University of Tennessee, Knoxville

TRACE: Tennessee Research and Creative Exchange

Masters Theses

Graduate School

5-2017

Consumer Preferences and Willingness to Pay for Natural Beef: a Discrete Choice Experiment Approach

Konstantinos Syrengelas
University of Tennessee, Knoxville, ksyrenge@vols.utk.edu

Follow this and additional works at: https://trace.tennessee.edu/utk_gradthes

Part of the Agricultural and Resource Economics Commons

Recommended Citation

Syrengelas, Konstantinos, "Consumer Preferences and Willingness to Pay for Natural Beef: a Discrete Choice Experiment Approach. " Master's Thesis, University of Tennessee, 2017.
https://trace.tennessee.edu/utk_gradthes/4781

This Thesis is brought to you for free and open access by the Graduate School at TRACE: Tennessee Research and Creative Exchange. It has been accepted for inclusion in Masters Theses by an authorized administrator of TRACE: Tennessee Research and Creative Exchange. For more information, please contact trace@utk.edu.

To the Graduate Council:

I am submitting herewith a thesis written by Konstantinos Syrengelas entitled "Consumer Preferences and Willingness to Pay for Natural Beef: a Discrete Choice Experiment Approach." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Karen E. Lewis, Major Professor

We have read this thesis and recommend its acceptance:

Kimberly Jensen, Dayton M. Lambert

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

Consumer Preferences and Willingness to Pay for Natural Beef: a Discrete Choice Experiment Approach

A Thesis Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Konstantinos Syrengelas

May 2017

Copyright © 2017 by Konstantinos Syrengelas

All rights reserved.

DEDICATION

To Georgios K. Syrengelas, Vasiliki V. Geitona, Niki-Alexandra Syrengela and Christina Angelakopoulou

ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. Karen E. Lewis, for her guidance during my Master's studies. Furthermore, I would like to thank her for the exceptional collaboration that we had on my research. I really appreciate the time that she devoted to advise me. Moreover I would like to thank my committee members, Dr. Kimberly Jensen, Dr. Dayton Lambert for their counsels and suggestions, regarding my thesis research. I thank the courtesy member, Dr. Carola Grebitus also.

Moreover, I would like to thank some people, from the Department of Agricultural Economics and Rural Development of the Agricultural University of Athens. The knowledge that they provided me, formed a strong background that helped me significantly during my Master's studies in the University of Tennessee-Knoxville. These people are my former advisor Christos T. Papadas, Stathis Klonaris, Athanasios Kampas, Pavlos Spathis, Stavros Zografakis and Giorgos Alexopoulos. These people made me a scientist. Furthermore, I would like to thank Dr. Roland K. Roberts, Dr. Edward Yu, Dr. Dayton Lambert, Dr. Hamparsum Bozdogan and Dr. Carlos Trejo-Pech for the knowledge that they provided to me. These people made me a better scientist.

I would like to thank my father Georgios K. Syrengelas, my mother Vasiliki V. Geitona and my sister Niki-Alexandra Syrengela also, for their support during this period. Moreover I would like to thank my girlfriend, Christina as well. These people were always happy for my academic progress and very supportive during the Master's studies. I would like to specially thank Cristos T. Papadas because, without his encouragment, I would never be in the University of Tennessee. Furthermore, I want to thank my other family members and I want to thank my friends from Greece as well for their true interest for my studies.

Furthermore, I would like to thank all of my fellow students and friends in the Master's program because the interaction with them enhanced my experience here. I would

like to express my gratitude to the administrative assistants of the Department. Finally, I want to express my gratitude to the Department of Agricultural and Resource Economics of the University of Tennessee-Knoxville for the whole educational experience.

ABSTRACT

"Natural" is one of the most common words appearing on new food products. Despite the wide use of the term, the Food and Drugs Administration (FDA) has not provided a formal definition of natural. The absence of a clear definition has led to various citizen petitions, either to define the term or even to prohibit its use. The main argument for prohibiting natural labeling is that the term is potentially misleading. Furthermore, findings in the existing literature indicate that some consumers tend to confuse natural and organic labels. A misleading label could lead to distortion of the consumer's budget allocation. Meanwhile, a non-misleading label would not affect consumer preferences and willingness to pay (WTP) for the product. Given this, in the second chapter of my thesis I examine if consumers that are aware of the United States Department of Agriculture (USDA) definition of natural and organic exhibit different WTP for natural beef in comparison to consumers that are either unaware or unfamiliar with the USDA definitions. Findings suggest that consumer knowledge regarding the definition of natural affects consumer WTP for beef. Furthermore I examine the complementation and substitution among different labels, providing useful implications to producers regarding the benefits of labeling their products. In the third chapter, I evaluate if the use of verbal or pictorial representation of the alternatives in a choice experiment affects the responses of the participants. Findings indicate that the structure of the utility functions are different among the pictures versus text representation of choice sets. This phenomenon is further illustrated by modeling for attribute non-attendance (ANA). When ANA is included in the model, the utility functions resulting from visual presentation, resemble with those coming from the text presentation. On the other hand, text representation of choice sets results in more statistically significant WTP estimates than the use of photographic choice sets both when accounting for ANA and when not considering ANA.

TABLE OF CONTENTS

Chapter I Introduction……1

Chapter II Consumer Preferences and Willingness to Pay for Natural beef: A Discrete Choice Experiment Approach……3

Abstract…….....4

Introduction……....……4

Literature Review……...5

Methods……..7

The Survey Instrument……...8

Choice, Preferences and Utility……13

The Random Parameters Logit Model……15

Empirical Model……...16

Willingness to Pay……18

Complementation and Substitution……..20

Results……..20

Demographics of the Responders……20

Empirical Results……22

Conclusions……..…26

Chapter III Examining Text versus Visual Presentation of Choice Experiments: Does the Presentation Method Affect Consumer Preferences and Willingness To Pay?……...29

Abstract…….....30

Introduction……..30

Literature Review……33

Visual versus Text Representation……...33

Attribute Non-Attendance……34

Methods……35

Attribute non-Attendance and Modeling……..38

Random Parameters Logit without ANA……39

Random Parameters Logit with ANA……..40

Willingness to Pay……42

Results……..43

Demographics of the Responders……43

Empirical Results……46

Conclusions……..55

Chapter IV Conclusions……...58

References……59

Appendix……..70

Vita……...85

LIST OF TABLES

Table 1. Choice experiment attributes and attribute levels.....12

Table 2. Demographics of the Information and Control Treatment and the Control Treatment Not Familiar and Familiar Groups……...21

Table 3. Random Parameters Logit estimates for the Information and Control Treatments and the Control Treatment Not Familiar and Familiar Groups……...23

Table 4. Willingness to pay for the Information and Control Treatments and the Control Treatment Not Familiar and Familiar Groups……..25

Table 5. Demographics and stated attribute non-attendance of the Text Treatment and Visual Treatment participants……..44

Table 6. Parameter Estimates of the Base Random Parameters Logit for the Text Treatment and Visual Treatment……...47

Table 7. Parameter Estimates of the Random Parameters Logit for the Visual Treatment and Text Treatment with attribute-non-attendance dummies (ANA-RPL)……49

Table 8. Willingness to Pay for the Text and Visual Treatments, for the Base-RPL and ANA-RPL models…….....53

LIST OF FIGURES

Figure 1. Example of choice experiment question that appears in the Information and Control Treatments……10

Figure 2. Example of choice experiment question that appears in the Text Treatment……...36

Figure 3. Example of choice experiment question that appears in the Visual Treatment……37

CHAPTER I

INTRODUCTION

In the modern food market context, labels are considered important means for providing information to the consumers regarding the characteristics of the product. Labels inform the consumers about quantitative attributes, such as weight, price and other components and qualitative attributes, such as type of feed or type of process. Other labels could include words that have a specific meaning, such as the organic label. With respect to new food products, consumers frequently see labels with the term natural appearing (USDA Economic Research Service 2016). In 2010, the natural label appeared on 8.4% of new food products, followed by the premium label that appeared on 7% of the new food products (USDA Economic Research Service 2016). In consumer and experimental economics, the researcher might be interested to elicit consumer preferences and willingness to pay (WTP) for food labels. Various experimental methods could be employed, such as stated choice experiments. The researcher could present the alternatives and their attributes either using visual or verbal presentation.

In Chapter II, the effect of the natural label on the consumer preferences and WTP is examined. The Food and Drug Administration (FDA) has received citizen petitions to define the natural term or even to prohibit its use on food products (U.S. Federal Register 2016). The main argument that the petitioners use is that the label might is misleading (U.S. Federal Register 2016). Specifically in Chapter II, I compare the preferences and WTP of the consumers when they (i) are unaware of the USDA definition of natural (Control Treatment), (ii) were provided the USDA definitions of natural and organic and (Information Treatment) (iii) were not provided with the USDA definitions but are either familiar (Control Treatment – Familiar) or not familiar (Control Treatment – Not-Familiar) with the USDA definition of natural before the survey. The results of this Chapter shed light on the effect of natural

labelling on consumer choices.

In Chapter III, the focus is related to the differences in the elicited preferences and WTP estimates resulting from different attribute presentation methods used in choice experiments. Choice experiments could be conducted with the use of a written description of the attribute levels or with the use of simulated shelf representations of the products in the choice set. Besides consumer economics and marketing, other fields, such as urban planning or environmental economics have examined the most efficient way to present choice sets to consumers. The analysis is expanded by using the concept of attribute non-attendance (ANA), which is the situation where the responders do not consider an attribute when responding to the hypothetical choice experiment. Utility structures and WTP estimates, presented either visually or verbally, are evaluated under (i) taking ANA in consideration and (ii) not taking it in consideration. The results of Chapter III provide useful information for researchers, given there is not a large amount of literature on this topic in the field of agricultural economics.

Chapter IV summarizes results, conclusions and implications from Chapter II and Chapter III.

CHAPTER II

CONSUMER PREFERENCES AND WILLINGNESS TO PAY FOR NATURAL BEEF: A DISCRETE CHOICE EXPERIMENT APPROACH

Abstract

Labels with the term natural are among the most common labels appearing on new food products. Even though natural labels appear frequently, the FDA does not have a formal definition of the term. The absence of the definition of natural, led consumer groups to submit petitions to the FDA and the USDA to define the term or even prohibit its use. This chapter evaluates if consumers that are aware of the USDA definitions of natural and organic or familiar with the USDA definition of natural exhibit the same preferences for natural beef as consumers that are unaware or unfamiliar with these definitions. The data were gathered after conducting an optimal orthogonal in the differences online discrete choice experiment and consumer preferences were modeled with the random parameters logit model. Furthermore, it was examined if labels that appear on meat products are complements or substitutes. The results indicate that consumers who are not aware of the definitions are willing to pay $1.22 more for natural beef in comparison to the unlabeled product, while the unfamiliar responders exhibit willingness to pay of $1.26. On the contrary, aware or familiar responders exhibit insignificant premiums; therefore, the use of the natural label affects consumer preferences relative to consumer knowledge of the definition of natural.

Introduction

There is an ongoing dispute over the use of natural labeling on food. The issue of the regulation of natural labeling is not new. In 2006, the Sugar Association requested the Food and Drug Administration (FDA) to define the term and subsequently Sara Lee Corporation and the Grocery Manufacturers Association submitted petitions for the same reason (U.S. Federal Register 2016). In 2014, Consumer Union also submitted a petition to the FDA, asking to prohibit the use of the natural label (U.S. Federal Register 2016). Another dispute over the regulation of the natural label is related with the State of Vermont Act 120 (see

Audette 2016). The State of Vermont enacted the Act 120 in May 2014 and by this Act it prohibits the use of natural labels on products that are produced whole or partially with the use of genetic engineering methods or contain artificial ingredients (Audette 2016). The Act both demands the disclosure of information about the presence of GM ingredients and prohibits the use of the term natural if these ingredients are present (Audette 2016).

In this chapter, consumer preferences and willingness to pay (WTP) for 12-ounce USDA choice boneless ribeye beef steaks with natural labeling are determined. Consumer preferences for labels such as grass-fed, corn-fed, no growth hormones, no antibiotics, no genetically modified feed and their interaction with the natural label are also examined. The choice of these labels is based on the fact that the first two consist part of the animals' diet (see Rock 2015) and consumers, mistakenly, associate the other three labels with the term natural (Rock 2016; Consumer Report National Research Center 2015). Additionally, consumer attitudes towards these labels are explored, from a complementation and substitution point of view (Gracia et al. 2014; Meas et al. 2015).

The structure of this chapter is the following. The next section contains a review of the existing literature on the natural labeling and the other labels that are used in the experiment. Next there is the presentation of the methods used to elicit consumer preferences and then there are the results of the research. The last part consists of the conclusions drawn from the results.

Literature Review

Consumers exhibit a significant preference for natural products, for various reasons, with health being one of these reasons, even if not being the most important (Rozin et al. 2004). The health concerns are expressed through food safety concerns (see Tonsor et al. 2009). This creates a relation between WTP and food safety that could be non-linear, either convex or

concave (Tonsor et al. 2009). Generally, consumers value food safety highly (Loureiro and Umberger 2007). Moreover, according to Rozin et al. (2004), some, people think of natural as a product on which the additive human intervention is reduced or absent. Therefore, this research can contribute to the literature by indicating if consumer preferences and WTP for 12-ounce boneless ribeye beef steaks that are USDA choice are affected by the presence of a label containing the term natural. This might be the case if we consider that the consumers' knowledge for the USDA requirements for natural is not perfect, resulting in overestimating the standards for labeling a product as natural (Gifford and Bernard 2011). Additionally, people that have concerns about the production process are more willing to pay for products labeled as natural (Ziehl, Thilmany and Umberger 2005). The labels can be used as means of providing information because the consumers value the information existing on labels (Xue et al. 2010; Van Loo et al. 2011; Lusk et al. 2001). Given that 9% of the food poisoning in U.S. comes from beef consumption (Rock 2015), it is reasonable to assume that consumers may need to be informed, properly and through labeling too, for the processes related to their food.

Grass-fed beef is preferred over corn fed beef (Xue et al. 2010) but grass fed and imported beef is not preferred to domestic and conventional in U.S. (Umberger et al. 2002). The preference for domestic beef is a European characteristic also, as Alfnes and Rickertsen (2003) results, from their research in Norway, indicate. According to Lim et al. (2013), U.S. consumers prefer domestic products over imported and in the same research, they state that the mentioned consumers exhibit significant WTP for beef tested for BSE. Consumers WTP for natural labeled 12-ounce ribeye beef steaks is greater than the WTP for products without this label but less than other attributes (Lusk and Schroeder 2004). There are evidence that the preference for natural is persistent (Grannis, Hooker and Thilmany 2000). Furthermore, the preference for characteristics that imply food safety, such as natural and organic, is affected by socioeconomic and behavioral characteristics such as residence and price

sensitivity (Sparling, Grannis and Thilmany 2002; Akgüngör, Miran and Abay 2010). Moreover, consumers tend to prefer local foods (Sanjuán et al. 2012; Onken, Bernard and Pesek 2011). The policy implication is that COOL or local labeling can generate profits for the domestic and local producers

Safer food is preferred not only in U.S. but in Europe also because, according to Rozin, Fischler and Shields-Argelès (2012) Europeans perceive positively the term natural. Growth hormones administration can be perceived as an activity that reduces the natural character of a product, given that it is a human intervention. This kind of interventions are sometimes believed to decrease the naturalness (Rozin et al. 2004). Many European consumers exhibit significant WTP in order to purchase food with no growth hormones administrated (see Lusk, Roosen and Fox 2003; Tonsor et al. 2005; Alfnes and Rickertsen 2003). Elimination of health risk, since it is a set of processes performed by humans, is a human intervention on the nature of the food too, but exhibits positive WTP, if it is applied in the early levels of food production but the WTP is negative for later stages of the productive process (Mørkbak, Christensen and Gyrd-Hansen 2011).

Methods

The method used to elicit consumers' preferences for USDA choice boneless ribeye steaks is a choice experiment. With the choice experiment, different combinations of attributes could be employed and the number of alternatives offered to the responder could exceed the two alternatives (Adamowicz et al. 1998). On the contrary, contingent valuation methods require the constant use of a base product and the responder has a maximum of two alternatives available (Adamowicz et al. 1998). Adamowicz et al. (1998) state that with the former method (choice experiment) trade-offs could be extracted for more attributes. Additionally, the choice experiment, is in accordance with the Random Utility Theory (Adamowicz et al.

