The Tart Cherry Market and Purchasing Preferences in the United States

Summary Report

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Executive Summary

The overall project goal is to gain a better understanding of consumer demand and preferences for tart cherry products to provide meaningful insights to producers, retailers, and marketers working on the promotion of tart cherry products.

To achieve this goal, we conducted a nationwide online survey of 1,235 U.S. consumers in July 2019. We collected a variety of insights on the current tart cherry consumer landscape by asking questions about respondent's socio-demographics, their consumption, dietary and expenditure habits, their knowledge and awareness of tart cherries and derivate products, as well as respondents' preferences for local food products and their ethnocentric tendencies. In addition, the survey included two discrete choice experiments on tart cherry juice selection, which were designed to enhance our understanding of (i) what attributes are important to consumers when purchasing tart cherry juice, and (ii) how tart cherry juice performs relative to other juice and soft drink alternatives available in the market.

Results suggest that tart cherry consumers systematically differ from non-tart cherry consumers. Our key findings are:

1. Around 56% of respondents consumed either fresh or dried tart cherries and/or tart cherry juice in the last three (3) months. Among those tart cherry consumers almost 50% are 25-44 years old compared to non-consumers, where 40% are 45-64 years old. Tart cherry consumers are also more likely to have children and at least three members in their household, which could indicate that tart cherry consumers tend to be adults with younger children.

2. Those respondents that can be classified as tart cherry consumers consume generally more fruit and fruit derivative products. They also tend to place a higher budget share towards purchasing fruits and vegetables compared to their counterparts. This occurs in conjunction with around 33% of tart cherry consumers following a partially meat and/or animal free diet vs. only 13% of non-tart cherry consumers.

3. The main attributes respondents value more when purchasing tart cherry juice are taste, nutrition, price, safety, and naturalness, with non-consumers putting greater relative importance on all of these attributes than tart cherry consumers except for naturalness. The higher relative importance of nutrition for non-consumers is also reflected in a significantly higher premium they are willing to pay to avoid added sugar in tart cherry juice compared to tart cherry consumers ($0.49 vs. $0.61 per 8 oz bottle).

4. Outside of the main production areas in Michigan and Washington, respondents were uncertain about where tart cherries are produced but are on average willing to pay a premium of around $0.25 per 8 oz bottle for tart cherry juice made in the United States.

5. While non-tart cherry consumers have an overall higher willingness-to-pay (WTP) for different beverage options, the difference in marginal WTP between the juice alternatives is substantially smaller than for tart cherry consumers.

Jointly these results demonstrate that existing consumers of tart cherries and non-tart cherry consumers differ from one another in various dimensions. These should be taken into consideration when marketing and promoting tart cherries and their derivative products.

1. Introduction

The market value of U.S. specialty crop production nearly reached $80 billion in 2017, which corresponds to around 16.2% of the total value of U.S. agricultural production (USDA 2019, 2020a). Moreover, on a global scale, some estimates indicate that growth of this market will continue with compounded annual growth rates of around 2.6% between 2020 and 2027 (The Insight Partners 2021).

Despite this growth potential, many specialty crops have experienced growing international competition as well as generational changes in demand. The U.S. tart cherry industry finds itself in this category (Campbell 2020; Lagoudakis et al. 2020). Indeed, both producer and processor groups indicate a decline in consumer demand for traditional tart cherry products such as cherry pies, while cheaper imports from other countries such as Turkey are simultaneously undercutting domestic producers (Campbell 2019; Lagoudakis et al. 2020).

Few studies have addressed these developments. Those that have explored these changes were limited in their scope and sample size. For example, Lagoudakis et al. (2019) surveyed 134 Michigan tart cherry consumers and used a cluster analysis to identify potential market segments. Their results indicate that there is commonly no overlap between fresh and frozen tart cherry consumers. Lagoudakis et al. (2020) combined a review of the existing literature and producer insights regarding the strengths, weaknesses, opportunities, and threats (SWOT) analysis of the tart cherry supply chain. Results from this study suggest that the health, craft beverage, and novel product markets represent possible growth opportunities for tart cherry finished product marketing. A more recent study by Hubbell (2021) used a discrete choice experiment (DCE) to explore consumer preferences for origin and nutrition labels on tart cherry juice, finding that consumers are willing to pay a premium for both attributes when farmer support and/or health-related claims accompany them.

This report uses an online survey of more than 1,200 U.S tart cherry consumers to take a closer look at the socio-demographics, consumption habits, overall tart cherry knowledge, and tart cherry perceptions relative to other food products of U.S. tart cherry consumers. We place particular emphasis on consumer preferences and demand for tart cherry juice.

