

**THE IMPACT OF SUPPORT CLAIMS ON CONSUMER WILLINGNESS TO PAY
FOR ORIGIN AND NUTRITION LABELS: THE CASE OF TART CHERRY JUICE**

By

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ABSTRACT

THE IMPACT OF SUPPORT CLAIMS ON CONSUMER WILLINGNESS TO PAY FOR ORIGIN AND NUTRITION LABELS: THE CASE OF TART CHERRY JUICE

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Modern consumers are continually searching for more information about where their food comes from and its nutritional value. As a result, policy makers and the food industry are using origin and nutrition labeling to capitalize on this change in demand. This study employs a discrete choice experiment on tart cherry juice selection to determine consumer preferences and willingness to pay for origin and nutrition related food attributes namely nutrient content claims, health-related claims, origin labelling and a novel “farmer support claim.” Tart cherries are the ideal case to study these two labels as they possess health-promoting nutrients and are a staple United States specialty crop. We find that consumers are willing to pay a premium for origin and nutrient content labels when accompanied by a farmer support claim and health-related claims, respectively. These findings are relevant for the tart cherry industry as they work to improve the market of domestic tart cherries in a crowded United States market.

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1. INTRODUCTION

Over the past three decades, consumer interest in the types of food products they are purchasing has evolved (Unnevehr et al. 2010). Now more than ever, consumers want to know what is in their food, as well as where it comes from (Budsieker-Jesse 2020; Olayanju 2019; Mintel 2021). As a result, agricultural and food markets are evolving alongside these changes in demand. By seeking to adapt to consumers' preferences and demands, the food industry is putting emphasis on the labeling of credence attributes such as nutrient content and product origin. Credence attributes embed quality features that cannot be evaluated by consumers either before or after purchase (Caswell and Mojuszka 1996). Hence, they are often depicted through labeling programs and claims.

Recognizing these changes in consumer interest and demand, academic researchers are continuing to explore the critical role labeling programs play in consumers' preferences and willingness to pay for food and agricultural products. For example, past studies have shown that the origin of a product, specifically the country of origin, is often associated with a price premium (Loureiro and Umberger 2003; Krystallis and Ness 2005). Other research has found that country of origin serves as a cue for quality attributes (Caputo, Scarpa and Nayga 2016), embedding quality features such as the safety/quality associated with a given country, as well as the economic impact or overall support for the country presented (Lusk et al. 2006). In addition, with the advancement of origin labeling in general, consumers are becoming interested in region of origin labeling and state agricultural product labeling (Van Loo, Grebitus and Roosen 2019; Quagraine, McCluskey and Loureiro 2003; Aprile, Caputo and Nayga 2012).

Likewise, with the rise in health-conscious consumers (Nielsen 2015), researchers have found that there is a positive valuation for nutrient content and health-related claims labeling. Nutrient content

claims are those that characterize the level of a nutrient found in a product; whereas health-related claims discuss the link between the nutrient content and the health of consumers, ranging from structure function claims to general well-being claims (Food and Drugs 2020a; Food and Drugs 2020c). At a glance, research indicates that consumers place a higher utility on a product with a nutrient content claim (Van Wezemael et al. 2014; de-Magistris and López-Galán 2016). However, research also suggests that consumers lack the knowledge and understanding of what such labels may mean for their health (Cowburn and Stockley 2005). As a result, the addition of health claims or health-related claims to the nutrient content claim is found to increase consumer willingness to pay for such products (Barreiro-Hurlé, Gracia and De-Magistris 2009; Chang, Moon and Balasubramanian 2012). Indeed, several studies suggest that consumers purchase products with health labels to help them reach their health goals and because they understand the product to be healthier (Drichoutis, Lazaridis and Nayga 2006; J. van buul and Brouns 2015).

Despite the abundance of studies looking at consumer valuation for origin and nutrition labels individually, little attention has been paid to the role of additional support claims for origin labeling and the effect of health-related claims on a wide range of food products. This paper addresses how nutrition and origin support claims, in the form of health-related and farmer support claims, influence consumer preferences and willingness to pay. In reference to origin claims, there has not been any research on the way additional claims that promote the support for farmers could add to the overall demand and preferences for origin labeling. For nutrition and health labeling, much of the research and supporting evidence for health-related claims in conjunction with nutrient content claims comes from the meat and dairy industry. Broadening this literature to include more products types – such as vegetables and fruits – is needed. Additionally, given that origin claims are cue

attributes, no study has investigated how nutrition and health-related claims specifically may impact the marginal willingness to pay for origin claims.

Our study fills these gaps through three objectives. First, it explores the impact “farmer support claims,” such as “Supports U.S. Farmers” and “Supports Michigan Farmers,” have on consumer preferences and willingness to pay for country of origin and state agricultural product labels. Second, it determines the impact health-related claims have on consumer preferences and willingness to pay for products with a nutrient content claim. Finally, it assesses the impact that both farmer support and health-related claims have on consumer preferences and demand for products bearing origin and nutritional labels.

To achieve our objectives, we conducted a discrete choice experiment using tart cherry juice as the product of focus. Tart cherry juice is the ideal case to study health-related and farmer support claims. Tart cherries are used in a variety of products across the food industry, such as juices, snacks, alcohols, and pie/pastry fillings and are recently referred to as super fruits because of their many health benefits (Cherry Marketing Institute 2015). Michigan leads the U.S. in the production of this specialty crop, but in recent years U.S. production has been threatened by imports. To explore the effect of origin and nutrition support claims on consumer valuation for tart cherry products we implemented a control treatment, in which consumers were asked to evaluate a 12-ounce bottle of tart cherry juice bearing origin (USA, Michigan, or Imported) and nutritional (melatonin or potassium) labels, and three additional treatments in which origin and nutritional labels were accompanied by farmer support claims and health-related claims through the implementation of various treatments. Our results generally indicate that there is a statistically significant willingness to pay for farmer support claims and health-related claims. In addition, the evidence shows mixed impacts on willingness to pay when two support claims are presented

simultaneously. Potentially, this suggests that choice overload or information overload may be at play when these two credence attributes, with associated support claims, are presented together.

Our study provides three key contributions to the food choice literature, as well as valuable information to producers and policy makers. First, to the best of our knowledge, this is the first study to present the use of a “farmer support claim” in conjunction with an origin claim. While origin can be a cue for economic support of one’s country or region, a farmer support claim could help present that cue to the consumers. Our results provide new insights into the way consumers respond to claims that indicate farmer support.

Second, while there are studies that support the use of health-related claims with nutrient content claims for the meat and dairy industries (Van Wezemael et al. 2014; Barreiro-Hurlé et al. 2009; Ballco and De-Magistris 2018), the combination of nutrient and health claims on other product types is not well researched. We contribute to this existing nutrition and health literature by providing an analysis on an under researched product, tart cherry juice, and its accompanying nutrient content. Because of the known health benefits of tart cherry juice, we can use health-related claims to assess consumers’ preferences for such health benefits, as well as the difference in willingness to pay for nutrient content claims and nutrient content claims paired with health-related claims. Through these two contributions, we provide labeling recommendations to the U.S. tart cherry industry so they can better market their products. In addition, our study informs policy makers as they continue to refine regulations on the use of nutrient content and health-related claims.

Finally, our study will contribute to the literature on information overload and the presentation of multiple attributes. With the combination of multiple prominent food labeling programs, there is a potential for choice overload which may lead to lower quality responses by the consumer. We find

that consumer willingness to pay is impacted when presenting two prominent credence attributes and additional support claims together.

The rest of this article proceeds as follows. We begin with an overview of the previous literature related to origin labeling, nutrition and health labeling, tart cherries, and choice overload. We then discuss the survey and choice experiment design with an explanation of the between sample treatments and research hypotheses. We follow this with the results and discussion. Finally, we present the conclusions and recommendations for food product labeling.

2. BACKGROUND

Over the last century, consumer income and spending patterns have continued to evolve (Chao and Utgof 2006). Alongside this development, food products are currently further differentiated beyond product price, with quality playing a key role in consumers' purchasing behaviors (Caswell and Mojduszka 1996). Because quality can be perceived and interpreted in many different ways, there are three categories which describe product quality attributes – search, experience, and credence attributes (Caswell and Mojduszka 1996; Darby and Karni 1973). Search attributes are those that allow a consumer to determine product quality before they make their purchase, for example product color (Caswell and Mojduszka 1996). Experience attributes, on the other hand, cannot be determined until the consumer purchases or tries the given product (Caswell and Mojduszka 1996). These such attributes can be presented to the consumer through labeling, marketing, or other advertisement practices. Credence attributes are quality attributes that cannot be observed or verified even after consumption, and thus require a type of monitoring or certification to portray the depicted level of quality (Caswell and Mojduszka 1996). Consumers rely on certifications and regulations, presented often through food labels, to receive credence attribute information.

Several studies show that a consumers' willingness to pay for a food product is impacted by credence attribute labeling, including location/origin (Ehmke, Lusk and Tyner 2008; Loureiro and Umberger 2003), production practices (Lusk and Briggeman 2009; Van Loo et al. 2011; Aprile et al. 2012), additives used in processing (Aoki, Shen and Saijo 2010), and the use of various biological technologies (Kilders and Caputo 2020; Britton and Tonsor 2019), among others. The study of these attributes remains relevant because of their use in the market to align products with consumer interests and demands. Two credence attributes that rise to the top in their presence in

the marketplace are origin labeling, and nutrition and health labeling. Although some consider nutritional information an experience attribute, it is difficult for consumers to verify nutritional information causing consumers to rely on regulations and product labeling. Thus, nutritional information is often treated as a credence attribute (Caswell and Mojduszka 1996). Likewise, a product's origin is a credence attribute because a consumer cannot confirm product origin and must rely on regulation and labeling to discern this information. Throughout the remainder of this section, we discuss more in-depth explanations of origin, and nutrition and health labeling.

2.1 Origin Labels and Farmer Support Claims

Overwhelmingly, origin labeling is among the most studied credence attribute to date, with over 4,000 papers discussing country of origin labeling, found in a Google Scholar search on March 23, 2021. Origin labeling has evolved over the years and today includes country of origin labeling (Norris and Cranfield 2019; Brester, Marsh and Atwood 2004; Ehmke et al. 2008; Loureiro and Umberger 2003; Lusk and Anderson 2004), region of origin labeling (Van Loo et al. 2019; van der Lans 2001), and geographical indications (Slade, Michler and Josephson 2019; Menapace et al. 2009; Moschini, Menapace and Pick 2008; Caputo, Sacchi and Lagoudakis 2018), among others. Overall, these labels aim to increase and provide reliable information to the consumer about the products they purchase.

