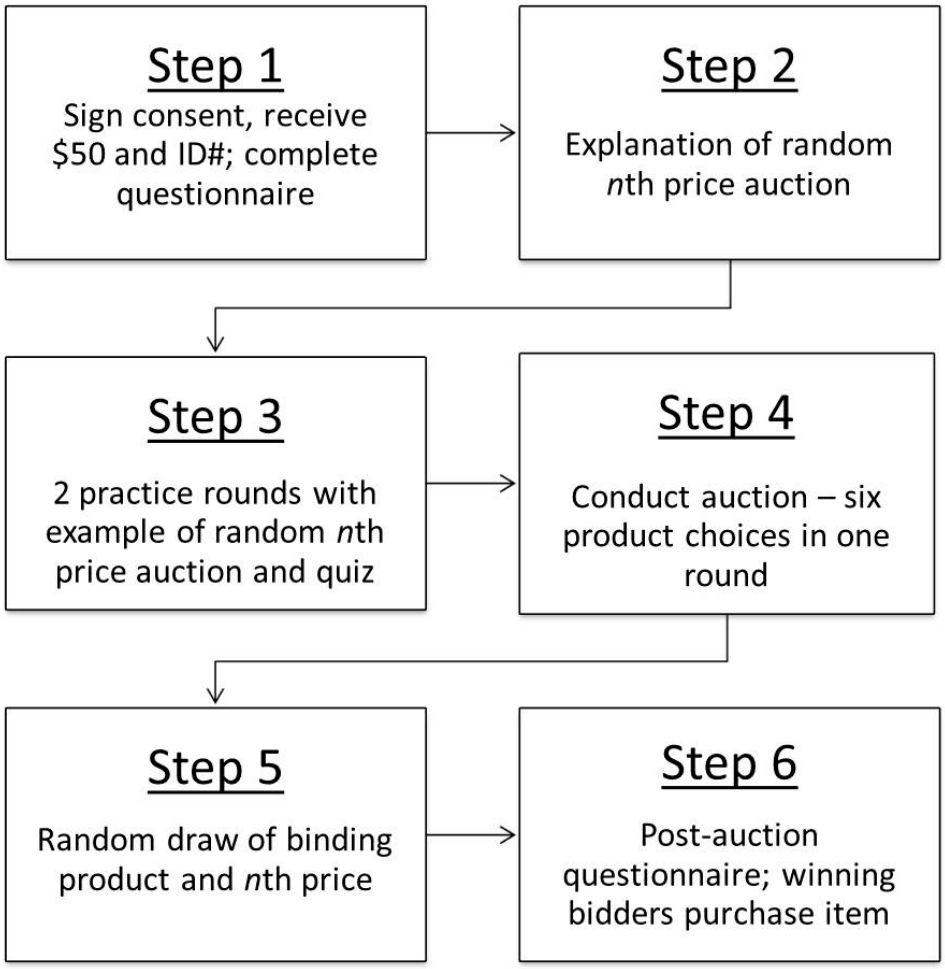

Figure 3.1: Details of experiment steps

This step introduces practice for the choice of bidding between products in separate opaque boxes containing the different label treatments as in the actual experiment. Specifically, participants are asked to list their bids (hypothetically, for practice rounds) for a 15 oz. can of black bean soup (or chicken broth in practice round 2) from inside containers under three different label options. Participants are not allowed to view the product within the containers, instead shown details about what information is present on the label of the product within each container, that are identical in every other way.

This practice round introduces the concept of risk by including a label option of a 50/50 probability of an organic product. See Figure 3.2 for example of practice round bid sheet containing all three options as viewed by bidders. For both practice rounds, monitors collect the bids, and rank in order from highest to lowest bid. From there, a coin toss determines which of the two practice rounds will be considered the binding round, followed by a random draw to select the *n*th price. Following the practice rounds, monitors answer any remaining questions about the auction procedures.

PRACTICE ROUND 2: Bid/Information Sheet

To make sure everyone is comfortable with how the n^{th} price auction works we will have two rounds of practice bidding.

The auction will consist of 3 products for which you will have the opportunity to place a bid. Only one of the two practice rounds will be "binding". By "binding" we mean that only one of the two practice rounds will be selected as the round where people would win goods and pay money for them (i.e. only one round "counts"). The round that is binding will be randomly selected and will be revealed after the second practice round. Since you do not know which round will be chosen, it is in your best interest to **bid your true value for the products in both practice rounds.**

You will compare 32oz. packages of chicken broth that are all of the same weight and size. However, each of the products will contain different labeling information than the other. You will bid the highest price you are willing to pay for each package of broth given the characteristics.

Remember, this is only practice, so **no goods will be purchased** and **no money will be exchanged**.

Option A

Chicken Broth

32 oz.

The highest price that I am willing to pay for Option A is S_____

Option B

Chicken Broth

Certified Organic
32 oz.

The highest price that I am willing to pay for Option B is $_____

Option C

Chicken Broth

50% Probability Certified Organic &
50% Probability NOT Certified Organic
15 oz.

The highest price that I am willing to pay for Option C is $_____

Figure 3.2: Example of practice round for auction

Following practice rounds, Step 4 begins the experimental auction portion of the study. Participants are shown a bag of pecans without labels for familiarity with the product, but not allowed to look inside of six containers, one for each label treatment option on which they bid. Before bidding commences, monitors place the six containers on a table, displaying them side-by-side, each clearly displaying product label information but with actual pecan bags inside and not visible to participants. The label options include no information (all options contain *Pecan Halves, 8 oz*.), *Product of the United States*, *Product of Mexico*, *Product of Mexico and/or the United States*, *Contains 50% Pecans from Mexico & 50% Pecans from the United States*, and *50% Probability Product of Mexico & 50% Probability Product of the United States.* No explanation beyond what is on the bid sheets and label wording is given to bidders.

The concept of uncertainty introduced in the practice round is expanded in the actual experiment to explore the influence of risk and/or ambiguity in the willingness to pay for the shelled pecan halves under the different labeling options. The "risk" present for the auction bids consists of some probability of determining the country of origin of the product, while "ambiguity" for our purposes indicates that those probabilities are not known. For example, in the case of the blank label, where only the product name and package weight are revealed, both risk and ambiguity are present since there is some probability of knowing the source country and the probability is not known because the label does not specify. As a second example, in the case of the *50/50 Probability Product of Mexico or United States* label, there is risk for this option since there is a probability of determining the origin, a 50% probability of product from Mexico (single origin) and 50% probability from U.S. (single origin), but there is no ambiguity present as the probabilities are known. See Table 3.2 for the available label treatment options and full descriptions of the risk and ambiguity present for the bidder.

For each treatment, we elicit the highest (non-negative) price the participant is willing to pay for pecans with the specific labeled option. These bids are submitted simultaneously in one round of bidding and collected by the monitor. Figure 3.3 is the bidding and instruction sheet for the auction.