Findings from this report provide several important contributions. By examining the composition of tart cherry consumers as well as their general attitudes and knowledge, we provide valuable information to influence effective marketing strategies for U.S. tart cherry producers, processors, and agribusinesses. We also provide fresh insights on whether tart cherry consumers display ethnocentric attitudes. This allows us to not only inform marketing strategies and implementation but might also assist policymakers in making decisions regarding on-going tart cherry trade and tariff debates (Campbell 2019). By determining consumer demand for tart cherry juice in general

and for relevant tart cherry attributes, we provide information pertinent to determining the market potential of tart cherry juice.

The remainder of the report is organized as follows: in the next section we summarize the project objectives before elaborating on the experimental procedures used in Chapter 2. Subsequently, we discuss the data analysis and results of the survey in chapters 3 and 4. Chapter 5 concludes by providing the study's implications.

2. Experimental Procedures

2.1 Survey Overview

We conducted a nationwide online survey in July 2019. The survey was developed in Qualtrics ® and delivered to an online panel of U.S. consumers maintained by SSI-Dynata®. To qualify to respond to the survey, respondents had to be 18 years or older and have consumed fruit juice in the last three months. Respondents were also required to complete all survey sections for their answer to be considered in the final analysis. This screening process led to 1,235 valid responses.

The survey included can be organized into five sections, each dedicated to a specific aspect of consumer behavior.

Section 1: Consumption and Dietary Habits

In this section, we asked respondents about their consumption and purchasing habits related to different fresh and dried fruits as well as fruit juices and related alternatives. For example, we asked respondents to indicate how often they ate different fresh berry alternatives in the past three months and where they typically purchase fresh or dried fruits and fruit juices. This allowed for a better understanding different tart cherry product consumption as well as their direct substitutes. Furthermore, we inquired about spending habits for fruit and vegetables consumed both at home and away from home.

Section 2: Consumer Knowledge and Attention to Packaging

In the second section, we collected general information on consumer knowledge of tart cherries. Specifically, we asked about the ease with which respondents were able to find the product in different store types and where tart cherries are mainly grown in the U.S. This allowed us to evaluate how aware respondents are of the product and whether there is some form of recognition that could be utilized in marketing campaigns.

Section 3: Consumer Ethnocentrism and Preferences for Local Food

Tying directly into section 2, we then asked about respondent's preferences for local food and general consumer ethnocentric behavior into the survey. To measure preferences for local food we adapted a 10-item scale from Dukeshire et al. (2011), where respondents indicate the degree to

which they agreed with statements such as, "I make it a priority to buy locally produced food," and "I like to buy food that is locally produced" on a 5-point Likert scale.

Correspondingly, we also wanted to measure respondent's preferences for U.S. made products as earlier studies showed the close relationship between consumer's preferences for local foods and ethnocentric tendencies (Aprile et al. 2016). Thus, we included a scale measuring respondents consumer ethnocentrism. Consumer ethnocentrism is defined as the "*belief held by [...] consumers about the appropriateness, indeed morality, of purchasing foreign made food*" (Shimp and Sharma 1987, pg. 280). Prior research indicates that consumer ethnocentrism impacts consumer's purchasing habits of domestic and imported goods (Weber et al. 2015; Fernandez-Ferrin et al. 2019, 2020; Kilders et al. 2021). This implication is likely to be relevant for U.S. tart cherry markets as imported tart cherries threaten the long-term profitability of domestic producers. To measure consumer ethnocentrism, we employed the commonly used consumer ethnocentric tendencies scale (CETSCALE) developed by Shimp and Sharma (1987) [1].

Section 4: Choice Experiment

To increase our understanding of consumer preferences and demand behavior for different tart cherry attributes and alternatives, we conducted two DCEs, which are discussed more in-depth in section 2.2.

Section 5: Socio-Demographics

In the last section of the survey, we gathered information on respondent's socio-demographics to better characterize and highlight differences between tart cherry consumers and non-consumers. We gathered information on characteristics such as age, gender, income, and education, as well as where respondents lived and, their race and ethnicity, and household composition.

2.2 Choice Experiment Design

DCEs are a well-established stated preference method commonly used to elicit consumer preferences and WTP for various goods and quality attributes. Respondents are asked to choose a product during a series of repeated questions of multiple product alternatives offered at different prices alongside a no-purchase option. The DCE methodology allows us to predict consumer behavior in actual market environments as the method's external validity for applications in food and agricultural marketing has been well documented (see e.g., Swait and Andrews 2003; Chang et al. 2009).

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[1] The scale consists of 17 statements of which have been validated to be associated with ethnocentric behavior (Shimp and Sharma 1987, Sharma et al. 1994). The statements include phrasings such as, "American people should always buy American-made products instead of imports," and "Purchasing foreign-made products is anti-American." Respondents were then asked to indicate to what degree they agree with each of the 17 statements on a 5-point Likert-scale.