1998). Furthermore, with the choice experiment, the research concentrates on the characteristics of the product and not on the product as a unit (see Lusk, Roosen and Fox 2003). Lancaster (1966), in his pioneering work on the consumer choice, states that the utility is derived from the characteristics of the product and not directly from the product as an object. Moreover, the choice experiment is preferable to other types of eliciting WTP (for example direct surveys, experiments and market data) because, firstly, it can be more cost or time effective than gathering market data and conducting laboratory experiments and secondly, the estimation of WTP is more valid than direct surveys (Breidert, Hahsler and Reutterer 2006).

The Survey Instrument

The experiment was conducted with the use of questionnaire, programmed and administrated with Qualtrics. It was online survey and took place in June 2016. The survey had full University of Tennessee Institutional Review Board approval. Before the original survey, a pretest was conducted in February 2016, in order to evaluate the time needed to complete the survey and locate possible issues. In the initial part of the questionnaire there was participant information and information regarding the rights of the responders and icebreaker questions for gender, age and frequency of shopping for the household. The icebreaker questions guaranteed that the responders consume beef and they are 18 years old or older (please see Appendix for survey questions). There were two different choice experiment structures, named treatments, each one with two blocks of 12 choice set each. The blocks were evenly and randomly presented to the responders. Each choice set consisted of three unlabeled alternative choices: Alternatives A and B were 12-ounce USDA choice boneless Ribeye beef steaks that are USDA choice with various attributes and Alternative C which was the neither option. The choice experiment was designed with NGene (ChoiceMetrics 2012). Treatment 1,

the Control Treatment, had 332 responders and included a cheap talk script. Treatment 2, the Information Treatment, had 331 responders and included a cheap talk script along with the USDA definitions of natural (USDA Food Safety and Inspection Service 2015a) and organic (USDA 2015b) (please refer to the Appendix for the definitions). Both treatments contained shelf-life simulated photos created by a professional photographer (Figure 1).

In surveys that do not include real monetary incentives for the participants, there is the possibility that the responder overestimates the actual WTP (see Tonsor and Shupp 2011). This difference between the real WTP and the hypothetical WTP is named hypothetical bias (Tonsor and Shupp 2011). In order to reduce the effects of hypothetical bias, a cheap talk script from Tonsor and Shupp (2011, p. 1020) was included to the survey flow. The cheap talk script is following:

"The experience from previous similar surveys is that people often state a higher willingness to pay than what one is actually willing to pay for the good. For instance, a recent study asked people whether they would purchase a new food product similar to the one you are about to be asked about.

This purchase was hypothetical (as it will be for you) in that no one actually had to pay money when they indicated a willingness to purchase. In the study, 80% of people said they would buy the new product, but when a grocery store actually stocked the product, only 43% of people actually bought the new product when they had to pay for it. This difference (43% vs. 80%) is what we refer to as hypothetical bias. Accordingly, it is important that you make each of your upcoming selections like you would if you were actually facing these exact choices in a store, i.e., noting that buying a product means that you would have less money available for other purchases."

Before the cheap talk there were the definitions of natural and organic, the provision of which was subject to the treatment structure. Then, the responder could answer the questions of the

Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.	
	___
	___
Neither	___

Figure 1. Example of choice experiment question that appears in the Information and Control Treatments

choice experiment, other questionnaire questions and demographics questions.

Each product is a composition of attributes and therefore of levels of attributes. The attributes' levels are defined as "a set of possible realizations, which are referred to as the attribute's levels" (Breidert, Hahsler and Reutterer 2006, p.15). The attributes (Table 1), were: price per pound, type of process, type of feed and natural or not. The levels of the attributes were: 4.99, 6.99, 8.99 and 10.99 all in $ for the price per pound; no genetically modified feed, no growth hormones, no antibiotics, and none for the type of process; corn fed grass-fed and none for the type of feed attribute and natural (minimally processed, no artificial ingredients) and none for the natural attribute.

Following Lewis et al. (2016) a range of prices is chosen, so that it can represent the majority of the products' prices in the market. The price range relies on market observation and the National Retail Report of Beef (USDA Agricultural Marketing Service 2016). The price range is divided in four levels so there can be a more balanced design (Van Loo et al. 2011). Moreover, there are not too many attribute levels in an attribute because this can bias the results by increasing the importance of the specific attribute in the experiment (Van Loo et al. 2011). It is possible that some levels or combination of attributes levels may make an alternative to be always (or the most of the times) preferred to other alternatives and therefore an alternative could become dominant (see Lusk, Roosen and Fox 2003). Furthermore, levels of an attribute may considered unacceptable, leading to the rejection of the whole alternative, (see Mehta, Moore and Pavia 1992). From the conjoint analysis research of Mehta, Moore and Pavia (1992) it could be inferred that eliminating the alternatives with unacceptable levels is not adding significant merits to the model, on the contrary, conjoint analysis models where the alternatives with unacceptable levels are eliminated may have inferior performance. Furthermore, in real purchasing situations the consumers have available choices where some levels may considered unacceptable, so including these cases doesn't make the

Table 1. Choice experiment attributes and attribute levels

Attributes	Attribute Levels
Type of Process	No Growth Hormones
	No Antibiotics
	No GM Feed
	None
Type of Feed	Grass Fed
	Corn Fed
	None
Natural	Natural (minimally processed; no artificial ingredients)
	None
Price	$4.99/pound
	$6.99/pound
	$8.99/pound
	$10.99/pound

experiment less realistic.

The importance of the correct scaling of the attributes is highlighted by Hensher (2006) who sates that there should be a few levels with obvious differences in order to avoid the phenomenon where the responder ignores an attribute completely. This situation is called attribute non-attendance (see Hensher, Rose and Greene 2012; Scarpa et al. 2009). In addition to this, it is mentioned that the processing strategy of the responder, is not affected only by the amount of information provided through attributes but from the "nature" of these information also (Hensher 2006). McFadden (1980) points the significance of the issue of the correct scaling of the attributes and states that the primary objective when the scales of an attribute is defined, is to provide predictive capability to the econometric model used.

The choice sets and the choices were programmed with NGene (ChoiceMetrics 2012). The design is optimal orthogonal in the differences. Under this formulation, the alternatives have all the attribute levels different, therefore the amount of trade-offs among the levels and the information provided by the model is increased (Domínguez-Torreiro 2014). Furthermore, this structure guarantees the existence of the desirable orthogonality, across the attribute levels of an alternative but not across the alternatives, something that does not affect the quality of the experiment since it is unlabeled (meaning unbranded) experiment

(Domínguez-Torreiro 2014). Rose and Bliemer (2009) state that with the orthogonal designs in the linear models of regression case, the presence of multicollinearity is eliminated from the model and the elements of the matrix of variance and covariance and the associated variances of the estimated coefficients are supposed to be minimized. Despite the fact that the efficient designs are performing better when some prior values for the coefficients are assumed, if no priors are assumed, the optimal orthogonal in the differences is not a less effective design (Domínguez-Torreiro 2014). After the choice experiment there were consumption pattern's questions and demographic questions that were asked to all the participants of the survey.

Choice, Preferences and Utility

This research concentrates on the preferences and choice of the consumer for 12 ounce boneless ribeye beef steaks that are USDA choice, labeled with various labels associated with the type of feed (grass-fed and corn-fed), type of process (no genetically modified feed, no growth hormones, no antibiotics), naturalness and price. Since the focus is on consumer choice, the theoretical background that governs the choice analysis follows. The choices that the consumers are making, are relying on their preferences and in order to elicit these preferences, the concept of utility is employed (Nicholson 2004). The general idea is that the consumer obtains utility from the use/consumption of a good (Nicholson 2004). Nicholson (2004), defines utility as satisfaction or pleasure obtained from activities of economics nature that the person participates. Therefore the consumer will try to maximize the utility but her/his maximization process is constrained by the budget available (Nicholson 2004).

In the Microeconomic Theory, there are some axioms that govern consumer behavior. When the behavior is described by the following axioms, is said to be rational (Nicholson 2005). These are completeness, transitivity and continuity (Nicholson 2005). According to

Nicholson (2005) completeness means that the person, for any situation A and B, is able to clearly declare if situation A is more preferable to B, if B is more preferable to A and if the two situations are equally appealing. Regarding transitivity, it means that if A is more preferable than B and in turn B is more preferable than C, then situation A is more preferable than situation C (Nicholson 2005). According to Nicholson (2005), continuity means that when situation A is more preferable than B, then situations approximating situation A ought to be more preferable than situation B as well.

The last of the three axioms mentioned, the axiom of continuity, is a concept of particular importance for the analysis that follows in Chapter III. Kragt (2013) describes the meaning of continuity by stating that the implication of this axiom is that the responders consider all the attributes when they make choices. The continuity axiom is violated when the situation of attribute non-attendance occurs (Yao et al. 2015) and the use of a dataset that includes both people that attend all the attributes and people that do not, ends up to biased marginal rates of substitution (MRS) estimates (Scarpa et al. 2009). Another assumption for the consumer preferences is that more quantity of a good is preferred to less (Nicholson 2004).

The consumer obtains utility from consumption of goods/products, which in turn have some characteristics. Lancaster (1966) moved a step further from examining the utility from the goods' point of view. His contribution (related to the present analysis) is the fact that he proposed a concept were the utility is derived from the characteristics of the good and not from the good as a single object (Lancaster 1966). An additional important point of Lancaster's (1966) approach is that the goods are not characterized by a single trait only, while these characteristics are not good-specific but could characterize other goods as well. According to Lancaster (1966), his theoretical framework consist a better description of the actual consumer behavior than the traditional approach.

The Random Parameters Logit Model

The random parameters logit model (RPL) is a limited dependent variable model. Its advantage is flexibility and it overcomes various limitations that come from the use of the standard multinomial logit model (Train 2009). Firstly, the random parameter logit allows variation of random taste, secondly it does not restrict the substitution patterns and thirdly it allows correlation in unobserved factors over time (Train 2009). With respect to the second advantage specifically, the property of Independence from Irrelevant Alternatives (IIA) needs to be mentioned. This assumption who characterizes other approaches of the logit models is very restrictive because eliminates the ability of substitution across many alternatives, making the models divergent from reality (Chen and Cosslett 1998). In the mixed logit this principle do not apply (Revelt and Train 1998; Train 1998). In contrast to the random parameters multinomial probit model, which demands a complex integration process of multivariate normal probability density function, the random parameters logit is easier to estimate (Layton and Brown 2000).

The description of the RPL model draws from the description of Train (2009). Let i=1,…,n be the number of the people participated in the survey, c be the choice of the responder in set t = 1,…,T. The utility of a specific responder i for a specific choice c from a specific choice set t is the following:

$$U_{ict} = \beta_i' x_{ict} + \varepsilon_{ict} \quad (1)$$

The utility function is interpreted as the maximum utility that the consumer can obtain from the specific alternative c given the budget available (McFadden 1980). For the right hand side, $\boldsymbol{\beta_i' x_{ict}}$ is the component where $\boldsymbol{x}_{ict}$ are the independent variables and $\boldsymbol{\beta}'_i$ is the vector of the coefficients of the covariates and indicate the ith person's preferences and, ε_{ict} is a random error term which is iid Extreme Value distributed (Train 2009) which either represent inefficiencies in the optimization process of the responder or errors in the specification of the

model from the side of the researcher, such as omitting significant attributes (Layton 2000). The coefficients vary across the *i* persons with a researcher-specified distribution.

Let *k* be an alternative among the *j*=1,...,*J* alternatives. The alternative *k* will be chosen if $U_{ikt} > U_{ijt}$ for every *j* different than *k* (Train 2009). Given that the researcher cannot directly observe the coefficients (if this ability existed, the standard logit would be used) instead of relying on the conditional probabilities, the researcher concentrates on the unconditional probabilities, which probabilities, in turn are the mixed logit probabilities (Train 2009):

$$P_{ikt} = \int \left(\frac{e^{\beta' x_{ikt}}}{\sum_c e^{\beta' x_{ict}}} \right) f(\beta|\mu, \omega) d\beta \qquad (2)$$

The distributional assumption for *f(β)* is defined by the researcher. According to Ghosh Maitra and Das (2013) it is better to estimate the model under different distributional assumptions and choose the best in terms of goodness-of-fit measures. In this research normal distribution is assumed for the random parameters with mean μ and covariance Ω.

The Halton draws were specified to 250. Halton sequences belong to the family of Quasi Monte Carlo Methods. Train (2000) mentions two important advantages of the Halton Sequences: firstly, they evenly cover the distribution space and secondly, the space that is left empty from the draws of an observation tends to be covered from the draws of the next observation.

Empirical Model

The empirical model for a person *i*, with choices *c* from choice set *t* is:

$$U_{ict} = \beta_{1ict} price_{ict} + \beta_{2ict} corn_{ict} + \beta_{3ict} grass_{ict} + \beta_{6ict} NoGMFeed_{ict}$$
$$+\beta_{5ict} no_hormones_{ict} + \beta_{4ict} no_antibiotics_{ict} + \beta_{7ict} natural_{ict} + \beta_{8ict} none_{ict}$$
$$+\beta_{9ict} Nat\&grass_{ict} + \beta_{10ict} Nat\&corn_{ict} + \beta_{13ict} Nat\&No_GM_Feed_{ict}$$

$$+\beta_{11ict}Nat\&hormones_{ict} + \beta_{12ict}Nat\&antibiotics_{ict} + \varepsilon_{ict} \quad (3)$$

U is the dependent vector variable of dimensions *[3x1]* and takes values of one for the alternative that is chosen and zero for the two alternatives that were not chosen. *Price* is the variable of the four leveled price. The non-interaction variables are qualitative variables with one if the label is present on the product and zero if not. *Grass* and *corn* are the dummies for the grass-fed and corn fed levels of the type of feed attribute, *No_GM_Feed*, *no_hormones* and *no_antibiotics* are the variables that represent the no genetically modified feed, no growth hormones and no antibiotics administrated levels of the type of process attribute. The dummy *none* indicates the absence of labels.

Regarding the interaction terms, they are qualitative variables as well, with one if both labels exist simultaneously on the product and zero otherwise. *Nat&grass* is the dummy for the interaction of grass-fed with natural and *Nat&corn* represents the interaction of corn-fed with natural. For the interaction of natural with the type of process attribute. *Nat&NO_GM_Feed* is the interaction of non-genetically modified feed and natural, *Nat&hormones* is the variable for the no hormones level and natural interaction and *Nat&antibiotics* is the dummy with one if both labels are present in the alternative and zero otherwise. The error term is represented by $\boldsymbol{\varepsilon}_{ict}$.

All the parameters were specified to be random, except the price which is assumed non-random. The price was set to non-random for two reasons. Firstly, this assumption makes the estimated WTP to be normal since the numerator is normally distributed and the denominator constant and secondly, the coefficient of the price have to maintain negative sign across all the sample (Layton and Brown 2000). An additional reason is that, according to Revelt and Train (1998) models with all the coefficients being random, converge to an optimum in so many iterations that their number is not considered logical. The same assumption for the cost-price's coefficient is followed by Lusk, Roosen and Fox (2003),

Layton and Brown (2000) and, Chen and Cosslett (1998) among others.

Besides the effect of information, I examined if the ex-ante familiarity of the consumers affect their willingness to pay. For examining this, I divided the participants of the Control Treatment to familiar responders and non-familiar responders. In the questionnaire, there was a question for the prior familiarity with the USDA definition of natural asking: *"Please indicate how familiar you were with the USDA definition of Natural prior to this survey on a scale from 1=not at all familiar to 5=extremely familiar"*. There were five levels of this answer available. The data analysis provided that three is the median category. Using the median, I created one class of 208 non-familiar responders for the people that answered one, two or three in this question and a class of 124 familiar responders for those who responded four or five in this question. Then I divided the dataset with respect to the familiarity and I estimated the random parameters logit of equation (3) for both the familiar and the non-familiar clusters.

Willingness to Pay

The consumer's WTP is calculated by dividing the coefficient of the variable of interest with the negative coefficient of the variable of price (see Lewis et al. 2016). It is a Marginal Rate of Substitution (see Scarpa et al. 2009). Furthermore, in the case of qualitative variables it has the interpretation of marginal WTP (see Tonsor and Shupp 2011). Analytically, the willingness to pay with respect to the attribute level *i* comes from the ratio:

$$WTP_i = -\frac{\beta_i}{\beta_p} \qquad (4)$$

Where β_p is the coefficient of price and β_i is the coefficient of the ith attribute level. This ratio characterized by consistency, it is unbiased and it distributed normally around the actual ratio of the population because it is a Maximum Likelihood Estimator (Daly, Hess and de Jong 2012).