Table 3.2: Label treatment options

Label	Option	Risk Present?[a]	Ambiguity Present?[b]
A	Blank	Yes[c]	Yes[c]
B	Product of the United States	No	No
C	Product of Mexico	No	No
D	Product of Mexico and/or the United States	Yes	Yes
E	50/50 Product of Mexico and United States	No	No
F	50/50 Probability Product of Mexico or United States	Yes	No

Notes:
[a] "Risk" denotes that there is some probability, known or unknown, of determining the origin
[b] "Ambiguity" denotes that the probabilities are not known.
[c] There is only risk/ambiguity if consumers actually consider the possible origin of the pecans in submitting their bids

For Step 5, as demonstrated in the practice rounds, bids are sorted and ranked from highest to lowest and a random draw selects which label option will be binding as well as the random *n*, then the winning bid ID numbers are posted on the whiteboard, along with the *n*th price that will be paid by the *n*-1 winners.

Step 6 concludes the experiment to elicit consumer valuation for the pecan label options and all participants answer the post-auction questionnaire and participate in the decision tasks used to measure their risk and ambiguity attitudes. Upon completion, auction winners exchange money for the bag of pecans from the binding label treatment, while the non-winners exit the room. All options presented in label treatments were available for auction winners for purchase, following Colson et al. (2016) and Rousu et al. (2015) to ensure that no deceptive practices were employed in the experiment.

Bid/Information Sheet

Please remember that the $50 cash compensation you received at the beginning of our study is yours to keep as compensation for your time. You do **NOT** have to use it in our study.

We will now begin the auction phase of our study. The auction will consist of 6 products for which you will have the opportunity to place a bid. However, only one set of product bids will be "binding" (i.e., winners of the auction will pay for their products). The binding product will be determined randomly after all bidding is completed. You will compare 8 oz. bags of pecan halves that are all of the same weight and consistency. However, each of the 6 products will contain different labeling information than the other.

You will bid the highest price you are willing to pay for each bag of pecans given the characteristics. At the end one product will be selected randomly as binding. If you are a winner of the auction, then you will receive pecans with the randomly selected characteristics and pay your bid as demonstrated in the practice round.

Please note that your bids are **not** hypothetical.

Option A	Option B
Pecan Halves 8 oz.	Pecan Halves Product of the United States 8 oz.
The highest price that I am willing to pay for Option A is $_____	The highest price that I am willing to pay for Option B is $_____
Option C	**Option D**
Pecan Halves Product of Mexico 8 oz.	Pecan Halves Product of Mexico and/or the United States 8 oz.
The highest price that I am willing to pay for Option C is $_____	The highest price that I am willing to pay for Option D is $_____
Option E	**Option F**
Pecan Halves Contains 50% Pecans from Mexico & 50% Pecans from the United States 8 oz.	Pecan Halves 50% Probability Product of Mexico & 50% Probability Product of United States 8 oz.
The highest price that I am willing to pay for Option E is $_____	The highest price that I am willing to pay for Option F is $_____

Figure 3.3: Example of auction label treatment round bid sheet

Methods

In this experiment, we elicit participant bids on 8 oz. bags of pecans in one auction round under six different label treatment options. Multiple regression analysis is employed to address any potential confounding factors, such as the participant's unique socioeconomic characteristics. The method theoretically holds constant the participants taste between pecans in the six containers, where the dependent variable is the highest (non-negative) dollar value that they are willing to pay for the pecans with the given characteristics. Consistent with this approach, the participant's inverse demand equation for pecans is (Rousu et al. 2007):

$$P_i^{Label\ Treatment\ Option} = \beta_1 + \beta_2 X_{i2} + \varepsilon_i,$$

where $P_i$is the price bid by participant i for the particular label treatment option, β_1 is the intercept, X_{i2} is a vector of explanatory variables for each individual, β_2 is a vector of coefficients, and ε_i is the error term. Under this specification, the experiment design results in a bid for willingness to pay, in terms of dollars and cents for selecting pecans with a specific label treatment option.

The perspective of risk and willingness to pay for food products has been largely addressed in terms of food safety (for example, see Loureiro and Umberger (2007), Lim et al. (2013), Lim et al. (2014), Lewis and Grebitus (2016)), typically exploring risk in the context of potential hazards involved in purchasing a meat product that may be unsafe or perceived as unsafe for consumption. For this study, we look at how risk and ambiguity in knowing the country of origin for auction bidding may influence consumers' willingness to pay varying label treatment options. The experimental method used to jointly elicit participant risk and ambiguity attitudes for this study is based on the approach introduced by (Gneezy, Imas, and List 2015), built upon the framework of (Holt and Laury 2002) for risk aversion and Ellsberg (1961) urn

techniques for ambiguity. Gneezy, Imas, and List (2015) stresses the importance of jointly estimating the risk and ambiguity attitudes to avoid overestimating ambiguity aversion by assuming a level of risk aversion rather than simultaneously obtaining the measures. As outlined for this paper-and-pencil instrument, the joint elicitation requires the individual to make a series of decisions under both subjective and objective uncertainty using the double multiple price list (DMPL) format, then using that data to estimate the risk aversion coefficient r and ambiguity aversion measure α. Specifically designed to be simple and easy to use in the field or laboratory, the approach makes minimal assumptions and restrictions.

Procedurally, this method involves asking individuals to make decisions in two separate "tasks" on forms (a "decision sheet") following the post-auction questionnaire, each a multiple price list (MPL). The first task, Task A, includes a set of ten decisions made over choices where the probabilities are objective. The second task, Task B, is a set of twenty decisions between choices where some probabilities are known and others ambiguous. Each decision sheet preceded by instructions read by participants and also with an explanation by the session monitor. See Appendix A for examples of the instructions and decision sheet for each task. The focus of the responses is the point at which the respondent switches from Option A in the left column or the gamble Option B in the right. The "switch point" selection is the data from which the risk attitude for Task A and ambiguity attitude is calculated for Task B. These experimental tasks are designed to be incentive compatible, with respondents receiving payment according to the randomly selected task and decision, following payment if auction winner. Like the Gneezy design, approximately one half of the research session respondents receive real money from their decision task while the others chose from hypothetical gambles. In the method development, they found no statistical difference between real or hypothetical incentives, nor did we (see table

3.3). Our refinements to the approach include paying exact dollar amounts for the real gambles as opposed to tokens as in the Gneezy experiments.

Table 3.3: Aggregate risk and ambiguity attitudes under real and hypothetical incentives (N=129)

	Risk Coefficient r	Ambiguity Attitude α
Hypothetical Incentives Joint Estimate	0.475	0.555
	(0.285)	(0.457)
Real Incentives Joint Estimate	0.479	0.601
	(0.285)	(0.357)
Difference	-0.004	-0.046
	(0.051)	(0.074)

Standard deviation for joint estimate, standard errors for difference in parentheses.