Many studies support the idea that a country of origin label substantially influences product evaluation (Verlegh and Steenkamp 1999). Part of the reason for this influence is due to country of origin's role as a cue for other attributes, specifically quality (Verlegh and Steenkamp 1999; Caputo et al. 2016; Lusk et al. 2006; Gao and Schroeder 2009). A cue attribute, like that of country of origin, embeds other product characteristics or quality characteristics within the cue attribute (Verlegh, Steenkamp and Meulenberg 2005; Caputo et al. 2016). In other words, the cue attribute

serves as a “cue” for other attributes or quality features. For example, when it comes to country of origin labeling, consumers are interested in these labels for two probable reasons – a country may depict a known quality or level of safety and/or the consumer prefers to purchase products from their country (Lusk et al. 2006). When it comes to quality, there are many examples where countries capitalize on their high-quality products in marketing. Non-exhaustive examples of these include, olive oil from Italy, wine from France, and cheese from France and Italy. Because of these reasons, origin labeling, specifically country of origin labeling presents a unique phenomenon in the way consumers make decisions.

In a meta-analysis on the country of origin effect, Peterson and Jolibert (1995) found that consumers’ perceptions and purchasing decisions vary depending on the product and country of interest. Similarly, in a study of the U.S. population, Tonsor, Schroeder and Lusk (2013), found that consumers prefer meat products that contain an origin label to one that does not. Similarly, Pouta et al. (2010) found that among Finnish consumers, there is a strong perception of domestically produced broiler products versus products produced from other countries. When country of origin labels are presented with other types of labeling, Verlegh et al. (2005), found the premium for country of origin labels on tomatoes remains. In stride Cai, Cude and Swagler (2004), also found that country of origin labeling impacts consumers buying intentions for products other than food and may override other product information.

Due to the positive consumer behavior toward country of origin labeling, researchers have investigated the impact origin labels have on the willingness to pay for products. Since the onset of the study of origin labeling, researchers have found that consumers are willing to pay a price premium for a label that connects a food to a specific location. The most popular, country of origin labeling, and its effect on demand began with Armington (1969), where he explored the effect of

such a label on food and agricultural products. In addition, Loureiro and Umberger (2003) found that U.S. consumers are willing to pay 38% more for beef products labeled “U.S. Certified Steak” and 58% more for “U.S. Certified Hamburger” than products without a country of origin designation. Krystallis and Ness (2005), through a conjoint analysis, found that consumers attached the highest importance to the country of origin attribute for olive oil brands compared to an organic label, health information, Hazard Analysis Critical Control Point (HACCP) certification, a Protected Designation of Origin (PDO) label, bottle type, International Organization for Standardization (ISO) certification and price. In addition, Lim et al. (2014) found that U.S. consumers prefer beef from the United States compared to Canada, associating a negative willingness to pay for imported beef. For the dairy industry, Norris and Cranfield (2019) highlight a discount associated with imported cheddar cheese, gouda cheese, ice cream, and yogurt. Conversely, other research indicates that consumer willingness to pay for country of origin labeling decreases when additional attribute information is provided to consumers; with more attribute information provided, the cue attribute loses some of its role as a proxy for other food quality features (Caputo et al. 2016; Gao and Schroeder 2009).

In addition to country of origin labeling, some consumers are interested in more narrowly defined origin labels, such as labeling the region, state or city of origin. There is an emerging discussion surrounding the impact region of origin labeling or geographical indications may have on consumer demand, specifically in Europe (Van Loo et al. 2019; van der Lans 2001; Slade et al. 2019; Menapace et al. 2009). In the United States, many states have begun to capitalize on this idea through state agricultural product labeling such as ‘Indiana Grown,’ ‘Michigan Grown,’ and ‘Grown in Idaho,’ to name a few (Lamb Weston Holdings 2021; Michigan Ag Council 2020;

Indiana State Department of Agriculture 2017).¹ As discussed in McCluskey and Loureiro (2003), these marketing strategies help to differentiate state products from other products on the market. For example, Quagraine et al. (2003), found that there is a price premium for apples labeled with “Washington apples” and Adelaja, Brumfield and Lininger (1990) found that the own price elasticity of “Jersey Fresh” tomatoes was more inelastic than other presented tomatoes. By in large, many believe that the higher demand and price premium for these state agricultural product labels is because of the support for local farmers and producers; however, there lacks a breadth of literature to confirm that farmer support is the reason for country of origin or region of origin labeling.

To support this idea, the European Union conducted a study to assess the economic impact of their regulated origin labeling, that found that the sale value for these products was EUR 74.8 billion (AND International 2021). Ufer, Ortega, and Lin (2021), in a study of U.S. consumers’ perspectives on farmers, found that U.S. consumers believe farmers should receive 58.6 cents for every dollar spent on food, when they only receive 14.6 cents. One such label that promotes the support of farmers is the Fairtrade label. The Fairtrade label exists in many forms depending on the country and regulating body, yet one of the key elements at this labels’ core is how purchasing products can support farmers and producers. Fair Trade USA describes their label as a, “choice to support responsible companies, empower farmers, workers and fishermen and protect the environment” (Fair Trade Certified 2021). Loureiro and Lotade (2005) point out that these types of labels are often awarded to goods from developing countries to support goods that abide by social and environmental regulations. Consistent with the idea of the fair trade label, Briggeman

¹ Often these campaigns have websites or marketing materials that present a host of information on the impact food purchases have on farmers, ranchers, and growers; however, the specifics of this support are not presented on the food label.

and Lusk (2011) found that consumers identify farmers as the most preferred group in the supply chain and associate farmers as the largest beneficiary of the premium for ‘fairness.’ Based on this knowledge, we believe that one can appeal to the needs of consumers by creating an additional claim to express the direct support provided to farmers. We classify this type of label as a “farmer support label” which will accompany an origin claim and express support of the farm industry. Through this study, we seek to understand how consumers’ purchasing preferences are impacted when a farmer support claim is added to a country of origin or state agricultural product label.

2.2 Nutrient Content and Health-Related Claims

Nutrition and health-related claims are another important credence attribute on food labels. Nutrient content, health, and health-related claims, as referred to in the United States, have been standardized since the 1990s, yet the rise in health-conscious consumers has led to a growing interest in their presence on food products today (Nielsen 2015). These labels are used to present information to consumers about the contents of the products they purchase and consume. To establish a standardized labeling procedure, in 1990, the United States Congress passed the Nutrition Labeling and Education Act (NLEA). This act, now embedded in the Federal Food, Drug & Cosmetic Act (FD&C Act), was created in response to consumers’ demand for more information regarding the contents of their food. The FD&C Act mandates many aspects of food product labeling such as the use of nutrient facts panels and the presentation of accurate serving sizes. In addition to requiring nutrients be listed on the nutrient facts panel, it also permits the use of claims to characterize a level of nutrient, known as nutrient descriptors or nutrient content claims, as well as the use of claims related to health, such as health claims and health-related claims.

The FD&C Act outlines strict regulations surrounding the use of nutrient content claims. At the onset of the NLEA, a nutrient content claim had to be defined in the regulation and recognized by

the Food and Drug Administration (FDA) to label a product with such a claim. However, starting in 1997 with the Food Safety Modernization Act (FSMA), a nutrient content claim may be used if the claim itself is recognized by a United States scientific body in a published statement.²

Often, nutrient content claims are coupled with health claims or health-related claims. Similar to a nutrient content claim, health claims are also defined in the FD&C Act as, “*any claim that expressly or by implication ... characterizes the relationship of any substance to a disease or health-related condition*” (Food and Drugs 2020a). To qualify as a health claim, a claim must connect a substance to a disease or health-related condition and must be validated by the FDA themselves. For example, “Adequate calcium and vitamin D as part of a healthful diet, along with physical activity, may reduce the risk of osteoporosis in later life” (Nutrition 2020). In addition to health claims specifically, health-related claims discuss the health of consumers and include a wide variety of statements from structure-function claims to dietary guidance to general well-being claims (Fortin 2017). Expressly, structure-function claims, as used in this study, describe the role of an ingredient or nutrient in maintaining the normal structure or function in humans. For example, “calcium builds strong bones,” informs the consumers that calcium (the nutrient/structure) leads to strong bones in humans (the function). Health-related claims, in general and including structure-function claims, are able to appear on labels without formal approval from the FDA.³

² A nutrient content claim can be presented to the consumers in two ways – an expressed nutrient content claim or an implied nutrient content claim (Food and Drugs 2020b, p.21).

³ However, the label must still abide by the FD&C Act in that the label does not mislead consumers and is truthful (Food and Drugs 2020b).

Overall, these strict regulations aim to reduce consumer uncertainty and provide reliable information the end user.⁴ Many studies support that the regulated nutrient content and health-related labeling guidelines are important because they influence consumers' choices when purchasing food products. In a meta-analysis of choice experiment studies specific to nutrition and health, Kaur, Scarborough and Rayner (2017) found consumers are 75% more likely to choose a food product that carries a health-related claim than a product that does not carry a health-related claim. Similarly, Ballco, Caputo and de-Magistris (2020) found that the utility increased for yogurt in the presence of nutrition and health claims. da Fonseca and Salay (2008) found that nutritional concerns impact consumers' intent to buy beef and pork and Rimal (2005) found that 60% of U.S. consumers found a health claim important on meat product labels. J. van buul and Brouns (2015), discuss that consumers purchase products with nutrient content and health-related claims to help them reach their health goals. In turn, J. van bull and Brouns suggest that nutrition and health claims may increase consumers' overall preference towards such products. In the same context, Drichoutis et al. (2006) point out that consumers tend to view products that present a nutrient or health-related claim as being the healthier purchase option.

The idea that nutrition and health impacts consumers' purchasing behavior, lead researchers to investigate the impact on consumer preferences and willingness to pay for such attributes. Through two choice experiments conducted in the European Union, Van Wezemael et al. (2014) found that consumers place a higher utility on products with a nutrient content label for lean beef steak but this utility varies by country. While investigating the willingness to pay for nutritional claims on cheese products, de-Magistris and Lopéz-Galán (2016), found that Spanish consumers are willing

⁴ Many other countries have a regulatory system for nutrient content type labels; however, all vary in their requirements and implementation. See Domínguez Díaz, Fernández-Ruiz and Cámara (2020) for more information.

to pay a premium for “reduced fat” and “low salt” claims. Additionally, Jurado and Gracia (2017) found that Spanish consumers were willing to pay a price premium for products that included a fiber and fat nutrient content claim.

