Impacts of Food Eco-Labels on Student Consumer Choices

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Preface

The purpose of this study was to investigate the ways in which university students interact with food eco-labels. I was interested in exploring this topic because I am passionate about the ways in which consumers impact sustainability at the production level within food systems. I felt that university students are an important demographic to include because they are both young and educated, two characteristics that I think could lead to more informed consumer behavior with regards to environmentalism. I hoped to see whether students in Boulder broadly share a concern for environmental issues and a hope to move toward a more sustainable future within food production. I chose to use food labels as this study's indicator of students' consumer interaction with green marketing because they are widely recognized and are also an integral method of green marketing. Overall, university students tend to be underrepresented in consumer studies and I hope this study is added to research related to environmentalism among students.

Acknowledgements

I would like to first thank my friend Eliza Fink, for the help she provided with organizing and analyzing my survey data in R Studio. I would also like to thank my advisors Dr. Peter Newton, Dale Miller, and Dr. Mark Meaney as well as my mom, Jo Aneshansley, for their help throughout this process and for reading this thesis paper countless times. I am extremely grateful for the UROP Grant I received that allowed me to invest more of my time into research for this thesis. And to everyone else in my life who has provided immense support this year, thank you so much and I look forward to sharing the results with you!

Abstract

Food eco-labels are a way to utilize consumer interactions within the market to create demand for more sustainable food production. This is important because climate change is drastically altering the way in which agriculture uses land and water resources, which means that more sustainable use of these and other resources must be developed quickly. There are, however, limitations to the extent to which consumers interact with food eco-labels and purchase the products that feature them with an example of this being the attitude-behavior gap, in which while consumers may place value on food eco-labels, their purchasing behavior does not reflect those values (Bray et. al, 2011). Student consumers are an often understudied demographic despite the large and unique populations they make up in the places where universities and colleges exist. This study examined the ways in which student consumers are influenced by food labels when purchasing food products. Through the use of a survey, quantitative and qualitative data was collected and analyzed in R Studio using a logistic regression model. The main findings were that although perceived valuation was the primary factor in consumers' purchasing behavior, this was limited by consumers' willingness to pay more for food labels which was dependent on their level of food label knowledge and financial security. These findings are representative of a complex argument that student consumers can behave differently from non-student populations of consumers. This study suggests that a high valuation of food eco-labels does in fact correspond to students purchasing those labels more frequently, which may suggest that the attitude-behavior gap is smaller among student populations than among other consumers. This study has implications for further research, which could illustrate more specific ways for how to market eco-labels toward student consumers and increase demand at the food production level for sustainability to create positive environmental change.

Introduction

This research examines the factors that influence food choice decision-making among students attending the University of Colorado Boulder. It explores perceptions and behaviors surrounding food labels such as USDA Organic, Non-GMO, and Local to examine factors that influence student food choices. It also analyzes whether these consumer choices are mediated by knowledge about these labels, financial insecurity, social pressures, or some combination of these factors. There is existing research on consumer choices related to food labels and this study adds to that existing research by providing a case study that is specific to student populations. Overall, this project is a case study of students at the University of Colorado Boulder through an extensive analysis of food labels and their influences on university student consumer choices. This study is centered around the following research questions: Do students perceive value in food eco-labels; how do those eco-labels influence their consumer purchasing behavior; and what factors influence students' perceived value of food labels and subsequent purchasing behavior?

Background and Review of Literature

One of the major global sustainability challenges is that of how to feed nearly 10 billion people in ways that minimize environmental harms. By the year 2050, there will be approximately 9.7 billion people on this planet, which will place considerable pressure on food and water systems globally (Godfray et. al, 2010). Three related challenges need to be addressed: to meet the food demands of a growing population, to make the production of food more environmentally sustainable, and to address global food distribution and scarcity (Godfray & Garnett, 2014). These challenges represent an extremely complex network of intersecting arenas

that all play a role in global food systems. Strategies for enhancing sustainability within the agricultural sector include improving crop varieties through genetic selection, improving soil structure, and increasing the efficiency of agricultural land through precision farming (Leaver, 2011). Food system challenges are further exacerbated by the worsening impacts of climate change, the effects of which can be seen on land and water resources as well as extreme weather events (Backlund et. al, 2008). Most land available for agriculture on the planet is already being used for food production, and it will be extremely difficult and/or environmentally costly to develop more land for agricultural purposes (Ronald, 2011). Competition for water resources will be particularly crucial in the coming decades for agriculture as land, water, energy, and mineral sectors compete for resources (Godfray & Garnett, 2014). There are three approaches that address the impending global food system crisis by looking at it via the lens of a production, consumption, or socio-economic crisis. Within a production lens, food systems are assessed based on improving efficiency. A consumption lens determines the demand for how food is produced. Finally, viewing these issues from a socio-economic perspective in which changes must occur in how food is distributed and managed (Garnett, 2013). While all of these perspectives are important to keep in mind when creating policy change, this study examines approaches to this food system crisis through solely a consumption lens and provides further clarity on consumption systems in play today that are working toward building higher demand for sustainable food products at the production level in agriculture.

Many solutions have been proposed and developed in order to create more sustainable agricultural systems of food production. One of these solutions is to produce higher yields and create more efficient production on the land that is already available for agriculture. There are broad solutions focused on water use, land use, food waste, and distribution. Within water use,

more sustainable methods of farming include using more efficient and precise irrigation technology to minimize the water used in agriculture to only be what is necessary for maximum plant productivity and yield (Chartzoulakisa & Bertaki, 2015).Within land use practices, solutions that move toward higher levels of sustainability include encouraging a high level of biodiversity among both crops and the surrounding landscape (Thrupp, 2000). This contrasts with the highly efficient monocropping large-scale agricultural systems that exist in countries like the United States. Monocropping, while efficient, often exposes crops to disease and other issues more frequently than in a biodiverse or intercropping agricultural system (Jacques & Jacques, 2012). Other solutions address food waste at the production level, which is characteristic of developing countries with inadequate transportation and storage facilities and infrastructure. Food waste is also managed at the post-consumer level, which is more characteristic of developed countries like the United States in which there is a tendency for overconsumption of food products which leads to food waste (Aschemann-Witzel et. al, 2015). These are all broad solutions that address the major changes to be made within the agricultural sector to begin moving toward a solution for global sustainable agriculture. These all directly address issues by presenting more efficient methods of farming or distributing food. Indirect solutions that work toward sustainability in the agricultural production of food products that this study focuses on is that of developing more consumer awareness of sustainability issues within food production. On a small scale, the behavior of individual consumers can be utilized in a variety of ways to further these large-scale goals of sustainability. For instance, within the larger solution for food waste, individual consumers can be influenced to purchase less food but typically only when those choices are influenced by multiple actors along the supply chain (Rohm et. al, 2017). In another area of sustainability within agriculture, sustainable land use can

be influenced by individual consumer action and can be seen through a variety of consumer behavioral approaches, including eco-labels. However, this approach tends to appeal to a specific demographic of "ethical consumer", described by Vermeir and Verbeke as: ". . . sustainable food markets remain niche markets, attracting consumers with a specific profile. In general, the ethical consumer is a middle-aged person with a higher income, who is above-average educated, with a prestigious occupation and who is well-informed" (Vermeir & Verbeke, p. 171, 2006). Overall, the use of consumer action to create demand for sustainable practices at the production level is the area of solutions focused on sustainability that will provide the necessary catalyst for sustainable change in agricultural food production.

More sustainable food systems can be developed through policies, technologies, individual consumer behavioral change, and also through voluntary sustainability programs. "Green marketing" strategies promote positive environmental impacts in using those products. These have been implemented as a method of involving the individual consumer in the push for global sustainable reform within food systems (Dangelico & Vocalelli, 2017). Consumers are becoming more conscious of the ways in which they have an impact on the environment meaning that food marketing has begun to reflect this ideology (Polonsky, 1994). While the food marketing and production process involves many actors, consumers have a strong influence and role in determining the demand for certain products. Consumer food choice is a way for consumers to create an impact in the demand for sustainable food products (Grunert, 2011). There has been an increase in public awareness about environmental issues, sustainable food production is in higher demand, resulting in the concept of green marketing (Cherian & Jacob, 2012). This is a method of marketing that businesses entities utilize to promote environmentally

friendly or sustainable practices (Cherian & Jacob, 2012). Green marketing tools include eco-labels, eco-branding, and environmental advertising (Rahbar & Wahid, 2011).

Eco-labels have emerged as one tool for incentivizing more sustainable production and consumption patterns. Eco-labels are the consumer-facing part of voluntary sustainability standard systems (Komives and Jackson 2014). Eco-labels are a subcategory of green marketing and are often a non-governmental method of marketing eco-friendly food and other products to consumers to appeal to people who wish to be more ethical consumers (Komives & Jackson, 2014). These types of labels have emerged as a method of both voluntary sustainability standard systems and green marketing within food systems, particularly those in developed countries like the United States or those of Western Europe where demand for eco-conscious consumerism is growing. Their efforts are intended to influence the ways in which farmers produce food, and often this is reflected in the eco-labels and what their values are. Food eco-labels are organized and operated by a variety of entities, including by federal, non-profit, or multi-stakeholder groups. One example is the Rainforest Alliance, which is operated by a non-profit organization and is an internationally recognized eco-label. Farms and businesses are able to go through an extensive audit and review process that evaluates whether they are in compliance with the Rainforest Alliance's standards. Once the farm is certified, they are able to put the label on their products for as long as the farm continues to maintain the standards (Rainforest, 2017). Another example of an eco-label is Fair Trade USA, a non-profit organization that focuses on farmer and other producer well-being and supporting their livelihoods. These examples serve to showcase the importance of the producer to consumer pipeline that occurs in the global distribution of food products. This is something that will only continue to grow in importance if food distribution is an area of sustainability that will need to be resolved in order to feed the growing population.

Eco-labels may be able to bridge the gap between how and where food is produced and the people who consume it.

The theory of change of eco-labels depends on the recognition of those labels by consumers, and their willingness to pay for the sustainability messages that they convey. There have been several success stories in eco-labeling over the last several decades in particular, such as with the Fair Trade example above (Takahashi & Yasuyuki, 2017; Rueda et. al, 2015; Ibanez & Blackman, 2016; Rueda & Lambin, 2013). This reflects a growing awareness and valuation of products with eco-labels attached. However, while consumers in developed countries may have a high valuation of eco-labels, their behavior often does not reflect that valuation. This is known as the attitude-behavior gap or ethical purchasing gap (Bray et. al, 2011). Despite a growing awareness and high level of demand for environmentally sustainable products, many people still will not purchase the products that are offered via green marketing strategies. In a study done in Europe, researchers found that, "sustainability labels currently do not play a major role in consumers' food choices, and future use of these labels will depend on the extent to which consumers' general concern about sustainability can be turned into actual behaviour," (Grunert et. al, 2014). Food eco-labeling does not always play a role in general consumption behavior, despite its efforts to encourage sustainability in food choices (Grunert et. al, 2014). This is an interesting issue that has affected the ways in which companies and organizations using green marketing approach their consumers. Green labels could do more to influence consumer behavior towards purchasing more eco-labeled food (Borin et. al, 2011Consumers may feel that there is a lack of communication about the purpose and effects of green or eco-labels, and positive messaging and marketing can help to alleviate this issue and encourage consumer purchasing (Borin et. al, 2011). Additionally, promoting positive cues within green marketing

can be a productive way to encourage consumer interaction with green labels (Cornelissen et. al, 2008). This takes a consumer's valuation of environmental sustainability and connects it to their behaviors. While food eco-labels are becoming more widely recognized and valued, there is a gap between consumer valuation and reflection of that valuation in consumption patterns that is likely limiting the effects of consumer demand on production level agricultural system sustainability.