For the variance of WTP, the formula introduced by Daly, Hess and de Jong (2012) is used. In the same research, the authors insist that the Delta Method for estimating the standard errors of various functions of parameters is superior to estimations coming from Simulation Methods. Actually, when the problem is not too complicated, the Delta method is appealing and quite adequate but when the complexity is increased the Simulation Methods should not be ignored (Daly, Hess and de Jong 2012). The formula of the variance of WTP is:

$$\left(\frac{\beta_k}{\beta_p}\right)^2 \left(\frac{\omega_{kk}}{\beta_k^2} + \frac{\omega_{pp}}{\beta_p^2} - 2\frac{\omega_{kp}}{\beta_k \beta_p}\right) \tag{5}$$

Where β_k is the coefficient of the level *k* of interest, for example natural, β_p is the coefficient of price *p*, ω_{ij} *i,j=p,k* are the elements of $\boldsymbol{\Omega}$, the variance-covariance matrix.

The WTP of the interaction terms can be computed using the following formula:

$$\frac{\beta_1 + \beta_2 + \beta_d}{-\beta_p} \tag{6}$$

Where *1*, *2* are the subscripts of attribute levels *1* and *2* and *d* is the subscript of the interaction term among them. The denominator is the coefficient of the price. Following Daly, Hess and de Jong (2012), the variance of the interaction term can be calculated by the Delta formula $\boldsymbol{L'\Omega L}$ where, $\boldsymbol{L}$ is a 4x1 vector of the partial first derivatives of (6) with respect to the betas.

$$\begin{aligned}
&\left(-\frac{1}{\beta_p}\right)^2 \left(\omega_{11} + \omega_{22} + \omega_{dd} + 2(\omega_{21} + \omega_{d1} + \omega_{d2})\right) \\
&+ \left(-\frac{1}{\beta_p}\right)\left(\frac{\beta_1 + \beta_2 + \beta_d}{(-\beta_p)^2}\right)\left(2\left(\omega_{p1} + \omega_{p2} + \omega_{pd}\right)\right) \\
&+ \left(\frac{\beta_1 + \beta_2 + \beta_d}{(-\beta_p)^2}\right)^2 \omega_{pp}
\end{aligned} \tag{7}$$

The square root of (7) is the standard error, which is used in the t-ratio test to determine the statistical significance of the WTP. The model was estimated with Nlogit 5 (Econometric Software, Inc 2012).

Complementation and Substitution

The parameter estimates and the WTP, provide information regarding if the labels are perceived by the consumers as complements or substitutes. If the parameter estimate of the interaction term of two labels is positive, then the labels are complements, on the contrary, if the parameter is negative, then the labels are substitutes (Meas et al. 2015). These effects could be approached through WTP. If the interaction WTP is larger than the sum of the individual WTPs of the two interacting labels, then the labels are complements (Gracia et al. 2014), while if the WTP of the interactions is smaller than the sum of the interacting attribute levels, then the labels are substitutes. Following Meas et al. 2015, I set the statistically insignificant WTPs to zero and then I compared the value of the interaction WTP versus the summation of the two individual levels.

Results

Demographics of the Responders

The Control and Information Treatments consist of 43.1% and 45.3%, respectively, of females (Table 2). The percentage of female responders in the non-familiar segment is 40.4% and in the familiar cluster is 47.6%. The median age of the Control Treatment is 41 years and in the Information Treatment is 40. The median age of the non-familiar with the USDA definition of natural responders is 44 years and it is statistically different at $\alpha = 0.05$ from the Control and Information Treatments and at $\alpha = 0.01$ from the median age of the familiar responders, which is 36.5 years and in turn, it is statistically different from the median age of the Control and Information Treatment at $\alpha = 0.01$. Responders with education of Bachelor's Degree and above consist 32.8% to 34.7% of the sample, while the median income category is $40,000-$49,000. The average household size ranges from 2.794 to 2.94. The median familiarity category, in a scale one to five, is three for both the Treatments and the non-

Table 2. Demographics of the Information and Control Treatment and the Control Treatment Not Familiar and Familiar Groups

Demographic	Description	Information Treatment (n=331)	Control Treatment (n=332)	Control Not Familiar[4] (n=208)	Control Familiar[5] (n=124)	U.S. Population
Gender	% Female[c]	45.3%	43.1%	40.4%	47.6%	50.8%[1]
Age	Median	40.0	41.0	44.0[a]	36.5[b]	37.8[2]
Education	% Bachelor's Degree or higher	33.0%	33.4%	32.7%	34.7%	29.3%[1]
Income	Median	$40,000-$49,999	$40,000-$49,999	$40,000-$49,999	$40,000-$49,999	$53,482[1]
Household Size	Mean	2.79	2.85	2.79	2.94	2.63[1]
Natural Familiarity[3]	Median	3	3	3	4	

Notes:
[1]U.S. Census Bureau (2016).
[2] U.S. Census Bureau (2015).
[3] Responses to the question, "Please indicate how familiar you were with the USDA definition of Natural prior to this survey on a scale from 1=not at all familiar to 5=extremely familiar.",
[4] Participants not familiar with the USDA definition of natural (one, two, or three values on the natural familiarity scale).
[5] Participants who were familiar with the USDA definition of natural (four or five values on the natural familiarity scale).
[a] As evidenced by a t-test, the age of the Control Not Familiar group is significantly different from the Control and Information Treatments at the 5% level and at 1% level with the Control Treatment Familiar group.
[b] As evidenced by a t-test, the age of the Control Familiar group is significantly different from the Control and Information Treatments and the Control Not Familiar group at the 1% level.
[c] The demographics for the Information Treatment, Control Treatment, Control not Familiar group and Control Familiar group were calculated with SPSS 22 (IBM Corp 2013) and the tests for the statistical significance of the differences were performed with STATA 13 (StataCorp 2013).

familiar group of the Control Treatment, while for the familiar responders, the median is four. Besides the median age, all the other demographics are not statistically different across the clusters.

Empirical Results

The results of the random parameters logit (Table 3) indicate that the utility functions of the consumers are affected by both the provision of information regarding the USDA definitions of natural and organic and their familiarity with the definition of natural. The Control Treatment responders exhibit preferences that are affected positively by grass-fed, no genetically modified feed, no growth hormones, no antibiotics and natural labels. Price, the no label level and the interaction of the natural and no antibiotics labels have negative effect on the utility of the Control Treatment participants. The non-familiar group of the Control Treatment exhibit similar structure of the utility function with the exception of grass-fed and no genetically modified feed which both have insignificant effect on the non-familiar responders' preferences. The provision of information regarding the definitions, changes the structure of the utility function. Specifically, the preferences of the participants of the Information Treatment are affected positively by the grass-fed and no growth hormones levels while price and the no label level affect the utility negatively. The utility of the familiar with the USDA definition of natural participants is affected positively by the no growth hormones and negatively from the price and the no label option. The rest of the attribute levels seem not to affect significantly the consumers' utility. Furthermore, it is observed that there is substantial heterogeneity in the preferences of the participants across all the responder groups.

Regarding the WTP, the Control Treatment responders are willing to pay on average \$0.67 ($p<0.05$) for grass-fed labeled beef in comparison to the no-label option, \$0.77

Table 3. Random Parameters Logit estimates for the Information and Control Treatments and the Control Treatment Not Familiar and Familiar Groups

Random Parameters	**Information Treatment**	**Control Treatment**	**Control Treatment Not Familiar[1]**	**Control Treatment Familiar[2]**
Grass fed	0.581***	0.256**	0.199	0.306
Corn fed	-0.016	-0.192	-0.231	-0.139
No genetically modified feed	0.234	0.295*	0.286	0.237
No growth hormones	0.306**	0.559***	0.661***	0.515*
No antibiotics	0.193	0.389***	0.517***	0.252
Natural	0.308	0.468**	0.583**	0.404
None	-4.181***	-4.325***	-4.677***	-4.324***
Natural-grass fed	-0.171	0.132	-0.025	0.364
Natural-corn fed	-0.322	-0.194	-0.265	-0.147
Natural-no GM feed	0.295	-0.05	-0.192	-0.172
Natural-no growth hormones	0.419	-0.070	-0.119	-0.090
Natural-no antibiotics	-0.127	-0.491***	-0.561**	-0.307
Non-random parameter				
Price	-0.336***	-0.384***	-0.464***	-0.283***
Std. dev. of random parameters				
Grass fed	0.752***	0.849***	0.769***	1.135***
Corn-fed	0.620***	0.524***	0.760***	0.812***
No genetically modified feed	1.249***	1.188***	1.554***	0.366
No growth hormones	0.392**	0.417**	0.177	0.705***
No antibiotics	1.177***	0.780***	0.985***	0.765***
Natural	0.432***	0.381***	0.008	0.666***
None	2.375***	2.291***	2.166***	2.487***
Natural and grass fed	0.453**	0.596*	0.989***	0.351
Natural and corn fed	1.041***	0.818***	0.721***	0.497
Natural and no GM feed	0.214	0.536**	0.507	0.888*
Natural and no growth hormones	0.267	0.386	0.245	0.543
Natural and no antibiotics	0.407	0.169	0.213	0.287
Participants	331	332	208	124
Observations	3972	3984	2496	1488
Log-likelihood	-3205.11	-3241.96	-1986.09	-1203.47
McFadden's Pseudo R-square	0.266	0.259	0.276	0.264

Notes: ***, **, * significant for α = 0.01, 0.05, 0.10 respectively.

[1,2] Responders who were not familiar with the USDA definition of natural and responders who were familiar with the USDA definition of natural respectively, prior the survey.

(p<0.10) on average for no genetically modified labeled beef steaks in comparison to the same product without labels (Table 4). Moreover, the average WTP of the Control Treatment participants for no growth hormones is $1.46 ($p$<0.01) and for no antibiotics is $1.01 ($p$<0.01) compared to the no labeled beef steaks. The average premium for natural labeled beef steaks is $1.22 ($p$<0.05) more than the non-labeled product. The non-familiar group exhibit average WTP of $1.43 ($p$<0.01) for the no growth hormones labeled steak, while the mean premium for the no antibiotics labeled product is $1.12 ($p$<0.01) compared to the beef steaks without labels. The average WTP for natural labeled steaks is $1.26 ($p$<0.05). The Information Treatment participants exhibit average WTP of $1.73 ($p$<0.01) for the grass-fed level and $0.91 ($p$<0.05) for the no growth hormones label in comparison to the non-labeled beef steaks. The premium for the natural label is statistically insignificant. The familiar segment of the Control treatment exhibit average WTP for no growth hormones labeled beef steaks of $1.82 ($p$<0.10) in comparison to the non-labeled product. All the other non-interactions WTPs are statistically insignificant.

With respect to the interactions WTP, the Control Treatment participants value the natural and grass fed labels at $2.23 ($p$<0.01) on average, in comparison to the counterpart without labels. The average premium for the natural and no genetically modified feed labels is $1.84 ($p$<0.01), for the natural and no growth hormones is $2.49 ($p$<0.01) and for the natural and no antibiotics is $0.96 ($p$<0.10), all in comparison to the no-label option. The non-familiar responders exhibit average WTP of $1.63 ($p$<0.01) for the simultaneous presence of the natural and grass-fed labels on the product, $1.46 ($p$<0.01) for the natural and no genetically modified feed labels, $2.43 ($p$<0.01) for the natural an no growth hormones labels and $1.16 ($p$<0.05) for the natural and no antibiotics labels, all compared to the counterpart beef steak without labels. The Information Treatment participants exhibit average premium in comparison to the non-labeled product of $2.13 ($p$<0.01) for the natural and grass

Table 4. Willingness to pay for the Information and Control Treatments and the Control Treatment Not Familiar and Familiar Groups

Non-Interaction terms	**Information Treatment**	**Control Treatment**	**Control Treatment Not Familiar**[1]	**Control Treatment Familiar**[2]
Grass fed	$1.73***	$0.67**	$0.43	$1.08
Corn fed	-$0.05	-$0.50	-$0.50	-$0.49
No GM feed	$0.70	$0.77*	$0.62	$0.84
No growth hormones	$0.91**	$1.46***	$1.43***	$1.82*
No antibiotics	$0.57	$1.01***	$1.12***	$0.89
Natural	$0.91	$1.22**	$1.26**	$1.43
Interaction terms				
Natural and grass fed	$2.13***[c]	$2.23***[c]	$1.63***[c]	$3.80***[c]
Natural and corn fed	-$0.09[n]	$0.21[s]	$0.19[s]	$0.42[n]
Natural and no GM feed	$2.49***[c]	$1.84***[s]	$1.46***[c]	$1.66[n]
Natural and no growth hormones	$3.07***[c]	$2.49***[s]	$2.43***[s]	$2.93***[c]
Natural and no antibiotics	$1.11*[c]	$0.96*[s]	$1.16**[s]	$1.23[n]

Notes: ***,**,* significant for α = 0.01, 0.05, 0.10 respectively.
[1, 2] Not familiar with the USDA definition of natural before the survey and familiar with the USDA definition of natural before the survey respectively.
[c, s, n] complements, substitutes, not significant substitution or complementation effect respectively.

fed labels, $2.49 ($p$<0.01) for the natural and no genetically modified feed labels, $3.07 ($p$<0.01) for the natural and no growth hormones labels and $1.11 ($p$<0.10) for the combined natural and no antibiotics labels.

It is observed that natural and grass-fed labels are considered complements for both the Control and Information Treatments participants and for both the familiar and non-familiar segments of the Control Treatment. Natural and corn-fed are substitutes for the Control Treatment and the non-familiar responders, while there is no complementation or substitution effect among these labels for the Information Treatment participants and the familiar segment.

Natural and no genetically modified feed are complements for the Information Treatment and for the non-familiar responders, substitutes for the Control Treatment participants while, there is no effect for the familiar responders. Natural and no growth hormones are perceived as complements from the Information Treatment participants and the familiar with the natural definition responders, while the labels are considered substitutes from the Control Treatment and non-familiar segment responders. Additionally, natural

labeling and no antibiotics are substitutes for the Control Treatment and the not familiar responders, complements for the Information Treatment participants and there is no substitution or complementation effect for the familiar cluster.

Conclusions

The designs of Control and Information Treatments, without and with information respectively, aimed to provide insights about the differences of the preferences and WTP for natural labeled beef steaks when the amount of information regarding the natural and organic definitions, provided to the consumers, differs. When a consumer is not informed, she/he is willing to pay significant premiums for the all the labels except the corn-fed label. When information regarding the USDA definitions of natural and organic definitions are provided, the premium for the grass-fed increases significantly while for the no hormones decreases. The WTP for the other labels becomes insignificant, and the WTP for the natural label becomes insignificant as well. The changes can be explained by taking in consideration that the consumers are not perfectly aware about the content of the term natural and usually tend to overestimate the standards for labeling a product natural (Gifford and Bernard 2011). When the consumers are informed about the content of natural label, they possibly realize that they overestimated the standards of natural labeling. Since the definition of natural is more related to the process than feed provided to the animals, the consumer can reasonably assume that he/she might overestimate the standards for the other process related labels also. An additional observation is that, regardless if the consumer is informed for the definitions or not and regardless of the ex-ante familiarity, the preference towards the no growth hormones is persistent in all the cases. This result regarding the no growth-hormones is consistent with the findings of relevant literature, for example Lusk, Roosen and Fox (2003); Tonsor et al. (2005); Alfnes and Rickertsen (2003). The effect of the information is positive for the grass-

fed level. This is a very specific label, unrelated to the type of process and it is not easy for the average consumer to misunderstand its content. Consequently, the informed consumer, having realized the imperfect knowledge about the process-related natural label, could turn to a more clear, in terms of meaning, not process-related label.

Producers, sellers and suppliers of grass-fed beef could be benefited from provision of information regarding the natural and organic definitions. For the familiar consumers the natural and grass-fed and natural and no growth hormones labels are complements. Familiar responders consist almost the 37.4% of the sample, and if this percentage is representative of the population, this consists a fairly large target group for the producers. When the number of informed consumers increases (Information Treatment), there is complementarity among the natural label and all the other labels, except natural and corn-fed which has insignificant WTP. On the other hand when the consumers are not informed or not familiar with the natural definition the simultaneous use of natural label with corn-fed, no growth hormones and no antibiotics exhibits substitution effects. This substitution effect indicates that these segments of the consumers, think that the information provided by these labels overlapping the one the other. This uncertainty regarding the exact content of terms of the labels could make the consumers suspicious for the reliability of the information provided by the suppliers, regarding the substitute labels. It seems that regardless the familiarity or the provision of information or not, natural and grass-fed are complementary the one of the other and therefore the producers of grass-fed beef could be benefited substantially by using both labels simultaneously. Grass-fed producers could be benefited from the increase of the number of informed consumers because, the WTP for grass-fed label, in comparison to a product without labels increases from \$0.67 ($p<0.05$) in the Control Treatment to \$1.73 ($p<0.01$) in the Information Treatment

From the data analysis, it seems that the consumer preferences and WTP are affected

by the natural labeling. Consumers that are not informed about the content of the term natural are willing to pay a significant premium of $1.22 ($p<0.05$) in comparison to the product without labels. Non-familiar responders exhibit a similar premium of $1.26 ($p<0.05$) while for the informed and familiar consumers the consumption pattern is entirely different, with the natural WTP being statistically equal to zero. The fact that the informed and familiar consumers exclude from their preferences the natural label and their natural WTP is statistically equal to zero, may implies that the use of the label is indeed misleading and the FDA should take in serious consideration the petitions for clearly defining the term. Additionally, official Authorities should consider if the regulation of the use of the label and an information campaign would be socially beneficial, given that actions like these will make more clear the content of terms that appear on beef labels and will benefit producers that use these labels to differentiate between these characteristics and the consumers as well, by creating a consumption environment with less noise in the information provided to them.