Given the higher willingness to pay for nutrient content claims/nutritional information, there is also literature to suggest that consumers do not fully understand these claims (Cowburn and Stockley 2005). Similarly, Chang et al. (2012) explored consumer willingness to pay for soy products finding that consumers responded to the presence of a health claim on all four products presented. An interesting take away from Chang, Moon and Balasubramanian is that consumers do not seem to associate the nutrient content claim – soy protein content levels – with the associated health claim presented. Still, consumer valuation for claims related to health results in a higher willingness to pay for products that present a health or health-related claim on their label. For example, surveying U.S. millennials Kolady, Kattelman and Scaria (2019) found that when it comes to probiotics, consumer willingness to pay for the word “probiotic” is the same as a broad structure-function claim related to probiotics. Kolady et al. conclude that millennials view the word ‘probiotic’ as an implicit health claim. Through an experimental study, Hwang, Lee and Lin (2016) found that college aged consumers are willing to pay for the labeling of fiber accompanied by an associated health claim, “promotes digestive health.” Barreiro-Hurlé et al. (2009), through a choice experiment for pork sausages, found health claims are valued more by consumers than nutritional attributes such as nutrient content claims and nutrient fact panels. Similarly, Verbeke, Scholderer and Lähteenmäki (2009), exploring the impact of nutrition and health claims through analyzing cross-sectional data, found that generally health claims outperformed nutrition claims. In the same way, Ballco and De-Magistris (2018) found that there is a higher impact on willingness to pay for health claims than nutrition claims, possibly due to the novelty of health claims. Given the few

studies that support the use of nutrient content claims presented together with health claims on products outside of the meat and dairy industry, our study seeks to explore the impact of nutrient content claims and health-related claims on a juice product.

In assessing these two types of claims together, we know consumers make tradeoffs between product attributes, including the price as well as label characteristics (McFadden 1974; Hanemann 1984). Pozo, Tonsor and Schroeder (2012) found that the combination of attributes presented influences willingness to pay. In addition, Caputo et al. (2016) found that consumer willingness to pay for product attributes depends on the type of attribute present, as well as the role the attribute plays to the consumers. Similarly, attribute number as well as attribute type may result in a decrease in the quality of choice made by a consumer (Iyengar and Lepper 2000; Schram and Sonnemans 2011; Hanoch et al. 2011; Besedeš et al. 2012). Applying these ideas, in this study we will explore the tradeoffs between origin and nutrition/health labeling. To do so, we use a product that is relevant for origin labeling, as well as nutrition/health labeling, tart cherry juice.

2.3 Tart Cherry Juice

Tart cherries are an ideal case study because they have multiple perceived health benefits and have a concentrated geographical production in the United States. Michigan leads the production of the specialty crop, producing nearly 74 percent of U.S. Montmorency tart cherries (United States Department of Agriculture 2016). New York, Oregon, Pennsylvania, Utah, Washington, and Wisconsin grow the other quarter of U.S. tart cherries. These tart cherries are used in a variety of products, such as dried tart cherries, ingredients in snacks, juice, ingredients in alcohol products and supplements.

Simultaneously, other countries, namely Turkey, import large amounts of tart cherries into the U.S. market. The Cherry Marketing Institute in the United States, reports that in 2016, 55% of tart cherry juice concentrate in the U.S. was from Turkey, largely due to the lower price charged for Turkish tart cherry juice concentrate compared to the equivalent U.S. product (Cherry Marketing Institute 2021). In 2015, the U.S. imported \$3,562,000 worth of dried tart cherries, resulting in a price decrease of nearly 50% for domestic producers (Noble 2018). As a result, the U.S. tart cherry industry pursued legal action by means of an anti-dumping case (Galloway 2019). Recently, however, the U.S. International Trade Commission voted that tart cherries from Turkey were not negatively impacting the U.S. industry and the case would not be approved (Hargreaves 2020; United States International Trade Commission 2020). Although the industry did not win the anti-dumping case, the large amounts of Turkish imports harm U.S. tart cherry producers. As such, to help U.S. producers reposition their place in the market, the Cherry Marketing Institute is pursuing means to better advertise and promote their products (Cherry Industry Administrative Board 2020). This study provides valuable information to producers and marketing groups on the use of origin labeling and farmer support claims to promote U.S. and Michigan grown tart cherries.

While tart cherry juice consumption is generally low among the average consumer (Lagoudakis et al. 2020), tart cherries are considered a “super fruit” by many across the juice industry because of their packed nutrient profile (Cherry Marketing Institute 2015). Market research expects the consumption of tart cherry juice to increase over the next five years (Brandessence Market Research 2020). This increase is due in part by the already rising demand for gourmet tart cherry snacks and juice in general over the past few decades (Conley and Lusk 2019). Additionally, demand for tart cherry products is expected to increase because of the fruit’s believed health benefits.

Although the U.S. regulatory community has not yet supported such claims for tart cherries, many pilot or small-scale studies support the consumption of tart cherries and tart cherry juice to provide various health benefits. The United States Cherry Industry Administration Board and the Cherry Marketing Institute describe Montmorency tart cherries as, “packed with multiple health-promoting nutrients and bioactive compounds” (Cherry Marketing Institute 2021). Sleep, recovery, arthritis and gout, heart health, and gut health are among the areas of health that tart cherries and tart cherry juice impacts. Specifically, when it comes to sleep, researchers believe that the natural melatonin present in tart cherries aids in regulating the natural sleep wake cycle and generating enhanced sleep quality (Howatson et al. 2012; Pigeon et al. 2010; Losso et al. 2018). In addition, researchers believe that tart cherry consumption reduces blood pressure due to the presence of high levels of potassium and other bioactive compounds (Chai et al. 2018; Keane et al. 2016). As such, we use potassium and melatonin as the nutrient content claims of interest for tart cherry juice with the accompanying structure-function claims of “helps maintain normal blood pressure” and “helps regulate sleep wake cycles.”

3. SURVEY DESIGN

To assess consumers' willingness to pay for nutrient content claims, health-related claims, origin labels, and farmer support claims, an online survey was administered in December 2020. The survey was created in the Qualtrics® platform and sent out by Dynata (Dynata 2020) to a pool of U.S. consumers. At the onset of the survey instrument, respondents were asked to consent to participating in the voluntary survey to be used for research purposes, as defined by IRB MSU study ID #STUDY00005314. To participate in the survey, respondents were to be 18 years or older, the primary shopper or share primary shopping responsibilities for their household and have purchased any type of fruit juice in the last three months. Respondents who did not fit these qualifications were dismissed from the survey. In addition, sample quotas were in place in an attempt to receive a more a representative sample of the U.S. population.

We used a discrete choice experiment to elicit consumers' willingness to pay (WTP) for credence attributes on tart cherry juice. The survey also included questions to help us understand the purchasing preferences and decisions of fruit juice consumers. Demographics questions, including age, gender, education, income, and wellness, were asked to better understand the differences in individual willingness to pay across consumers. Diet and wellness questions were included as these characteristics could impact WTP for nutrient content and health-related claims. In addition, we asked questions related to consumer preferences toward local products and products from a specific geographic origin to understand their use of such labels when making purchasing decisions. After cleaning the data, we collected 1,535 usable responses.

4. EXPERIMENTS AND RESEARCH HYPOTHESES

4.1 Attributes and Attribute Levels

In the case of tart cherry juice, consumers are increasingly concerned with where the juice comes from (Cherry Industry Administrative Board 2020) and the health benefits the juice possesses (Cherry Marketing Institute 2015). Thus, the attributes of focus for this analysis are price, origin, and nutrient content (Table 1). These attributes and attribute levels are consistent with what a consumer might encounter in a grocery store setting when purchasing tart cherry juice. Through market research at the time the survey was administered, prices in the grocery store ranged between \$1.09 and \$5.10 for a 12-ounce bottle of tart cherry juice. Therefore, the four price levels chosen were \$1.25, \$2.75, \$4.25, and \$5.75. The origin attribute has three levels – U.S. Grown, Grown in Michigan, and Imported. Michigan was chosen as the state agricultural product label because it is the largest cherry producing state in the United States (United States Department of Agriculture 2016). Along with the origin label, in some treatments, described below, the U.S. and Michigan origin labels were accompanied by an associated farmer support claim. The third attribute, nutrient content, has three levels – good source of potassium, natural source of melatonin, and no label. These claims were chosen because of the health benefits of tart cherries (Cherry Marketing Institute 2021). Knowing that tart cherry juice contains a high level of potassium, the claim “good source of potassium” is allowable within the current regulations.⁵ The second level, natural source of melatonin, is used because of the levels of melatonin present in tart cherry juice. In two of the treatments described below, an associated health-related claim, including “helps maintain normal

⁵ According to Section 101.54 of the Code of Federal Regulations, to be labelled with “good source” the product must contain 10 to 19% of the recommended daily intake or daily recommended value of the nutrient of focus (Food and Drugs 2020d).

blood pressure” or “helps regulate sleep wake cycles,” is used in conjunction with the nutrient content claim from potassium and melatonin, respectively.

Table 1. Attributes and attribute levels for a 12 oz bottle of tart cherry juice

Attributes	Attribute levels
Price	\$1.25, \$2.75, \$4.25, \$5.74
Origin ^a	U.S. Grown, Grown in Michigan, Imported
Nutrient Content ^b	Good Source of Potassium, Natural Source of Melatonin, None

^a Includes associated farmer support claims based on the treatment, see Table 2

^b Includes associated health-related claim based on the treatment, see Table 2

4.2 Discrete Choice Experiment

This study uses hypothetical discrete choice experiments (DCE) to investigate consumer preferences for nutrient content and associated health-related claims, as well as origin labels and associated farmer support claims for tart cherry juice. With hypothetical experiments, there is a potential for an over estimation bias for individual willingness to pay (Hensher 2010; Johansson-Stenman and Svedsäter 2008); however, when studying the marginal willingness to pay, Lusk and Schroeder (2004) found that the bias from hypothetical experiments are minimized. To minimize the potential bias, we use a cheap talk script (Lusk 2003a; Cummings and Taylor 1999), found in Appendix A.

Choice experiments are designed relative to the attributes and attribute levels that surround the chosen product. To mimic shopping behavior, where multiple substitutes are available, multiple alternatives were presented within each choice question. Respondents were presented repeated choice questions that contained three alternatives – two types of tart cherry juice, with varying attribute levels, and a no-buy option (Figure 1). Providing a no-buy option allowed consumers to

choose not to buy a tart cherry product, given the presented choices (Adamowicz, Louviere and Swait 1998).

Choose the type of juice you would prefer to purchase at the listed price. If you would not purchase either product choose the no-purchase option to the right.

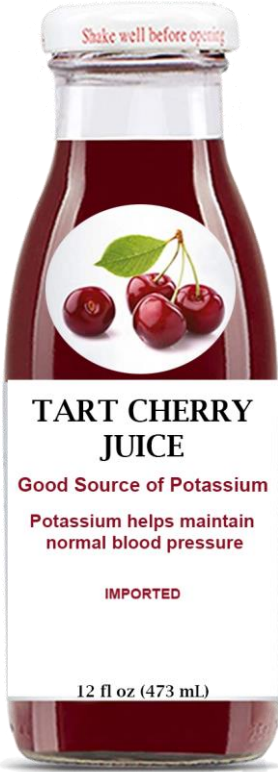
Option A	Option B	Option C
 \$4.25	 \$2.75	If these were the only products available I would not buy any juice.
☐	☐	☐

Figure 1. Example of a Choice Experiment Question

Based on the attributes and attribute levels selected, a full factorial design with two alternatives would require $4^{2*1} \times 3^{2*2} = 1,296$ choice questions for one treatment.⁶ Using an orthogonal optimal design we were able to reduce the number of choice questions to 36 per treatment with

⁶ The full factorial design is calculated by solving L^{MA} , where L is the number of levels, M is the number of alternatives, and A is the number of attributes (Hensher, Rose and Greene 2005).