Eco-labels have had mixed success and have been met by limitations and road-blocks. Eco-labels originated as a way to help consumers distinguish between sustainable and unsustainable choices, but in some cases they have just created further confusion for the consumer (Horne, 2009). "The main shortcomings of the eco-labels were found in their ambiguity about environmental themes, their failure to assure the buyer about the product's ecological impact, the insufficient information about producers' compliance, and presence of recommendations," (Van Amstel et. al, p. 263, 2008). This suggests that eco-labels have potential to be successful but that that success is determined by how clearly the sustainability of a product is communicated to the consumer directly. Eco-labeling can even be a source of distrust for consumers if not marketed effectively or with enough clarity (Moon et. al, 2017). So, some eco-labels have only further increased the confusion over sustainable consumerism. Eco-labels are designed to provide consumers with background information on how the food they are consuming is produced, and do this by eliminating some of the mystery behind the production of food from farm to supermarket (Rubik et. al, 2007). Eco-labels emerged as an attempt to clarify the methods by which food products are produced and marketed to consumers. However, instead of providing uniform clarity to this system, eco-labels instead have in some cases added another layer of confusion to the mix (Erskine & Collins, 1997). This perhaps has fed into the distrust

that already existed within much of the food industry. Most of the food that is consumed in the United States, for example, is purchased through grocery stores, which largely eliminates any direct connection between the food on the table and how or where it was grown. This has been a topic of much discussion, and much of what food eco-labels do is to bridge the gap between production and consumer.

Despite a growing body of knowledge about the potential for eco-labels to promote sustainable food systems, there is relatively little information known about how *students* in particular recognize or respond to different labels. Nor do we fully know what barriers, if any, exist that prevent students from engaging with those labels. While some research has examined student consumerism within food systems, little is known about how students respond to eco-labels and the systems they support. Students are of particular interest because university student populations are often highly educated, are less financially secure, and make up a large proportion of the population of cities and towns where universities exist. University student populations also demarcate an important demographic to study within consumption behavioral patterns because they are exploring their options and developing consumer habits (Marietta et. al, 1999) – the potential magnitude of impact that shifting a student towards more environmentally conscientious consumption is therefore greater than for other demographics. In a study that examined the influences of age, sex, and prior knowledge on nutrition, younger female students were more likely to use food labels to guide their choices than their male peers (Misra, 2007). This finding was confirmed by another study, in which female participants were more likely to use food labels to inform their consumer decision-making than male participants (Smith et. al, 2000). Yet another study found that student consumers were more likely to purchase food labels if they already had some prior knowledge of what they are, and that they could then use that

information to inform their decision (Van der Merwe et. al, 2010). Otherwise, students were not as likely to take the time to use the label to inform their consumption behavior, especially if the label was not clear in its messaging (Van der Merwe et. al, 2010). These studies all present different ways of approaching the implementation of food eco-labels to encourage sustainable behavior. However, these studies do not examine the influences of valuation, food label knowledge, and financial security as factors in how student consumers interact with food eco-labels. This study seeks to fill in this research gap with a case study of students at the University of Colorado Boulder and will examine the ways in which students respond to food labels in their consumer decision-making within food systems.

Therefore, this study is centered around the following research questions: Do students perceive value in food eco-labels; how do those eco-labels influence their consumer purchasing behavior; and what factors influence for students a perceived value of food labels and purchasing behavior? My hypotheses about the results of this study are: 1) that high food label knowledge would lead to a lower willingness to pay for food items labeled as USDA Organic, Non-GMO, and Local since there are many misconceptions associated with each of these labels that a higher level of food label knowledge would illuminate; 2) that financial insecurity would be associated with a lower willingness to pay higher prices for food items with these labels as they tend to cost more than similar food items without these labels; 3) that student food purchasing behavior is influenced by food labels and that those influences include varying levels of either food label knowledge, financial insecurity, or perceived valuation; and 4) that perceived valuation of food labels is independent of financial security.

Methodology

This study investigated the interactions between student consumers and three different food eco-labels, using University of Colorado Boulder students as the population case study. Below, I define and describe these eco-labels for the purposes of this study. I also describe the methods of data collection and analysis that were used.

Case-Study Labels

USDA Organic

The USDA Organic label originated in 1990 as a byproduct of the Organic Foods Production Act of 1990. This Act initiated a series of guidelines, regulations, and requirements for food to be labeled USDA Organic (Gold, 2020). These guidelines pertain to agricultural practices and are defined as follows, “The principal guidelines for organic production are to use materials and practices that enhance the ecological balance of natural systems and that integrate the parts of the farming system into an ecological whole,” (Gold, 2020). There are a set of four USDA Organic labels that are used to denote different characteristics about a food or food product. They are as follows: the *100% Organic* label is used for products that feature only USDA Organic certified ingredients, the *Organic* label is used for products that contain 95% or more USDA Organic certified ingredients, products with multiple ingredients cannot use the USDA Organic label but if they have at least 70% USDA Organic certified ingredients included they can use the *Made With Organics* label, and the final category includes products made with less than 70% certified USDA Organic ingredients and which cannot feature the USDA Organic label at all but which can in the ingredient list state which specific ingredients are USDA Organic and in what percentages (Labeling, 2012). For the purposes of this study, I will be

considering any of the above labels associated with USDA Organic. The creation of the USDA Organic label or seal created widespread demand in the United States for these products. The demand for USDA Organic labeled products in the United States has drastically increased to a point at which domestic producers of organic foods can no longer meet this demand. This has led to increased prices due to high production costs and limited supply (Greene, 2009). Despite the extent to which USDA Organic labels are defined and regulated, there are several misconceptions and consumer confusion on the perception of USDA Organic labels. USDA Organic products may be seen as overarchingly more sustainable and even healthier due to a lack of synthetic chemicals in their production and thus be seen as a solution to increasing global food demand (Meemken & Qaim, 2018). However, while organic practices are more environmentally friendly per unit of land, this is not the case per unit of output compared to conventional practices. Thus, organic agriculture alone is not likely to accommodate the growth of the human population and its food demand by 2050 (Meemkin & Qaim, 2018). Additionally, organic farms are significantly less productive in terms of land use than conventional farms and also have a much greater eutrophication potential than conventional farms due to the instability of manure nitrogen release (Ritchie, 2017).

Local.

Food is often labeled as being ‘local’ in grocery stores, and there is a fast growing market and demand for local food products, which is accounted for in the so-called “locavore movement” that has erupted in the last several years as a way to encourage consumers to purchase food that was grown in a close vicinity to their place of residence (Ruth-McSwain, 2012). Despite this interest among consumers, there is no defined or regulated set of standards in the United States used for Local labels. There is no definition of local food, or rather a wide

variation in the definitions. For example, some definitions focus on how far from a place of retail a food can be produced while still be labeled as Local, while other definitions focus on direct producer-to-consumer transactions (e.g., farmers' markets) (Zepeda & Li, 2006). Marketing strategies and the growth of the local food movement have been based on the argument that purchasing local food is a more sustainable practice when consuming food products as it tends to support small scale farmers and minimize any negative environmental externalities associated with the transportation and storing of food over long distances (Feldmann & Hamm, 2015). However, as with organic practices, Local labeled products have several misconceptions tied to them that can cause consumer confusion. Consumers have increased interest in where their food comes from and the concept of food miles, or the distance from a place of production and the consumer, suggests that it is more sustainable to purchase food that was grown closer to a consumer's place of residence. This has been shown to be a misrepresentation of the greenhouse gas emissions associated with both food production and transportation, with the majority of emissions occurring during the production phase rather than the transportation phase (Weber & Matthews, 2008). Only 11% of the total greenhouse gas emissions associated with food are from transportation of that food, with only 4% from transportation from producer to retailer (Desrochers & Shimizu, 2008). Thus, the extent to which Local labels reduce greenhouse gas emissions is minimal in addition to being misleading for consumers.

Non-GMO Project.

Genetically engineered food is the precise selection or manipulation of specific genetic traits that result in the presence of desired characteristics in the organism being modified. These genes can be manipulated and transferred between species, a process that creates transgenic organisms (Uzogara, 2000). Genetic modification thus occurs in crop and animal species when a

gene from an foreign source, such as bacteria or yeasts, is inserted into the genetic makeup of a given crop or animal species and creates a genetically modified organism (GMO) (Nsanzabera et. al, 2016). The Non-GMO project label was created between 2006 and 2007 as a joint venture between The Natural Grocery Company and The Big Carrot Natural Food Market. These two grocery chains worked to not only raise awareness of the use of GMOs in food products but also to form a voluntary third party accredited label to put on food products that undergo a verification process to determine whether the product contains genetically modified organisms (Roff, 2009). The way in which genetic engineering is accomplished is relatively unknown or unfamiliar technology for the average consumer, and as a result has fear-based stigma due to the perceived unfamiliarity and uncertainty associated with how genetic modification actually occurs and what the long term effects will be (Wynne, 2001). This means that because the biotechnology that creates GMOs is unfamiliar to the general public and the long term effects of genetic engineering on ecosystems are unknown, proponents of the Non-GMO label believe that GMOs are dangerous for the environment and people's health. On the other hand, there are many benefits to further developing genetic engineering technology. For instance, GMOs can reduce the amount of pesticides used in agriculture by developing genetic pest resistance, thus minimizing negative environmental externalities associated with conventional food production and its use of synthetic chemicals (Dannenberg, 2009). GMOs also have the potential to solve many production level issues and create crops that are faster growing, drought resistant, and more nutritious among many other beneficial effects (Uzogara, 2000). It has been argued that the labeling of GMOs only serves to better inform consumers about the products they consume (Huffman & McCluskey, 2014). However, this has led to people expressing loyalty in their consumption of Non-GMO products in response to this label becoming more recognizable in the

market (Leonhardt & Robinson, 2018). This is especially true because there is no “GMO” label alternative. Overall, the misconceptions regarding GMOs and the Non-GMO label have more to do with a lack of understanding about how genetic engineering technology works as well as how it will impact ecosystems in the long term.

These three labels were chosen as they represent different features of green marketing within widely recognized labels or movements in the United States today. As such, these labels are just a broad representation of several ways in which labels enter the market. USDA Organic is a federally operated and recognized label that has been in existence since the early 2000s. Local labels are a byproduct of the locavore movement that began primarily with farmers markets and has since spread to be used as a label within grocery stores. However, they are not regulated by an independent or federal entity and so are relatively undefined on a standardized level. The Non-GMO label was popularized by the Non-GMO Project organization which operates privately as a voluntary third party accreditor. The differences between these labels was important for this study because they represent a small selection of the variety of food eco- labels that are currently being used in green marketing. This study hopes to assess the influences of these different labels on how university students make consumer choices regarding food.

Data Collection

This research utilized the student population at the University of Colorado Boulder as a case study population within a larger body of research examining student consumerism as it relates to three food eco-labels, USDA Organic, Local, and Non-GMO. This study used a survey (Appendix 1) that was distributed among approximately 200 students currently enrolled at the University of Colorado Boulder. This survey collected information about: demographics,

knowledge and perception about food labels, and consumer spending habits. By utilizing a survey, both qualitative and quantitative data was received to further analyze.

The survey was distributed to students via email and social media outlets. There was a link to the survey and the results were anonymous (unless the participant chose to disclose their email address for a chance to win a gift card). The survey was created and then distributed through the Qualtrics program through the University of Colorado Boulder. It was available for a duration of 3 weeks, in May-June 2020. There was an incentive to fill out the survey as there were five $25 gift cards to the CU Bookstore available for those who participated. The email addresses entered into the survey were only used to contact the winners of these gift cards and were discarded immediately after they had been awarded.

This study and accompanying survey underwent an Institutional Review Board (IRB) report, in which it was approved by the IRB for use and distribution.

The survey itself features a variety of questions exploring the role of food label knowledge, perceived valuation, perceived social pressures, and financial security or insecurity on the purchasing behavior and willingness of students to buy food with these three eco-labels. Students' knowledge of these labels was assessed through a series of three questions for each of the three food labels, which was then compiled to create an overall score for each food label. Financial security was measured primarily through the amount of money a student allocated toward groceries each week. The questions from this survey are located in Appendix 1 of this thesis.

Data Analysis

The results of this survey were analyzed primarily quantitatively utilizing statistics software, with the help of the LISA drop-in consultants on campus and my colleague, Eliza Fink.