Data Analysis and Results

Table 3.4 presents summary statistics of the auction bid prices, with unconditional tests of differences between bids across the six label treatment options, exploring whether single source country of origin and mixed country of origin in the presence of various risk and ambiguity scenarios influence consumer valuation for 8 oz. bags of shelled pecan halves. Despite identical product contained within, the bidders' valuation for the products range from $3.40 to $4.54 per 8 oz. bag.[5] At $4.54, the highest average value (label option F) is for the unambiguous *Product of the United States*, topping the next highest option of $3.74 (label treatment A) for the blank label containing only the product name and weight with no country of origin data. At the other end of the spectrum, the lowest in preference ordering is the average bid is for the single origin *Product of Mexico* label ($3.40 – label treatment C), though the value is similar to the average bid for known-probability risk (50/50) of purchasing a single country source product from either the United States or Mexico ($3.44 – label treatment F). The average

[5] The approximate retail value for the product in grocery stores is $5.99.

bid for label treatment D with non-specified origin information at $3.59 is the same on average as the clearly defined 50/50 mixed origin product from U.S. and Mexico with no risk or ambiguity for a determination of origin (treatment E). Similar to the Klain et al. (2014) findings for consumer preferences for meat origin, any label information that includes or may include Mexico origin are the least preferred of all available treatment options.

Table 3.4: Summary statistics of auction bid prices (N=129)

Summary Statistics by Label Treatment Options*			
Treatment	Label Information	Mean	Std. Deviation
A	Blank	$3.74	$2.04
B	Product of U.S.	$4.54	$2.32
C	Product of Mexico	$3.40	$2.05
D	Product of Mexico and/or the United States	$3.59	$2.12
E	50/50 Product of Mexico and United States	$3.59	$2.11
F	50/50 Probability Product of Mexico or United States	$3.44	$2.04

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In table 3.5, the difference in bids between all label treatments and statistical tests of differences from zero is presented, exploring how varying country of origin options affect the average willingness to pay among the bidders. Overall, there are consistent and significant differences in bid prices between the label information options. The largest mean bid difference ($1.15) is between *Product of the United States* over the *Product of Mexico* pecans. On average, consumers bid between significantly more (between $0.95 and $1.15) for the U.S. product over all other label treatment options. There is no significant difference between treatment D and E, nor D and C. With the exception of the guaranteed single origin U.S. product, the differences between the blank label (treatment A) and other options are positive, meaning that the average bid for product from Mexico or any mixture of origins is less preferred than knowing nothing but product name and weight. Though seemingly paradoxical that reliable, additional information about product origin results in lower average bids, it suggests several possibilities. It could be

that consumers are confused as the labels become more complex (Kuchler et al. 2017), that consumers may infer or assume certain characteristics about the product despite the blank label, or that the country of origin may not have been part of their preference profile or purchase decision process prior to it being pointed out on the label.

Table 3.5: Mean bid difference between all pairs of label treatments

Mean bid difference between all label information options (N = 129)						
Treatment	Label Information	B	C	D	E	F
A	Blank	-$0.80***	$0.34***	$0.15*	$0.15*	$0.30***
		(0.08)	(0.08)	(0.08)	(0.08)	(0.09)
B	Product of the United States		$1.15***	$0.95***	$0.96***	$1.11***
			(0.10)	(0.09)	(0.10)	(0.10)
C	Product of Mexico			-$0.19***	-$0.19***	-$0.04
				(0.05)	(0.06)	(0.07)
D	Product of Mexico and/or the United States				$0.00	$0.15**
					(0.07)	(0.07)
E	50/50 Product of Mexico and United States					$0.15***
						(0.06)
F	50/50 Probability Product of Mexico or U.S.					

[a]Standard errors in parentheses. Difference is calculated using the bid on vertical columns minus bid on horizontal top column. Statistical significance * p<0.10, ** p<0.05, *** p<0.01

We find that, relatively, consumers are significantly willing to pay less to obtain a single origin product under the known probability of risk (treatment F) than for any other single or mixed origin product offered, besides the known origin product from Mexico. This result could also seem contradictory, for example, that bidders on average would be willing to pay $0.15 *more* for the ambiguous risk of determining the country of origin (treatment D – "and/or") or the 50/50 product origin mix under no risk or ambiguity (treatment E). In the case of the higher average bids for D and E, the pecans are either potentially or known mixed origin, so bidders appear to prefer a mix of pecans from both countries over the 50% chance of receiving a single origin product that is less preferred, as the pecans from Mexico appear to be.

To further investigate preferences for the different label options and the influence of risk and ambiguity attitudes on consumer willingness to pay, we expand our definitions and clarify relevant bid dissimilarities in Table 3.6, presenting the mean, hypothesized sign, and statistical tests of differences from zero, along with a definition of each with respect to hypotheses. Consistently, the largest premium is for the U.S. single origin product compared to the product known to be from Mexico. The unambiguously certain single country of origin premium (U.S. vs. Mexico, $1.15) highlights the premise of well-defined preferences and certainty over uncertainty.

From the perspective of contrasting single and mixed origin bids, we make comparisons between the weighted-average bids for a single origin pecan product with the mixed origin treatment options. From this angle, results reveal the largest discount in willingness to pay for mixed vs. single origin (-$0.54) when the risk is both explicit on the label and the probability is known for the mixed origin pecans. Similarly, bidders reveal a discount (-$0.38) for mixed origin pecans over single origin under both risk and ambiguity or if the pecans are a known 50/50 mix from both U.S. and Mexico.

Table 3.6: Relevant Bid Differences and Definitions (note changes: simpler version than we had last discussed)

Bid Differences	Expected Sign	Mean	Definition
B-C	>0	$1.15 ***	Premium for single origin product of United States vs. Mexico
D-A	≷ 0	-$0.15 *	Discount/Premium for explicit[a] vs. implicit[a] origin ambiguity
D-F	≷ 0	$0.15 **	Discount/Premium for explicit origin risk vs. known-risk single origin
A-F	≷ 0	$0.30 ***	Discount/Premium for implicit origin risk vs. known-risk single origin
D-E	<0	$0.00	Discount for explicit origin risk vs. explicit mixed origin
D-(0.5B + 0.5C)	<0	-$0.38 ***	Discount for explicit origin risk vs. single origin product
E-(0.5B + 0.5C)	<0	-$0.38 ***	Discount for mixed vs single origin product
F-(0.5B + 0.5C)	<0	-$0.54 ***	Discount for risk

[a] Explicit origin ambiguity refers to that which is brought to the attention of the consumer as a result of being on the label. Implicit indicates that the same ambiguity is present for the product but it is not noted on the label.
Statistical significance * p<0.10, ** p<0.05, *** p<0.01

Beyond the unconditional analysis of the average bids, we look at the potential drivers of the consumer willingness to pay for single and mixed origin pecans across different label contexts. For this purpose, we present a series of regressions looking at the influence of socio-demographic, shopping preferences, consumer ethnocentrism, and risk and ambiguity attitudes on bid prices. For each label treatment option and for the bid differences, we estimate standard linear regression models (OLS). We find few variables statistically significant with consistency across the models and treatments. Noteworthy results in the estimates for each label treatment (table 3.7) is the positive effect of bidder certainty (ranging from $0.21 to $0.29) across all six options and from female bidders ($0.69 to $0.93) for all but treatment F. In the regressions for relevant bid differences (table 3.8), we find limited evidence of a premium for consumers who look for country of origin on food labels between the single origin products, but a discount among them in comparison between single and mixed origin products. We do not find any consistent support for our measure of consumer ethnocentrism influencing values nor for any of our risk and ambiguity attitudes, despite the clear preference away from single origin products from Mexico. Overall, our regression analysis offers little meaningful understanding into the

factors influencing consumer preferences for single or mixed country of origin information in pecan purchases, even in the presence of risk and ambiguity for these purchases.