96.54% D-Optimality. The orthogonal optimal design assumes that all parameter priors are simultaneously equal to zero, i.e. null parameter prior hypothesis. This was done using the ChoiceMetrics choice software, Ngene (Ngene 2018). Next, we reduced the number of choice questions seen per respondent by splitting the choice questions into three blocks of 12 questions to reduce respondent fatigue. Randomization was used within each choice set to prevent ordering effects.

4.3 Between Sample Treatments

Through a between sample approach, respondents were randomly assigned to one of the four treatments. These treatments are used to evaluate the willingness to pay for nutrient content and origin labels with and without supporting claims. As presented in Table 2, the treatments are labelled as: *Control (CTRL)*, *Health Claim (HCLAIM)*, *Farmer Support Claim (FCLAIM)*, and *All Claims (ALLCLAIM)*.

Table 2. Choice experiment treatment design

	<i>Control</i> CTRL	<i>Health Claim</i> HCLAIM	<i>Farmer Support Claim</i> FCLAIM	<i>All Claims</i> ALLCLAIM
<i>USA</i>	√	√		
<i>Michigan</i>	√	√		
<i>USA + Farmer Support Claim</i>			√	√
<i>Michigan + Farmer Support Claim</i>			√	√
<i>Potassium</i>	√		√	
<i>Melatonin</i>	√		√	
<i>Potassium + Health-Related Claim</i>		√		√
<i>Melatonin + Health-Related Claim</i>		√		√

The first treatment, *Control*, does not provide support claims for either of the attributes described above. The second treatment, *Health Claim*, includes a health-related claim in addition to the nutrient content claim. In this treatment, “good source of potassium” is accompanied by “potassium helps maintain normal blood pressure” and “natural source of melatonin” is accompanied by “melatonin helps regulate the sleep-wake cycle.” The third treatment, *Farmer Support Claim*, includes a farmer support claim when “Grown in Michigan” or “U.S. Grown” are present. In this treatment, “Supports Michigan Farmers” is displayed with “Grown in Michigan” and “Supports U.S. Farmers” is displayed with “U.S. Grown.” There is not a farmer support claim presented for the imported attribute level. For the fourth and final treatment, *All Claims*, we combine the *Health Claim* and *Farmer Support Claim* treatments by presenting the supporting claims for both the origin and nutrient content attributes.

4.4 Research Hypotheses

The treatment design allows us to test the impact of supporting claims on the willingness to pay for origin and nutrient content labels for tart cherry juice. With the presentation of these hypotheses, origin includes USA and Michigan, $ORIG = \{USA, MICH\}$, and nutrient content is composed of potassium and melatonin, $NUTR = \{POT, MEL\}$.

To test our first hypothesis – willingness to pay for nutrient content claims will be greater when coupled with a health-related claim – we present two tests between treatments. We compare WTP estimates for nutrient content between *Control* ($CTRL$) and *Health Claim* ($HCLAIM$). We expect that the presence of a health-related claim in the *Health Claim* treatment (WTP_{NUTR}^{HCLAIM}) will result in a higher WTP for nutrient content compared to the *Control* (WTP_{NUTR}^{CTRL}), that does not display a health-related claim. Second, we compare the WTP estimates for nutrient content between products that do not have a health-related claim in the *Control* treatment (WTP_{NUTR}^{CTRL}) and products

that present health-related claims in the *All Claims* treatment ($WTP_{NUTR}^{ALLCLAIM}$). Here, we expect to find that the WTP for a health-related claim, even in the presence of another support claim, will increase. These hypotheses are consistent with Hwang et al. (2016) who found that consumers had a higher willingness to pay for fiber when presented with a fiber health-related claim.

$$H_{01A} = (WTP_{NUTR}^{CTRL} - WTP_{NUTR}^{HCLAIM}) \geq 0 \quad (1)$$

$$H_{11A} = (WTP_{NUTR}^{CTRL} - WTP_{NUTR}^{HCLAIM}) < 0 \quad (2)$$

$$H_{01B} = (WTP_{NUTR}^{CTRL} - WTP_{NUTR}^{ALLCLAIM}) \geq 0 \quad (3)$$

$$H_{11B} = (WTP_{NUTR}^{CTRL} - WTP_{NUTR}^{ALLCLAIM}) < 0 \quad (4)$$

Similarly, there are two tests for our second hypothesis – willingness to pay for an origin label will be greater when coupled with a farmer support claim. To first test this hypothesis, we compare the WTP estimates for origin between the *Control* ($CTRL$) treatment and the *Farmer Support Claim* ($FCLAIM$) treatment. We expect that the presence of a farmer support claim (WTP_{ORIG}^{FCLAIM}) will result in a higher WTP compared to the control (WTP_{ORIG}^{CTRL}), that does not display a farmer support claim. Additionally, we can compare the WTP estimates across products that do not have a farmer support claim in the *Control* treatment (WTP_{ORIG}^{CTRL}) and those that do have a farmer support claim in the *All Claims* treatment ($WTP_{ORIG}^{ALLCLAIM}$). Here, we expect to find the WTP for a farmer support claim, even in the presence of health support claims, will increase. While no studies have looked at the impact of such claims specifically, this hypothesis is derived from the growing support consumers have farmers (Ufer, Ortega and Lin 2021; AND International 2021).

$$H_{02A} = (WTP_{ORIG}^{CTRL} - WTP_{ORIG}^{FCLAIM}) \geq 0 \quad (5)$$

$$H_{12A} = (WTP_{ORIG}^{CTRL} - WTP_{ORIG}^{FCLAIM}) < 0 \quad (6)$$

$$H_{02B} = (WTP_{ORIG}^{CTRL} - WTP_{ORIG}^{ALLCLAIM}) \geq 0 \quad (7)$$

$$H_{12B} = (WTP_{ORIG}^{CTRL} - WTP_{ORIG}^{ALLCLAIM}) < 0 \quad (8)$$

Finally, there are two tests for our third hypothesis – the willingness to pay when health-related and farmer support claims are presented simultaneously will be less than when the farmer support claims or health-related claims are presented by themselves. When comparing the *Farmer Support Claim (FCLAIM)* treatment to the *All Claims (ALLCLAIM)* treatment, we expect that the presence of a farmer support claim coupled with a health-related claim in the *All Claims* treatment ($WTP_{ORIG}^{ALLCLAIM}$) to be less than the WTP for origin in the *Farmer Support Claim* treatment (WTP_{ORIG}^{FSUP}). In addition, we can compare the *Health Claim (HCLAIM)* treatment to the *All Claims (ALLCLAIM)* treatment. Here, we expect that the presence of a health-related claim coupled with a farmer support claim in the *ALLCLAIM* treatment ($WTP_{NUTR}^{ALLCLAIM}$) to be less than the WTP for nutrient content compared to the control (WTP_{NUTR}^{CTRL}).

$$H_{03A} = (WTP_{ORIG}^{ALLCLAIM} - WTP_{ORIG}^{FCLAIM}) \leq 0 \quad (9)$$

$$H_{13A} = (WTP_{ORIG}^{ALLCLAIM} - WTP_{ORIG}^{FCLAIM}) > 0 \quad (10)$$

$$H_{03b} = (WTP_{NUTR}^{ALLCLAIM} - WTP_{NUTR}^{HCLAIM}) \leq 0 \quad (11)$$

$$H_{13B} = (WTP_{NUTR}^{ALLCLAIM} - WTP_{NUTR}^{HCLAIM}) > 0 \quad (12)$$

This hypothesis is informed by previous studies about information overload, which can occur when consumers are presented with multiple attributes at a time. As presented in a meta-analysis by Scheibehenne, Greifeneder and Todd (2010), there is a large variation in the effect of information overload. In addition Caputo et al. (2016) and Gao and Schroeder (2009) highlight the impact different types of attributes may have on WTP. Because of the large amount of information on the label and the presence of two cue attributes with support claims in the *All Claims* treatment, we hypothesize that this may overwhelm respondents leading to a lower quality of choices selected by the respondent.

5. EMPIRICAL MODELS AND SPECIFICATION

5.1 Utility Maximization and Probabilistic Models

In discrete choice experiments, consumers make a choice between alternative products presented in a choice set where each alternative has varying attribute levels. Discrete choice experiments are consistent with the Lancaster theory of consumer demand (Lancaster 1966), which postulates that the utility of a good can be segregated into the utility of different attributes characterizing the good in question. Additionally, this method is consistent with Random Utility Theory (McFadden 1974), which assumes that a given alternative will be selected by an individual if the perceived utility provided by such alternative is the highest among the other presented alternatives. Formally, the indirect utility U that an individual n derives from alternative j at choice situation t can be expressed as follows:

$$U_{njt} = V_{njt} + \varepsilon_{njt} \quad (13)$$

where V_{njt} is the representative portion of the utility determined by the selected attributes and attribute levels, observed by the researcher, and ε_{njt} is the error term, not observed by the researcher and considered random. The probability that an individual n chooses alternative j is

$$Prob_n \{j \text{ chosen}\} = \Pr (U_{nj} > U_{nk}, \text{ for all } k \in C_n \text{ with } k \neq j) \quad (14)$$

where C_n is the choice set for respondent n . In this study, each choice set is represented by two experimentally designed product alternatives and a “none” option, $C_n = \{A, B, None\}$. Various econometric models can be estimated depending on the assumption about the distribution of the error term, ε_{njt} , in equation (13) and the underlying assumptions for individual preferences.

Consistent with other studies on consumer preference for credence attributes (Aprile, Caputo and Nayga 2016; Van Loo et al. 2011), a multinomial logit model (MNL), as the baseline, and a mixed

logit with an error component (MXL-EC), also known as random parameter logit with an error component, are used. The MNL model assumes homogenous consumer preferences across consumers. In the MNL model the error term, ε_{njt} , is assumed to be independently and identically distributed across alternatives, individuals, and choice sets with an extreme value distribution. Because of the potential heterogeneity that may arise among consumers taste preferences, we estimate the MXL-EC model (Van Loo et al. 2011). The MXL-EC model assumes heterogeneous preferences across consumers. By including an error component (EC) in the model, we can account for the correlation across utilities, that may exist in the no-buy or ‘none’ option in our choice experiments (Scarpa, Ferrini and Willis 2005; Scarpa, Willis and Acutt 2007).