R Studio was used to run a logistic regression model in which the data associated with four hypotheses was coded and applied. Applicable data was used in this logistic regression for each hypothesis. Each of the four hypotheses had results for each of the three food eco-labels used in this study. As a result, 18 initial findings were analyzed using this model. These findings were then broken down into those determined to be the most influential toward answering the research question of what impacts student consumers' decision making with regards to purchasing food eco-labels.

Results

This study is centered around the following three research questions: Do students perceive value in food eco-labels; how do those eco-labels influence their consumer purchasing behavior; and what factors influence for students a perceived value of food labels and purchasing behavior? The following results are primarily tied to the four hypotheses presented in this study. Each hypothesis was assessed using a logistic regression model and graphs associated with the significant findings are located with their accompanying hypothesis. Additional graphs are located in Appendix 2. However, there are also additional findings that emerged from the data analysis.

A total of 205 people responded to the survey that was used in this study to gather data. Of the 158 people that responded to the question, "What gender do you identify as?", 31.7% responded *Male* and 65.8% responded *Female* with the remaining 2.5% having responded as *Other* or *Prefer not to respond.* Of the 175 people that responded to the question, "Race/Ethnic Identity", 81.1% of respondents were *White*, 1.1% responded *Black or African American*, 0.6%

responded *American Indian or Alaska Native,* 5.1% responded *Asian,* 1.1% responded *Native Hawaiian or Pacific Islander,* 8.0% responded *Hispanic/Latinx,* and 2.9% responded *Prefer not to respond.* Of the 157 people that responded to the question, "What year in school are you?", 9.6% responded *1st year*, 21.0% responded *2nd year*, 21.7% responded *3rd year*, 33.8% responded *4th year*, 5.1% responded *5th+ year*, and 8.9% responded *Graduate student*.

Hypothesis 1: Higher knowledge of eco-labels leads to a lower willingness to pay for food items labeled as USDA Organic, Non-GMO, and Local.

This stated that higher knowledge about the eco-labels would lead to a lower willingness to pay for food items labeled as USDA Organic, Non-GMO, and Local since there are many misconceptions associated with each of these labels that a higher level of knowledge would illuminate. The main input for this hypothesis was food eco-label knowledge. Students' overall scores were found from the three questions about each label and those overall scores were used in this model. The output for this hypothesis was willingness to pay, which was measured by asking respondents how much more likely they would be willing to pay for an item of food with the associated label if the unlabeled version were priced at $3.00. This was coded as *willing to pay (WTP)* if respondents answered between $0.50-$2.00+ and *not willing to pay (WTP)* if respondents answered between $0.00-$0.50 in order to maintain a binary output with the logistic regression model that was used.

USDA Organic

Students who scored higher on the food label knowledge questions were more likely to be willing to pay for USDA Organic food labels. That is, for this label there was a statistically significant positive relationship between the USDA Organic food label knowledge scores and

WTP (p = 0.0089). This can be seen in *Figure 1a* in which as knowledge scores improved, so did willingness to pay.

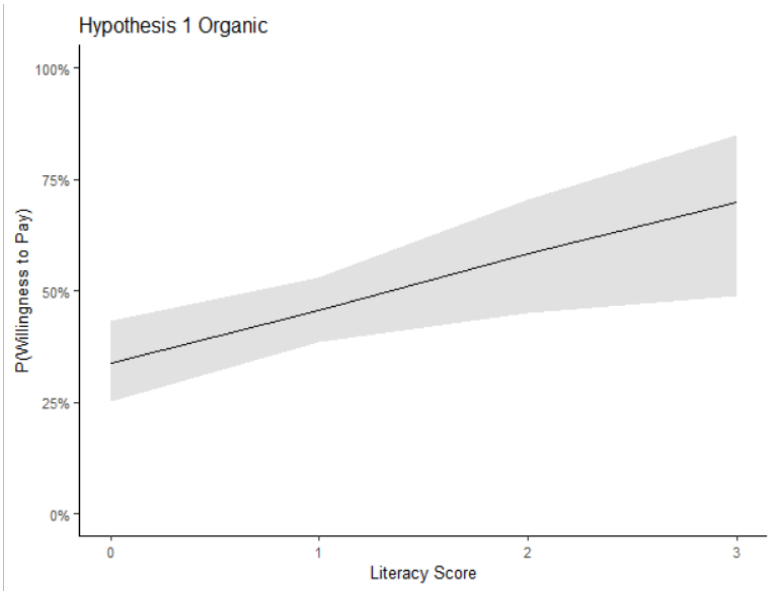
Local

Students who scored higher on the food label questions were more likely to be willing to pay for Local food labels. For this label, there was a highly statistically significant positive correlation between the Local food label knowledge scores and WTP (p = 0.000895). This can be seen in *Figure 1b* in which as knowledge scores increased, so did willingness to pay.

Non-GMO

Students who scored higher on the food label questions were no more or less likely to be willing to pay for Non-GMO food labels. For this label, there was no significant statistical relationship between the Non-GMO food label knowledge score and WTP for Non-GMO food labels (p = 0.404). The graph for this is included in Appendix 2.1.

a



b

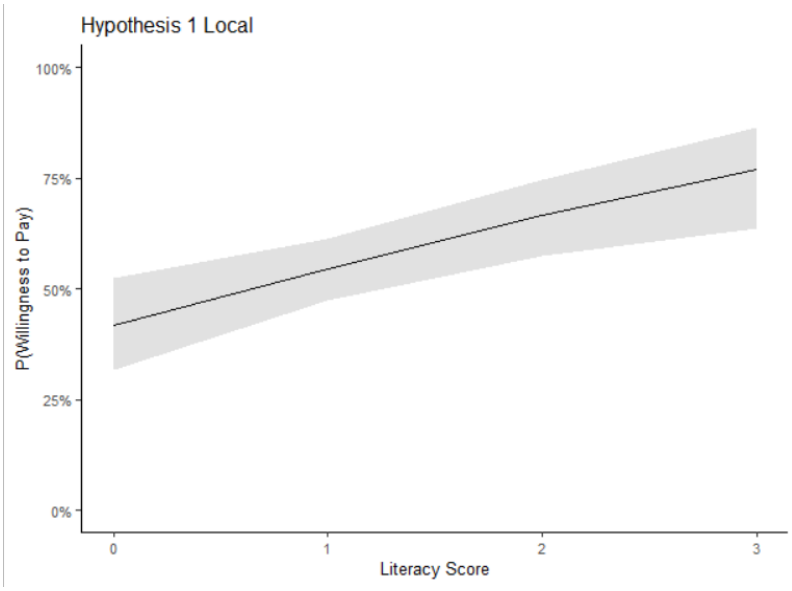


Figure 1. The relationships between knowledge scores (labeled here as 'literacy') and willingness to pay for each of the three labels used in this study. Because the findings for Non-GMO labels related to this hypothesis were not statistically significant, the associated graph for this is included in Appendix 2.1 rather than here.

Hypothesis 2: Financial insecurity is associated with a lower willingness to pay higher prices for food labels.

The main input for this was financial security, which was measured in the survey questions primarily by how much money a student allocated for grocery purchases each week. The output for this model was willingness to pay (WTP) which was coded as *willing to pay (WTP)* if respondents answered between $0.50 and $2.00+ and *not willing to pay (WTP)* if respondents answered between $0.00 and $0.50 in order to maintain a binary output with the logistic regression model that was used.

USDA Organic

The more money a student allocated each week for groceries the more likely they were willing to pay for USDA Organic food labels. For the model of this label, there was a significant statistical positive correlation between financial security and WTP for USDA Organic food labels ($p = 0.00152$). This relationship can be seen in *Figure 2a* in which as the amount of money a respondent allocates toward food each week increases, so does the likelihood that they are willing to pay for USDA Organic labels.

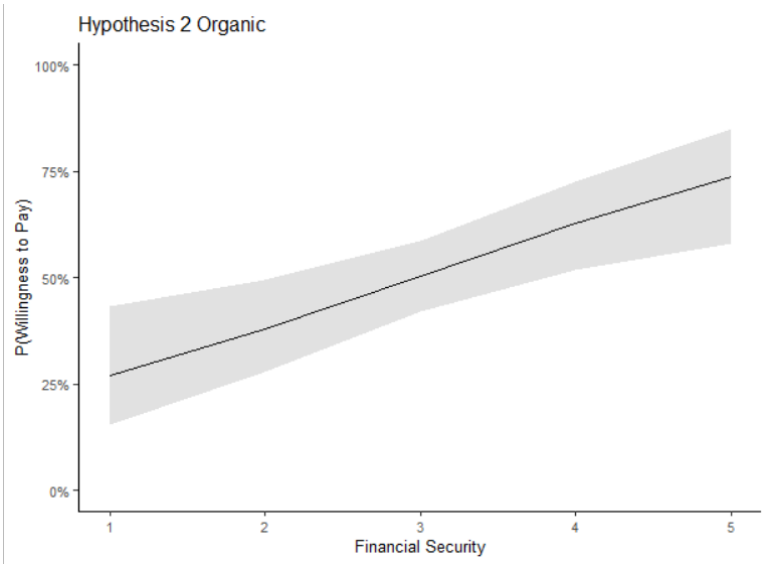
Local

The more money a student allocated each week for groceries, they were no more or less likely to be willing to pay for Local food labels. For the model of this label, there was no significant statistical relationship between financial security and willingness to pay for Local food labels ($p = 0.277$). The graph for this model is included in Appendix 2.2.

Non-GMO

The more money a student allocated each week for groceries, the more likely they were willing to pay for Non-GMO food labels. For the model of this label, there was a minimally significant positive correlation between just financial security and WTP ($p = 0.05547$). This relationship can be seen in *Figure 2b* in which more money allocated toward groceries led toward a higher likelihood that the respondent was willing to pay for Non-GMO labels.

a



b

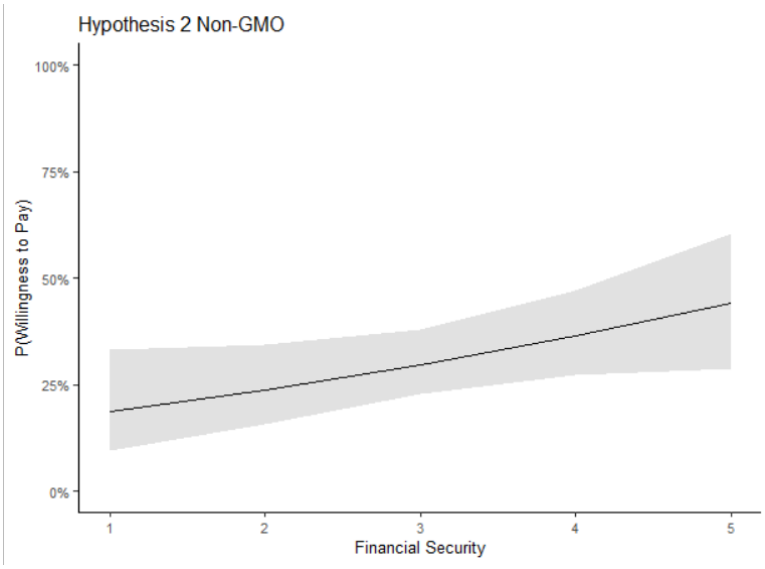


Figure 2. These figures show graphically the relationships between financial security and willingness to pay for the USDA Organic and Non-GMO labels used in this study. Because Local labels were not found to have a significant relationship for this hypothesis, the associated graph is located in Appendix 2.2 rather than here.

Hypothesis 3: Student food purchasing behavior is influenced by food labels and those influences include knowledge about eco-labels, financial insecurity, and/or perceived valuation.

The main inputs for this hypothesis included financial security, food label knowledge, and perceived valuation. Financial security was assessed using a survey question asking respondents to state how much money is allocated each week for groceries. Knowledge was assessed using a combined score from their answers to three questions about each of the three labels. Perceived valuation was assessed on a ten-point scale. The output for this model was their current purchasing behavior which was coded as: they *do purchase* a given label if they answered Always or Frequently and they *do not purchase* a given label if they answered Never, Infrequently, or No Preference in order to maintain a binary output with the logistic regression model that was used.