Conclusion

Providing attributes that consumers desire and have confidence in can prove challenging for food products, particularly with respect to successfully relaying information on the label. With a multi-attribute product or with multi-national sourcing, these issues grow more complicated in not only understanding and addressing well-defined consumer preferences, but also complying with regulations concerning specifics. Country of origin labeling requirements provide an example of these complexities, with producers facing obstacles of potential product commingling, seasonality, and different rules depending on whether product is sourced from a single country or from multiple. Further, if consumers are uncertain about product attributes or origin, it can threaten the price premium needed to maintain profit margins.

In this study, we conduct a series of experimental auctions to elicit the direct willingness to pay for pecans under labeling scenarios that include single and mixed country of origin products, both with and without explicit risk and/or ambiguity of knowing the origin. On average, consumers value the single origin product from the U.S. with certainty over all other options, with the relatively least preferred being the product with a known risk of potentially obtaining the single origin product from Mexico. Despite the implicit, yet still present, risk of not knowing the country of origin where the label is blank, consumers appeared to have either not understood or not considered the risk and ambiguity of the choices unless pointed out to them by its occurrence explicitly on the label. The overall findings indicate a preference ordering of single origin product over mixed origin, regardless of whether the risk of determining the origin is known or unknown. Because consumers show a clear preference of willingness to pay more

for unambiguous single origin product, it follows that single source producers might favor the mandatory COO labeling as currently exists in order to capture those premiums. However, those with product from mixed or potentially mixed origins might favor a voluntary COO policy in order to avoid lower consumer valuations. Consumers are indifferent between product that specifies what fraction comes from each country (50/50 U.S. and Mexico) or simply stating "and/or" (U.S. and/or Mexico) on the label, which is not currently allowed under COO regulation.

Though a clear pattern of preference ordering appears in the unconditional analysis of the bids, conditional analysis reveals no distinct influence of the socio-demographic, shopping patterns, or risk and ambiguity attitudes in these consumer valuations. This finding could reflect the signaling nature of the country of origin attribute, that it is more than just a reduction of asymmetric information to the consumer, but incorporates multiple dimensions of the consumer preferences such as a quality marker or a way to support one's native country. As a result, these differences across the average consumer may not fall into expected categories.

For future research efforts, some variation in experiment design might prove fruitful in untangling the details of the primary influences of consumer willingness to pay in the presence of both risk and ambiguity for particular product attributes. Some areas to explore include using a different commodity of focus, comparing two products that have different inherent risk profiles, or to examine other attributes in conjunction with COO such as a known brand name to detail consumer willingness to pay.

Table 3.7: Regression estimates for bids

	Treatment A	Treatment B	Treatment C	Treatment D	Treatment E	Treatment F
Risk Aversion (CRRA coeff.)	-0.245	-0.037	-0.103	-0.136	-0.134	-0.117
	(0.242)	(0.251)	(0.249)	(0.248)	(0.245)	(0.237)
Alpha (Ambiguity attitude coeff.)	0.046	0.338	0.184	0.169	0.187	0.142
	(0.441)	(0.531)	(0.509)	(0.491)	(0.498)	(0.487)
Bid Certainty (true maximum WTP)	0.227***	0.291***	0.247***	0.267***	0.210**	0.257***
	(0.083)	(0.090)	(0.076)	(0.080)	(0.096)	(0.088)
Female	0.898**	0.930**	0.686*	0.739*	0.803**	0.603
	(0.352)	(0.391)	(0.365)	(0.383)	(0.387)	(0.388)
Age	0.018	0.023	0.010	0.015	0.004	0.009
	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)
Income	-0.116	-0.063	0.109	0.067	0.130	0.060
	(0.336)	(0.377)	(0.381)	(0.384)	(0.382)	(0.376)
Education	0.029	0.005	0.022	0.014	0.004	0.001
	(0.076)	(0.078)	(0.076)	(0.076)	(0.076)	(0.067)
Household size	-0.050	-0.032	0.029	0.036	0.033	0.013
	(0.138)	(0.138)	(0.134)	(0.138)	(0.136)	(0.134)
Consumer Ethnocentrism	-0.070	0.024	-0.062	-0.008	-0.031	-0.100
	(0.242)	(0.246)	(0.238)	(0.247)	(0.239)	(0.217)
Eat pecans	-0.172	-0.111	-0.449	-0.468	-0.327	-0.472
	(0.412)	(0.460)	(0.469)	(0.461)	(0.447)	(0.440)
Look for COO on food labels	0.261	0.682	0.235	0.076	0.143	0.322
	(0.436)	(0.440)	(0.468)	(0.460)	(0.471)	(0.425)
Aware of mandatory COO on pecans	0.632	0.501	0.160	0.252	0.480	0.194
	(0.392)	(0.447)	(0.419)	(0.429)	(0.422)	(0.402)
Constant	0.367	0.229	0.496	0.298	1.021	1.029
	(1.381)	(1.349)	(1.370)	(1.336)	(1.511)	(1.355)
N	123	123	123	123	123	123
adj. R-sq	0.131	0.173	0.061	0.071	0.048	0.061
F	3.366***	3.725***	1.895**	2.137**	1.778*	1.862**