CHAPTER III

EXAMINING TEXT VERSUS VISUAL PRESENTATION OF CHOICE EXPERIMENTS: DOES THE PRESENTATION METHOD AFFECT CONSUMER PREFERENCES AND WILLINGNESS TO PAY?

Abstract

In the field of consumer and experimental economics, researchers can use a variety of methods to elicit consumer preferences. Possibly, the employment of different methods could affect the results and the relevant inferences about consumer preferences. In this chapter, it is examined if the use of written descriptions of the attribute levels of a product in a choice experiment produces different results in comparison to visual representation of attributes in terms of utility, willingness to pay (WTP) and attribute non-attendance (ANA). Furthermore, it is examined, if taking ANA in consideration in the analysis, affects the utility and the WTP estimates. A discrete choice experiment was conducted, with 680 participants and the data were analyzed with the random parameters logit. The participants were divided in two groups, the Text and Visual Treatments, with respect to the way that the product was presented. ANA was introduced in the analysis as well. The results indicate that the preferences and the WTP deviate between the Text and Visual Treatments when ANA is not taken in consideration. When ANA is incorporated in the model, the WTP estimates continue to deviate, implying that the visual and verbal representations provide divergent results.

Introduction

Stated preferences methods are widely used, in many different scientific fields, to elicit preferences and willingness to pay (WTP) for various attributes of interest. In order to assure high quality of data, increase the predictive ability of the econometric models and reliability of the results, researchers try to evaluate, improve and develop applied methods employed in consumer behavior research. For example, Domínguez-Torreiro (2014) investigated the sensitivity of the elicited preferences for beef attributes to the experimental design used in the research. In particular, the optimal orthogonal in the differences and D-efficient designs were investigated. The findings indicate that the parameter estimates are not invariant to the

experimental design and additionally, the unambiguous superiority of the D-efficient designs to the optimal orthogonal in the differences designs was not proved (see Domínguez-Torreiro 2014). Furthermore, Caussade et al. (2005) examined the effect of the dimensions of the experimental design on the responder choices. The researchers (Caussade et al. 2005) defined experimental dimensions as the number of alternatives, number of attributes, number of levels, range of levels and number of choice sets. Their results indicate that while the utility functions are affected by all these dimension components, the WTP estimates are not affected by any of them (Caussade et al. 2005).

Alfnes and Steine (2005) found that hypothetical experiments with pictures can end up in utility estimates that do not deviate from the results of non-hypothetical experiments, with the exception of the none-of-these option parameter. Therefore, realism in attribute presentation could help in obtaining results that are representative of consumer behavior, and this makes realism desirable. Lewis, Grebitus and Nayga (2016a) incorporated the concept of taste in an experimental auction. The taste experiment provided results that deviated from the experiment that did not include real product tasting. Therefore, the results between a more and a less realistic experiment could deviate. Lewis, Grebitus and Nayga (2016b) used eye tracking to examine the impact of incorporating brand and design of the products in their choice experiment. These characteristics do not appear frequently in applied consumer analysis (Lewis, Grebitus and Nayga 2016b). The inclusion of brand does not always affect the WTP while it seems that the amount of attention that the responder pays to specific attribute levels, measured with the time that the responders devotes on seeing each label, could explain the variation of WTP (Lewis, Grebitus and Nayga 2016b). Both the inclusion of sensory cues and brand (visually presented cue), increase the realism of the choices presented to the experiment participants. Therefore, in consumer economics, it is possible that the more realistic experiments end up producing different results in comparison to those

that rely on only text description of the product attributes in a choice experiment. Consequently, the researcher should consider devoting time and funds to create a more realistic experiment. On the contrary, from Arentze et al. (2003) in transportation research, it is could be inferred that the attempt to create a realistic experiment (Arentze et al. (2003) examine visual presentation) is not worthy of the resources that it employs. Therefore, the question that arises is that, are the attempts to increase the realism worth the resources necessary? In the present chapter, it is attempted to answer this question. Specifically, it will be examined if the visual representation (shelf life simulated; for example: Mueller Loose, Peschel and Grebitus (2013); Lewis et al. (2016)) of attributes and levels provide different results from the text only representation (for example Scarpa, Thiene and Hensher (2010)) of the attributes given that there may be differences in the processing of verbal and visual cues (Holbrook and Moore 1981). Attribute non-attendance (ANA) will also be used to examine this research question. ANA is the situation where a responder does not take in consideration one or more attributes when responding to a choice experiment (Hensher, Rose and Greene 2012; Hess and Hensher 2013). ANA is a heuristic (Scarpa et al. 2009) that violates the continuity axiom (Yao et al. 2015, Kragt 2013), resulting in biased estimates and affecting the computed MRS (Scarpa et al. 2009). Scarpa et al. (2009) speculated that the non-attendance of the cost attribute, in their study, could be a result of the distracting effect of the pictures used in the experiment (familiarity and the hypothetical nature of their experiment are mentioned also). Scarpa et al. (2009) is the only research to my knowledge that connects non-attendance and the attribute representation method. This connection is expressed as a speculation and it is not examined.

Consequently, this chapter is motivated by the small amount of research in the consumer economics concerning the text versus visual representation of products examined both from an ANA and a non-ANA point of view. Furthermore, the study is motivated from

the divergent results regarding the effect of presentation method on the elicited preferences and WTP. On the aggregate, the contribution of this chapter is that it examines the differences of preferences and WTP, (i) resulting from different representation methods and (ii) resulting from taking ANA into consideration given the presentation method.

The structure of the chapter is the following: there is a literature review where the processes associated with processing of verbal versus visual cues are presented with the findings of applied research, then there is the methods section, the results and the conclusions.

Literature Review

Visual versus Text Representation

Psychology and neuropsychology literature, indicate that there are differences in the processing of visual and verbal stimuli. Generally, imagery seems to be processed simultaneously while verbal cues seem to be processed sequentially, both of them processed by different hemispheres of the brain (Holbrook and Moore 1981). Holbrook and Moore (1981) mention that this distinction is not a definite rule but it should serve as a very general trend in visual/verbal information processing. Furthermore, it seems that perceiving cues that are depicted imaginary it is a relatively less aggravating cognitive process (Fitzsimons et al. 2002). These lead to the hypothesis that participants' responses could be affected by the representation method.

Additionally, Arentze et al. (2003), Caussade et al. (2005) and Hensher (2006) in transportation research, found that responders' choices are affected by the dimensions of the experiment. Furthermore, in Childers and Houston (1984) it is inferred that it is easier to remember advertisements provided by visual means in comparison to verbal means when the focus is (i) on the sensory attributes of advertisements, regardless the time horizon, and (ii)

on the semantic content over time. Regarding the semantic content and the ability to immediately recall information provided with visual and verbal cues, the two representation approaches are equivalent (Childers and Houston 1984). Patterson et al. (2017), in urban planning, mentions positives of the use of visual representation such as realism of the task that ends up to more valid data and the negatives, such as the introduction of undesirable noise in the information provided to the responder, regarding the choices. Noise could be created by the color (see Patterson et al. 2017). The color and form could subconsciously affect the processing related to the responses (see Ro et al. 2009). MacInnis and Price (1987) state that when visual cues are processed, the complexity of the choice decision is inversely related to the amount of attributes.

Regarding the applied research, researchers in transportation or in urban planning investigated the difference of pictorial representation versus verbal representation. In the former field, Arentze et al. (2003) suggest that visual presentation does not add significant merits to the analysis. In the latter field, Orzechowski et al. (2005) found that there were no significant differences between the two representation methods in terms of internal and external validity. They do mention though that it is possible that some attribute levels could be perceived better with the use of imagery even if this could introduce some noise and does not necessarily lead to improved results (Orzechowski et al. 2005). On the contrary, Jansen et al. (2009), found that the use of pictures and verbal representations could provide different results. Patterson et al. (2017) found that the results of a virtual reality experiment and of an experiment that text descriptions were used were very close.

Attribute Non-Attendance

With respect to the ANA, Nguyen et al. (2015) found that ANA could be a response to the difficulty of the choice tasks. Furthermore, models that take ANA in consideration, seem to

be better in terms of goodness of fit, to model the responder preferences (see Hensher, Rose and Greene 2012; Kragt 2013; Nguyen et al 2015). The number choice sets and alternatives, is negatively related to the number of attributes attended while, the number of attributes itself and the number of levels and their range are not expected to affect the attendance (Weller et al. 2014). According to Hensher (2006) though, the number of levels and their range, affect the probability of attendance.The importance of the effect of the levels and their range and the importance of eliminating ANA, in the choice experiments, could be understood by the fact that Hensher, Rose and Greene (2012), state that the choice of levels and their range may influence responder's trade-offs. Therefore, for reflecting the attendance range of individual responders, a solution could be to incorporate in the choice experiment structure, a build-in dynamic adaptation (Hensher, Rose and Greene 2012). Another effect of the ANA is that it can lead to increased non-attendance for the cost/price attribute (Scarpa et al. 2009; Weller et al. 2014) therefore the estimates of the marginal rates of substitution (MRS) could be biased (Scarpa et al. 2009; Kragt 2013).

Taking in consideration the findings of the reviewed literature, it is hypothesized that (i) the preferences and WTP estimates deviate among the representation methods of photo versus text, (ii) when ANA is introduced to the analysis the model fit increases significantly, (iii) given that processing verbal cues is generally more burdensome process, the ANA is expected to be greater for the verbal representation and (iv) the more realistic representation (visual) may end up being lower WTP estimates (taking in consideration specifically Lewis, Grebitus and Nayga 2016a).

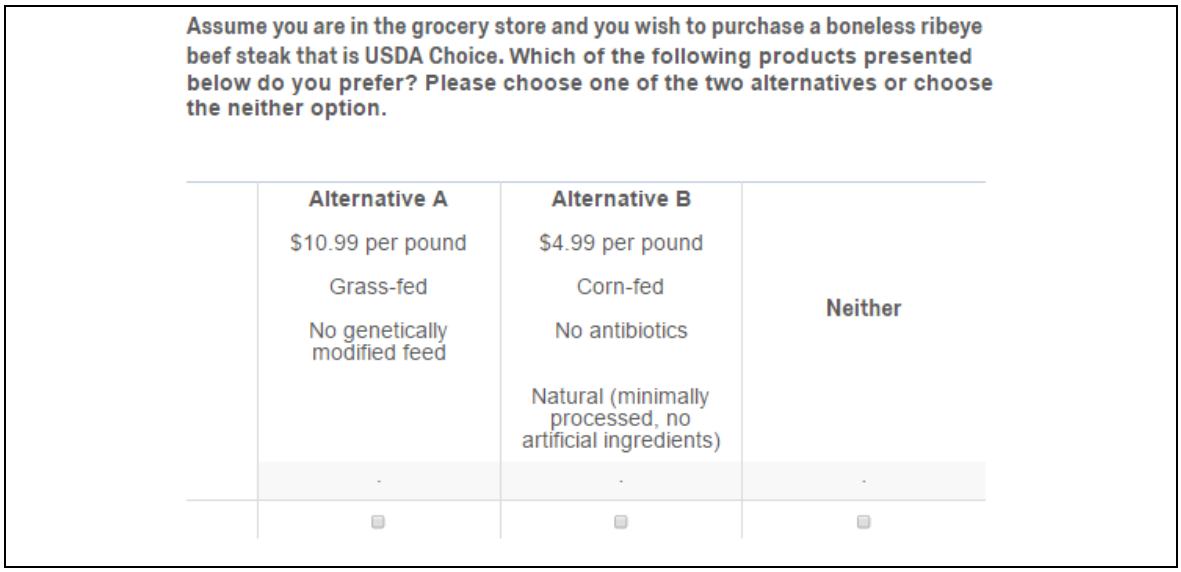
Methods

The data were collected with the online survey, conducted in May and June 2016, which was programmed and administrated by Qualtrics and designed with Ngene (ChoiceMetrics 2012).

The survey had full University of Tennessee Institutional Review Board approval. The questionnaire consisted of information regarding the objective of the survey, icebreaker questions, the USDA definitions of natural and organic, information for how to complete the survey, the cheap talk script and the choice experiment (please refer to Chapter II Methods for details on these and the Appendix).

The choice experiment was presented either with text description of the product or with pictures. Therefore, with respect to the presentation method, there were two different treatments, named Text Treatment (*n*=350) for the responders who saw a text description of the labels and Verbal Treatment (*n*=330) for the responders who saw shelf life simulated photos of the product. After the choice experiment, there were consumption pattern and demographics questions.

An example of the choice sets that the participants of the Text Treatment saw is presented in Figure 2. In these choice sets, no visual cues were used at all. Regarding the Verbal Treatment the choice sets that the responders saw in the experiment, are presented in Figure 3. The photos were created by a professional photographer.


Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

	Alternative A	Alternative B	
	$10.99 per pound Grass-fed No genetically modified feed	$4.99 per pound Corn-fed No antibiotics Natural (minimally processed, no artificial ingredients)	Neither

Figure 2. Example of choice experiment question that appears in the Text Treatment

Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.	
	___
	___
Neither	___

Figure 3. Example of choice experiment question that appears in the Visual Treatment

Attribute Non Attendance and Modeling

There are two ways to identify the presence of ANA (see Weller et al. 2014). One way involves direct questions to the responders if they did or did not take in consideration attributes when answered the choice questions (Weller et al. 2014; see Hole, Kolstad and Gyrd-Hansen 2013 also). This is the responder's stated ANA (see Weller et al. 2014; see Hole, Kolstad and Gyrd-Hansen 2013). Another framework employed to detect ANA is the analytical ANA approach (see Weller et al. 2014). Specifically, ANA is inferred from the available data with the employment of econometric techniques (Weller et al. 2014). The term inferred ANA is used also for this approach (see Hole, Kolstad and Gyrd-Hansen 2013).

There are various modeling approaches to infer ANA. The researcher could use a latent class model, the Equality Constrained Latent Class (ECLC) model, which estimates the probabilities of assignment in non-attendance classes (see Scarpa et al. 2009). There are extensions of the ECLC model, such as the Endogenous Attribute Attendance Model (EAA) and the Mixed Endogenous Attribute Attendance Model (MEAA; Hole, Kolstad and Gyrd-Hansen 2013). The disadvantages of EAA is that it provides the same parameters (perfectly homogeneous preferences) for the attributes for all the classes and in addition to this, it is assumed that there is no dependence among the class assignment probabilities (Hole, Kolstad and Gyrd-Hansen 2013). On the other hand, MEAA model has the advantage of incorporating both preference heterogeneity and ANA in the estimation and it dominated every other alternative model in terms of goodness of fit (Hole, Kolstad and Gyrd-Hansen 2013).

Regarding the stated ANA could provide useful information for the responders' strategies (Hole, Kolstad and Gyrd-Hansen 2013) it could possible introduce endogeneity in the model (Hole, Kolstad and Gyrd-Hansen 2013; Nguyen et al. 2015) and additionally it is possible that the responders may overestimate their ANA, given that they may are not

perfectly aware about the strategies that they used to answer the choice set (Hole, Kolstad and Gyrd-Hansen 2013). The responder could answer that attends an attribute in order to conform with a socially accepted norm (Balcombe, Burton and Rigby 2011), therefore, providing answers that are not describing their behavior. In contrast to these researchers, Balcombe, Burton and Rigby. (2011) found that when responders say that they ignored an attribute, they generally do it. Furthermore, the researcher is not aware regarding the processing strategy that the responder actually uses (Alemu et al. 2013), and the modeling techniques might affect the results also (Mariel et al. 2012). Therefore the inappropriateness of the stated-ANA-based methods cannot be established.

Immediately after the choice experiment, there was the question, "When making your choices for the ribeye beef steaks, which of the attributes factored into your decision?" The options were "Yes" or "No" for price, natural labeling, type of feed (e.g. grass fed, corn-fed) and type of process (no growth hormones, no antibiotics, no genetically modified feed). A question like this, asking about the attribute attendance in the real (non-hypothetical) market environment also and not strictly in the choice experiment, is considered appropriate because according to Alemu et al. (2013), in the actual market, consumer choice, may be affected by dimensions of the choices, the relevance of attributes and the cognitive abilities of the person.