USDA Organic

The higher a student rated their valuation of USDA Organic food labels, the more likely they were to purchase those food labels. For the model of this label, there was a highly significant positive correlation between only the valuation of USDA Organic labels and the purchasing behavior of participants independent of financial security and knowledge ($p = 4.22x10^{-7}$). This can be seen in *Figure 3a* in which the model shown features a significant positive correlation between valuation and purchasing behavior.

Local

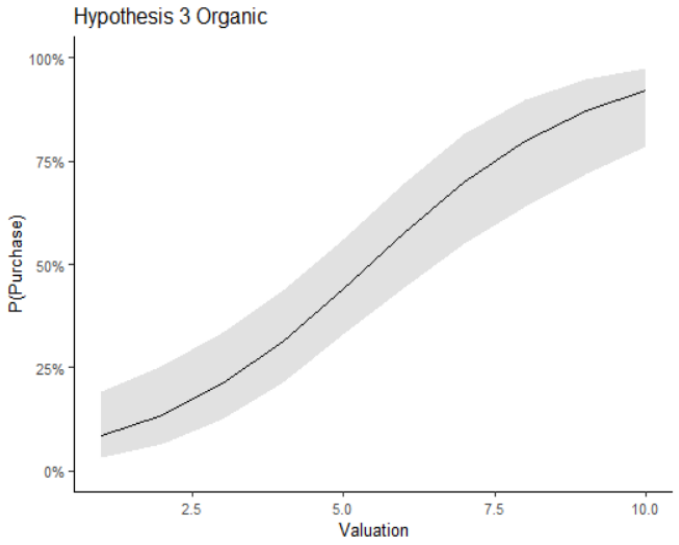
The higher a student rated their valuation of Local food labels the more likely they were to purchase those food labels. For the model of this label, there was a highly significant positive

correlation between the valuation of Local labels and the purchasing behavior of participants independent of financial security and knowledge (p = 3.41x10^-7). *Figure 3b* shows this relationship clearly, indicating that as valuation of a label increased, so did purchasing behavior.

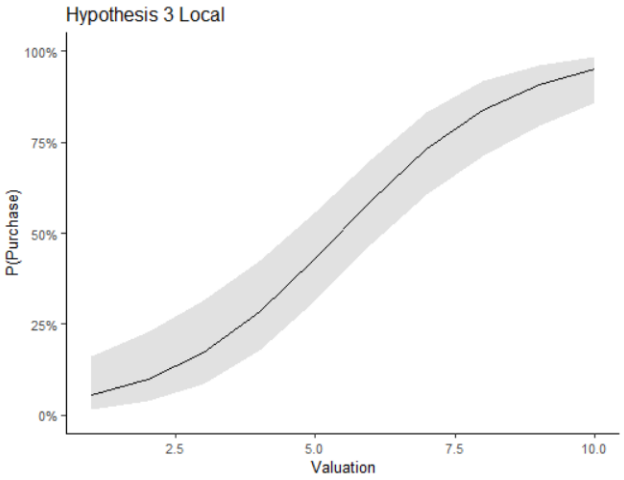
Non-GMO

The higher a student rated their valuation of Non-GMO food labels the more likely they were to purchase those food labels. For the model of this label, there was a highly significant positive correlation between only the valuation of Non-GMO labels and the purchasing behavior of participants independent of financial security and knowledge (p = 3.16x10^-7). This is shown in *Figure 3c* in which higher valuation of Non-GMO labels led to a higher likelihood that respondents purchased those labels.

a



b



c

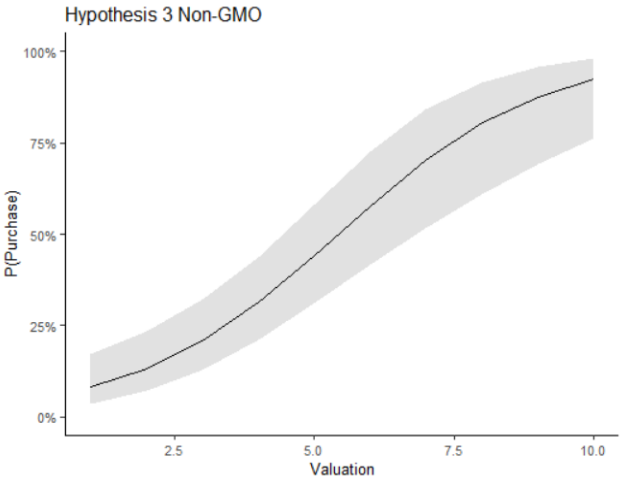


Figure 3. These graphs show the relationships that were found for each label used in this study between valuation and the purchasing behavior of respondents as financial security and knowledge scores were not found to be statistically significant. All graphs not shown here are located in Appendix 2.3.

Hypothesis 4: Perceived valuation of food labels is independent of financial security.

The input for this model was financial security which was measured using a survey question asking respondents how much money they allocate each week towards grocery purchases. The output for this model was perceived valuation, which was coded as the respondent *valuing* a given food label if they rated their valuation from 6-10 and *not valuing* a

given food label if they rated their valuation from 1-5 in order to maintain a binary output with the logistic regression model that was used.

USDA Organic

The more money a student spent each week on groceries, the more valuation they placed on USDA Organic labels. For the model of this label, there was a significant correlation between the amount of money spent on groceries with a valuation of USDA Organic food labels ($p = 0.004590$). This can be seen in *Figure 4* in which as financial security related to purchasing groceries increased, so too was their valuation higher for USDA Organic products.

Local

The more money a student spent each week on groceries, they were no more or less likely to place valuation on Local labels. There were no statistically significant findings for this model ($p = 0.774$). The graph associated with this model is located in Appendix 2.4.

Non-GMO

The more money a student spent each week on groceries, they were no more or less likely to place valuation on Non-GMO labels. There were no statistically significant findings for this model ($p = 0.119872$). The graph associated with this model is located in Appendix 2.4.

a

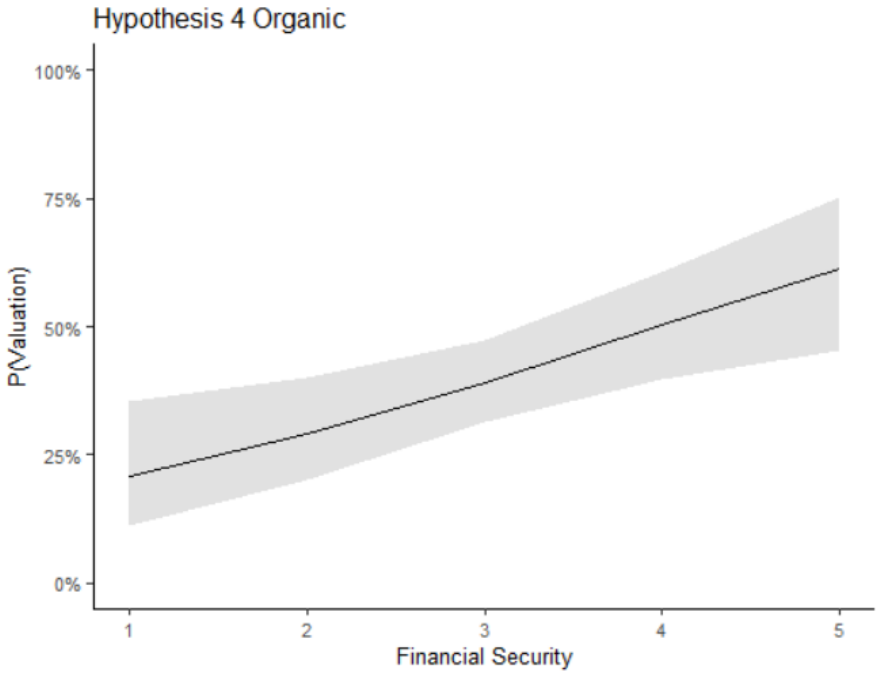


Figure 4. This figure shows that there is a positive relationship between financial security and valuation of USDA Organic food labels. There were no statistically significant relationships found for either Local or Non-GMO labels, although these graphs can be found in Appendix 2.4.

Additional Results

In addition to the logistic regression models that were found using R Studio, there were several findings that provide additional information into how respondents view each of these labels and how their consumer behavior reflects those views.

Perceived Value: How does perceived value of eco-labels affect WTB?

USDA Organic food label valuation

Out of 161 students that responded, 40.4% of those respondents at least partially valued purchasing food products labeled as USDA Organic (rated 6-10 on survey question 17). Respondents provided qualitative explanations in survey question 18. Their reasons for valuing USDA Organic included: believing it is healthier for them as well as for the environment, with one respondent stated, “I believe organic food is better for our bodies and the ecosystem as a whole.”; that these labels avoid pesticides, an example of this by one respondent stated, “I perceive that organic has less harmful chemicals from pesticides.”; and that USDA Organic produces better quality food products, with one respondent saying, “It’s typically of a notic[e]ably higher quality.”

Local food label valuation

More people valued Local labeled foods than USDA Organic or Non-GMO. Of 162 students that responded, 53.7% of those respondents at least partially valued purchasing local products (rated 6-10 on survey question 19). Respondents provided qualitative explanations in survey question 20. Their reasons for valuing USDA Organic included: believing that these food items benefit local farmers and the local economy, with an example of this in one respondent’s answer stating they valued Local labels, “Because supporting local farms is both better for the environment but supports a strong local economy.”; that buying local lowers their carbon footprint and is more environmentally friendly, with an example from another respondent being, “Local food produces fewer emissions and is overall better for the environment.”; and that food products labeled as Local are fresher, with one respondent stating that buying Local labels, “Helps my community. Always fresher.”

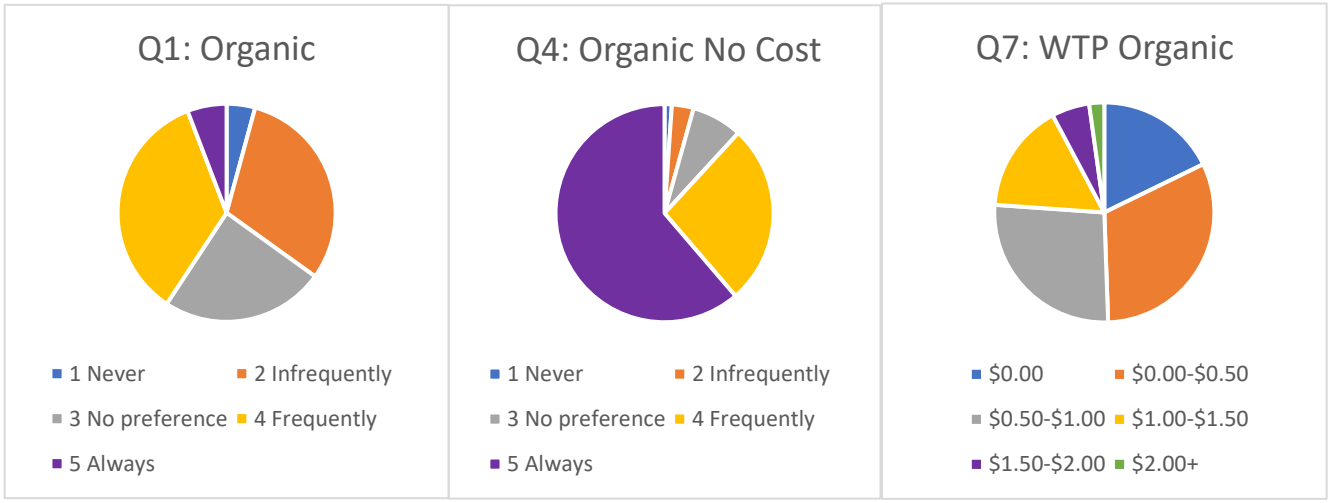
Non-GMO food label valuation

There was overall lower perceived value in Non-GMO labeled foods. Of 160 students that responded, only 23.8% of those respondents at least partially valued purchasing Non-GMO labeled products (rated 6-10 on survey question 21). Respondents that perceived value in Non-GMO labeled food products provided qualitative explanations in survey question 22. Their reasons for valuing Non-GMO food labels included: believing that Non-GMO products are healthier for people, with one respondent stating, “It is important for my health.”; that not enough information is known about the future impacts of genetic modification, with another respondent stating, “We don't know what we're doing and the repercussions of genetically modifying food”; and that GMO products promote local and small economy collapses, with one respondent stating, “I don't want to eat GMO food. Studies suggest GMO produce and livestock are . . . documented as one cause of economic issues around the world, especially for small growers.”. In contrast, 40% of respondents rated just a 1 out of 10 on survey question 21, with some respondents stating that they have little to no valuation of Non-GMO labeled food products stating reasons like, “This is unimportant to me because I have seen no convincing research that GMOs are harmful to human health. GMOs are necessary to feed an overpopulated world,” "[There is] no scientific backing that it’s good or bad for you,” and that, “There is little to no evidence that GMO food is any different nutritionally than non-GMO foods or causes harm.”