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01

Table 3.8: Regression estimates for bid differences

	B-C	D-A	D-F	A-F	D-E	D-(.5B+.5C)	E-(.5B+.5C)	F-(.5B+.5C)
Risk Aversion (CRRA coeff.)	0.066	0.109	-0.020	-0.129	-0.002	-0.066	-0.064	-0.047
	(0.114)	(0.099)	(0.084)	(0.102)	(0.082)	(0.059)	(0.077)	(0.079)
Alpha (Ambiguity attitude coeff.)	0.154	0.123	0.027	-0.096	-0.018	-0.092	-0.074	-0.119
	(0.279)	(0.243)	(0.208)	(0.252)	(0.202)	(0.144)	(0.189)	(0.195)
Bid Certainty (true maxWTP)	0.045	0.040	0.011	-0.029	0.058*	-0.002	-0.059**	-0.013
	(0.043)	(0.038)	(0.032)	(0.039)	(0.031)	(0.022)	(0.029)	(0.030)
Female	0.244	-0.159	0.137	0.295	-0.064	-0.069	-0.005	-0.205
	(0.205)	(0.179)	(0.153)	(0.185)	(0.149)	(0.106)	(0.139)	(0.143)
Age	0.013*	-0.002	0.006	0.008	0.011**	-0.001	-0.013**	-0.007
	(0.007)	(0.006)	(0.006)	(0.007)	(0.005)	(0.004)	(0.005)	(0.005)
Income	-0.172	0.183	0.008	-0.176	-0.063	0.044	0.107	0.037
	(0.220)	(0.191)	(0.164)	(0.198)	(0.159)	(0.114)	(0.149)	(0.153)
Education	-0.018	-0.016	0.012	0.028	0.010	0.000	-0.009	-0.012
	(0.044)	(0.038)	(0.033)	(0.039)	(0.032)	(0.023)	(0.030)	(0.031)
Household size	-0.061	0.087	0.023	-0.064	0.003	0.038	0.035	0.015
	(0.073)	(0.064)	(0.055)	(0.066)	(0.053)	(0.038)	(0.050)	(0.051)
Consumer Ethnocentrism	0.086	0.062	0.092	0.030	0.024	0.011	-0.013	-0.081
	(0.126)	(0.110)	(0.094)	(0.114)	(0.091)	(0.065)	(0.085)	(0.088)
Eat pecans	0.339	-0.296	0.004	0.300	-0.141	-0.188	-0.046	-0.192
	(0.250)	(0.217)	(0.186)	(0.225)	(0.181)	(0.129)	(0.169)	(0.174)
Look for COO on food labels	0.447*	-0.185	-0.245	-0.061	-0.067	-0.382***	-0.316*	-0.137
	(0.240)	(0.208)	(0.178)	(0.216)	(0.173)	(0.124)	(0.162)	(0.167)
Aware of mandatory COO on pecans	0.342	-0.380*	0.058	0.438*	-0.228	-0.078	0.149	-0.136
	(0.247)	(0.215)	(0.184)	(0.223)	(0.179)	(0.128)	(0.167)	(0.172)
Constant	-0.267	-0.069	-0.731	-0.662	-0.723	-0.064	0.659	0.666
	(0.817)	(0.711)	(0.608)	(0.737)	(0.592)	(0.423)	(0.552)	(0.570)
N	123	123	123	123	123	123	123	123
adj. R-sq	0.123	0.043	-0.048	0.053	0.008	0.099	0.099	0.048
F	2.429***	1.452	0.534	1.568	1.081	2.120**	2.120**	1.509

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01

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CHAPTER 4: GENERAL CONCLUSION

Pecans are a high-value component of U.S. agriculture, yet little information about particular consumer preferences along with the corresponding willingness to pay (WTP) for this native North American tree nut can be found. Because pecans are considered a "covered commodity" subject to mandatory country of origin (COO) labeling requirements by retailers under United States Department of Agriculture guidelines, questions related to this requirement and consumer valuations emerge alongside the others. Because product labels convey vital information from producers and manufacturers to consumers, they are key in investigating consumer valuations. Clear and effective labels not only allow consumers to align their preferences with available options, but hold potential economic gains when product information garners a price premium for desired attributes.

Employing choice experiments and random *n*th price experimental auctions in a series of research sessions with adult consumers in two Southeastern U.S. cities, this study assesses how consumers respond to product attributes and label details in different information contexts for purchases of shelled pecan halves. From the data collected in the sessions, we address the following: 1) consumers' willingness to pay for select initiatives proposed in conjunction with the recent Federal Marketing Order (FMO) regarding pecan attributes, 2) direct elicitation of the consumers' value of obtaining information about attributes under alternative labeling scenarios, and 3) the influence of consumer risk and ambiguity attitudes on consumer preferences for single or mixed country of origin products.

In Chapter 1, we look at how long standing issues in the U.S. pecan industry ultimately led to the 2016 approval of a Federal Marketing Order (FMO), which underscores the importance of understanding consumer valuation as stakeholders pursue avenues to address industry-wide concerns that include supply, prices, market disruption, and lack of uniform quality, container, and packaging standards. Yet, there are no guarantees that the passing of the FMO or any subsequent actions that may be implemented will bring about the anticipated increased demand, additional profits, or better prices for pecan producers. Our findings reveal that the most consistent overall attribute for which consumers are willing to pay is for pecans sourced from the U.S., the labeling of which is already a requirement by COO regulation. In addition, consumers generally value organic, larger size (as long as they are not too large), designated fancy grade and a heart healthy claim for pecan purchases. However, these results show significant taste heterogeneity across consumers for many pecan attributes, which must be considered in anticipation of consumer responses to any proposed initiatives. Findings indicate that, in choice experiments, consumer ethnocentric tendencies and purchasing patterns play a role in defining differences among consumer taste preferences and WTP, while efforts to inform and educate consumers about attributes are essential.

In Chapter 2, we examine how much consumers are willing to pay for knowing vs. not knowing information on the label for pecan purchases using a direct approach in an experimental setting. The direct value of information (VOI) method measures how much consumers will pay to have additional information about their product purchase rather than the typical approach measuring consumer valuation of specific attributes. On average, we find that consumers have a positive VOI for country of origin information, even without knowing exactly which country, yet the median individual has none. How consumer VOI varies in the presence of other knowledge

about the product is not clear from the available data, though there is some evidence that the value of origin information diminishes (or at least changes) in a more complex label environment.

In Chapter 3, we employ a series of experimental auctions to elicit the consumer willingness to pay for pecans under labeling scenarios that include single and mixed country of origin products, both with and without the risk and/or ambiguity of knowing the country of origin. We found that, on average, consumers value most the single origin product from the U.S. with certainty over any other option and least value the single origin product from Mexico. In comparing mixed country of origin options, consumers are indifferent between two mixed product label options and in the presence of risk or ambiguity regarding knowledge of product provenance, consumers prefer mixed origin over any risk of obtaining the single origin product from their lowest ranked preference country.

APPENDIX A: PARTICIPANT INFORMATION PACKET

Welcome to our research session about decision making. Thank you for choosing to participate. The information you provide today is a very important contribution to ongoing research by the University of Georgia.

Enclosed is the packet of information that you will need during the session. Once you have looked at a form during the session, feel free to go back and reexamine the form again if needed, but please *do not look ahead* until we reach the right point in the session.

Please follow instructions in this packet carefully. To ensure accuracy, we request that you do not talk to any other participants during the session.

We would like to emphasize that all information obtained today will be used only for group comparisons. No personal or individual information will be divulged for any reason.

Please turn to the next page.

Please answer the following questions by circling the appropriate choice or filling in the appropriate line.

1. What is your gender?
   1 = Male
   2 = Female

2. What is your age? _____

3. What best describes your marital status?
   1 = Single
   2 = Married
   3 = Divorced, widowed, or separated
   0 = Other

4. How many people live in your household (including yourself)? _____

5. What is the highest level of schooling that you have completed?
   1 = Some high school
   2 = Graduated from high school/GED
   3 = Some college
   4 = 2 year college degree
   5 = 4 year college degree
   6 = Master's Degree
   7= Doctoral Degree
   8= Professional Degree (JD, MD)

6. What is your racial-ethnic background?
   1 = Native American or Alaska Native
   2 = White or Caucasian (non-Hispanic)
   3 = African-American
   4 = Asian-American
   5 = Hispanic or Latino
   6= Native Hawaiian or Pacific Islander
   0 = Other (please fill in) _____

7. What was your total household income (before taxes) in 2015?
   1 = Under $24,999
   2 = $25,000-$49,999
   3 = $50,000-$99,999
   4 = $100,000-$149,999
   5 = $150,000 or more

Please do not turn the page until instructed by your monitor.