Four MXL-EC models are estimated, one for each treatment, to test for treatment effects. The utility function for each model is:

$$U_{njt} = ASC_{none} + \alpha Price_{njt} + \beta_{USA} USA_{njt} + \beta_{MICH} MICH_{njt} + \beta_{MEL} MEL_{njt} + \beta_{POT} POT_{njt} + 1_j(h_{nt}) + \varepsilon_{njt} \quad (15)$$

where ASC_{none} is the alternative specific constant representing the no-buy option; $Price_{njt}$ is a continuous variable indicating the price levels selected for a 12 oz bottle of tart cherry juice; USA_{njt} and $MICH_{njt}$ are dummy variables indicating the origin of tart cherry juice, from the broader United States or the state of Michigan; MEL_{njt} and POT_{njt} are dummy variables indicating a nutrient content claim for tart cherry juice, either the presence of potassium or melatonin. $1_j(\cdot)$ is an indicator function that takes the value of 1 for experimentally designed food profiles; h_{nt} is a normally distributed zero mean error component shared by the two purchase alternatives; ε_{njt} is the random error that follows a Type I extreme value distribution. We used imported tart cherry juice without a nutrient content claim as the baseline. We assumed a fixed

price coefficient and that the coefficients of the non-price attribute levels were normally distributed in the population. The MXL-EC models were estimated using a panel data structure and full correlation, where the error component is correlated with the other random parameters (Caputo 2020; Caputo et al. 2018), as evidence indicates that mixed logit models require full correlation to ensure the invariance of estimates (Burtton 2019). The correlation and Cholesky matrices for each treatment are in Appendix E and D, respectively.

In addition, in discrete choice experiments and online surveys in general, there is a potential for inattention bias, that could lead to statistically different decisions (Malone and Lusk 2018; Gao, House and Bi 2016; Murphy et al. 2005). To reduce the impact of inattention bias in evaluation, Malone and Lusk (2018) introduce a method which reduces this bias through the random response share (RRS). To implement this methodology, we use a latent class logit model (LCM), with three classes and restrict all parameters for one class to zero. The coefficient values of zero indicate that completely random choices were made by the respondent. After estimating the LCM model, we eliminate respondents with a class probability greater than 0.90 for the RRS class from successive choice models, as their responses are considered to be random choices. The respondents remaining after this data cleaning procedure are used in the mixed logit model with an error component.

5.2 Willingness to Pay Estimates

The coefficients obtained from the MXL-EC model were utilized to calculate the marginal WTP for each of the selected non-monetary attributes. For each treatment of interest, the marginal WTP for each attribute k was calculated as follows:

$$MWT P_k = -\frac{\beta_k}{\alpha} \quad (16)$$

where β_k is the coefficient estimated for each k attribute and α is price the coefficient.

In addition to the marginal willingness to pay, we calculate the total WTP for each combination of attributes – USA with a potassium claim, USA with a melatonin claim, Michigan with a potassium claim, and Michigan with a melatonin claim. Following a similar process as above, we calculate the total willingness to pay for each combinations of product attributes as follows:

$$Total\ WTP_T = -\frac{(B_m + B_l)}{\alpha} \quad (17)$$

where β_m and β_l are the coefficient estimates for m and l attributes.

To determine statistical differences in the marginal WTP estimates across treatments, we implemented a two-step process. First, through the Krinsky and Robb (1986) procedure, 1,000 willingness to pay estimates were simulated from multivariate normal distributions created using the coefficient estimates and the variance covariance matrix from the MXL-EC models. Using this procedure, we generated a marginal willingness to pay estimate and a 95% confidence interval for each label in each treatment. Next, we implemented the pair-wise, combinatorial test suggested by Poe, Giraud and Loomis (2005). This test assumes a null hypothesis of the difference between the willingness to pay of attribute k in one treatment is equal to the willingness to pay for attribute k in another treatment. If we reject the null hypothesis, then we confirm that the willingness to pay for a label in one treatment is significantly different than the willingness to pay for that label in another treatment. This pairwise, combinatorial procedure provides an unbiased, nonparametric test using all possible combinations from the 1,000 willingness to pay draws produced by the Krinsky and Robb procedure. Namely, there were 1,000,000 differences used to determine the p-value from the pairwise test between each treatment (e.g. $WTP_x - WTP_y \forall x, y$; where $x=1, \dots, 1000$ and $y=1, \dots, 1000$).

5.4 Differences in Marginal Willingness to Pay Estimates Across Demographics

Because the willingness to pay for product attributes are not the same for every individual, we explore the heterogeneity that exists among the marginal WTP estimates. These differences can be the result of many things, such as demographic or sociodemographic characteristics (Scarpa, Ferrini, et al. 2005, Scarpa and Del Giudice 2004, Skuras and Vakrou 2002 and Fotopoulos and Krystallis 2003). We used the Bayesian procedure illustrated in Train (2009) and derived the conditional or individual-specific marginal WTP for each non-monetary attribute k . Subsequently, these individual-specific marginal WTP are used to estimate a seemingly unrelated regression (SUR) model, found in equations (18) and (19), to determine how WTP varies based on demographics and purchasing habits. The SUR allows for cross equation correlation and more efficient estimates compared to individual ordinary least squares (OLS) regressions for each WTP individually (Bartels 2006; Zellner 1962). The model was specified as follows:

$$WTP = X\delta + \vartheta \quad (18)$$

where

$$WTP = \begin{pmatrix} WTP_{USA} \\ WTP_{MICH} \\ WTP_{POT} \\ WTP_{MEL} \end{pmatrix} = \begin{pmatrix} X_{USA} & 0 & 0 & 0 \\ 0 & X_{MICH} & 0 & 0 \\ 0 & 0 & X_{POT} & 0 \\ 0 & 0 & 0 & X_{MEL} \end{pmatrix} \cdot \begin{pmatrix} \delta_{USA} \\ \delta_{MICH} \\ \delta_{POT} \\ \delta_{MEL} \end{pmatrix} + \begin{pmatrix} \vartheta_{USA} \\ \vartheta_{MICH} \\ \vartheta_{POT} \\ \vartheta_{MEL} \end{pmatrix} = X\delta + \vartheta \quad (19)$$

For each individual n , X_f for $f = \{USA, MICH, POT, MEL\}$ are vectors of explanatory variables in each regression, such that X_f for equation f consists of explanatory variable vector X_{fn} for individual n , with corresponding coefficient vectors, δ_f , to be estimated. The explanatory variable vector is composed of demographic and purchasing habit variables. The normally distributed error terms are contained in vectors ϑ_f and are assumed to be correlated across attributes but not across

respondents. To test for the efficiency of the SUR model versus individual OLS regressions, we use the Breusch and Pagan (1980) Lagrange multiplier test (Greene 2012).

6. RESULTS AND DISCUSSION

6.1 Sample Characteristics

Table 3 presents the demographic and sociodemographic characteristics, of the sample and is also disaggregated by the four individual treatments.⁷ The sample is composed of near equal parts males and females. The respondents' ages ranged from 18 to 88, with over 25% of the sample being composed of consumers 65 years and older. Approximately 37% of respondents have a household income of greater than \$75,000 per year and near 50% of the sample have a four-year degree or higher. Compared to the U.S. population, our sample is more educated than average. In 2019, 22.5% of U.S. residents over the age of 25 had a 4-year college degree (US Census Bureau 2020b). Additionally, the average household income in this sample is between \$50,000 and \$59,000, whereas the average U.S. household income in 2018 was \$64,324 (US Census Bureau 2020a). Over 50% of the sample resides in suburban areas and less than 5% of respondents resides in the state of Michigan. Overall, the demographic and sociodemographic characteristics for all four samples are similar. We found no significant differences (ANOVA) between the treatments for the characteristics below.

In addition to sociodemographic characteristics for respondents, we also gathered information related to consumers purchasing preferences and overall health (Table 4). On average, 86% of respondents make an effort to buy products from a specific geographical region. For local foods specifically, 57% of respondents always try to buy local foods or have started buying local foods within the last year. In terms of health, over 80% of respondents indicated that they have excellent,

⁷ To reduce inattention bias in our estimates, we removed participants with random choices using the RRS method described in the Empirical Models and Specifications section. This resulted in removing 135 participants including 22%, 11%, 15% and 8% of respondents in each treatment, respectively. This data cleaning procedure resulted in a usable sample of 1,400 U.S. consumers for this analysis.

very good or good general, physical, and mental health; however, about 30% indicated that they or someone in their household has hypertension. These participant demographic characteristics will be used in the post estimation analysis of individual willingness to pay.

Table 3. Basic demographic and sociodemographic characteristics of sample, percentages

Experiment	Description	<i>All Treatments</i>	<i>Control</i>	<i>Health Claims</i>	<i>Farmer Support Claims</i>	<i>All Claims</i>
<i>n</i>		1400	320	352	346	382
Gender	1 if female; 0 otherwise	0.51	0.50	0.50	0.49	0.53
<i>Age</i>						
Young	1 if ages 18 to 44; 0 otherwise	0.38	0.31	0.41	0.36	0.43
Middle aged	1 if ages 45 to 64; 0 otherwise	0.36	0.43	0.31	0.37	0.34
65 and older	1 if ages 65 years old and older; 0 otherwise	0.26	0.26	0.28	0.27	0.24
High Income	1 if household income over \$75,000; 0 otherwise	0.37	0.38	0.37	0.39	0.35
College Education	1 if four-year degree of higher; 0 otherwise	0.52	0.49	0.53	0.53	0.52
<i>Political Affiliation</i>						
Republican	1 if republican party affiliation; 0 otherwise	0.33	0.32	0.33	0.33	0.33
Democrat	1 if democratic party affiliation; 0 otherwise	0.39	0.38	0.41	0.36	0.39
Other	1 if other party affiliation; 0 otherwise	0.29	0.31	0.26	0.31	0.29
<i>Neighborhood Description</i>						
Rural	1 if resides in a rural area; 0 otherwise	0.21	0.22	0.20	0.21	0.20
Suburban	1 if resides in a suburban area; 0 otherwise	0.55	0.56	0.55	0.55	0.53
Urban	1 if resides in an urban area; 0 otherwise	0.25	0.22	0.25	0.24	0.27
Michigan	1 if resident of Michigan, 0 otherwise	0.03	0.02	0.03	0.04	0.04

Table 4. Purchasing preferences and overall health of sample, percentages

Variable	Description	All Treatments	Control	Health Claims	Farmer Support Claims	All Claims
<i>n</i>		1400	320	352	346	382
Geographic Origin	1 if make an effort to buy products from a specific geographical origin; 0 otherwise	0.86	0.89	0.84	0.86	0.85
Local Food Purchasers	1 if always try to buy local foods or have tried to buy local foods within the last year; 0 otherwise	0.57	0.63	0.53	0.53	0.59
Good general health	1 if general health is excellent, very good or good on Likert-scale; 0 otherwise	0.84	0.83	0.83	0.85	0.85
Good physical health	1 if physical health is excellent, very good or good on Likert-scale; 0 otherwise	0.82	0.81	0.81	0.83	0.83
Good mental health	1 if mental health is excellent, very good or good on Likert-scale; 0 otherwise	0.84	0.85	0.85	0.83	0.83
Hypertension	1 if respondent or someone in household has hypertension; 0 otherwise	0.31	0.31	0.31	0.32	0.32

6.2 Estimates from the MXL-EC Model

Table 5 reports the estimation results from the MXL-EC model for each treatment.⁸ Because the alternative specific constant (ASC_{none}) is normalized to indicate the utility the respondents have for the no-buy option (Alternative C) compared to Alternative A and Alternative B, a negative coefficient means that if the price is constant consumers prefer to have one of the juice products presented than none at all. As presented in Table 5, we find this to be true for all four treatments, validating the relevancy of the attributes selected to describe tart cherry juice – origin and nutrient content. We also find the coefficient on price to be negative across all treatments, meaning that an increase in price will decrease the consumer’s utility, consistent with the law of demand. Also, the standard deviations of the parameters derived for each label are statistically significant, except for melatonin in treatment 3, indicating that consumers exhibit significant preference heterogeneity in respect to these labels.