Financial Security: What role does perceived cost of food eco-labels play in purchasing behavior and willingness to pay?

Students were much more likely to purchase USDA Organic labels if price were not a factor. Only 5.8% of students always buy USDA Organic food, but 61.3% indicated that they would always buy USDA Organic food if price were not a factor (Fig. 5a-5b). Most students

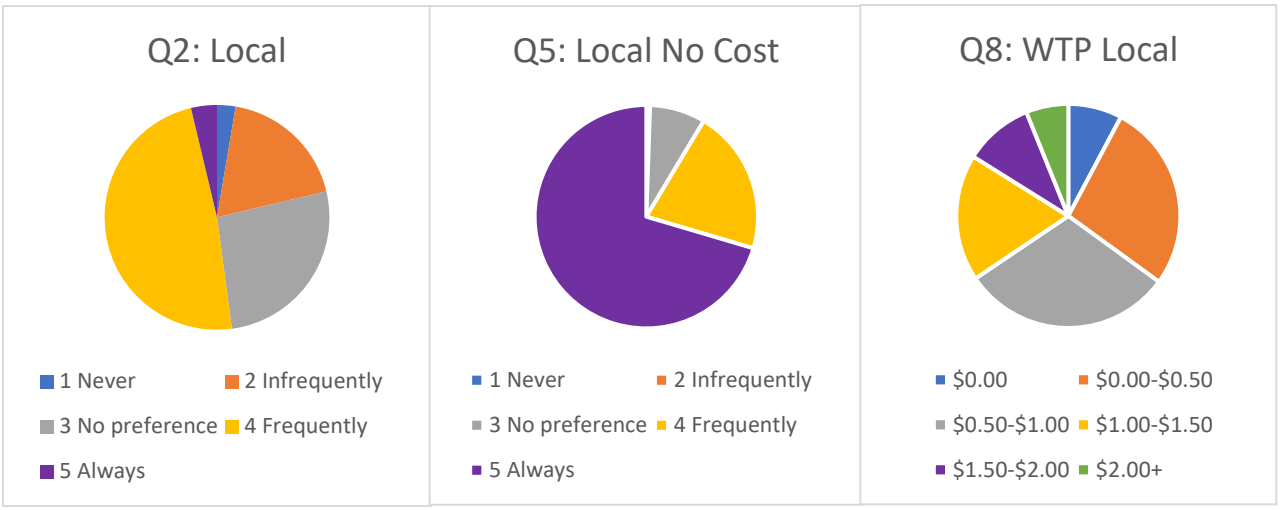
(76.1%) were not willing to spend more than an additional $1.00 on food products labeled as USDA Organic (Figure 5c).



a *b* *c*

Figure 5: The distribution of respondents who answered question 1 (Rate the frequency that you purchase food labeled as USDA Organic over food not labeled as USDA Organic, in cases in which both are available.), question 4 (Rate the frequency that you **would** purchase food labeled as USDA Organic over food not labeled as USDA Organic, in cases in which both were available **and were equally priced**.), and question 7 (I am willing to pay _____ more for an item of food labeled as USDA Organic as compared to a similar product not labeled as USDA Organic that is priced at $3.00.) on the survey regarding food products labeled as USDA Organic.

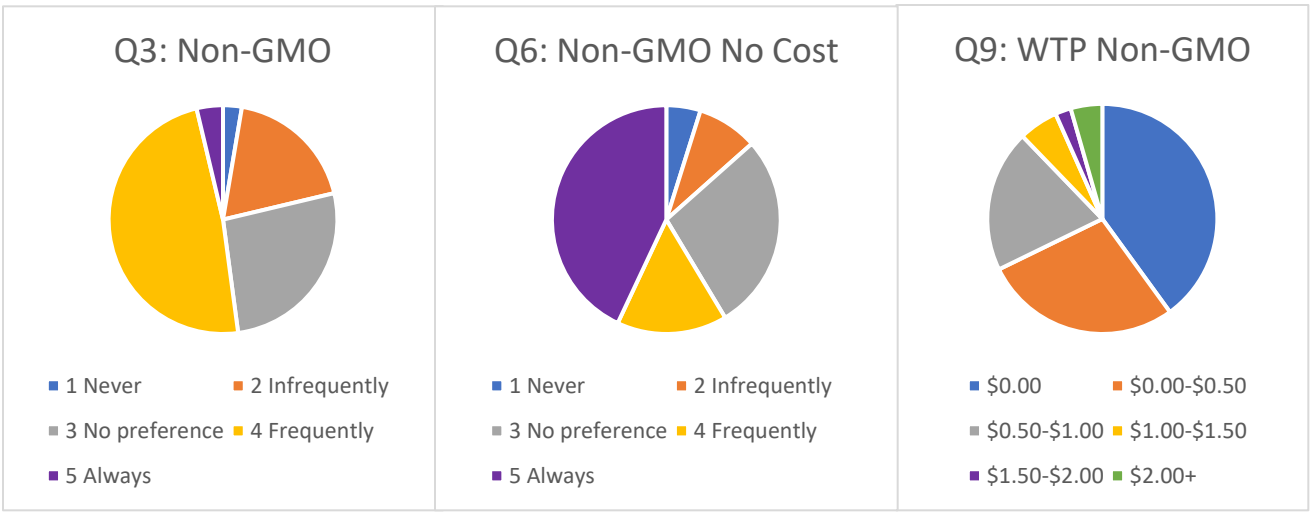
Almost all student respondents stated they would always purchase Local labels if price were not a factor. Only 3.7% of students always buy Local labeled food, but 70.43% indicated that they would always buy Local labeled food if price were not a factor (Fig. 6a-6b). (Fig. 6). Most students (65.6%) were not willing to spend more than $1.00 on food products labeled as Local, although slightly more were willing to pay slightly more, up to $1.50 (an additional 18.3%) for products labeled as Local (Fig. 5c).



a *b* *c*

Figure 6. The distribution of respondents who answered question 2 (Rate the frequency that you purchase food labeled as Local over food not labeled as Local, in cases in which both are available.), question 5 (Rate the frequency that you **would** purchase food labeled as Local over food not labeled as Local, in cases in which both were available **and were equally priced**.), and question 8 (I am willing to pay _____ more for an item of food labeled as Local as compared to a similar product not labeled as Local that is priced at $3.00.) on the survey regarding food products labeled as Local.

Students were much more likely to purchase Non-GMO labels if price were not a factor. Only 3.7% of students always buy Non-GMO labeled food, but 43% indicated that they would always buy Non-GMO labeled food if price were not a factor (Fig. 7a-7b). (Fig. 7). Most students (67.8%) were not willing to spend more than $0.50 on food products labeled as Non-GMO.



a *b* *c*

Figure 7. The distribution of respondents who answered question 3 (Rate the frequency that you purchase food labeled as Non-GMO over food not labeled as Non-GMO, in cases in which both are available.), question 6 (Rate the frequency that you **would** purchase food labeled as Non-GMO over food not labeled as Non-GMO, in cases in which both were available **and were equally priced**.), and question 9 (I am willing to pay _____ more for an item of food labeled as USDA Organic as compared to a similar product not labeled as USDA Organic that is priced at $3.00.) on the survey regarding food products labeled as Non-GMO.

Discussion

This study explored the research question, "Do students perceive value in food eco-labels; how do those eco-labels influence their consumer purchasing behavior; and what factors determine those two things?" and was investigated through the following hypotheses: 1) that higher knowledge of eco-labels would lead to a lower willingness to pay for food items labeled as USDA Organic, Non-GMO, and Local since there are many misconceptions associated with each of these labels that a higher level of knowledge about eco-labels would illuminate; 2) that financial insecurity would be associated with a lower willingness to pay higher prices for food items with these labels, which tend to cost more than similar food items without these labels; 3) that student food purchasing behavior is influenced by food labels and that those influences

include varying levels of either eco-label knowledge, financial insecurity, or perceived valuation; 4) that perceived valuation of food labels is independent of financial security.

Summary of Findings

For Hypothesis 1, the main findings were that for USDA Organic and Local labels, the higher a student scored on the knowledge questions associated with those labels, the more likely they were willing to pay for products that had those labels. This suggests that students who have a basic understanding of USDA Organic and Local labels are more likely to buy those labels and pay a slightly higher cost. Conversely, students who knew less about these two specific labels were less willing to purchase them. When there is confusion or a lack of clarity about the efficacy of a given food label and how it impacts sustainability within the production of agricultural products, it can cause consumer confusion and create a barrier to purchasing that label (Van Amstel et. al, 2008; Moon et. al, 2017; & Borin et. al, 2011).

For Hypothesis 2, the main finding was that the more money students were able to allocate toward groceries each week, the more likely they were willing to pay for USDA Organic food labels. This suggests that there is an underlying assumption that USDA Organic food labels cost more, something that was also shown in the results for Non-GMO labels under this hypothesis, in which the frequency students rated they would purchase Non-GMO labels if price were not a factor had a highly statistically significant positive relationship to willingness to pay. These two findings suggest that students who allocate less money each week on groceries were most likely less financially secure, and so were not willing to pay more for labels such as Non-GMO or USDA Organic.

For Hypothesis 3, the main finding was that for each label, the more a student perceived value in a food label the more likely they were to purchase that label regularly. This provides evidence that overall, financial security and knowledge are less important factors than overall perceived valuation in how students make purchasing decisions with regards to food labels. While financial security may play a role in how much more a student is willing to pay for those labels and that overall students are relatively unwilling to pay much more for food labels, the overarching main influence on a students' consumer decision-making is their valuation of those food labels.

For Hypothesis 4, the main finding was that for USDA Organic labels, the more money a student allocated each week toward groceries, the more likely they were to perceive value in USDA Organic food labels. This suggests that students who have the means to purchase USDA Organic labeled food, which tends to cost more than non-USDA Organic labeled food, are more likely to value that label and thus likely purchase more USDA Organic food.

Overall, these findings answer the research question in that students' consumer choices are primarily influenced by their own level of valuation in a food eco-label, although this is limited by how much more they are willing to pay for that product as a function of financial security and general knowledge of that eco-label with financial security likely being the biggest inhibitor for students.