Once again, we would like to thank you for participating in today's session about decision making.

We will be conducting auctions of some common products. Details for how the auction works will be provided shortly.

Because we are trying to determine values for products, we ask that you please refrain from communicating with the other participants. If you have any questions, the monitors can assist you.

How the Auction Works

We are going to hold what is called an **n^{th} price auction**. For those of you who have participated in auctions before, please note that the n^{th} price auction is slightly different than what you may have previously encountered. The **n^{th} price** auction works as follows:

1. We will pass out bid sheets explaining information about products on which to bid. Carefully examine the bid sheet, ensuring that it contains the ID# you were assigned.

2. Write down your bid for each product

   After examining the bid sheet, write down what dollar amount (if any) you would like to bid for the products being auctioned on the provided bid sheet.

3. Choosing of the n^{th} price

   Once everyone has bid, we will collect the bids and determine what will be called the "n^{th} price". Everyone who bids **higher** than this price will win the product, and pay the n^{th} price.

   (Your monitor will go through an example of this)

4. Determining who wins the auction

   (Your monitor will go through an example of this)

Please note that in this auction it is **always in your best interest to bid your true value for a product**. Unlike many auctions in which you might bid less than your true value to try to get a deal, this auction **does not reward that strategy**. This is because you do not necessarily pay your bid price, but you pay the n^{th} price that is randomly chosen. Likewise, it is not in your interest to bid more than you are truly willing to pay because you may have to pay more than you wanted to for the product.

Short Quiz on the n^{th} Price Auction Format

Please note: this sheet will remain in your packet

1. The people who win will always pay the amount they bid for a product.
   1 = True
   2 = False

2. If you have the 4^{th} highest bid and the randomly drawn n^{th} price is the 2^{nd} highest, you will win the auction.
   1 = True
   2 = False

3. I might get to pay less than my bid for a product, but I will never have to pay more than my bid for a product.
   1 = True
   2 = False

4. If the binding price that is randomly drawn is the 7^{th} highest price, how many people win the good?
   4
   5
   6
   7
   8

Practice Auction

To make sure everyone is comfortable with how the n^{th} price auction works we will have two rounds of practice bidding.

Since some of the products in the two rounds are similar, only one of the two practice rounds will be "binding". By "binding" we mean that only one of the two practice rounds will be selected as the round where people will win goods and pay money for them (i.e. only one round "counts"). The round that is binding will be randomly selected and will be revealed after the second practice round. Since you do not know which round will be chosen, it is in your best interest to **bid your true value for the products in both practice rounds**.

These two rounds are **practice** so no goods will actually be purchased and no money will be exchanged.

Practice Bidding Round 1 of 2

Step 1 - Examine the 2 products

Examine the products in practice round 1

Step 2 - Write down your bid

Please fill out your bid sheet. It will be collected by monitors.

Please do not turn the page until instructed by your monitor.

Practice Bidding Round 2 of 2

Step 1 - Examine the 2 products

Examine the products in practice round 2

Step 2 - Write down your bid

Please fill out your bid sheet. It will be collected by monitors.

Step 3 – Determine the binding round (randomly selected)

Monitors will randomly determine which of the two rounds of bidding will be binding.

Step 4 – Determine the n^{th} price for each product (computer generated)

Monitors will randomly determine the n^{th} price for products in the binding round.

Step 5 – Announcement of the auction winners for each product

If this auction was real, the winners in the binding round would exchange money for the goods in the room next door.

Please do not turn the page until instructed by your monitor.

Auction

We are about to begin the real auction. The auction will consist of 6 products for which you will have the opportunity to place a bid. However, only one set of product bids will be "binding" (i.e., winners of the auction will pay for their products). The binding product will be determined randomly after all bidding is completed. You will compare 8 oz. bags of pecan halves that are all of the same weight and consistency. However, each of the 6 products will contain different labeling information than the other. You will bid the highest price you are willing to pay for each bag of pecans given the characteristics. At the end one product will be selected randomly as binding. If you are a winner of the auction, then you will receive pecans with the randomly selected characteristics and pay your bid as demonstrated in the practice round. Remember, please bid with your **true value.**

Bidding Procedure

Step 1 - Examine the information/bid sheet for 6 products

Examine the products, reading carefully the information explaining the differences between the products

Step 2 - Write down your bid for each product

Please fill out your bid sheet. It will be collected by monitors.

To ensure accuracy, write your bids here also:

Option A
The highest price that I am willing to pay is
$_____

Option B
The highest price that I am willing to pay is:
$_____

Option C
The highest price that I am willing to pay is
$_____

Option D
The highest price that I am willing to pay is:
$_____

Option E
The highest price that I am willing to pay is
$_____

Option F
The highest price that I am willing to pay is:
$_____

Please do not turn the page until instructed by your monitor.

Step 3 – Determine the binding product (randomly selected)

Monitors will randomly determine which of the product bids will be binding

Step 4 – Determine the n^{th} price for each product (randomly selected)

Researchers will randomly determine the n^{th} price for the binding product bids

Step 5 – Announcement of the auction winners

Step 6 – Post auction questionnaire

Please fill out the questionnaire on the following pages. Once you have completed the questionnaire, please return your information packet to the session monitor.

Step 7 – Auction winners exchange money for goods

Please do not turn the page until instructed by your monitor.

The following questions represent different descriptions for the purchase of an 8 oz. bag of pecan halves. Please check the option which you would be most likely to purchase.

C- 1.1:

	Option A	**Option B**	**Option C**
Price	$2.25	$5.00	Neither A nor B is preferred
Organic?	Yes	No	
Expiration Date	6 Months	3 Months	
Country of Origin	U.S.A.	Mexico	
Size	Jumbo Halves	Small Halves	
Grade	Choice	Standard	
Health/Nutrient Claim		Heart Healthy	
I would choose…	☐	☐	☐

C- 1.2:

	Option A	**Option B**	**Option C**
Price	$5.00	$5.00	Neither A nor B is preferred
Organic?	No	Yes	
Expiration Date	6 Months	6 Months	
Country of Origin	U.S.A.	Mexico	
Size	Large Halves	Large Halves	
Grade	Fancy		
Health/Nutrient Claim	Heart Healthy		
I would choose…	☐	☐	☐

C- 1.3:

	Option A	**Option B**	**Option C**
Price	$2.25	$8.50	Neither A nor B is preferred
Organic?	Yes	No	
Expiration Date	3 Months	12 Months	
Country of Origin	Mexico	U.S.A.	
Size	Small Halves	Extra Large Halves	
Grade	Fancy		
Health/Nutrient Claim	Naturally High in Antioxidants	Naturally High in Antioxidants	
I would choose…	☐	☐	☐

The following questions represent different descriptions for the purchase of an 8 oz. bag of pecan halves. Please check the option which you would be most likely to purchase.