Given the differences in scales across treatments, interpretation of individual coefficients is discouraged in MXL-EC models (Greene and Hensher 2003). Hence, we discuss and interpret our results in terms of marginal WTP.

⁸ The parameter estimates of the basic multinomial logit model can be found in Appendix C. Because the MNL model assumes that consumers are homogenous, we estimate the mixed logit model with an error component to allow heterogeneity across respondents. Using the Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC) we determine that the MXL-EC is the best fit, with the lowest AIC and BIC.

Table 5. Parameter estimates from the Mixed Logit with Error Component models for each treatment

Variables	Coefficients			
	Control	Health Claim	Farmer Support Claim	All Claims
NOBUY	-3.61*** (0.33)	-3.45*** (0.42)	-3.70*** (0.48)	-3.59*** (0.40)
PRICE	-1.16*** (0.05)	-0.79*** (0.03)	-0.96*** (0.04)	-0.68*** (0.03)
USA	1.61*** (0.20)	1.39*** (0.14)	2.41*** (0.19)	1.42*** (0.13)
MICH	1.68*** (0.21)	1.41*** (0.15)	2.41*** (0.20)	1.51*** (0.14)
MEL	-0.13 (0.12)	0.42*** (0.11)	-0.01 (0.10)	0.16** (0.08)
POT	0.01 (0.12)	0.40*** (0.10)	-0.01 (0.10)	0.27** (0.09)
<i>Standard deviations of parameter distributions</i>				
USA	2.53*** (0.22)	1.69*** (0.15)	2.20*** (0.18)	1.62*** (0.13)
MICH	2.86*** (0.25)	1.87*** (0.16)	2.22*** (0.19)	1.86*** (0.15)
MEL	0.43* (0.23)	1.20*** (0.13)	0.17 (0.12)	0.28** (0.11)
POT	0.74** (0.15)	0.94*** (0.13)	0.35* (0.20)	0.43** (0.20)
<i>Error component standard deviation</i>				
	6.28***	6.06***	7.72***	6.25***
<i>Summary statistics</i>				
N	3840	4224	4512	4584
LL	-2003.06	-2515.27	-2232.87	-2819.70
AIC ^b	4048.10	5072.50	4507.70	5681.40
BIC ^b	4012.20	5036.63	-4459.65	5645.49
McFadden Pseudo R ²	0.53	0.46	0.51	0.44

^a Numbers in parenthesis are the standard errors.

^b AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion.

*** p<0.01, ** p<0.05, * p<0.1

6.2.1 Marginal WTP Estimates

Table 6 displays the marginal willingness to pay estimates for product attributes across all four treatments and the corresponding confidence intervals following Krinsky and Robb (1986) parametric bootstrapping method, as used in a variety of discrete choice studies (Lusk and Schroeder 2004; Chang et al. 2012; de-Magistris, López-Galán and Caputo 2016). We expect there to be a positive price premium for USA, Michigan, melatonin, and potassium across the *Control* treatment to validate the selection of relevant attribute levels. We find this to be the case for all attributes except melatonin. While we were not surprised with the outcome of this hypothesis entirely, we were surprised by the insignificance of melatonin. With the rise in sleep issues among consumers, especially with the ongoing COVID-19 pandemic, we expected that melatonin would be a characteristic of interest for consumers (Clea 2020; Lufkin 2021). According to Nielsen, consumers increased their spending on melatonin supplements by 42.6% in 2020 from 2019 (Allana 2021; Caitlin 2021). Overall, origin claims had a higher willingness to pay than nutrient content claims.

To test hypotheses one through three, pair-wise combinatorial tests proposed by Poe et al. (2005) were conducted to statistically compare the marginal willingness to pay estimates for each label across treatments with p-values reported in Table 7. Looking at the estimates across treatments, the marginal willingness to pay for each attribute level varies (Table 6). Specifically, we begin by assessing hypothesis one, making the comparison between the *Control* and *Health Claim* treatments, as well as the *Control* and *All Claims* treatment for the nutrient content attributes. In comparing *Control* and *Health Claim*, we find that consumers are willing to pay \$0.43 and \$0.50 more for a 12 oz bottle of tart cherry juice, respectively, when the melatonin and potassium nutrient content claims are accompanied by a health-related claim. Using the combinatorial test, we find

that these differences in willingness to pay for melatonin and potassium are statistically significant at the 99% significance level, allowing us to reject H_{01A} . When comparing *Control* to *All Claims* for the nutrient content attributes, there is an increase in willingness to pay of \$0.34 for melatonin and \$0.38 for potassium in the presence of an associated health-related claim. The statistical significance between willingness to pay estimates in each treatment is significant at the 99% significance level, allowing us to reject H_{01B} . These results are consistent with other studies which found consumers have a preference for health-related and health claims when purchasing food products in addition to the nutrient content claim (Hwang et al. 2016; Chang et al. 2012; Kolady et al. 2019; Barreiro-Hurlé et al. 2009). However, this result contradicts studies by Barreiro-Hurle, Gracia and De-Magistris (2010) and Szathvary and Trestini (2014) which found that when multiple nutrient and health claims were presented at once, there was a negative impact on willingness to pay.

Next, we compare the *Control* and *Farmer Support Claim* treatments and the *Control* and *All Claims* treatment to understand how farmer support claims impact the WTP for origin claims, testing hypothesis two. For origin claims, we find that consumers are willing to pay over one dollar more for a 12 oz bottle of tart cherry juice, \$1.13 and \$1.06, respectively, for the USA and Michigan origin labels when accompanied by a farmer support claim. Using the combinatorial test, we find that these differences in willingness to pay for USA and Michigan labels are statistically significant at the 99% level, allowing us to reject H_{02A} . In the comparison between the *Control* and *All Claims* treatments for origin labels, we find that the difference between willingness to pay is \$0.70/bottle for USA and \$0.76/bottle for Michigan labels in the presence of a farmer support claim. The statistical significance between willingness to pay estimates in each treatment is significant at the 99% level, allowing us to reject H_{02B} .

The results from these hypotheses tests are positive for agricultural, and specifically, tart cherry stakeholders. Although past literature has found positive willingness to pay for country of origin and state agricultural product labeling, we find that the addition of a claim that supports local farmers could increase this premium. Given the struggles currently facing the United States tart cherry industry, the additional farmer support label is a good candidate for future marketing initiatives.

Table 6. Mean Willingness-to-Pay Estimates and 95% Confidence Intervals ^a for each treatment

Attributes	<i>Treatments</i>			
	<i>Control</i>	<i>Health Claim</i>	<i>Farmer Support Claim</i>	<i>All Claims</i>
USA	1.39 [1.07, 1.70] ^a	1.77 [1.45, 2.10]	2.52 [2.14, 2.92]	2.09 [1.72, 2.46]
MICH	1.45 [1.12, 1.80]	1.78 [1.40, 2.15]	2.51 [2.13, 2.92]	2.21 [1.79, 2.64]
MEL	-0.11 [-0.32, 0.08]	0.54 [0.28, 0.81]	-0.01 [-0.22, 0.19]	0.23 [0.00, 0.44]
POT	0.01 [-0.19, 0.21]	0.51 [0.25, 0.75]	-0.01 [-0.21, 0.19]	0.39 [0.15, 0.63]

^a 95% confidence intervals were found using the Krinsky Robb bootstrapping method (Krinsky and Robb 1986)

Table 7. Poe test p-values comparing willingness to pay for attributes across treatments

Treatment Pairings	<i>Attributes</i>			
	USA	MICH	MEL	POT
<i>Control vs. Health Claim</i>	0.06	0.10	<0.01	<0.01
<i>Control vs. Farmer Support Claim</i>	<0.01	<0.01	0.23	0.44
<i>Control vs. All Claims</i>	<0.01	<0.01	0.01	0.01
<i>Health Claim vs. All Claim</i>	0.11	0.06	0.04	0.26
<i>Farmer Support Claim vs. All Claim</i>	0.06	0.15	0.07	0.01

For our third hypothesis – willingness to pay when only shown one type of support claim (health-related claim or farmer support claim) will be less than the willingness to pay when support claims are shown for both origin and nutrition simultaneously – we evaluate two comparisons across treatments. For the first comparison, between the nutrient content attributes in the *Health Claim* treatment and the *All Claims* treatment, we find that the willingness to pay decreases, by \$0.31 and \$0.12/ bottle, respectively, for melatonin and potassium. When looking at the combinatorial test, the difference in willingness to pay for melatonin is significant at the 95% level yet is not significant for potassium. Similarly, when we compare the origin attributes between the *Farmer Support Claim* treatment and the *All Claims* treatment, we find that the willingness to pay decreases by \$0.43 and \$0.30/bottle for the USA and Michigan attributes, respectfully. In the same fashion, using the combinatorial test, we find that the difference in willingness to pay for USA is statistically significant at the 95% level, but the difference between the WTP for Michigan is not statistically significant. Therefore, we support H_{03A} and H_{03B} for USA and melatonin, but not potassium and Michigan.

The finding that the willingness to pay for the cue attributes does not improve when both support claims are shown together is consistent with Caputo et al. (2016). Potentially, consumers have to make tradeoffs between cue and independent attributes (Caputo et al. 2016). Furthermore, our results are contrary to Verlegh et. al. (2005), who found that the willingness to pay for country of origin labeling remains even as other attributes were included on the label. Another potential reason for the lower marginal WTP when both support claims are shown is choice overload.

Although the concept of choice or information overload is not completely understood, it is still acknowledged as a potential outcome when consumers are presented with a multitude of choices (Scheibehenne et al. 2010). Using a meta-analysis Scheibehenne et al. (2010) found varying

support for choice overload, with some studies finding significant effects while others did not. However, when there was an effect from choice overload, the result was a decrease in product choice or overall satisfaction with the product chosen. Many studies, especially in the health care industry support this idea (Iyengar and Lepper 2000; Schram and Sonnemans 2011; Hanoch et al. 2011; Besedeš et al. 2012). We see this to be true in our study. When consumers are presented with support claims separately, they tend to associate a higher preference and willingness to pay with the attribute; however, when they are presented with multiple support claims at one time, their willingness to pay goes down per attribute. With a multitude of attributes presented, the choice the consumer makes decreases in quality and is not consistent in the effect of a health-related claim and the farmer support claim.