Random Parameters Logit without ANA

The analysis was conducted in the random parameters logit (RPL) framework presented in Chapter II Methods. Two models of this form were estimated, one for the Text Treatment and one for the Visual Treatment. Their formulation is identical to formula (3) of Chapter II. Consequently, under this modeling approach, it is implicitly assumed that the whole sample exhibited full-attendance (see Nguyen et al. 2015). The model is named Base-RPL for the rest of Chapter III.

Random Parameters Logit with ANA

This modeling approach was proposed by Balcombe, Burton and Rigby (2011) as a generalization of the random parameters logit, in the sense that it takes in consideration the skewness in the distribution of the parameters. The parameters are transformed with the use of a dummy with one for declared non-attendance and zero for declared attendance. The transformation is the following (Balcombe, Burton and Rigby 2011):

$$\beta_{ij} = a_0 + a_1 z_{ij} + u_{ij} \tag{8}$$

Where β_{ij} is the parameter-marginal utility of person *i* for attribute *j*, α_0 is the value of the parameter for the population that attends the attribute *j*, α_1 is the effect of the sample that stated that ignore the attribute *j* and z_{ij} is the dummy with one for stated ANA and zero for stated attribute attendance (Nguyen et al. 2015).

Firstly, it is expected that α_1 and α_0 will have opposite signs and secondly, this flexible transformation allows for not full ANA, even if the responders stated ANA for a specific attribute, since it does not constraint the two right-hand-side parameters in (8) to be exactly the opposite (such a constraint is feasible though; Balcombe, Burton and Rigby 2011). The dummies z_{ij} are used for creating interactions among all the levels $k = 1,..,K$ of the attribute, with *K* being the number of levels of each attribute *j*. The applied model is:

$$U_{ict} = \alpha_{0,1ict} price_{ict} + \alpha_{0,2ict} grass_{ict} + \alpha_{0,3ict} corn_{ict} + \alpha_{0,4ict} NoGMFeed_{ict}$$
$$+\alpha_{0,5ict} nohormones_{ict} + \alpha_{0,6ict} noantibiotics_{ict} + \alpha_{0,7ict} natural_{ict} + \beta_{0,8ict} neither_{ict}$$
$$+\alpha_{0,9ict} Nat\&grass_{ict} + \alpha_{0,10ict} Nat\&corn_{ict} + \alpha_{0,11ict} Nat\&NoGMFeed_{ict}$$
$$+\alpha_{0,12ict} Nat\&no_hormones_{ict} + \alpha_{0,13ict} Nat\&no_antibiotics_{ict} + \alpha_{1,14ict} anap * price_{ict}$$
$$+\alpha_{1,15ict} anaf * grass_{ict} + \alpha_{1,16ict} anaf * corn_{ict} + \alpha_{1,17ict} anar * NoGMFeed_{ict}$$
$$+\alpha_{1,18ict} anar * no_hormones_{ict} + \alpha_{1,19ict} anar * no_antibiotics_{ict}$$
$$+\alpha_{1,20ict} anan * natural_{ict} + \alpha_{1,21ict}\big((anaf * grass_{ict}) * (anan * natural_{ict})\big)$$
$$+\alpha_{1,22ict}\big((anaf * corn_{ict}) * (anan * natural_{ict})\big)$$

$$+\alpha_{1,23ict}\big((anar * NoGMFeed_{ict}) * (anan * natural_{ict})\big)$$

$$+\alpha_{1,24ict}\big((anar * no_hormones_{ict}) * (anan * natural_{ict})\big)$$

$$+\alpha_{1,25ict}((anar * no_antibiotics_{ict}) * (anan * natural_{ict})) + v_{ict} \quad (9)$$

The main variables are specified as in Chapter II, formula (3). Regarding the ANA interactions, they are dummies with one for stated non-attendance and zero for stated attendance. *Anap* is the dummy for price ANA, *anaf* is the dummy for the type of feed attribute ANA. The dummy for the type of process is the *anar* while the *anan* is the qualitative variable for the natural ANA.

Our experimental design allows for interactions therefore, interactions among the natural attribute and the type of feed and type of process attribute levels are used as well, both for the attending responders and the responders who stated ANA. The use of interactions is justified from the fact that when responders ignore attributes, they probably tend to ignore attribute pairs and not single attributes (Scarpa et al. 2009). The error, $\boldsymbol{v}_{ict}$ is again i.i.d. Extreme Value distributed (Train 2009). The interaction structure is the same with the non-ANA random parameter logit models for comparability reasons and for being consistent with the interactions design of the experiment. Moreover, all the parameters, except the price parameter, are assumed to be normally distributed, including the ANA parameters. This model is defined for convenience as ANA-RPL for the rest of the chapter.

Regarding the parameters, $\alpha_{0,mict}$ corresponds to α_0 of (8) and $\alpha_{1,mict}$ corresponds to the α_1 of (8) with $m=1,\ldots,25$ being a counter of the parameter for convenience in the presentation. According to Nguyen et al. (2015) the parameter for the responders that attended an attribute is α_0 while the parameter that expresses the preferences of the responders that declared non-attendance for an attribute is $\alpha_0+\alpha_1$. Any insignificant ANA-interaction terms (α_1) imply that the preferences of the responders that declared that do not attend an attribute *j* are not significantly different (in statistical sense) from the preferences of

the responders that answered that attended to the attributes (Nguyen et al. 2015).

Willingness to Pay

For the Base-RPL variables, the WTP is calculated and its statistical significance is examined with the framework described in Chapter II, Methods. For the ANA-RPL, the unconditional WTP was calculated following Nguyen et al. (2015):

$$WTP = -\frac{\beta_i}{\beta_p} \tag{10}$$

Where β_i is the parameter of level i = *grass-fed, corn-fed, no genetically modified feed, no growth hormones, no antibiotics* and *natural* and β_p is the coefficient of the price:

$$\beta_i = \pi_r^a a_{0i} + \pi_r^n (a_{0i} + a_{1i}) \tag{11a}$$

$$\beta_p = \pi_p^a a_{0p} + \pi_p^n (a_{0p} + a_{1p}) \tag{11b}$$

Where π_r^a is the probability (approached through relative frequency) that the responders attend attribute r and π_r^n is the probability that they do not attend attribute $r = n, f, c$ for natural, type of feed and type of process attributes respectively (see Nguyen et al. 2015). Regarding the αs, α_{0i} is the parameter estimate of the attribute level i from the ANA-RPL and α_{1i} is the parameter estimate of the ANA dummies for the attribute level i.

For the denominator $r = p$ and refers to the price. The numerator and denominator are attendance-weighted parameter of the attribute and level of interest. The attendance probability is not dependent of the attendance or not to other attributes, this is the reason that it is defined as unconditional (see Nguyen et al. 2015).

With respect to the interactions WTP, it is calculated by enveloping formulas (11a) and (11b) into formula (6) of Chapter II.

$$WTP = -\frac{\beta_i + \beta_j + \beta_d}{\beta_p} \tag{12}$$

Where β_i, β_j are the parameter of the attribute level i, j = *grass-fed, corn-fed, no genetically*

modified feed, no growth hormones, no antibiotics and *natural* and $i \neq j$ with for the attribute levels that are involved in the interaction and β_d is the parameter of the interaction of the levels that are interacting.

For example, taking in consideration (11α), (11β) and (12), the interaction WTP for the natural and grass-fed is equal to $-(\beta_{grass\text{-}fed}+\beta_{natural}+\beta_{grass\text{-}fed\ \&\ natural})/\beta_p$. Where in turn $\beta_{grass\text{-}fed} = \pi_f^a\alpha_{0,2} + \pi_f^n(\alpha_{0,2}+\alpha_{1,15})$; $\beta_{natural} = \pi_n^a\alpha_{0,7} + \pi_n^n(\alpha_{0,7}+\alpha_{1,20})$ and $\beta_{grass\text{-}fed\&natural} = \pi_{fn}^a\alpha_{0,9} + \pi_{fn}^n(\alpha_{0,9}+\alpha_{1,21})$.

In order to define the statistical significance of the WTP, the Delta Method was used for both the interactions and non-interaction terms. Given that the parameters were attendance-weighted the variance was attendance weighted as well using the following transformation of the elements of the Variance Covariance Matrix:

$$\omega_{ij} = \pi_r^a\omega_{0ij} + \pi_r^n\left(\omega_{0ij} + \omega_{1ij}\right) \tag{13}$$

Where ω_{ij} is the element of the probability adjusted matrix in for the attribute levels *i* and *j*. Furthermore, ω_{0ij} is the covariance of the non-ANA attribute levels *i*, *j* and ω_{1ij} is the element of the matrix that refers to the ANA variables' parameters. The transformation of the variance covariance matrix is necessary because otherwise, the WTP variance would be a combination of attendance adjusted parameters and full attendance variances and covariances. Both Base-RPL and ANA-RPL were estimated with Nlogit 5 (Econometric Software, Inc 2012).

Results

Demographics of the Responders

Females consist the 63% of the Text Treatment (Table 5) while the Visual Treatment consists of 45% of females. The two samples differ at α = 0.01 regarding the gender. The median age of the Text Treatment is 39 years while the Visual Treatment participants' median age is 40 years. The responders of the Text Treatment that have education of Bachelor's Degree and

Table 5. Demographics and stated attribute non-attendance of the Text Treatment and Visual Treatment participants

Demographic[b]	Description	Visual Treatment (n=330)	Text Treatment (n=350)	U.S. Population
Gender (% Female)[a]	%[e]	45.2%	62.6%	50.8%[1]
Age	Median	40.0	39.0	37.8[2]
Education (Bachelor's Degree or higher)	%	33.0%	34.8%	29.3%[1]
Income	Median	$40,000-$49,000	$40,000-$49,000	$53,482[1]
Household Size	Mean	2.80	2.92	2.63[1]
Stated attribute non-attendance[c]				
Attend all attributes	%	36.67%	40.86%	
Not attend price[d]	%	18.79%	12.86%	
Not attend natural	%	33.03%	33.43%	
Not attend feed	%	34.24%	35.43%	
Not attend process	%	24.24%	27.43%	
Not attend natural and feed	%	19.09%	22.00%	
Not attend natural and process	%	18.18%	21.14%	
Not attend any attribute	%	0.30%	0.28%	

Notes: [1] U.S. Census Bureau quick facts, 2016.
[2] U.S. Census Bureau, American Fact Finder.
[a] As evidenced by the t-tests, the gender composition of the two treatments are different for $\alpha = 0.01$.
[b] As evidenced from the t-tests the two treatments do not differ significantly with respect to age, education, income and household size.
[c] Non-attendance is not conditioned to the attendance or non-attendance to other attributes or combination of attributes. It refers to the responders that declared non-attendance, regardless their attendance or not for other attributes and combinations of attributes.
[d] As evidenced from the t-tests only the price attribute non-attendance differs significantly across the two treatments. The other attributes' percentages, interactions of attributes percentages, stated attendance for all attributes percentages and stated non-attendance for all attributes percentages do not differ significantly across the two treatments.
[e] The demographics of the Visual and Text Treatment were calculated with SPSS 22 (IBM Corp 2013) and the tests for the statistical significance of the differences were performed with STATA 13 (StataCorp 2013).

above consist 35% of the group, while for the Visual group the percentage is 33%. The median income category is $40,000-$49,000 and the average household size is 2.92 persons for the Text Treatment and 2.80 persons for the Visual Treatment. Besides the gender, all the other demographics do not differ significantly.

With respect to the stated-ANA, 37% of the responders of the Visual Treatment declared that they attend all the attributes used while for the Text Treatment the percentage is 41%. Regarding the price, 19% of the Visual Treatment and 13% of the Text Treatment declared price non-attendance. The natural attribute was not attended by 33% of the Visual Treatment participants and 33% of the Text Treatment participants, while the type of feed attribute was not attended by 34% of the responders of the former Treatment and 35% of the latter. The type of process attribute was not attended by 24% of the Visual Treatment responders and 27% of the Text Treatment responders.

Regarding the interactions, the natural and type of feed combination was not attended by the 19% of the Visual Treatment and 22% of the Text Treatment, while the non-attendance for the both the natural and type of process attribute was 18% for the former Treatment and 21% for the latter. Non-attendance for any attribute was declared by around 0.30% of both treatments.

The price non-attendance is the only attribute that there are statistically significant differences between the treatments in the stated-ANA for $\alpha = 0.05$. For the other attributes and combinations of attributes, except the complete non-attendance, it is observed that there is higher declared non-attendance for the Text Treatment in absolute number but the differences are statistically insignificant. Regarding the complete non-attendance, the people that state that do not attend any attribute compose a very small fraction of the sample (two people in total, one in each treatment). According to Kragt (2013), when no attribute is attended, it seems that the choice is random (see Weller et al. 2014 also).

Empirical Results

Regarding the Base-RPL where full attendance (Nguyen et al. 2015) is assumed, when the responders see visual presentation of the alternative products, grass-fed, no growth hormones and no antibiotics affect the utility positively, while price and the no labels option affects the utility negatively (Table 6). Furthermore, the interactions of the levels seem to have insignificant effect on the preferences.

On the contrary, with the verbal representation the structure of the utility function changes with grass-fed, no genetically modified feed, no growth hormones, no antibiotics, natural and the interaction of natural label and corn fed, all of the significantly and positively affecting the utility. Moreover, in the Text Treatment, the no label option and price has negative effect on the utility. The remaining parameters are insignificant. These results differ from the results of Holbrook and Moore (1981) in consumer research, where it was found that pictorial representation ends up to arithmetically more significant main effects than the significant effects with text representation. Furthermore, in the same research (Holbrook and Moore 1981), after further investigation was confirmed that pictorial representation ends up to more significant interaction terms. Again, this is not in accordance with the results presented here, since there is only one significant interaction (corn-fed and natural) in the Text Treatment and no significant interactions in the Visual Treatment.

The heterogeneity structure is similar across both treatments, with the grass-fed, corn-fed, no genetically modified feed, no antibiotics, natural, no label and natural and corn-fed interactions exhibiting substantial heterogeneity for both the Text and Visual Treatments, while the heterogeneity of the other levels and interactions are insignificant. In terms of goodness of fit, the Visual Treatment random parameters logit exhibit Log-likelihood of -3188.639 while the corresponding model of the Text Treatment has Log-likelihood of -3281.31. The McFadden's Pseudo R-square is 0.267 for the former treatment and 0.289 for

Table 6. Parameter Estimates of the Base Random Parameters Logit for Text Treatment and Visual Treatment

	Visual Treatment		Text Treatment	
Random Parameters	**Parameter Estimates**	**Standard Errors**	**Parameter Estimates**	**Standard Errors**
Grass fed	0.556***	0.127	0.759***	0.125
Corn fed	-0.021	0.120	-0.050	0.120
No genetically modified feed	0.222	0.176	0.548***	0.174
No growth hormones	0.318**	0.154	0.793***	0.149
No antibiotics	0.246*	0.146	0.475***	0.134
Natural	0.250	0.201	0.738***	0.201
None	-4.051***	0.249	-4.105***	0.233
Natural-grass fed	-0.167	0.199	-0.152	0.197
Natural-corn fed	-0.225	0.204	0.350*	0.194
Natural-no genetically modified feed	0.328	0.273	-0.194	0.263
Natural-no growth hormones	0.439	0.269	-0.349	0.256
Natural-no antibiotics	-0.142	0.192	0.011	0.188
Non-random parameter				
Price	-0.332***	0.017	-0.407***	0.018
Std. dev. of random parameters				
Grass fed	0.738***	0.104	0.536***	0.112
Corn fed	0.538***	0.138	0.507***	0.150
No genetically modified feed	1.306***	0.129	1.246***	0.116
No growth hormones	0.182	0.291	0.114	0.170
No antibiotics	1.164***	0.114	0.637***	0.123
Natural	0.427***	0.097	0.737***	0.078
None	2.395***	0.177	2.012***	0.158
Natural-grass fed	0.369	0.256	0.018	0.291
Natural-corn fed	0.972***	0.156	0.935***	0.209
Natural-no genetically modified feed	0.196	0.289	0.041	0.254
Natural-no growth hormones	0.133	0.206	0.164	0.197
Natural-no antibiotics	0.186	0.223	0.025	0.208
Participants	330		350	
Observations	3960		4200	
Log-likelihood	-3188.639		-3281.31	
McFadden's Pseudo R-square	0.267		0.289	

Notes: ***,**,* significant for $\alpha = 0.01, 0.05, 0.10$ respectively.

the latter.