Implications

These findings are representative of a complex argument that student consumers can behave differently from non-student populations of consumers. There is a widely identified attitude-behavior gap that occurs between consumers' environmental values and their actual behavior (Bray et. al, 2011). However, this study suggests that a high valuation of food eco-

labels does in fact correspond to students purchasing those labels more frequently, which may suggest that the attitude-behavior gap is smaller among students than among other consumers. This relationship between students' value and behaviors is mediated by several limiting factors that include knowledge of eco-labels and financial security. For both of these factors, the willingness of students to pay more money for specific food eco-labels was facilitated by having more money allocated towards weekly grocery purchases. This applied more directly to USDA Organic food labels, which had statistically significant findings for each of the four hypotheses that were run through a logistic regression model, compared to the less consistent statistically significant findings for either Local or Non-GMO labels across the four hypotheses. More students responded positively to Local labels, despite them being unregulated and undefined in the United States. Non-GMO labeled products received fewer significant responses across the four hypotheses used in this study that were run through a logistic regression model, with the only significant findings occurring in Hypotheses 2 and 3 for results associated with Non-GMO labels. In their qualitative explanations of why they did or did not value certain labels, many respondents stated that they did not see value in Non-GMO labels as there is not enough scientific evidence to support the claims that GMOs are dangerous for human and environmental health among other reasons. These responses align with scientific consensus that genetically engineered foods do not pose any special risks to humans or the environment (NASEM 2016, Christiansen et. al, 2019). Perhaps because USDA Organic labels are a government-regulated entity, they provide consumers with a larger breadth of widely accepted knowledge and research about the impacts of USDA Organic versus non-USDA Organic food products. This could help to eliminate confusion about what the eco-label is signifying or conveying to the consumer (Moon et. al, 2017). This has been shown in studies to be a major limiting factor in the attitude

behavior gap, in which consumers do not understand what food eco-labels either mean or what impact they have, and so are less willing to buy those products (Van Amstel et. al, 2008). The Non-GMO label is highly disputed as there is currently no scientific data to support claims that GMOs are environmentally dangerous (Marris, 2001, Wynne, 2001, Nsanzabera et. al, 2016). For Local labels, it seems as though a lack of regulation may have created a culture of acceptance that purchasing food labeled as Local is sustainable, and that this is mediated by a deeper level of understanding about the impacts of food production on a global scale and bringing production back to a local level. The conclusion that all locally produced food is sustainable is perhaps a misconception tied to food miles, in which consuming local food is in theory supposed to minimize greenhouse gas emissions associated with production to consumption transport. However, this transport only accounts for 4% of the emissions associated global food production, meaning that only purchasing local food is not likely to create drastic environmental change (Desrochers & Shimizu, 2008).

This study has shown that some food eco-labels do have an impact on the ways in which students consume food products and make decisions in their consumerism. This suggests that university students have a generally high valuation of improving sustainability in food systems and that many students are using this valuation to purchase food eco-labels that promise continued development of sustainable methods of producing food, such as through the reduced use of pesticides in organic farming, or through a shift from more globalized food production back to local farms. This is important because university aged students represent a population that will have to live through and deal with the effects of climate change and other environmental change (Zsoka et. al, 2013). Perhaps this is why so many younger generations are speaking out now about climate change and demanding action. One of the easiest ways to do this is by

demanding sustainable action in food systems and consumers may feel that they can make their concerns and preferences known through the purchasing of food eco-labels (Grunert et. al, 2014). University students have illustrated a willingness to move toward more sustainable food choices so the demand is present in this demographic (Spencer et. al, 2018; Szerényi et. al, 2012). In addition, students in particular are a critical demographic group to develop high levels of environmental education within because many of them are forming their consumer habits for the first time and their lifetime of decision-making could have more impact on how environmental sustainability develops in the future (Wachholz et. al, 2014).

Limitations

There were several limitations put on this research study that may have influenced the findings. First, the number of respondents was not as high as I might have hoped. 205 respondents participated in the survey, which was sufficient for the purposes of this study. But a larger number of respondents would have captured more of the variation among the diverse population of students that attends the University of Colorado Boulder.

Another limitation of this study includes some of the survey questions that were used to assess various levels of interest, particularly the food label knowledge questions. There were only three questions associated with each label, USDA Organic, Local, and Non-GMO, which allowed this study to gather an approximate level of basic understanding of these three labels. However, the questions themselves were not uniform in the number of respondents that answered correctly, perhaps creating issues in the results that were found. Essentially, some of the knowledge based questions may have been too simple and others may have been too challenging for the average student respondent. This was an experimental methodology, with no precedence

in the literature that I could find. I hope that my initial efforts to develop a method for testing eco-label knowledge could be built upon further and further developed by future research.

Future Studies

This study was conducted to fill in a gap within a broader analysis of the impacts of food eco-labels on consumer decision-making. Where students stand amidst this form of green marketing is relatively unexplored. Future research of this topic could include a wide variety of studies, in order to gain a better understanding of the ways in which university student populations respond to green marketing strategies I present evidence from one university, but Boulder has a somewhat unusual focus and ethic on sustainable food and so it would be interesting to compare these data with case-studies from other locations or universities to understand how they compare or differ from each other in the influences of food eco-labels on students' consumer choices.

Future studies could involve case studies of different student populations across the United States and other countries, looking at different base demographics of student populations in those locations and how preferences change depending on various factors including gender, race or ethnic identity, and degree program among other demographic characteristics.….

Other future research could utilize a more in-depth food label knowledge questionnaire to assess just the impacts of food label knowledge. Similarly, more in-depth studies could focus on just students' perceived valuation or financial security through more focus specifically on these variables. This could be interesting because it would allow for more specialized focus on one of these inputs as opposed to looking at all three at the same time, as this study has done, and may result in more definitive and specific findings.

Another method of continuing this research could be to compare the student responses with responses from members of the general public in the place where the university is located. This could provide valuable insight into the ways in which student populations interact with the towns and cities in which they live and whether views on food eco-labels are affected by the location in which the university or college is located. Once this is understood, more specific green marketing strategies could be implemented to encourage sustainable food choices among both groups.

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Appendix

Appendix 1. Online survey questions used to gather data.

For the following few questions, we want to ask you about your purchase decisions when you shop for food in a grocery store.

1. Rate the frequency that you purchase food labeled as USDA Organic over food not labeled as USDA Organic, in cases in which both are available.

Never-----Infrequently-----No preference-----Frequently-----Always

2. Rate the frequency that you purchase food labeled as local over food not labeled as local, in cases in which both are available.

Never-----Infrequently-----No preference-----Frequently-----Always

3. Rate the frequency that you purchase food labeled as non-GMO over food not labeled as non-GMO, in cases in which both are available.

Never-----Infrequently-----No preference-----Frequently-----Always

Now, for the following questions, we would like you to discount the variable of price. So, imagining that all products were the same cost, what would your purchase decisions be?

4. Rate the frequency that you **would** purchase food labeled as USDA Organic over food not labeled as USDA Organic, in cases in which both were available **and were equally priced**.

Never-----Infrequently-----No preference-----Frequently-----Always

5. Rate the frequency that you **would** purchase food labeled as local over food not labeled as local, in cases in which both were available **and were equally priced**.

Never-----Infrequently-----No preference-----Frequently-----Always

6. Rate the frequency that you **would** purchase food labeled as non-GMO over food not labeled as non-GMO, in cases in which both were available **and were equally priced**.

Never-----Infrequently-----No preference-----Frequently-----Always

7. I am willing to pay _____ more for an item of food labeled as USDA Organic as compared to a similar product not labeled as USDA Organic that is priced at $3.00.

a. $0.00
b. $0.00-$0.50
c. $0.50-$1.00
d. $1.00-$1.50
e. $1.50-$2.00
f. $2.00+

8. I am willing to pay _____ more for an item of food labeled as local as compared to a similar product not labeled as local that is priced at $3.00.

a. $0.00
b. $0.00-$0.50
c. $0.50-$1.00
d. $1.00-$1.50
e. $1.50-$2.00
f. $2.00+

9. I am willing to pay _____ more for an item of food labeled as non-GMO as compared to a similar product not labeled as non-GMO that is priced at $3.00.

a. $0.00
b. $0.00-$0.50
c. $0.50-$1.00
d. $1.00-$1.50
e. $1.50-$2.00

f. $2.00+

For the following questions: on a scale from 1-10 assume 1 is no pressure and 10 is extreme pressure; fill in the blank with the option that is the most correct for you as an individual.

10. On a scale from 1-10 how much social pressure do you feel to purchase food labeled as USDA Organic?

1-2-3-4-5-6-7-8-9-10

11. I feel social pressure from _____to purchase food labeled as USDA Organic. (Select all that apply)

a. My friends/peers
b. People who are shopping around me at the same time.
c. Grocery store marketing, advertising, store layouts, etc.
d. My family
e. I don't feel social pressure to purchase food labeled as USDA Organic .
f. Other _____

12. On a scale from 1-10 how much social pressure do you feel to purchase food labeled as local?

1-2-3-4-5-6-7-8-9-10

13. I feel social pressure from _____ to purchase food labeled as local. (Select all that apply)

a. My friends
b. People who are shopping around me at the same time.
c. Grocery store marketing, advertising, store layouts, etc.
d. My family
e. I don't feel social pressure to purchase food labeled as local.
f. Other _____

14. On a scale from 1-10 how much social pressure do you feel to purchase food labeled as non-GMO?

1-2-3-4-5-6-7-8-9-10

15. I feel social pressure from _____ to purchase food labeled as non-GMO. (Select all that apply)

a. My friends
b. People who are shopping around me at the same time.
c. Grocery store marketing, advertising, store layouts, etc.
d. My family
e. I don't feel social pressure to purchase food labeled as non-GMO.
f. Other _____

16. The primary grocery store I typically shop at is _____.

a. Whole Foods
b. Alfalfa's
c. Kroger Brand (i.e. King Soopers)
d. Lucky's Market
e. Sprouts
f. Safeway
g. Trader Joe's
h. Other_____

For the following questions, on a scale from 1-10 assume that 1 is no importance and 10 is extreme importance.

17. On a scale from 1-10 it is important to me that the food I purchase is labeled as USDA Organic.

1-2-3-4-5-6-7-8-9-10

18. Briefly explain why it is or is not important to you to purchase food labeled as USDA Organic?

_____

19. On a scale from 1-10 it is important to me that the food I purchase is labeled as local.

1-2-3-4-5-6-7-8-9-10

20. Briefly explain why it is or is not important to you to purchase food labeled as local?

_____

21. On a scale from 1-10 it is important to me that the food I purchase is labeled as non-GMO.

1-2-3-4-5-6-7-8-9-10

22. Briefly explain why it is or is not important to you to purchase food labeled as non-GMO?

_____

You will have three minutes to answer the following three questions. These questions will be used to assess your current existing knowledge of USDA Organic food labels. It is okay if you do not know the answers to the following questions, select the option that you think provides the most correct answer. If you fail to answer these three questions in the given time limit, you will not be disqualified from either this survey or from being entered in the gift card drawing if you choose to do so.

For the following questions regarding USDA Organic food labels: select the option that provides the most correct answer to the following questions. These questions will be used to assess your current existing knowledge of USDA Organic food labels.

23. For how long must land have had no USDA prohibited substances applied to it before the crops grown on it can be certified USDA Organic?

a. 1 year
b. 3 years
c. 5 years
d. 10 years

24. Which of the following is the most accurate description of the use of pesticides in USDA Organic agriculture?

a. Pesticides are not allowed to be used to grow USDA Organic products.
b. Most non-synthetic (natural) but no synthetic pesticides are allowed to be used to grow USDA Organic products
c. Most non-synthetic (natural) and some synthetic pesticides are allowed to be used to grow USDA Organic products
d. There are no restrictions on the pesticides that can be used to grow USDA Organic products

25. Describe any overlap between non-GMO and USDA Organic products.

a. All non-GMO products are also USDA Organic
b. Some USDA Organic products are also non-GMO
c. All USDA Organic products are also non-GMO
d. There is no overlap

You will have three minutes to answer the following three questions. These questions will be used to assess your current existing knowledge of local food labels. It is okay if you do not know the answers to the following questions, select the option that you think provides the most correct answer. If you fail to answer these three questions in the given time limit, you will not be disqualified from either this survey or from being entered in the gift card drawing if you choose to do so.

For the following questions regarding local food labels, select the option that provides the most correct answer to the following questions. These questions will be used to assess your current existing knowledge of local food labels.

26. On average in the U.S. what proportion of the greenhouse gas emissions associated with food come from transporting the food from farm to retailer?

a. 4%
b. 26%

c. 47%
d. 76%

27. How are local food labels determined?
    a. A food item can be labeled as local if it was grown within 100 miles of the place it is being sold.
    b. A food item can be labeled as local if it was grown within the same state as it is being sold.
    c. There is no regulatory method of determining what causes a food item to be labeled as local.
    d. A food item can be labeled as local if it was grown within the same country as it is being sold.