C- 1.4:

	Option A	**Option B**	**Option C**
Price	$2.25	$8.50	Neither A nor B is preferred
Organic?	No	Yes	
Expiration Date	12 Months	3 Months	
Country of Origin	U.S.A.	Mexico	
Size	Mammoth Halves		
Grade		Fancy	
Health/Nutrient Claim	Naturally High in Antioxidants	Naturally High in Antioxidants	
I would choose…	☐	☐	☐

C-1.5:

	Option A	**Option B**	**Option C**
Price	$8.50	$2.25	Neither A nor B is preferred
Organic?	No	Yes	
Expiration Date	6 Months	6 Months	
Country of Origin	Mexico	U.S.A.	
Size	Extra Large Halves	Small Halves	
Grade	Standard	Choice	
Health/Nutrient Claim	Naturally High in Antioxidants	Naturally High in Antioxidants	
I would choose…	☐	☐	☐

C-1.6:

	Option A	**Option B**	**Option C**
Price	$5.00	$2.25	Neither A nor B is preferred
Organic?	Yes	No	
Expiration Date	12 Months	3 Months	
Country of Origin	Mexico	U.S.A.	
Size		Mammoth Halves	
Grade		Fancy	
Health/Nutrient Claim	Heart Healthy		
I would choose…	☐	☐	☐

The following questions represent different descriptions for the purchase of an 8 oz. bag of pecan halves. Please check the option which you would be most likely to purchase.

C- 1.7:

	Option A	**Option B**	**Option C**
Price	$5.00	$5.00	Neither A nor B is preferred
Organic?	No	Yes	
Expiration Date	3 Months	12 Months	
Country of Origin	Mexico	U.S.A.	
Size	Extra Large Halves	Small Halves	
Grade	Choice	Standard	
Health/Nutrient Claim		Heart Healthy	
I would choose…	☐	☐	☐

C- 1.8:

	Option A	**Option B**	**Option C**
Price	$8.50	$2.25	Neither A nor B is preferred
Organic?	Yes	No	
Expiration Date	3 Months	12 Months	
Country of Origin	U.S.A.	Mexico	
Size	Small Halves	Jumbo Halves	
Grade	Standard	Choice	
Health/Nutrient Claim	Naturally High in Antioxidants	Naturally High in Antioxidants	
I would choose…	☐	☐	☐

Please answer the following questions by circling the appropriate choice or filling in the appropriate line.

8. Are you aware of mandatory country of origin labeling for pecan products?
   1 = Yes
   2 = No
   3 = I don't know

Rate the following three statements on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

9. *Americans should not buy foreign products, because this hurts American business and causes unemployment*.
   1=Strongly Disagree
   2=Disagree
   3=Neutral
   4=Agree
   5=Strongly Agree

10. *It is not right to purchase foreign products because it puts Americans out of jobs*.
    1=Strongly Disagree
    2=Disagree
    3=Neutral
    4=Agree
    5=Strongly Agree

11. *A real American should always buy American made products*.
    1=Strongly Disagree
    2=Disagree
    3=Neutral
    4=Agree
    5=Strongly Agree

12. Do you read the nutrition facts label printed on the food packages you consume?
    1 = Always
    2 = Often
    3 = Sometimes
    4 = Rarely
    5 = Never

13. Do you look for expiration dates printed on the food packages you consume?
    1 = Always
    2 = Often
    3 = Sometimes
    4 = Rarely
    5 = Never

14. Do you look for country of origin printed on the food packages you consume?
    1 = Always
    2 = Often
    3 = Sometimes
    4 = Rarely
    5 = Never

15. On a scale of 1 to 10, with 1 being unhealthy and 10 being very healthy, how healthy is your diet? _____

16. On a scale of 1 to 10, with 1 being unhealthy and 10 being very healthy, how do you consider your physical health? _____

17. How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please check a box on the scale, where the value 0 means: 'not at all willing to take risks' and the value 10 means: 'very willing to take risks'.

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

18. On average, how often do you purchase organic foods?
    1=Very Often
    2=Often
    3=Sometimes
    4=Rarely
    5=Very Rarely

19. On average, how often do you consume pecans?
    1=Very Often
    2=Often
    3=Sometimes
    4=Rarely
    5=Very Rarely

20. Select which statement best describes the form in which you consume pecans.(circle all that apply)
    1=Pecans as a snack by themselves
    2=Pecans along with other nut products (mixed nuts)
    3=Pecans as ingredients in cooking and baking
    4=Pecans in prepared meals from restaurants
    5=Pecans in other forms

21. Please circle the products that you currently have in your home. (circle all that apply)
    1 = Pecans as a snack by themselves
    2 = Pecans along with other nut products (mixed nuts)
    3 = Pecans as ingredients for cooking and baking
    4 = Pecans in prepared forms such as restaurant meals or baked goods

5 = Other forms

22. What price would you expect to pay for a ½ lb. package of shelled pecan halves at the store? $_____

23. On a scale of 1 to 10, where 1 means “very uncertain” and 10 means “very certain,” how certain are you that the price you listed above is within 50¢ of the price of pecans at the grocery store? _____

24. On a scale of 1 to 10, where 1 means “very uncertain” and 10 means “very certain,” how certain are you that all of your auction bids today were equal to your true maximum willingness to pay for the different types of pecans? _____

Please do not turn the page until instructed by your monitor.

Instructions for Task A

In addition to these Instructions, you are provided with a Decision Sheet. Please look over the Decision Sheet as you read these Instructions to ensure that you understand the procedures involved in this task Let the monitor(s) know if you have a question by raising your hand.

The Decision Sheet contains 10 separate Decisions numbered 1 through 10. Each of these Decisions is a choice between "Option A" and "Option B". One of these decisions will be randomly selected to determine how much money you will receive. In order to select one of the choices, a ten-sided die will be used to determine the payoffs. After you have made your choice, this die will be rolled twice: once to select one of the 10 Decisions to be used, and then again to determine your payoff for the Option associated with that decision, either A or B, given your choice at that decision.

To choose an Option for each decision, you will make one selection in the "Choice" column on the right. This choice indicates whether you would choose Option A or Option B, and will signify whether Option A or Option B will be used to determine your earnings for each of the 10 decisions.

For example, if the die roll outcome is 6, Decision No. 6 would determine payment.

1. If your "Choice" for No. 6 is A, then Option A would be used to determine your payoff. You would have a 6/10 chance of earning $2.00, and a 4/10 chance of earning $1.60.
2. If your "Choice" for No. 6 is B, then Option B would be used to determine your payoff. You would have a 6/10 chance of earning $3.85, and a 4/10 chance of earning 10¢.

As an example, look at No. 3 on the Decision Sheet. You can see that Option A pays $2.00 with a chance of 3/10, and $1.60 with a chance of 7/10. Since each side of a ten-sided die has an equal chance of being the outcome in a throw, this corresponds to Option A paying $2.00 if the throw of the die is 1, 2 or 3, and $1.60 if the throw of the die is any other number (4 through 10). Option B pays $3.85 if the throw of the die is 1, 2 or 3, and 10¢ if the throw of the die is any other number (4 through 10). All of the other choices are similar, except that as you go down the table, the chances of the higher payoff for each Option increase. For Decision 10 in the bottom row, no die will be needed since each Option pays the highest payoff for sure. Your choice there is between $2.00 and $3.85.