The ANA-RPL provides the following results (Table 7). When the responders see a visual presentation of the attributes, the responders who declared that they attended to the respective attributes exhibit positive preference for the grass-fed, no genetically modified feed, no growth hormones, no antibiotics and natural levels. Price, the no label option and the natural and no antibiotics interaction exhibit negative parameter estimates. Furthermore, the responders who attend the attributes, exhibit significant heterogeneity.

Regarding the responders who declared that they do not attend to certain attributes, they have negative signs for the ANA-interaction dummies' parameters of grass-fed, no antibiotics and natural and grass-fed meaning that they have lower probability of taking in consideration these attribute levels, in comparison to the responders who attend the relevant attributes (interpretation based on Nguyen et al. (2015)). The natural and no-antibiotics ANA dummy is positive meaning that the non-attenders were more likely to purchase a product which is labeled as natural and grass-fed in comparison to the people that attend both natural and type of process attributes. The price ANA dummy is positive meaning that the probability of buying a more expensive product is greater for the non-attenders than the people who attend the price attribute. The statistical insignificance of the other ANA dummies imply that there is no significant difference among the preferences of the responders who stated ANA and those who declared attendance (Nguyen et al. 2015). Regarding the Text Treatment, the significant parameters for the responders who attend the parameter-relative attributes are the same with the Visual Treatment. The natural and corn-fed interactions is positive, meaning that the responders who attend both the natural and type of feed attributes exhibit utility functions where the natural and grass-fed interactions participate significantly and positively. The no-label option and the price affect negatively the utility of the attenders. The parameters of the ANA dummies are negative for the no growth

Table 7. Parameter Estimates of the Random Parameters Logit for the Visual Treatment and Text Treatment with attribute-non-attendance dummies (ANA-RPL)

	Visual Treatment		Text Treatment	
Random Parameters	**Parameter Estimates**	**Standard Errors**	**Parameter Estimates**	**Standard Errors**
Grass-fed	0.707***	0.141	0.834***	0.137
Corn-fed	-0.128	0.140	-0.049	0.140
No genetically modified feed	0.408**	0.188	0.655***	0.188
No growth hormones	0.416**	0.167	0.996***	0.163
No antibiotics	0.368**	0.156	0.524***	0.150
Natural	0.461**	0.209	0.979***	0.211
None	-4.305***	0.275	-4.285***	0.239
Natural-grass fed	-0.092	0.208	-0.034	0.209
Natural-corn fed	-0.150	0.217	0.378*	0.205
Natural-no genetically modified feed	0.365	0.284	-0.172	0.282
Natural-no growth hormones	0.379	0.279	-0.430	0.270
Natural-no antibiotics	-0.425**	0.203	0.051	0.201
Non-random parameter				
Price	-0.398***	0.020	-0.450***	0.020
Random ANA parameters				
ANA_feed * grass-fed	-0.442**	0.179	-0.186	0.160
ANA_feed * corn-fed	0.231	0.179	0.065	0.179
ANA_process * no genetically modified feed	-0.425	0.294	-0.421	0.273
ANA_process * no growth hormones	-0.290	0.222	-0.731***	0.195
ANA_process * no antibiotics	-0.590*	0.327	-0.193	0.244
ANA_natural * natural	-0.507***	0.150	-0.585***	0.171
ANA_natural_feed * natural and grass-fed	-0.637**	0.305	-0.689**	0.277
ANA_natural_feed * natural and corn-fed	-0.504	0.326	-0.228	0.297
ANA_natural_process * natural and no genetically modified feed	-0.392	0.396	-0.264	0.371
ANA_natural_process * natural and no growth hormones	0.345	0.363	0.292	0.322
ANA_natural_process * natural-no antibiotics	1.586***	0.412	0.030	0.335
Non-random ANA parameter				
ANA_price * Price	0.316***	0.033	0.307***	0.036
Std. dev. of random parameters				
Grass-fed	0.715***	0.117	0.434***	0.124
Corn-fed	0.508***	0.182	0.653***	0.118
No genetically modified feed	1.224***	0.127	1.134***	0.117
No growth hormones	0.432**	0.193	0.083	0.153

Table 7 (Continued). Parameter Estimates of the Random Parameters Logit for the Visual Treatment and Text Treatment with attribute-non-attendance dummies (ANA-RPL)

	Visual Treatment		Text Treatment	
Std. dev. of random parameters	**Parameter Estimates**	**Standard Errors**	**Parameter Estimates**	**Standard Errors**
No antibiotics	0.919***	0.124	0.691***	0.120
Natural	0.325***	0.101	0.648***	0.081
None	2.852***	0.231	2.375***	0.164
Natural and grass fed	0.293	0.250	0.198	0.201
Natural and corn fed	0.916***	0.182	0.605**	0.263
Natural and no genetically modified feed	0.032	0.323	0.247	0.198
Natural and no growth hormones	0.201	0.258	0.100	0.216
Natural and no antibiotics	0.384	0.236	0.177	0.197
Std. dev. of ANA random parameters				
ANA_feed * grass-fed	0.050	0.144	0.142	0.154
ANA_feed * corn-fed	0.047	0.153	0.049	0.152
ANA_process * no genetically modified feed	0.155	0.452	0.715	0.443
ANA_process * no growth hormones	0.054	0.243	0.062	0.222
ANA_processs* no antibiotics	1.135***	0.332	0.458	0.291
ANA_natural * natural	0.029	0.168	0.037	0.220
ANA_natural_feed * natural and grass-fed	0.170	0.286	0.024	0.212
ANA_natural_feed * natural and corn-fed	0.146	0.294	0.056	0.360
ANA_natural_process * natural and no genetically modified feed	0.061	0.525	0.233	0.291
ANA_natural_process * natural and no growth hormones	0.168	0.322	0.444*	0.260
ANA_natural_process * natural-no antibiotics	0.048	0.279	0.026	0.308
Participants	330		350	
Observations	3960		4200	
Log-likelihood	-3097.487		-3206.303	
McFadden's Pseudo R-square	0.288		0.305	

Notes: ***,**,* significant for α = 0.01, 0.05, 0.10 respectively.

hormones, natural and natural and grass-fed, therefore, the non-attending participants are less likely to take in consideration these attribute levels. The price ANA dummy parameter is positive, therefore the, by statement, non-attenders of the price indeed exhibit different preferences than the attenders with respect to the price. All the other levels and interactions are statistically insignificant; therefore, there is no significant difference among the attenders and non-attenders.

There is preference heterogeneity in the text among the responders as well. The first thing that it is observed is that while for the Base-RPL, there were significant differences in the structure of the utility functions among the two treatments participants, the ANA-RPL provide utility functions that are similar for both treatments, but not identical. Secondly, the number of the significant parameters for the attenders is the same across the treatments but taking in consideration the non-attenders as well, the Visual Treatment provide two significant levels more, if we consider the non-attendance dummies' parameter estimates, than the Text Treatment. Therefore, considering the interactions, the findings approximate the results of Holbrook and Moore (1981) where they find more significant levels for the main effects under pictorial representation. Moreover, it is observed that comparing the Base-RPL parameter estimates of each treatment with the parameter estimates for the attenders of the ANA-RPL for the corresponding treatment, the significant estimates are greater for the ANA-RPL model, meaning that this model indicates greater degree of sensitivity to the attribute levels than the Base-RPL which assumes full attendance from all the responders.

The ANA-RPL of the Visual Treatment exhibits Log-Likelihood of -3097.487 while the Text Treatment model has Log-Likelihood value of -3206.303. The Pseudo R^2 is 0.288 for the former treatment model and 0.305 for the latter treatment model. The ANA-RPL exhibits better model fit, both in terms of Log-Likelihood and in terms of Pseudo R^2, compared to the Base-RPL model. This is in accordance with the evidence from the literature

(see Scarpa et al. 2009; Kragt 2013 and Nguyen et al. 2015) where models that accounted for ANA exhibited better fit to the data than models that do not incorporate ANA.

In terms of Base-RPL WTP the results of the Visual Treatment indicate that the responders are willing to pay, in comparison to the non-labeled boneless ribeye beef steak, on average \$1.67 (p<0.01) for grass-fed beef, \$0.96 (p<0.01) for no growth-hormones label, \$0.74 (p<0.10) for the no antibiotics labeled beef, \$1.92 (p<0.01) for the interaction of natural and grass-fed, \$2.41 (p<0.01) for the natural and no genetically modified feed, \$3.03 (p<0.01) for the natural and no growth hormones and \$1.07 (p<0.10) for the simultaneous presence of natural and no antibiotics labels (Table 8). Regarding the Text Treatment, the WTP for grass-fed beef is on average \$1.87 (p<0.01), in comparison to the no label option. The average premium for no genetically modified feed is \$1.35 (p<0.01), for the no growth hormones label is \$1.95 (p<0.01), for the no antibiotics is \$1.17 (p<0.01) and for the natural label is \$1.81 (p<0.01) all in comparison to the counterpart beef product without labels. Regarding the interaction terms, the average WTP for both the natural and grass-fed is \$3.31 (p<0.01) in comparison to the no label option and \$2.55 (p<0.01) for the interaction of natural and corn-fed interaction, compared with the steak without labels. Additionally, regarding the interactions of the natural with the type of process attribute, the average premium for the beef steaks with both natural and no genetically modified feed is \$2.68 (p<0.01), for the interaction of natural and no growth hormones the average WTP is \$2.91 (p<0.01) and for the natural and no antibiotics interaction the mean premium is \$3.01 (p<0.01) all in comparison to the beef steaks without labels.

Regarding the ANA-RPL WTP estimates for the Visual Treatment, it is observed that the average premium for grass-fed beef in comparison to the non-labeled steak is \$1.45 (p<0.01) and for the no growth hormones is \$0.90 (p<0.10). For the natural and grass-fed interaction the average WTP is \$1.66 (p<0.05), for the natural and no genetically modified

Table 8. Willingness to Pay for the Text and Visual Treatments, for the Base-RPL and ANA-RPL models

	Base-RPL WTP estimates		ANA-RPL WTP($) estimates	
Labels	**Visual Treatment**	**Text Treatment**	**Visual Treatment**	**Text Treatment**
Grass fed	$1.67***	$1.87***	$1.45***	$1.74***
Corn fed	-$0.06	-$0.12	-$0.13	-$0.06
No genetically modified feed	$0.67	$1.35***	$0.79	$1.22**
No growth hormones	$0.96***	$1.95***	$0.90*	$1.80***
No antibiotics	$0.74*	$1.17***	$0.59	$1.06**
Natural	$0.75	$1.81***	$0.76	$1.77***
Natural-grass fed	$1.92***	$3.31***	$1.66**	$3.09***
Natural-corn fed	$0.01	$2.55***	-$0.01	$2.45***
Natural-no genetically modified feed	$2.41***	$2.68***	$2.33***	$2.47***
Natural-no growth hormones	$3.03***	$2.91***	$2.82***	$2.74***
Natural-no antibiotics	$1.07*	$3.01***	$1.00	$2.96***

Notes: ***,**,* significant for α = 0.01, 0.05, 0.10 respectively.

feed the average premium is $2.33 ($p$<0.01) and for the natural and no growth hormones the mean WTP is $2.82 ($p$<0.01) all in comparison to the non-labeled option.

With respect to the Text Treatment, the average premium for the grass-fed label is $1.74 ($p$<0.01), for the no genetically modified feed it is $1.22 ($p$<0.05), for the no growth hormones it is $1.8 ($p$<0.01), for the no antibiotics it is $1.06 ($p$<0.05) and for the natural label it is $1.77 ($p$<0.01) compared with the beef steaks without labels. The average WTP for the natural and grass-fed interaction is $3.09 ($p$<0.01), for the natural and corn-fed is $2.45 ($p$<0.01), for the natural and no genetically modified feed is $2.47 ($p$<0.01), for the natural and no growth hormones interaction is $2.74 ($p$<0.01) and for the natural and no antibiotics it is $2.96 ($p$<0.01).

The most important observation is that there are fewer statistically significant WTP estimates coming from the visual treatment compared to the text treatment either considering ANA and not. With the use of text, all the labels, except corn-fed, and interactions are significant while, in the Visual Treatment only a subset of levels is significant including: grass-fed, no growth hormones, natural and grass-fed, natural and no genetically modified

feed and natural and no growth hormones are ANA or not and additionally no antibiotics and natural and no antibiotics exhibit significant premiums when ANA is not accounted. Moreover, the WTP estimates resulting from the Text Treatment are highly significant, except not genetically modified feed and no antibiotics labels in the ANA-RPL WTP estimates which are significant at $\alpha = 0.05$. On the contrary, the WTP estimates from the Visual Treatment are significant at varying levels. These results depart from the results of Arentze et al. (2003) in transportation research and Orzechowski et al. (2005) and Patterson et al. (2017) in urban planning, where these researchers found no significant differences (in different concepts than WTP) among visually and verbally presented choice sets.

The WTP estimates of both treatments, resulting from the Base-RPL differ numerically from the WTP estimates of the corresponding treatment resulting from the ANA-RPL. This difference among the WTP estimates of Text with ANA versus Text without ANA and Visual with ANA versus Visual without ANA, was expected given the implications that ANA affects the MRS (Scarpa et al. 2009) and it is in contrast with the findings of Kragt (2013) and Hole, Kolstad and Gyrd-Hansen (2013) where no significant difference among models that account for ANA and models that do not were found. The only exception is the natural and no growth hormones which exhibits greater premiums in the Text Treatment.

The results, on aggregate, indicate that generally there are substantial differences in the WTP estimates among the Visual and Text treatments. Consequently, premiums that come from experiments with verbal description, tend to be higher than premiums that come from experiments with pictorial representation of the attributes. Therefore, the more realistic visual representation, results to generally more conservative WTP estimates. This is in accordance with Lewis, Grebitus and Nayga (2016a) where they found that the (more realistic) taste experiment provide lower WTP estimates or even zero bids, in comparison to the less realistic experiment.

Conclusions

In this chapter, it was examined if there are differences in the elicited preferences for beef when the presentation method of the choice alternatives differs. The results indicate that there are differences in the structure of the utility functions among the Visual and Text Treatments when ANA is not taken in consideration. When ANA is accounted for, the Visual Treatment exhibits an increased number of significant levels compared to the Base-RPL parameter estimates of the same treatment.

Regarding the WTP, the number of significant levels differs significantly among the Text and Visual Treatments, therefore, the representation method should be decided carefully. The premiums from the Text Treatment are greater than the premiums from the visual representation in all the cases, except the natural and no growth hormones interaction. Taking in consideration the results of the Chapter II and especially those of the Control Treatment, the possibility of utility functions with many significant levels (like those that result from the Text Treatment models) for experiments with visual representation is not eliminated. Therefore, regarding the Visual Treatment of this Chapter, it could not be established that the pictorial representation results to underestimated significance of attribute levels, and additionally to non-realistic premiums, compared to the Text Treatment. The number of significant WTP estimates seem not to be affected significantly by the use incorporation of ANA in the analysis within each treatment. Consequently, it seems that it is more possible that the text description leads to overestimated average WTP estimates. A possible explanation is that, since the responders tend to process the verbal attribute levels sequentially (see Holbrook and Moore 1981), they pay more attention to the attribute levels and this results in more significant WTP estimates for the Text Treatment. The observed higher WTP values of the Text Treatment, in comparison to the Visual Treatment, provide an implication for the grocery stores, or other stakeholders. Specifically, besides the provision of

information for the product attributes with the use of labels on the packages, grocery stores could explore the option of placing verbal description of the product attributes on individual labels, providing the product information with text.

Given that the Text and Visual Treatments differ significantly in terms of gender, it could be argued that the results are affected by the gender difference. Since the type of feed, type of process and natural attributes are related to food quality, it might be argued that females (who consist the majority of the Text Treatment participants), given that they, in some cases, are more risk averse than males (Fehr-Duda, de Gennaro and Schubert 2006; see Booth, Cardona-Sosa and Nolen (2014) also) exhibit preferences that are affected more by the attribute levels used in this research. On the contrary, Binswanger (1980) found that there are evidence that there are no significant differences in terms of risk aversion among the two genders. Furthermore, risk aversion is not by definition characteristic of the gender but it could be affected by learning from the social environment (Booth, Cardona-Sosa and Nolen 2014). Therefore the differences in the elicited preferences could be attributed to the presentation method.

It was asked from the responders to choose products (in hypothetical choice situations). These products, in order to be judged sufficiently, the responder should come in contact with them because could incorporate sensorial, symbolic or aesthetic avails (Holbrook and Moore 1981). Therefore, it could be argued that the results elicited with realistic pictorial methods provide more accurate results compared to the verbal methods regarding the responders' choices, if the noise from the color of the pictures is not distracting the participants. This remains a hypothesis for further testing though, because in this experiment there is not a non-hypothetical Treatment to compare with the Visual and Text Treatment. The inclusion of a non-hypothetical Treatment in a future research, would allow direct comparisons between the actual purchasing behavior (real WTP) and the hypothetical

WTP estimates Text and Visual Treatments, providing the capability to establish, which representation method provides more realistic results. Up to then, the superiority of the Visual Treatment over the Text Treatment could be implied by the results but is not proved quantitatively. Consequently, the researchers examining consumer behavior and consumption patterns, should pay particular attention to the representation method, in order to obtain maximum and reliable information from their analysis.