28. Which of the following can be benefits of buying food labeled as local?
    a. Doing so can allow you to purchase food that is in season as well as guarantees you buy organic, since all food labeled as local is also USDA Organic
    b. Doing so is always cheaper than buying food that is not labeled as local and also guarantees that you buy organic, since all food labeled as local is also USDA Organic.
    c. Doing so supports local farmers and is also always cheaper than buying food that is not labeled as local.
    d. Doing so can support local farmers and allows you to purchase food that is in season.

You will have three minutes to answer the following three questions. These questions will be used to assess your current existing knowledge of non-GMO food labels. It is okay if you do not know the answers to the following questions, select the option that you think provides the most correct answer. If you fail to answer these three questions in the given time limit, you will not be disqualified from either this survey or from being entered in the gift card drawing if you choose to do so.

For the following questions regarding <u>non-GMO food labels</u>: select the option that provides the most correct answer to the following questions. These questions will be used to assess your current existing knowledge of non-GMO food labels.

29. GMO stands for which of the following?

a. Genetically Modified Object
b. Genetically Modified Organism
c. Genetically Mutated Object
d. Genetically Mutated Organism

30. According to the statement below, which of the following crop varieties are considered GMOs?

Crop varieties produced through_____.

a. Selective breeding & radiation mutagenesis
b. Radiation mutagenesis, transgenesis, & CRISPR-cas9
c. Transgenesis & CRISPR-cas9
d. Radiation mutagenesis & CRISPR-cas9

31. How many different crops are currently approved by the USDA to be grown in the US with GMO variants?

a. 5
b. 13
c. 34
d. 67

Demographic Information

32. What gender do you identify as?

a. Male
b. Female
c. Prefer not to respond.

d. Other _____

33. Race/Ethnic Identity (Select all that apply)
    a. White
    b. Black or African American
    c. American Indian or Alaska Native
    d. Asian
    e. Native Hawaiian or Pacific Islander
    f. Hispanic/Latinx
    g. Prefer not to respond.
    h. Other _____

34. What is your current living arrangement?
    a. On-campus
    b. Off-campus alone
    c. Off-campus with roommates
    d. Off-campus with parents/guardians
    e. Off-campus with spouse and/or children
    f. No current arrangement
    g. Prefer not to respond.
    h. Other _____

35. Are you a student at the University of Colorado Boulder?
    a. Yes
    b. No

36. What is your current degree program?

_____

37. What year in school are you?
    a. 1st year

b. 2nd year
c. 3rd year
d. 4th year
e. 5th+ year
f. Graduate student

38. What is your GPA?
a. 0.00-1.99
b. 2.00-2.75
c. 2.76-3.49
d. 3.50-4.00
e. Prefer not to respond.

39. Do you receive financial support through student loans or any other funding that DOES NOT require repayment?
a. Yes
b. No
c. Prefer not to respond.

40. If yes, how much this academic year?
a. _____
b. Not applicable

41. Do you receive financial support through student loans or any other funding that DOES require
repayment?
a. Yes
b. No
c. Prefer not to respond.

42. If yes, how much this academic year?

a. _____
b. Not applicable

43. Other than being a student, do you currently hold a part-time or full-time job?
    a. Part-time less than 20 hours a week
    b. Part-time less than 20 hours a week with work study
    c. Part-time 20 hours or more a week
    d. Part-time 20 hours or more a week with work study
    e. Full-time
    f. Full-time with work study
    g. No Job
    h. Prefer not to respond.

44. In which of the following ways do you cover food expenses?
    a. My family pays for my food expenses
    b. I pay for my own food expenses
    c. I receive federal food assistance (e.g. SNAP program) to cover my food expenses.
    d. Prefer not to respond.
    e. Other:_____

45. On average, how much money do you allocate each week for grocery purchases?
    a. $0-$20
    b. $20-$40
    c. $40-$60
    d. $60-$80
    e. $80+
    f. Prefer not to respond.

46. What region/regions of the country did you grow up in? (Select all that apply)
    a. Northeast
    b. Midwest

c. South
d. West
e. Southwest
f. West Coast
g. I grew up outside of the United States
h. Prefer not to respond.
i. Other _____

47. How would you characterize the region/regions you grew up in? (Select all that apply)
a. Rural
b. Urban
c. Suburban
d. Prefer not to respond.

Please answer the following questions if you wish to be entered in the drawing to receive one of five $25 gift cards to the CU Bookstore and/or you wish to receive the results of this study at its completion. If you do not wish to do either of these options you may skip this section and submit this survey now.

48. Would you like to be entered to receive one of five $25 gift cards to the CU Bookstore?
a. Yes
b. No

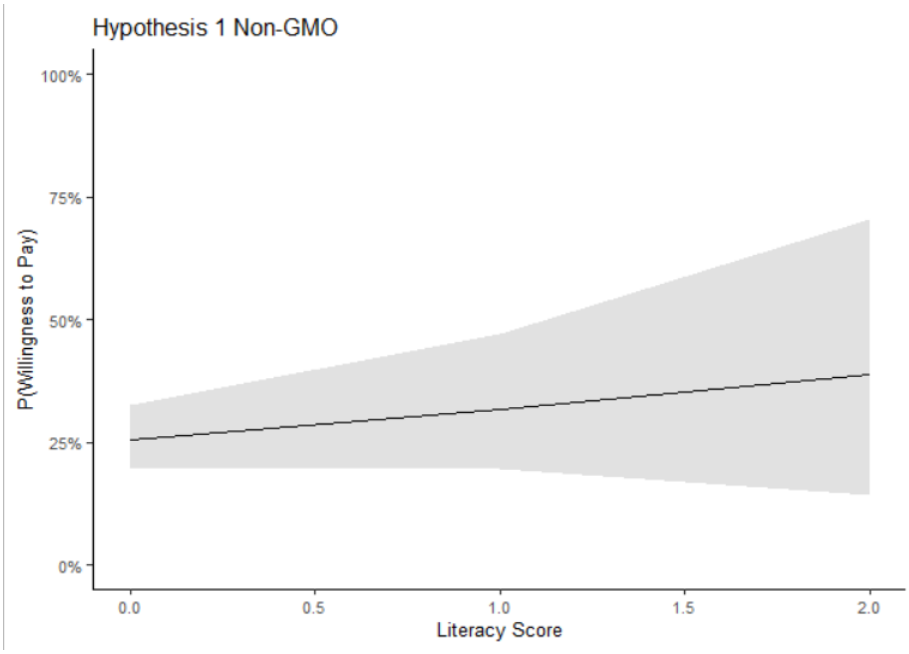
49. Would you like to receive the results of this study at its completion?
a. Yes
b. No

50. If you answered *Yes* to either or both of the two previous questions, please enter your CU university email address in the space below.