Once you are done with both tasks A and B, you will proceed to another room where an experimenter will flip a coin. If the outcome is Heads, the experimenter will throw a ten-sided die to select which of the ten Decisions will be used. The die will then be thrown again to determine your earnings for the Option you chose for the selected Decision. **You will be paid in cash when finished.**

Please turn over these instructions so that the experimenter knows that you have finished reading them. If you do not have any questions, please proceed to the Decision Sheet and mark your choices.

Task A Decision Sheet

This is your Decision Sheet. Please indicate at each decision number whether you would like to choose Option A or Option B by putting a check mark in the box of the Choice column. When you are finished, you should have only 1check mark for each row in the Choice column.

No.	Option A	Option B	Choice
1	1/10 chance of $2.00 9/10 chance of $1.60	1/10 chance of $3.85 9/10 of 10¢	☐ Option A ☐ Option B
2	2/10 chance of $2.00 8/10 chance of $1.60	2/10 chance of $3.85 8/10 of 10¢	☐ Option A ☐ Option B
3	3/10 chance of $2.00 7/10 chance of $1.60	3/10 chance of $3.85 7/10 of 10¢	☐ Option A ☐ Option B
4	4/10 chance of $2.00 6/10 chance of $1.60	4/10 chance of $3.85 6/10 of 10¢	☐ Option A ☐ Option B
5	5/10 chance of $2.00 5/10 chance of $1.60	5/10 chance of $3.85 5/10 of 10¢	☐ Option A ☐ Option B
6	6/10 chance of $2.00 4/10 chance of $1.60	6/10 chance of $3.85 4/10 of 10¢	☐ Option A ☐ Option B
7	7/10 chance of $2.00 3/10 chance of $1.60	7/10 chance of $3.85 3/10 of 10¢	☐ Option A ☐ Option B
8	8/10 chance of $2.00 2/10 chance of $1.60	8/10 chance of $3.85 2/10 of 10¢	☐ Option A ☐ Option B
9	9/10 chance of $2.00 1/10 chance of $1.60	9/10 chance of $3.85 1/10 of 10¢	☐ Option A ☐ Option B
10	10/10 chance of $2.00 0/10 chance of $1.60	10/10 chance of $3.85 0/10 of 10¢	☐ Option A ☐ Option B

Instructions for Task B

In addition to the Instructions, you are also provided with a Decision Sheet. Please look over your Decision Sheet as you read these Instructions to ensure that you understand the procedure of the experiment. If you have a question at any point, please raise your hand.

The Decision Sheet contains 20 separate Decisions that are numbered from 1 through 20. Each of these Decisions is a choice between drawing a ball from "Urn A" or "Urn B". One of these decisions would be randomly selected to determine how much money you would receive. You will first select a color, Blue or Green, and this will be your **Success Color**. Once a decision is selected, your earnings will be determined by whether the ball drawn from the Urn matches your Success Color.

After choosing your Success Color, you will make one choice for each row in the "Choice" column on the right. This choice indicates whether you would like to choose between drawing a ball out of Urn A or drawing out of Urn B.

After choosing your Success Color, you will make one choice for each row in the "Choice" column on the right. This choice indicates whether you would like to choose between drawing a ball out of Urn A or drawing out of Urn B.

For example, if the dice roll outcome is 9, Decision No. 9 would determine payment.

1. If your "Choice" is Urn A, a ball would be drawn from Urn A, and if the color of the ball matches the chosen Success Color, then you would earn $2.00. If it does not match, you would earn 0.
2. If your "Choice" is Urn B, a ball would be drawn from Urn B, and if the color of the ball matches the chosen Success Color, then you would earn $2.28. If it does not match, you would earn 0.

In each of the 20 decisions, Urn A has 50 Blue balls and 50 Green balls, and pays $2.00 if the ball drawn from Urn A matches your Success Color, and 0 if it does not match. Since each color has a 1/2 chance of being drawn, this means that drawing from Urn A pays $2.00 with a chance of 1/2, and pays 0 with a chance of 1/2.

Urn B, on the other hand, has an unknown number of Blue and Green balls (with a total of 100 balls). It pays a positive payout amount if the ball drawn from Urn B matches your Success Color, and 0 if it does not match. Since the chance of each color being drawn is unknown, the chance of Urn B paying a positive payout amount is unknown as well. The only difference between the 20 options is the amount paid when a ball matching your Success Color is drawn from Urn B.

Once you are done with both tasks A and B, you will proceed to another room where an experimenter will flip a coin. If the outcome is Tails, the experimenter will throw one twenty-sided dice to select which of the 20 decisions will be used. The experimenter will then draw a ball from the Urn you had selected for that Decision to determine the payoff. **You will then be paid in cash.**

When you have finished reading the Instructions and do not have any questions, please proceed to the Decision Sheet and mark your choices.

Task B Decision Sheet

My Success Color is (please circle one): **Blue** **Green**

Please indicate at which decision you would like to switch from Urn A to Urn B by putting a check mark in the box of the Switch column. When you are finished, you should have only 1check mark in the Switch column. For any decisions **before** this check mark, a ball will be drawn from Urn A. For any decisions **after and including** the check mark, a ball will be drawn from Urn B.

	Urn A	**Urn B**	**Choice**
No.	**50 Blue balls, 50 Green balls**	**? Blue balls, ? Green balls**	**(select 1 per row)**
1	$2.00 if Chosen Color 0 if not	$1.64 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
2	$2.00 if Chosen Color 0 if not	$1.72 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
3	$2.00 if Chosen Color 0 if not	$1.80 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
4	$2.00 if Chosen Color 0 if not	$1.88 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
5	$2.00 if Chosen Color 0 if not	$1.96 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
6	$2.00 if Chosen Color 0 if not	$2.04 if Chosen Color 0 if not 60	☐ Urn A ☐ Urn B
7	$2.00 if Chosen Color 0 if not	$2.12 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
8	$2.00 if Chosen Color 0 if not	$2.20 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
9	$2.00 if Chosen Color 0 if not	$2.28 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
10	$2.00 if Chosen Color 0 if not	$2.36 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
11	$2.00 if Chosen Color 0 if not	$2.44 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
12	$2.00 if Chosen Color 0 if not	$2.52 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
13	$2.00 if Chosen Color 0 if not	$2.60 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
14	$2.00 if Chosen Color 0 if not	$2.68 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
15	$2.00 if Chosen Color 0 if not	$2.76 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
16	$2.00 if Chosen Color 0 if not	$2.84 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
17	$2.00 if Chosen Color 0 if not	$2.92 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
18	$2.00 if Chosen Color 0 if not	$3.00 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
19	$2.00 if Chosen Color 0 if not	$3.08 if Chosen Color 0 if not	☐ Urn A ☐ Urn B
20	$2.00 if Chosen Color 0 if not	$3.16 if Chosen Color 0 if not	☐ Urn A ☐ Urn B

Thank you for your participation!
Please return your entire packet to the monitors