6.2.2 Total Willingness to Pay Estimates

Table 8 displays the total willingness to pay estimates for four products across all four treatments and the corresponding confidence intervals following Krinsky and Robb (1986) parametric bootstrapping method. It can be noted that all four products present positive total willingness to pay estimates across all treatments.

In Table 9 we present results of the pair-wise combinatorial tests to statistically compare the total willingness to pay estimates for each label across treatments in terms of p-values. For all of the products of interest, there is a significant difference between the products in the *Control* treatments compared to the *Health Claim*, *Farmer Support Claim*, and *All Claims* treatments. This makes sense in reference to hypothesis one and two where we suggest that the willingness to pay for a product with a support claim will be higher than a product without a support claim.

When comparing the *Health Claim* and *Farmer Support Claim* treatments, where one support claim is present, to the *All Claims* treatment, where two support claims are present, the differences in total willingness to pay for the products are not statistically significant. This result can be motivated in two different ways – the concept of diminishing marginal utility for an additional product attribute and the “budget consideration” for tart cherry juice. In the case of the diminishing marginal utility for an additional product attribute, when a consumer is presented with another attribute in addition to the current attributes present, the marginal utility of that attribute may be less than if it were presented by itself (Lusk 2003b). In this study, we see this to be true; one support claim results in a price premium for tart juice, yet two support claims do not provide any additional price premium. Partially linked to this concept is also the “budget consideration” consumers have for the total price they are willing to pay for a 12-ounce bottle of tart cherry juice. We see that the total price a consumer is willing to pay for the product does not increase when additional claims are presented. Therefore, consumers may be willing to pay a maximum or “ceiling” price for tart cherry juice but will not go beyond the that total price when additional claims are added to due to budget constraints.

Table 8. Total willingness to pay for four possible product alternatives ^a

Products	<i>Treatments</i>			
	<i>Control</i>	<i>Health Claim</i>	<i>Farmer Support Claim</i>	<i>All Claims</i>
USA_MEL	1.27 [0.89, 1.66] ^a	2.30 [1.81, 2.77]	2.52 [2.10, 2.95]	2.31 [1.88, 2.75]
USA_POT	1.39 [1.03, 1.77]	2.28 [1.84, 2.69]	2.51 [2.10, 2.93]	2.47 [2.04, 2.92]
MICH_MEL	1.33 [0.95, 1.72]	2.33 [1.88, 2.80]	2.52 [2.12, 2.94]	2.44 [2.02, 2.87]
MICH_POT	1.45 [1.09, 1.86]	2.30 [1.89, 2.75]	2.51 [2.09, 2.92]	2.60 [2.15, 3.03]

^a 95% confidence intervals were found using the Krinsky Robb bootstrapping method (Krinsky and Robb 1986)

Table 9. Poe test p-values comparing total willingness to pay for attributes across treatments

Treatment Pairings	<i>Products</i>			
	USA_MEL	USA_MEL	MICH_MEL	MICH_POT
<i>Control vs. Health Claim</i>	<0.01	<0.01	<0.01	<0.01
<i>Control vs. Farmer Support Claim</i>	<0.01	<0.01	<0.01	<0.01
<i>Control vs. All Claims</i>	<0.01	<0.01	<0.01	<0.01
<i>Health Claim vs. All Claim</i>	0.49	0.26	0.64	0.83
<i>Farmer Support Claim vs. All Claim</i>	0.26	0.45	0.59	0.38

6.3 Differences in Marginal Willingness to Pay Estimates across Demographics

Based on papers by Scarpa, Ferrini, et al. (2005), Scarpa and Del Giudice (2004), Skuras and Vakrou (2002) and Fotopoulos and Krystallis (2003), we expect to find that sociodemographic characteristics impact willingness to pay. Table 10 reports the relationship between the sociodemographic, purchase preference, and health variables and the individual willingness to pay for respondents using a SUR model. The Breusch and Pagan (1980) Lagrange multiplier test confirms that the SUR approach is needed to allow for cross-equation correlation ($\chi^2=1922.140$; p-value=<0.01).

Most of the variables were not associated with differences in WTP for the attribute levels presented, but we did find some relationships between gender, age, and where the participant lived. Females, and respondents over the age of 65 were willing to pay more for both the USA and Michigan labels. Consumers over the age of 65, were willing to pay a \$0.45 and \$0.52 premium per bottle of tart cherry juice labeled as being from the USA or Michigan, respectively. Middle aged consumers were willing to pay \$0.23 more for a tart cherry juice product with a USA label. Michigan residents were willing to pay \$0.39/bottle more for tart cherry juice from Michigan than non-residents. In addition, when it comes both USA and Michigan origin labels, there also exists

a negative impact on willingness to pay for those that reside in urban neighborhoods by \$0.38 and \$0.47, respectively. The only characteristic that had a statistically significant effect on WTP for nutritional claims was mental health. Those who self-reported good mental health were willing to pay less for both the nutritional attributes. In addition, the relevant treatment coefficients were statistically significant confirming the Poe tests for differences in WTP when support claims are presented. For example, the WTP for origin claims in treatments 3 and 4, and the WTP for nutrient claims in treatments in 3 and 4 are statistically different from the control when the supporting claims are shown.

Table 10. Relationship between demographics/purchasing preferences and WTPs for nonprice attributes using a seemingly unrelated regression

VARIABLES ^a	USA	MICH	POT	MEL
Female	0.23** (0.09)	0.29*** (0.10)	0.02 (0.02)	0.02 (0.03)
High income	-0.11 (0.10)	-0.03 (0.11)	0.02 (0.03)	-0.01 (0.03)
College degree	-0.07 (0.10)	-0.01 (0.11)	0.03 (0.03)	0.03 (0.03)
65 years old	0.45*** (0.12)	0.52*** (0.13)	-0.04 (0.03)	-0.04 (0.03)
Middle age	0.23** (0.11)	0.19 (0.12)	-0.01 (0.03)	-0.04 (0.03)
Republican	0.03 (0.09)	0.04 (0.10)		
Urban	-0.38*** (0.13)	-0.47*** (0.15)		
Suburban	-0.08 (0.11)	-0.13 (0.13)		
Geographical origin	-0.04 (0.13)	0.08 (0.14)		
Local		0.07 (0.05)		
Michigan		0.39*** (0.13)		

Table 10 (cont'd).

VARIABLES ^a	<i>USA</i>	<i>MICH</i>	<i>POT</i>	<i>MEL</i>
General health			-0.03 (0.06)	0.05 (0.06)
Physical health			0.05 (0.05)	0.01 (0.06)
Mental health			-0.09** (0.04)	-0.12*** (0.04)
Hypertension			0.00 (0.02)	
Treatment 2	0.42*** (0.13)	0.35** (0.14)	0.49*** (0.03)	0.63*** (0.04)
Treatment 3	1.18*** (0.13)	1.10*** (0.14)	-0.01 (0.03)	0.11*** (0.04)
Treatment 4	0.70*** (0.13)	0.76*** (0.14)	0.39*** (0.03)	0.33*** (0.04)
Constant	1.22*** (0.16)	1.18*** (0.18)	0.04 (0.04)	-0.05 (0.05)
Observations	1,400	1,400	1,400	1,400
R-squared	0.084	0.078	0.221	0.204

^a Numbers in parenthesis are the standard errors.

*** p<0.01, ** p<0.05, * p<0.1

7. CONCLUSIONS AND IMPLICATIONS

Consumers are continually searching for more information about where a food product is produced and the nutritional value it possesses. This information is often provided through labels, such as country or region of origin labels, and nutrition and health labels. Origin labels have been successful because consumers view them as a cue for other quality features, such as food safety and quality. Nutrition labels, coupled with health claims, are popular among consumers because of the information they provide about the product's health benefits.

Using an online survey of United States consumers, we explored the willingness to pay for supporting origin and nutrition labels, specifically “farmer support claims” and health-related claims, respectively, and the impact of providing multiple support claims together on consumer willingness to pay. Using tart cherry juice as an empirical application, we found that consumers are willing to pay a premium for origin support claims and health-related claims. However, when both support claims were present simultaneously, the marginal WTP for the health-related and farmer support claims decreased in some cases but remained positive. The total willingness to pay analysis revealed that consumers may be experiencing information overload, have decreasing marginal utility for additional attributes, or could have a maximum willingness to pay for a bottle of tart cherry juice, which we call a “budget consideration.”

The findings in this thesis are important to many stakeholders in the agricultural and food industry, specifically academics, food marketing groups/producers, and policy makers. For the United States tart cherry industry specifically, producers are exploring new ways to better market their products among U.S. consumers. Because of the large amount of tart cherries imported into the U.S., which are often sold at a low price, it has become harder for domestic producers to generate enough revenue to cover costs. Coupled with low per capita consumption of tart cherries across the U.S.

population, demand enhancing activities are needed. Currently, the tart cherry industry, via the Cherry Marketing Institute, recommends cherry producers include origin on the label for their products (Cherry Industry Administrative Board 2020). While our study supports this idea, we also suggest producers add an additional farmer support claim to their origin label. By adding a support claim, such as “Supports U.S. Farmers” in addition to origin claims, producers can gain an additional premium for their specialty crop product of over \$1.00 per 12 oz bottle.

Furthermore, the tart cherry industry currently promotes the health benefits of tart cherries on their product websites. Our study suggests that producers should print the nutrient content and health-related claims, in the case of potassium and melatonin, directly on the product label. By adding a health-related claim to a nutrient content claim for potassium and melatonin, producers can receive a premium of near \$0.50 for a 12 oz bottle of tart cherry juice.

In the case of origin and nutrition, producers should consider only presenting one support claim at a time due to the idea of information overload, diminishing marginal utility and budget considerations. When presenting two support claims at once, the willingness to pay is not greater than when presenting just one support claim at a time. Overall, our study finds that the marginal WTP for origin and farmer support claims are higher than nutrient and health-related claims.

The findings from this study open the door for future research questions and initiatives. First, this study focused on one product and two nutrients. Future work could include the impacts such nutrient content claims and health claims have on other nonmeat products. In addition, the use of supporting origin claims could vary based on the agricultural product presented; therefore, future research into the impacts of such claims for other agricultural products should be explored. While this study used a hypothetical choice experiment, future work on food products currently present in the market could use a real choice experiment to simulate a real shopping environment with incentive

compatible choices. As this study presents one case, further studies could explore the way willingness to pay for a prominent cue attribute, like origin labels, is impacted by the presence of other attributes. Additionally, coupling this type of work with sensory evaluation could assist the industry in understanding consumers' taste preferences for tart cherry products to better align their product offerings. Finally, in the case of food and agricultural products, food processing can play a role in the overall willingness to pay for the product (McKendree et al. 2013). Future research could include the role processed foods and non-processed foods plays in the willingness to pay for origin and nutrition support labels.