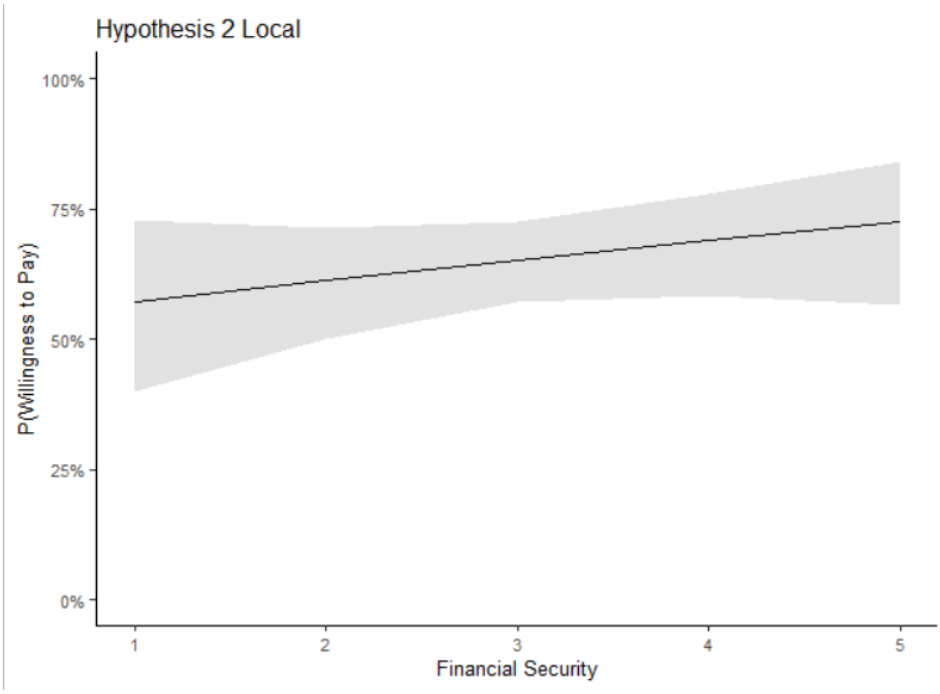
_____

Appendix 2. Additional Results Graphs

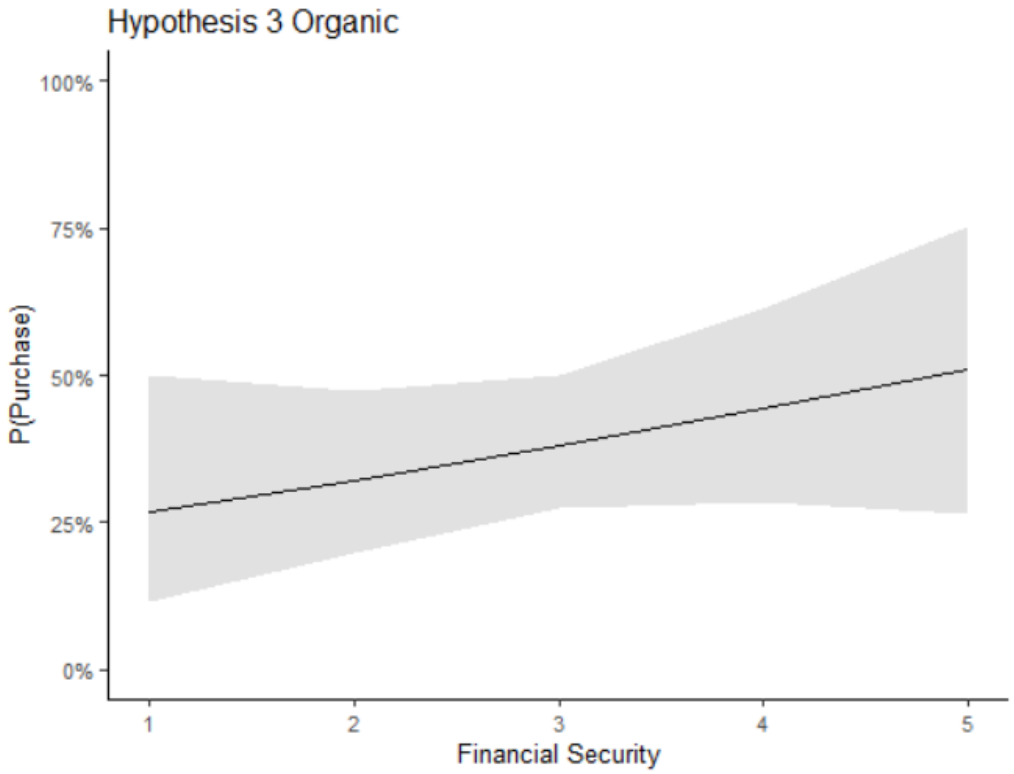
2.1. Hypothesis 1

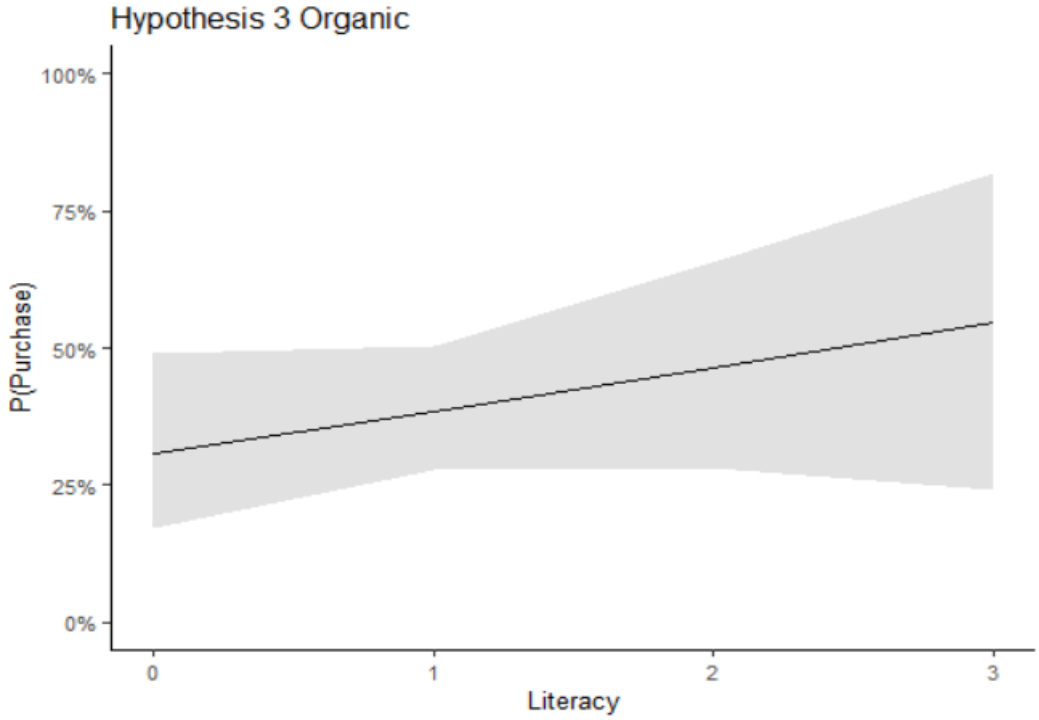


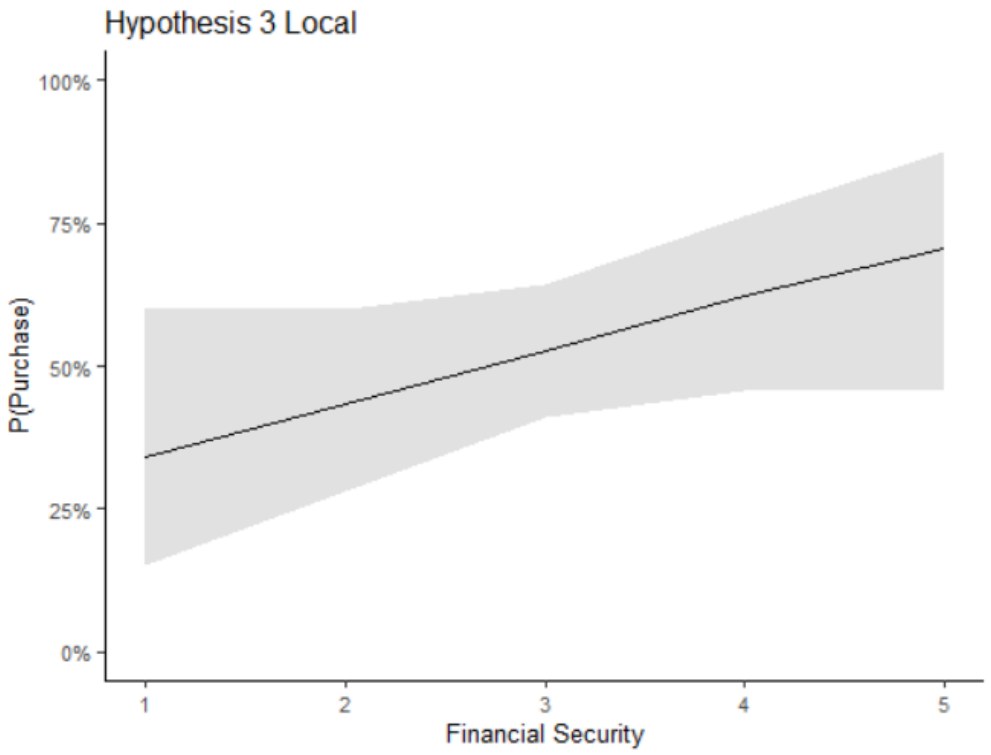
2.2. Hypothesis 2

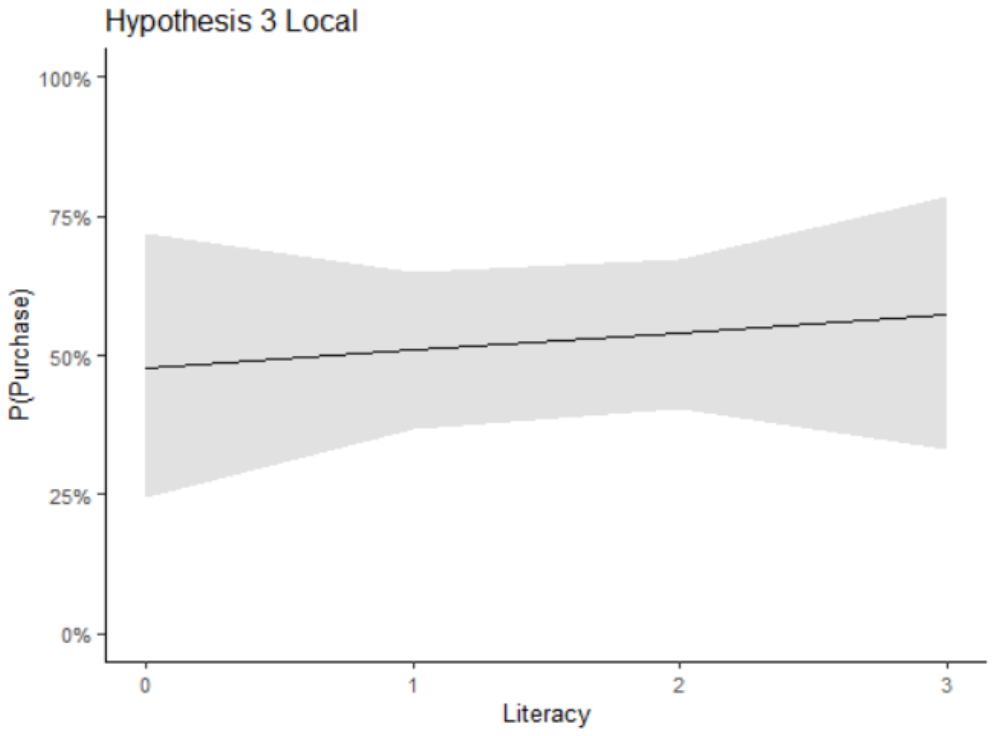


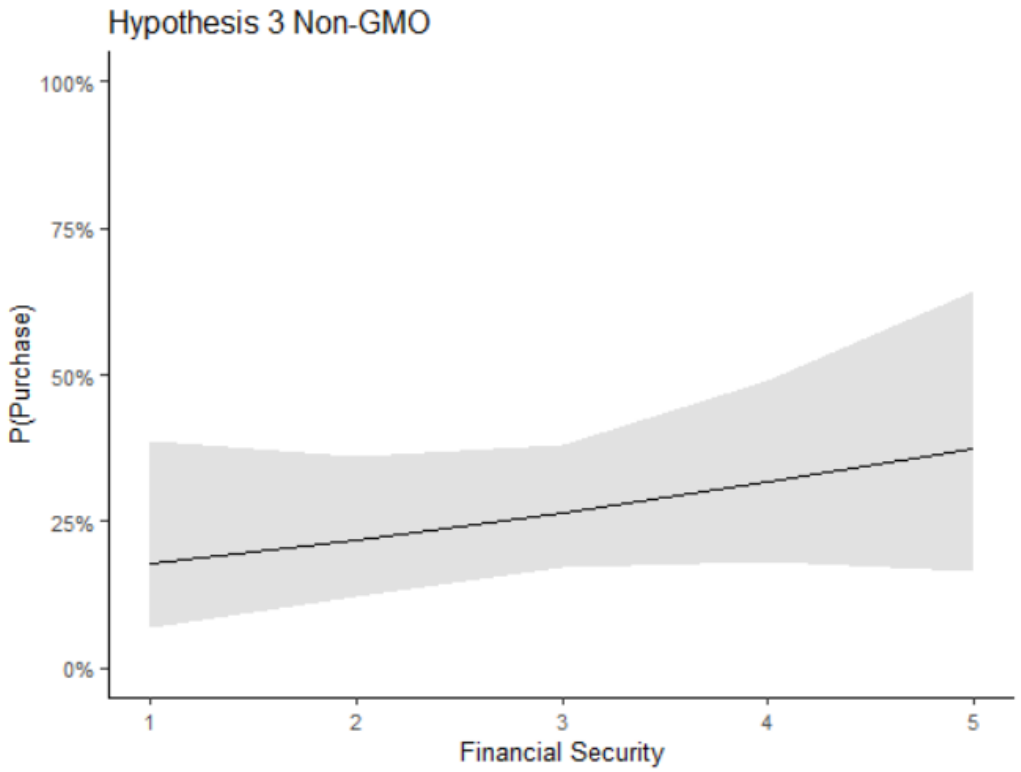
2.3. Hypothesis 3

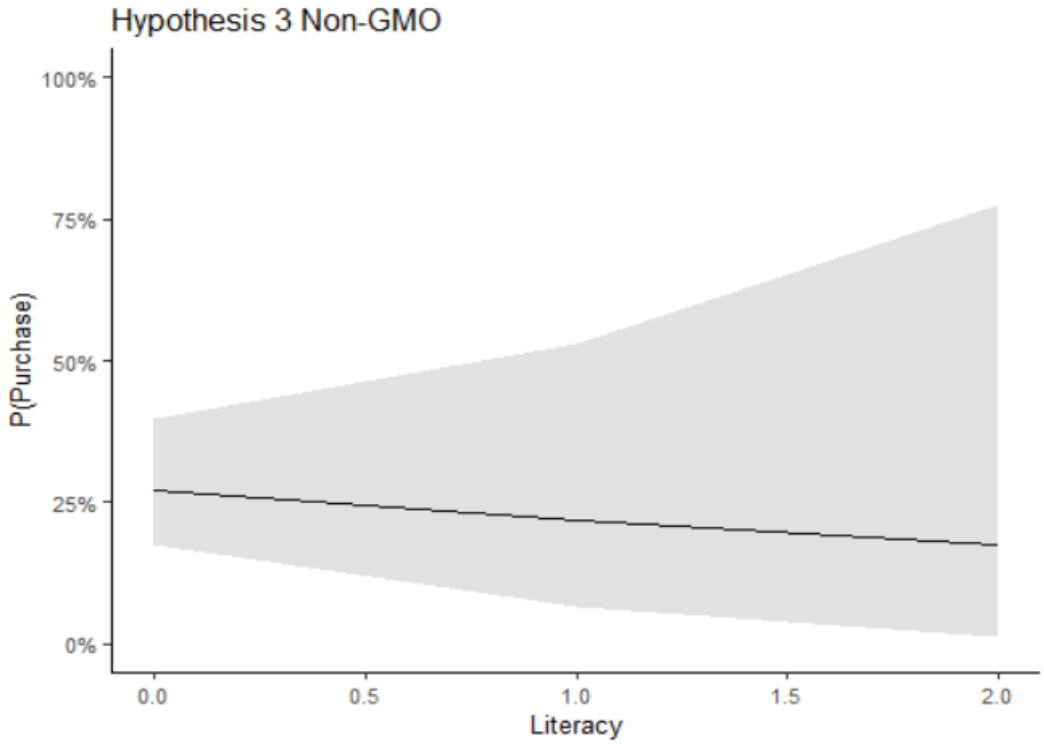





Hypothesis 3 Local
100%
75%
50%
25%
0%
P(Purchase)
1
2
3
4
5
Financial Security


Hypothesis 3 Local
100%
75%
50%
25%
0%
P(Purchase)
0
1
2
3
Literacy


Hypothesis 3 Non-GMO
100%
75%
50%
25%
0%
P(Purchase)
1
2
3
4
5
Financial Security


Hypothesis 3 Non-GMO
100%
75%
50%
25%
0%
P(Purchase)
0.0
0.5
1.0
1.5
2.0
Literacy

2.4. Hypothesis 4