CHAPTER IV

CONCLUSIONS

In this thesis it was examined, firstly, if the use of the term natural on beef steaks is misleading and secondly, if the different attribute presentation methods in a choice experiment, leads to deviating results.

Regarding the first topic, covered in Chapter II, the results indicate that people who either were familiar with the USDA definition of natural before the survey or were treated with information regarding the USDA definitions of natural and organic in the beginning of the survey, were not willing to pay significant premiums for the natural label. Furthermore, they generally perceived the natural label as complement to the other labels, meaning that in their understanding the combination of natural and other food quality labels provide more information than the individual labels separately. In other words, these responders did not overestimate the content of the natural term. Responders that were not treated with information or were non-familiar the USDA definition of natural before the survey, exhibited significant premiums for natural labeled beef steaks. These differences among the responder groups lead to the conclusion that the natural label creates consumer confusion, therefore, the FDA should consider the provision of a definition for the natural label.

Regarding the second topic, addressed in Chapter III, the results indicate that there are substantial differences in the WTP measures resulting from choice experiments where verbal and visual presentation methods are used either taking ANA in consideration or not. This result implies that the researchers should not be indifferent among verbal and visual means of conducting a choice experiment. Furthermore, given that the model that accounts for ANA provides divergent results from the model that assumes full attendance, it is concluded that taking ANA in consideration is a practice highly recommended.

REFERENCES

Adamowicz, W., P. Boxall, M. Williams, and J. Louviere. 1998. "Stated Preference Approaches for Measuring Passive Use Values: Choice Experiments and Contingent Valuation." *American Journal of Agricultural Economics* 80(1):64–75.

Akgüngör, S., B. Miran, and C. Abay. 2010. "Consumer Willingness to Pay for Organic Food in Urban Turkey." *Journal of International Food & Agribusiness Marketing* 22(3–4):299–313.

Alemu, M.H., M.R. Mørkbak, S.B. Olsen, and C.L. Jensen. 2013. "Attending to the Reasons for Attribute Non-attendance in Choice Experiments." *Environmental and Resource Economics* 54(3):333–359.

Alfnes, F. and G. Steine. 2005. "None-of-These Bias in Stated Choice Experiments". Paper prepared for presentation at the XIth International Congress of the European Association of the Agricultural Economists, Copenhagen Denmark. 24-27 August.

Alfnes, F., and K. Rickertsen. 2003. "European Consumers' Willingness to Pay for U.S. Beef in Experimental Auction Markets." *American Journal of Agricultural Economics* 85(2):396–405.

Arentze, T., A. Borgers, H. Timmermans, and R. DelMistro. 2003. "Transport stated choice responses: effects of task complexity, presentation format and literacy." *Transportation Research Part E: Logistics and Transportation Review* 39(3):229–244.

Audette, R. 2016. Vermont's GMO Labeling Law – Taking on the Natural Claim. VTDigger.org. Available at: https://vtdigger.org/2016/06/07/vermonts-gmo-labeling-law-is-the-term-natural-confusing/.

Balcombe, K., M. Burton, and D. Rigby. 2011. "Skew and attribute non-attendance within the Bayesian mixed logit model." *Journal of Environmental Economics and Management* 62(3):446–461.

Binswanger, H.P. 1980. "Attitudes toward Risk: Experimental Measurement in Rural India."

American Journal of Agricultural Economics 62(3):395-407.

Booth, A., L. Cardona-Sosa, and P. Nolen. 2014. "Gender differences in risk aversion: Do single-sex environments affect their development?" *Journal of Economic Behavior & Organization* 99:126–154.

Rose, J.M., and Bliemer, M.C.J. 2009. "Constructing Efficient Choice Experimental Designs." *Transport Reviews* 29(5):587-617.

Breidert, C., M. Hahsler, and T. Reutterer. 2006. "A Review of Methods for Measuring Willingness to Pay." *Innovative Marketing* 2(4):8-32.

Caussade, S., J. de D. Ortúzar, L.I. Rizzi, and D.A. Hensher. 2005. "Assessing the influence of design dimensions on stated choice experiment estimates." *Transportation Research Part B: Methodological* 39(7):621–640.

Chen, H.Z., and S.R. Cosslett. 1998. "Environmental Quality Preference and Benefit Estimation in Multinomial Probit Models: A Simulation Approach." *American Journal of Agricultural Economics* 80(3):512–520.

Childers, T.L., and M.J. Houston. 1984. "Conditions for a Picture Superiority Effect on Consumer Memory." *Journal of Consumer Research* 11(2):643-654.

ChoiceMetrics. 2012. *Ngene 1.1.1 User Manual & Reference Guide*. Australia.

Consumer Reports National Research Center. 2015. Survey Research Report. Available at: http://www.consumerreports.org/content/dam/cro/magazine-articles/2016/March/Consumer_Reports_Natural_Food_Labels_Survey_2015.pdf

Daly, A., S. Hess, and G. de Jong. 2012. "Calculating errors for measures derived from choice modelling estimates." *Transportation Research Part B: Methodological* 46(2):333–341.

Domínguez-Torreiro, M. 2014. "Alternative experimental design paradigms in choice experiments and their effects on consumer demand estimates for beef from

endangered local cattle breeds: An empirical test." *Food Quality and Preference* 35:15–23.

Econometric Software, Inc. 2012. *NLOGIT: Version 5*. Plainview NY: Econometric Software, Inc.

Fehr-Duda, H., M. de Gennaro, and R. Schubert. 2006. "Gender, Financial Risk, and Probability Weights." *Theory and Decision* 60(2–3):283–313.

Fitzsimons, G.J., J.W. Hutchinson, P. Williams, J.W. Alba, T.L. Chartrand, J. Huber, F.R. Kardes, G. Menon, P. Raghubir, J.E. Russo, B. Shiv, N.T. Tavassoli. 2002. "Non-Conscious Influences in Consumer Choice." *Marketing Letters* 13(3):269-279.

Ghosh, S., B. Maitra, and S.S. Das. 2013. "Effect of Distributional Assumption of Random Parameters of Mixed Logit Model on Willingness-to-Pay Values." *Procedia - Social and Behavioral Sciences* 104:601–610.

Gifford, K., and J.C. Bernard. 2011. "The effect of information on consumers' willingness to pay for natural and organic chicken: Information effect on consumer's WTP for chicken." *International Journal of Consumer Studies* 35(3):282–289.

Gracia, A., J. Barreiro-Hurlé, and B.L.- Galán. 2014. "Are Local and Organic Claims Complements or Substitutes? A Consumer Preferences Study for Eggs." *Journal of Agricultural Economics* 65(1):49–67.

Grannis, J., N.H. Hooker, and D. Thilmany. 2000. "Consumer Preferences for Specific Attributes in Natural Beef Products." Paper Presented at the 2002 WAEA Annual Meetings, Vancouver British Columbia, June 29-July 1.

Hensher, D.A. 2006. "How do respondents process stated choice experiments? Attribute consideration under varying information load." *Journal of Applied Econometrics* 21(6):861–878.

Hensher, D.A., J.M. Rose, and W.H. Greene. 2012. "Inferring attribute non-attendance from

stated choice data: implications for willingness to pay estimates and a warning for stated choice experiment design." *Transportation* 39(2):235–245.

Hess, S., and D.A. Hensher. 2013. "Making use of respondent reported processing information to understand attribute importance: a latent variable scaling approach." *Transportation* 40(2):397–412.

Holbrook, M.B., and W.L. Moore. 1981. "Feature Interactions in Consumer Judgments of Verbal versus Pictorial Presentations." *Journal of Consumer Research* 8(1):103-113.

Hole, A.R., J.R. Kolstad, and D. Gyrd-Hansen. 2013. "Inferred vs. stated attribute non-attendance in choice experiments: A study of doctors' prescription behaviour." *Journal of Economic Behavior & Organization* 96:21–31.

IBM Corp. 2013. *IBM SPSS Statistics for Windows, Version 22.0*. Armonk NY: IBM Corp.

Jansen, S., H. Boumeester, H. Coolen, R. Goetgeluk, and E. Molin. 2009. "The impact of including images in a conjoint measurement task: evidence from two small-scale studies." *Journal of Housing and the Built Environment* 24(3):271–297.

Kragt, M.E. 2013. "Stated and Inferred Attribute Attendance Models: A Comparison with Environmental Choice Experiments." *Journal of Agricultural Economics* 64(3):719–736.

Lancaster, K.J. 1966. "A New Approach to Consumer Theory." *Journal of Political Economy* 74(2):132–157.

Layton, D.F. 2000. "Random Coefficient Models for Stated Preference Surveys." *Journal of Environmental Economics and Management* 40(1):21–36.

Layton, D.F., and G. Brown. 2000. "Heterogeneous Preferences Regarding Global Climate Change." *Review of Economics and Statistics* 82(4):616–624.

Lewis, K.E., C. Grebitus, and R.M. Nayga. 2016a. "The Importance of taste in experimental auctions: consumers' valuation of calorie and sweetener labeling of soft drinks."

Agricultural Economics 47(1):47–57.

———. 2016b. “The Impact of Brand and Attention on Consumers’ Willingness to Pay: Evidence from an Eye Tracking Experiment: THE IMPACT OF BRAND AND ATTENTION ON CONSUMERS’ WTP.” *Canadian Journal of Agricultural Economics/Revue canadienne d’agroeconomie* 64(4):753–777.

Lewis, K.E., C. Grebitus, G. Colson, and W. Hu. 2016. “German and British Consumer Willingness to Pay for Beef Labeled with Food Safety Attributes.” *Journal of Agricultural Economics*. Available at: http://doi.wiley.com/10.1111/1477-9552.12187

Lim, K.H., W. Hu, L.J. Maynard, and E. Goddard. 2013. “U.S. Consumers’ Preference and Willingness to Pay for Country-of-Origin-Labeled Beef Steak and Food Safety Enhancements.” *Canadian Journal of Agricultural Economics/Revue canadienne d’agroeconomie* 61(1):93–118.

Loureiro, M.L., and W.J. Umberger. 2007. “A choice experiment model for beef: What US consumer responses tell us about relative preferences for food safety, country-of-origin labeling and traceability.” *Food Policy* 32(4):496–514.

Lusk, J.L., and T.C. Schroeder. 2004. “Are Choice Experiments Incentive Compatible? A Test with Quality Differentiated Beef Steaks.” *American Journal of Agricultural Economics* 86(2):467–482.

Lusk, J.L., J. Roosen, and J.A. Fox. 2003. “Demand for Beef from Cattle Administered Growth Hormones or Fed Genetically Modified Corn: A Comparison of Consumers in France, Germany, the United Kingdom, and the United States.” *American Journal of Agricultural Economics* 85(1):16–29.

Lusk, J.L., J.A. Fox, T.C. Schroeder, J. Mintert, and M. Koohmaraie. 2001. “In-Store Valuation of Steak Tenderness.” *American Journal of Agricultural Economics* 83(3):539–550.

MacInnis, D.J. and L.L. Price. 1987. The Role of Imagery in Information Processing: Review and Extensions." *Journal of Consumer Research* 13(4):473-491.

Mariel, P., M. Boeri, J. Meyerhoff, and D. Hoyos. 2012. "Dealing with Controversial and Non-Attended Attributes in Discrete Choice Experiments." Paper presented at the EAERE 19th Annual Conference, Prague Czech Republic, 27-30 June.

McFadden, D. 1980. "Econometric Models for Probabilistic Choice Among Products." *The Journal of Business* 53(S3):S13.

Meas, T., W. Hu, M.T. Batte, T.A. Woods, and S. Ernst. 2015. "Substitutes or Complements? Consumer Preference for Local and Organic Food Attributes." *American Journal of Agricultural Economics* 97(4):1044–1071.

Mehta, R., W.L. Moore, and T.M. Pavia. 1992. "An Examination of the Use of Unacceptable Levels in Conjoint Analysis." *Journal of Consumer Research* 19(3):470.

Mørkbak, M.R., T. Christensen, and D. Gyrd-Hansen. 2011. "Consumers' willingness to pay for safer meat depends on the risk reduction methods – A Danish case study on Salmonella risk in minced pork." *Food Control* 22(3–4):445–451.

Mueller Loose, S., A. Peschel, and C. Grebitus. 2013. "Quantifying effects of convenience and product packaging on consumer preferences and market share of seafood products: The case of oysters." *Food Quality and Preference* 28(2):492–504.

Nguyen, T.C., J. Robinson, J.A. Whitty, S. Kaneko, and T.C. Nguyen. 2015. "Attribute non-attendance in discrete choice experiments: A case study in a developing country." *Economic Analysis and Policy* 47:22–33.

Nicholson, W. 2004. *Intermediate microeconomics and its application* 9th ed. Mason, Ohio: Thomson/South-Western.

———. 2005. *Microeconomic theory: basic principles and extensions* 9th ed. Mason, Ohio: Thomson/South-Western.

Onken, K.A., J.C. Bernard, and J.D. Pesek Jr. 2011. "Comparing Willingness to Pay for Organic, Natural, Locally Grown, and State Marketing Program Promoted Foods in the Mid-Atlantic Region." *Agricultural and Resource Economics Review* 40(1):33-47.

Orzechowski M.A., T.A. Arentze, A.W.J. Borgers, and H.J.P. Timmermans. 2005. "Alternate methods of conjoint analysis for estimating housing preference functions: Effects of presentation style." *Journal of Housing and the Built Environment* 20(4):349–362.

Patterson, Z., J.M. Darbani, A. Rezaei, J. Zacharias, and A. Yazdizadeh. 2017. "Comparing text-only and virtual reality discrete choice experiments of neighbourhood choice." *Landscape and Urban Planning* 157:63–74.

Revelt, D., and K. Train. 1998. "Mixed Logit with Repeated Choices: Households' Choices of Appliance Efficiency Level." *Review of Economics and Statistics* 80(4):647–657.

Ro, T., N.S. Singhal, B.G. Breitmeyer, and J.O. Garcia. 2009. "Unconscious processing of color and form in metacontrast masking*." Perception & Psychophysics* 71(1):95–103.

Rock, A. 2015. "How Safe is your Beef?" *Consumer Reports*, October, pp. 26-33.

———. 2016. Peeling Back the 'Natural' Food Label. Consumer Reports. Available at: http://www.consumerreports.org/food-safety/peeling-back-the-natural-food-label/.

Rozin, P., C. Fischler, and C. Shields-Argelès. 2012. "European and American perspectives on the meaning of natural." *Appetite* 59(2):448–455.

Rozin, P., M. Spranca, Z. Krieger, R. Neuhaus, D. Surillo, A. Swerdlin, and K. Wood. 2004. "Preference for natural: instrumental and ideational/moral motivations, and the contrast between foods and medicines." *Appetite* 43(2):147–154.

Sanjuán, A.I., H. Resano, G. Zeballos, P. Sans, N. Panella-Riera, M.M. Campo, S. Khliji, A. Guerrero, M.A. Oliver, C. Sañudo, and P. Santolaria. 2012. "Consumers' willingness to pay for beef direct sales. A regional comparison across the Pyrenees." *Appetite* 58(3):1118–1127.

Scarpa, R., M. Thiene, D.A. Hensher. 2010. "Monitoring Choice Task Attribute Attendance in Nonmarket Valuation of Multiple Park Management Services: Does It Matter?" *Land Economics* 86(4):817-839.

Scarpa, R., T.J. Gilbride, D. Campbell, and D.A. Hensher. 2009. "Modelling attribute non-attendance in choice experiments for rural landscape valuation." *European Review of Agricultural Economics* 36(2):151–174.

Sparling, E., J. Grannis, and D.D. Thilmany. 2002. "Regional Demand for Natural Beef Products: Urban vs. Rural Willingness to Pay and Target Consumers." Paper Presented at the WAEA Annual Meeting, Long Beach CA, 28-31 July.

StataCorp. 2013. *Stata Statistical Software: Release 13*. College Station TX: StataCorp LP.

Tonsor, G.T., and R.S. Shupp. 2011. "Cheap Talk Scripts and Online Choice Experiments: 'Looking Beyond the Mean.'" *American Journal of Agricultural Economics* 93(4):1015–1031.

Tonsor, G.T., T.C. Schroeder, J.A. Fox, and A. Biere. 2005. "European Preferences for Beef Steak Attributes." *Journal of Agricultura1 and Resource Economics* 30(2):367-380.