APPENDICES

Appendix A: Introduction to Discrete Choice Experiment with Cheap Talk Script

Introduction for Treatment 1

In the next section, we will present you with 12 choice questions. Each choice question includes two alternative tart cherry juice products and a no-buy option. The tart cherry juice products vary regarding price (\$1.25, \$2.75, \$4.25, \$5.75), geographic origin (United States, Michigan, and Imported) and nutrient content claims (potassium, melatonin, no claim).

Please assume that any other features of the tart cherry juice product that are not reported in the product profiles are identical across products.

For each question, please select only 1 tart cherry juice product that you would prefer to purchase at the listed price. If you would not purchase either product, select the no-purchase option.

While these questions are hypothetical, that is, you will not actually have to pay for the selected product at the listed price, please answer each question as if you were actually buying the product at a retailer. Thus, before making your selection, consider whether you would actually be willing to pay the listed price for the selected product, keeping in mind you would no longer have that amount of money available for other purchases.

We would also like to inform you that the results of this experiment will be available to farmers, food processors, retailers, and policymakers, as well as to the wider general public of consumers. This means that the survey could affect the decisions of farmers, food processors, retailers, and policymakers.

Introduction for Treatment 2

In the next section, we will present you with 12 choice questions. Each choice question includes two alternative tart cherry juice products and a no-buy option. The tart cherry juice products vary regarding price (\$1.25, \$2.75, \$4.25, \$5.75), geographic origin (United States, Michigan, and Imported) and nutrient content (potassium, melatonin, no claim) and associated health claims (health benefits for potassium and melatonin such as helps with blood pressure, regulates sleep-wake cycle or no claim). Please assume that any other features of the tart cherry juice product that are not reported in the product profiles are identical across products.

For each question, please select only 1 tart cherry juice product that you would prefer to purchase at the listed price. If you would not purchase either product, select the no-purchase option.

While these questions are hypothetical, that is, you will not actually have to pay for the selected product at the listed price, please answer each question as if you were actually buying the

product at a retailer. Thus, before making your selection, consider whether you would actually be willing to pay the listed price for the selected product, keeping in mind you would no longer have that amount of money available for other purchases.

We would also like to inform you that the results of this experiment will be available to farmers, food processors, retailers, and policymakers, as well as to the wider general public of consumers. This means that the survey could affect the decisions of farmers, food processors, retailers, and policymakers.

Introduction for Treatment 3

In the next section, we will present you with 12 choice questions. Each choice question includes two alternative tart cherry juice products and a no-buy option. The tart cherry juice products vary regarding price (\$1.25, \$2.75, \$4.25, \$5.75), nutrient content claims (potassium, melatonin, or no claim), geographic origin claims (Grown in United States, Grown in Michigan, and Imported), and associated origin claims (Supports US Farmers, Supports Michigan Famers, or no claim). Please assume that any other features of the tart cherry juice product that are not reported in the product profiles are identical across products.

For each question, please select only 1 tart cherry juice product that you would prefer to purchase at the listed price. If you would not purchase either product, select the no-purchase option.

While these questions are hypothetical, that is, you will not actually have to pay for the selected product at the listed price, please answer each question as if you were actually buying the product at a retailer. Thus, before making your selection, consider whether you would actually be willing to pay the listed price for the selected product, keeping in mind you would no longer have that amount of money available for other purchases.

We would also like to inform you that the results of this experiment will be available to farmers, food processors, retailers, and policymakers, as well as to the wider general public of consumers. This means that the survey could affect the decisions of farmers, food processors, retailers, and policymakers.

Introduction for Treatment 4

In the next section, we will present you with 12 choice questions. Each choice question includes two alternative tart cherry juice products and a no-buy option. The tart cherry juice products vary regarding price (\$1.25, \$2.75, \$4.25, \$5.75), geographic origin claims (United States, Michigan, and Imported) and associated origin claims (Supports US Farmers, Supports Michigan Famers, no claim), as well as nutrient content (potassium, melatonin, no claim) and associated health claims (health benefits for potassium and melatonin such as helps with blood pressure, regulates sleep-wake cycle or no claim). Please assume that any other features of the tart cherry juice product that are not reported in the product profiles are identical across products.

For each question, please select only 1 tart cherry juice product that you would prefer to purchase at the listed price. If you would not purchase either product, select the no-purchase option.

While these questions are hypothetical, that is, you will not actually have to pay for the selected product at the listed price, please answer each question as if you were actually buying the product at a retailer. Thus, before making your selection, consider whether you would actually be willing to pay the listed price for the selected product, keeping in mind you would no longer have that amount of money available for other purchases.

We would also like to inform you that the results of this experiment will be available to farmers, food processors, retailers, and policymakers, as well as to the wider general public of consumers. This means that the survey could affect the decisions of farmers, producers, retailers, and policymakers.

Appendix B: Number of all no buy alternatives selected across treatments

Table B1. Respondents with that selected no buy for all choice questions in their choice set

<i>Treatment</i>	<i>Number of all no-buys</i>	<i>Percentage of no-buys</i>
1 Control	64	17%
2 Health Claim	63	17%
3 Farmer Support Claim	58	15%
4 All Claims	62	16%

Appendix C: Multinomial Logit Model

Table C1. Multinomial logit model estimation across treatments

<i>Parameters</i>	<i>Treatments</i>			
	<i>Control</i>	<i>Health Claim</i>	<i>Farmer Support Claim</i>	<i>All claims</i>
USA	0.99*** (0.07)	0.79*** (0.06)	1.15*** (0.06)	0.89*** (0.06)
MICH	1.08*** (0.07)	0.88*** (0.06)	1.23*** (0.06)	0.96*** (0.06)
MEL	-0.04 (0.06)	0.28*** (0.06)	-0.01 (0.06)	0.12** (0.05)
POT	0.07** (0.06)	0.28*** (0.06)	-0.04 (0.06)	0.21*** (0.05)
PRICE	-0.56*** (0.02)	-0.43*** (0.02)	-0.5*** (0.02)	-0.41*** (0.02)
NOBUY	-0.94*** (0.08)	-0.74*** (0.08)	-0.99*** (0.08)	-0.79*** (0.07)
N	3840	4224	4152	4584
Log likelihood	-3452.12	-4025.07	-3723.78	-4363.38
AIC	6916.30	8062.10	7459.60	8738.80
BIC	6907.82	8053.72	7451.14	8730.34

Note: Standard errors are in parentheses. * denotes statistically significant variables at the 1%, 5%, and 10% level respectively.

Appendix D: Cholesky Matrices from MXL-EC

Table D1. Cholesky Matrix from MXL-EC for treatment 1, *Control*

	<i>USA</i>	<i>MICH</i>	<i>MEL</i>	<i>POT</i>	<i>ERC</i>
<i>USA</i>	2.52854				
<i>MICH</i>	-2.55009	1.28880			
<i>MEL</i>	-0.06719	-0.33241	0.26608		
<i>POT</i>	0.07694	-0.02341	0.21199	0.70476	
<i>ERC</i>	-1.83750	-0.11869	-3.07652	1.52433	4.92286

^aParameters in bold are statistically significant at the 95% level or better

Table D2. Cholesky Matrix from MXL-EC for treatment 2, *Health Claim*

	<i>USA</i>	<i>MICH</i>	<i>MEL</i>	<i>POT</i>	<i>ERC</i>
<i>USA</i>	1.68825				
<i>MICH</i>	-1.57324	1.00201			
<i>MEL</i>	-0.13832	0.04185	1.18797		
<i>POT</i>	0.09022	0.05020	0.78241	0.51687	
<i>ERC</i>	0.62316	0.78427	0.05173	0.82993	5.91716

^aParameters in bold are statistically significant at the 95% level or better

Table D3. Cholesky Matrix from MXL-EC for treatment 3, *Farmer Support Claims*

	<i>USA</i>	<i>MICH</i>	<i>MEL</i>	<i>POT</i>	<i>ERC</i>
<i>USA</i>	2.20049				
<i>MICH</i>	-1.73914	1.37609			
<i>MEL</i>	0.03780	-0.16394	0.04199		
<i>POT</i>	-0.00401	-0.20300	-0.25769	0.12880	
<i>ERC</i>	4.10375	1.11896	6.24323	-1.48642	0.55652

^aParameters in bold are statistically significant at the 95% level or better

Table D4. Cholesky Matrix from MXL-EC for treatment 4, *All Claims*

	<i>USA</i>	<i>MICH</i>	<i>MEL</i>	<i>POT</i>	<i>ERC</i>
<i>USA</i>	1.61783				
<i>MICH</i>	-1.51071	1.08689			
<i>MEL</i>	0.00219	-0.21400	0.18613		
<i>POT</i>	0.05091	-0.19662	-0.30595	0.21728	
<i>ERC</i>	0.41432	-0.58463	1.59976	3.56389	4.82454

^aParameters in bold are statistically significant at the 95% level or better

Appendix E: Correlation Matrices from MXL-EC

Table E1. Correlation Matrix from MXL-EC for treatment 1, *Control*

	<i>USA</i>	<i>MICH</i>	<i>MEL</i>	<i>POT</i>	<i>ERC</i>
<i>USA</i>	1				
<i>MICH</i>	-0.892	1			
<i>MEL</i>	-0.156	-0.209	1		
<i>POT</i>	0.104	-0.107	0.185	1	
<i>ERC</i>	-0.293	0.253	-0.242	0.061	1

Table E2. Correlation Matrix from MXL-EC for treatment 2, *Health Claim*

	<i>USA</i>	<i>MICH</i>	<i>MEL</i>	<i>POT</i>	<i>ERC</i>
<i>USA</i>	1				
<i>MICH</i>	-0.843	1			
<i>MEL</i>	-0.116	0.116	1		
<i>POT</i>	0.096	-0.052	0.814	1	
<i>ERC</i>	0.103	-0.017	0.001	0.099	1

Table E3. Correlation Matrix from MXL-EC for treatment 3, *Farmer Support Claim*

	<i>USA</i>	<i>MICH</i>	<i>MEL</i>	<i>POT</i>	<i>ERC</i>
<i>USA</i>	1				
<i>MICH</i>	-0.784	1			
<i>MEL</i>	0.218	-0.758	1		
<i>POT</i>	-0.011	-0.348	0.365	1	
<i>ERC</i>	0.532	-0.327	0.175	-0.751	1

Table E4. Correlation Matrix from MXL-EC for treatment 4, *All Claims*

	<i>USA</i>	<i>MICH</i>	<i>MEL</i>	<i>POT</i>	<i>ERC</i>
<i>USA</i>	1				
<i>MICH</i>	-0.812	1			
<i>MEL</i>	0.008	-0.447	1		
<i>POT</i>	0.119	-0.366	-0.122	1	
<i>ERC</i>	0.066	-0.108	0.239	0.158	1

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