Tonsor, G.T., T.C. Schroeder, J.M.E. Pennings, and J. Mintert. 2009. "Consumer Valuations of Beef Steak Food Safety Enhancement in Canada, Japan, Mexico, and the United States." *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie* 57(3):395–416.

Train, K. 1998. "Recreational Demand Models with Taste Differences Over People." *Land Economics* 74(2):230-239.

———. 2000. "Halton Sequences for Mixed Logit." Dept. of Econ., University of California, Berkeley. Available at: http://escholarship.org/uc/item/6zs694tp.

———. 2009. *Discrete choice methods with simulation*, 2nd. ed. New York: Cambridge University Press.

U.S. Census Bureau. 2011. Age and Sex Composition: 2011. Available at: https://www.census.gov/population/age/publications/.

———. 2016. Quick facts. Available at: https://www.census.gov/quickfacts/table/PST045215/00.

U.S. Department of Agriculture, Agricultural Marketing Service. 2016. Retail Reports. Available at: https://www.ams.usda.gov/market-news/retail.

U.S. Department of Agriculture, Economic Research Service. 2016. New Products. Available at: https://www.ers.usda.gov/topics/food-markets-prices/processing-marketing/new-products/.

U.S. Department of Agriculture, Food Safety and Inspection Service. 2015a. Meat and Poultry labeling terms. Available at: http://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/food-labeling/meat-and-poultry-labeling-terms/meat-and-poultry-labeling-terms/!ut/p/a1/jZDNCsIwEISfxQcI2doqepSCtFVbRNSYi6ya1kCblCYq-vRaREHxp7unZb5hh6GcMsoVHmWGVmqFeX3z7hqm0HX6PkRJ3xlCGC-mycj3oTfr3IDVDyB2G_q_zAD--aMGD9rVxJ9klJdo90SqVFOWCUtQmZOoDGWp1jtiMBX2TFLcWmL2QtiHkONG5FJllBUCa9eOlPqQ2-r8lIgVVWH-A0vKX-OCc9swdmdeEMUuJN478KHPO_C9sLKYs8t4EIAMW1dofMrM/#top.

U.S. Department of Agriculture. 2015b. Organic Agriculture. Available at: http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=organic-agriculture.html.

U.S. Federal Register. 2016. Use of the Term “Natural” in the Labeling of Human Food Products; Request for Information and Comments. Available at:

https://www.federalregister.gov/documents/2015/11/12/2015-28779/use-of-the-term-natural-in-the-labeling-of-human-food-products-request-for-information-and-comments.

Umberger, W.J., D.M. Feuz, C.R. Calkins, and K. Killinger-Mann. 2002. "U.S. consumer preference and willingness-to-pay for domestic corn-fed beef versus international grass-fed beef measured through an experimental auction." *Agribusiness* 18(4):491–504.

Van Loo, E.J., V. Caputo, R.M. Nayga, J.-F. Meullenet, and S.C. Ricke. 2011. "Consumers' willingness to pay for organic chicken breast: Evidence from choice experiment." *Food Quality and Preference* 22(7):603–613.

Weller, P., M. Oehlmann, P. Mariel, and J. Meyerhoff. 2014. "Stated and inferred attribute non-attendance in a design of designs approach." *Journal of Choice Modelling* 11:43–56.

Xue, H., D. Mainville, W. You, and R.M. Nayga. 2010. "Consumer preferences and willingness to pay for grass-fed beef: Empirical evidence from in-store experiments." *Food Quality and Preference* 21(7):857–866.

Yao, R.T., R. Scarpa, J.M. Rose, and J.A. Turner. 2015. "Experimental Design Criteria and Their Behavioural Efficiency: An Evaluation in the Field." *Environmental and Resource Economics* 62(3):433–455.

Ziehl, A., D.D. Thilmany, and W. Umberger. 2005. "A Cluster Analysis of Natural Beef Product Consumers by Shopping Behavior, Importance of Production Attributes, and Demographics." *Journal of Food Distribution Research* 36(1):209-217.

APPENDIX

Participant Information. (All the participants saw the participant information.)

Research Investigators:

Dr. Karen E. Lewis, Assistant Professor (klewis39@utk.edu)

Konstantinos Syrengelas, Graduate Research Assistant (ksyrenge@vols.utk.edu)

This study is being conducted by researchers from the University of Tennessee. The purpose is to identify how consumers make purchasing decisions with respect to beef steaks. It is hoped that by studying factors that are related to consumers' purchase decisions, knowledge can be gained on the public perception and status of such products. Results from the study could be used to inform policy-makers on views related to beef, which may ultimately benefit consumers, such as yourself.

You are being asked, as a consumer of beef, to participate in a research project through taking an online survey. We expect the online survey might take about 20 minutes of your time. You can be assured that your answers are confidential and will only be released as summaries. Your name will not be collected as part of your survey response and thus can never be associated with the data. Your responses will not be individually identified or publicized. Your answers are strictly voluntary. You are free to withdraw from the survey at any time or leave any questions unanswered. You must be 18 or older to participate.

The submitted data will be used for statistical purposes only and statistical results will be reported in research papers, technical reports and academic journals. In the future, the statistical data may be used for subsequent research in the area of consumer preferences, as a basis for comparison to future results, and as an example in teaching. There are no anticipated

risks to participating in this study. Benefits include a broader understanding of consumer preferences of beef that can contribute to the formation of public policy.

If you have questions at any time about the study or the procedures, (or you experience adverse effects as a result of participating in this study), you may contact the researcher, Dr. Karen Lewis, at klewis39@utk.edu, and (865) 974-7465. If you have questions about your rights as a participant, you may contact the University of Tennessee Institutional Review Board Compliance Officer at utkirb@utk.edu or (865) 974-7697. Completing the survey (questionnaire) and clicking the button to continue will be considered your consent to participate.

Icebreaker Questions. (All the responders saw the icebreaker questions.)

Do you eat beef? Yes _____ No _____

If "No" is chosen, then the survey is terminated.

What is your gender? Male _____ Female _____

How old are you? _____

If less than 18 years old, then the survey is terminated.

Are you responsible for food shopping in your household?

Always _____ Sometimes _____ Never _____

Cheap Talk & Natural and Organic definitions. (Appeared to: Text and Information-Visual Treatments)

On the following screen you will see the United States Department of Agriculture (USDA) definition for the label "Natural" on beef products. The USDA is the government agency that defines how the label "Natural" is allowed to be used on meat products.

USDA definition of the label Natural

A product containing no artificial ingredient or added color and is only minimally processed. Minimal processing means that the product was processed in a manner that does not fundamentally alter the product. The label must include a statement explaining the meaning of the term natural (such as "no artificial ingredients; minimally processed").

On the following screen you will see the United States Department of Agriculture (USDA) definition of the label "Organic". The USDA is the government agency that defines how the label "Organic" is allowed to be used on meat products.

USDA definition of the label Organic

Organic agriculture produces products using methods that preserve the environment and avoid most synthetic materials, such as pesticides and antibiotics. USDA organic standards describe how farmers grow crops and raise livestock and which materials they may use.

Organic farmers, ranchers, and food processors follow a defined set of standards to produce organic food and fiber. Congress described general organic principles in the Organic Foods Production Act, and the USDA defines specific organic standards. These standards cover the

product from farm to table, including soil and water quality, pest control, livestock practices, and rules for food additives.

Organic farms and processors:

Preserve natural resources and biodiversity

Support animal health and welfare

Provide access to the outdoors so that animals can exercise their natural behaviors

Only use approved materials

Do not use genetically modified ingredients

Receive annual onsite inspections

Separate organic food from non-organic food

Now, please take time to carefully read the following instructions before proceeding. Imagine you are in your usual grocery store and considering the purchase of boneless ribeye beef steaks. In the following you will see 12 choice scenarios (decision situations). Each decision situation includes a description of different product features. All features of the product in each decision situation are identical except that they vary in their **price, the type of feed used, the type of production practices, and natural labeling.** In each decision situation, please indicate the decision you would make based on your own preferences. Specifically, in each choice scenario that will be visible to you on the screen, you are asked which product you would CHOOSE to purchase. Alternatively, you may choose NOT TO PURCHASE either product. Please carefully examine each option before you make a decision and select the decision that you would make based on your own preferences.

IMPORTANT

o CHOOSE one of the options on each page. Or you may choose NOT TO PURCHASE

either product.

o Assume that the options on each page are the only ones available.

o Do not compare options on different pages.

You might see a few options that may seem counter-intuitive (e.g., a lower price but a higher quality in your personal opinion). Be assured that this is not an error but part of the design of the survey. Simply choose the option in each choice scenario that you prefer most, based on its characteristics.

The experience from previous similar surveys is that people often state a higher willingness to pay than what one is actually willing to pay for the good. For instance, a recent study asked people whether they would purchase a new food product similar to the one you are about to be asked about. This purchase was hypothetical (as it will be for you) in that no one actually had to pay money when they indicated a willingness to purchase. In the study, 80% of people said they would buy the new product, but when a grocery store actually stocked the product, only 43% of people actually bought the new product when they had to pay for it. This difference (43% vs. 80%) is what we refer to as hypothetical bias.

Accordingly, it is important that you make each of your upcoming selections like you would if you were actually facing these exact choices in a store, i.e., noting that buying a product means that you would have less money available for other purchases.

Cheap Talk only. (Appeared to Control Treatment)

Now, please take time to carefully read the following instructions before proceeding. Imagine you are in your usual grocery store and considering the purchase of boneless ribeye beef steaks. In the following you will see 12 choice scenarios (decision situations). Each decision situation includes a description of different product features. All features of the product in each decision situation are identical except that they vary in their **price, the type of feed used, the type of production practices, and natural labeling.** In each decision situation, please indicate the decision you would make based on your own preferences. Specifically, in each choice scenario that will be visible to you on the screen, you are asked which product you would CHOOSE to purchase. Alternatively, you may choose NOT TO PURCHASE either product. Please carefully examine each option before you make a decision and select the decision that you would make based on your own preferences.

IMPORTANT

o CHOOSE one of the options on each page. Or you may choose NOT TO PURCHASE either product.

o Assume that the options on each page are the only ones available.

o Do not compare options on different pages.

You might see a few options that may seem counter-intuitive (e.g., a lower price but a higher quality in your personal opinion). Be assured that this is not an error but part of the design of the survey. Simply choose the option in each choice scenario that you prefer most, based on its characteristics.

The experience from previous similar surveys is that people often state a higher willingness

to pay than what one is actually willing to pay for the good. For instance, a recent study asked people whether they would purchase a new food product similar to the one you are about to be asked about. This purchase was hypothetical (as it will be for you) in that no one actually had to pay money when they indicated a willingness to purchase. In the study, 80% of people said they would buy the new product, but when a grocery store actually stocked the product, only 43% of people actually bought the new product when they had to pay for it. This difference (43% vs. 80%) is what we refer to as hypothetical bias.

Accordingly, it is important that you make each of your upcoming selections like you would if you were actually facing these exact choices in a store, i.e., noting that buying a product means that you would have less money available for other purchases.

Choice Experiment. (Examples of choice sets follow, as appeared in Control and Information-Visual Treatments. In total, there were 24 choice sets, divided to two blocks of 12 questions each)

Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.		
		___
		___
Neither		___

Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.		
		___
		___
Neither		___

Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.		
		___
		___
Neither		___

Choice Experiment. (Examples of choice sets follow, as appeared in the Text Treatment.

There were 24 choice sets in total, divided to two blocks of 24 questions each)

Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.		
Alternative A	**Alternative B**	
4.99	6.99	Neither
	Grass-fed	
	No genetically modified feed	
	Natural (minimally processed, no artificial ingredients)	
___	___	___

Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.		
Alternative A	**Alternative B**	
8.99	10.99	Neither
	Grass-fed	
No growth hormones		
Natural (minimally processed, no artificial ingredients)		
___	___	___

Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.		
Alternative A	**Alternative B**	
10.99	4.99	Neither
Grass-fed	Corn-fed	
No genetically modified feed	No antibiotics	
	Natural (minimally processed, no artificial ingredients)	
___	___	___

Demographics and other survey questions. (All the survey participants saw the following questions.)

When making your choices for the ribeye beef steaks, which of the attributes factored into your decision?

Price Yes _____ No _____

Natural Labeling Yes _____ No _____

Type of feed (e.g., grass-fed, corn-fed) Yes _____ No _____

Type of process (no growth hormones, no antibiotics, no genetically modified feed)

Yes _____ No _____

For the following questions, please recall that the USDA definition of the label Natural is the following:

A product containing no artificial ingredient or added color and is only minimally processed. Minimal processing means that the product was processed in a manner that does not fundamentally alter the product. The label must include a statement explaining the meaning of the term natural (such as "no artificial ingredients; minimally processed").

Please also recall that the USDA definition of the label Organic is the following:

Organic agriculture produces products using methods that preserve the environment and avoid most synthetic materials, such as pesticides and antibiotics. USDA organic standards describe how farmers grow crops and raise livestock and which materials they may use. Organic farmers, ranchers, and food processors follow a defined set of standards to produce organic food and fiber. Congress described general organic principles in the Organic Foods Production Act, and the USDA defines specific organic standards. These standards cover the product from farm to table, including soil and water quality, pest control, livestock practices,

and rules for food additives.

Organic farms and processors:

Preserve natural resources and biodiversity

Support animal health and welfare

Provide access to the outdoors so that animals can exercise their natural behaviors

Only use approved materials

Do not use genetically modified ingredients

Receive annual onsite inspections

Separate organic food from non-organic food

Now, please answer the following questions:

Please indicate how familiar you were with the USDA definition of Organic <u>prior to this survey</u> on a scale from 1=not at all familiar to 5=extremely familiar.				
not at all familiar 1	2	3	4	extremely familiar 5

Please indicate how familiar you were with the USDA definition of Natural <u>prior to this survey</u> on a scale from 1=not at all familiar to 5=extremely familiar.				
not at all familiar 1	2	3	4	extremely familiar 5

Do you think the current USDA definition of Organic is sufficient on a scale from 1=not at all sufficient to 5=extremely sufficient?				
not at all sufficient 1	2	3	4	extremely sufficient 5

Do you think the current USDA definition of Natural is sufficient on a scale from 1=not at all sufficient to 5=extremely sufficient?				
not at all sufficient 1	2	3	4	extremely sufficient 5

This is the last part of the survey. We would like to ask you for some background information about you, as it is a critical part of our analysis. This is an anonymous survey and your name is not linked to the responses. In addition, all of this information will be treated as confidential. Results of the survey will only be used in aggregate form and only for research purposes.

For the following questions, check or fill in the answers which best describe you.

What is your educational background? Mark the box next to the highest level of education you have completed.

High School Diploma	_____	Bachelor's Degree	_____
Some college	_____	Master's Degree	_____
Technical School Diploma	_____	Doctorate	_____
Associate's Degree	_____	Other:	_____

Are you a U.S. citizen? Yes _____ No _____

What is your race?

White	_____	African American	_____
Hispanic	_____	Asian/Pacific Islander	_____
Native American	_____	Other	_____

How many individuals live in your household, including yourself? If you are a student, do not include your parents or roommates? _____

Are children under the age of 12 present in the household? Yes _____ No _____

Are you a student? Yes, undergraduate _____ Yes, graduate _____ No _____

Do you consider your roots to be urban or rural? Rural _____ Urban _____

Do you live today in an urban or rural area? Rural _____ Urban _____

In general, do you get vaccinated against illnesses (e.g., polio, measles, flu)?

Yes _____ No_____

If you have children, do you get them vaccinated against illnesses (e.g., polio, measles, flu)?

Yes _____ No _____ I do not have children _____

Please indicate your approximate annual household income before taxes:

Less than $10,000	_____	$60,000 to $69,999	_____
$10,000 to $19,999	_____	$70,000 to $79,999	_____
$20,000 to $29,999	_____	$80,000 to $89,999	_____
$30,000 to $39,999	_____	$90,000 to $99,999	_____
$40,000 to $49,999	_____	$100, 000 to $149,999	_____
$50,000 to $59,999	_____	$150,000 or more	_____

Thank You!

If you have any comments regarding this survey, please enter them in the box.

VITA

Konstantinos Syrengelas was born in Tripolis, Arcadia, Greece, in August 08, 1991. He comes from Tripolis and Ioannina. He has a BSc from the Department of Agricultural Economics and Rural Development of the Agricultural University of Athens. He was ranked first graduate among the students that were admitted to the Department the same year with him and eight among eighty-three students that graduated the same year with him, regardless their admission year. In August 2015 he was admitted as graduate research assistant in the Department of Agricultural and Resource Economics of the University of Tennessee-Knoxville. He fulfilled his class requirements with A's in all the classes and he is expected to graduate in Spring 2017.