Given the scarcity of tart cherry demand analyses aside from Hubbell (2021), the overall goal of our DCEs are to provide a broad overview of consumer demand and preferences for tart cherry juice. Tart cherry juice was chosen as more traditional tart cherry product sales such as cherry pies declined or stagnated in the recent decade while demand for tart cherry juice is expected to continue its substantial growth over the next several years (Woods 2019; Brandessence 2020). Tart cherry juice could have the potential to compete against other juice and soda alternatives available in the market. To assess this potential, the DCE portion of the study focused on two central questions:

1. What attributes are important to consumers when purchasing tart cherry juice, and
2. How does tart cherry juice perform relative to other juice and soft drink alternatives available in the market?

To this end, we implemented two DCEs, described in sections 2.2.1 and 2.2.2. Each respondent answered both DCEs in a randomized order.

2.2.1 Unlabeled DCE

The first DCE aimed to uncover consumer preferences for specific attributes associated with an 8-ounce (oz) bottle of tart cherry juice. To accomplish this task, each choice question presented respondents with two different tart cherry juice options carrying several attributes at different levels alongside a no-purchase scenario.[2] By including a no-purchase option, we allow respondents to opt out of the purchase of either buying option, thus making the choice scenario more realistic (Adamowicz et al. 1998).

The attributes chosen for the DCE were price, sugar added, and geographic origin, with their respective levels displayed in Table 1. All other attributes were held constant across the alternatives and choice questions.

Table 1. Attributes and levels Unlabeled DCE

| Attributes	Levels considered
Price per 8 oz bottle	$1.75, $2.25, $2.75, $3.25
Sugar added per 8 oz bottle	0g added, 4g added
Geographic Origin	Made in the USA, none

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[2] This set-up is commonly referred to as an "unlabeled" DCE.

Price levels were consistent with those commonly observed in the market at the time. Added sugar levels were included as a nutritional component. Where previous studies on other fruit such as blueberries indicate that respondents are willing to pay a premium when the product is labeled as "sugar free," the willingness-to-pay (WTP) for free-of-added-sugar label has not yet been explored for tart cherry juice (Hu et al. 2009). Finally, we included information regarding whether the product was made in the United States or not to evaluate whether respondents are willing to pay a premium for domestically produced juice.

The three attributes with either two or four levels each, would require a total of $4^{(1*2)} \times 2^{2*2} = 256$ choice questions if all possible combinations would be explored (i.e., a full-factorial design). Therefore, in order to reduce the number of choice questions, we used the NGene software (http://www.choice-metrics.com/features.html) and generated an orthogonal optimal design, resulting in a total of eight choice questions and a D-optimality of 96.66%.

An example of one of the choice questions in the unlabeled DCE is shown in Figure 1.

Figure 1. Example of a Choice Question, unlabeled DCE.
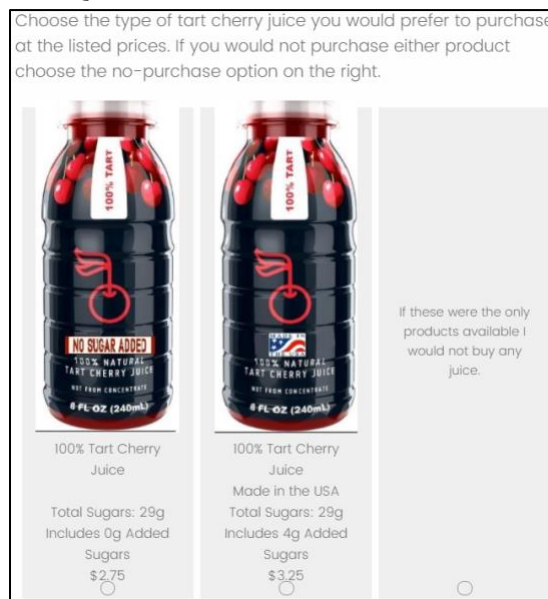
2.2.2 Labeled DCE

Ultimately, tart cherry juice drinkers do not just choose between two tart cherry products. In the second DCE, we sought to evaluate likely substitution effects between tart cherry juice and other common drink alternatives. During repeated choice questions, we asked respondents to choose between tart cherry juice, apple juice, cranberry juice, grape juice, blueberry juice, and Coca-Cola

or to choose nothing at all.[3] The price levels selected for this DCE were the same as the ones chosen in the unlabeled DCE and held constant across the six drink alternatives.

Given the number of alternatives a full factorial design here would have resulted in a total of $4^6 =$ 4096 possible choice questions. Consequently, we generated a simultaneous orthogonal fractional factorial design using Ngene (http://www.choice-metrics.com/features.html). This resulted in a total of 16 choice questions distributed evenly across two blocks, which means that as in the unlabeled DCE, each respondent saw a total of eight choice questions.

An example of one of the choice questions in the labeled DCE is shown in Figure 2.

Figure 2. Example of a Choice Question, labeled DCE

3. Data Analysis

3.1 Socio-demographics, Consumption habits, Knowledge, Purchasing, Dietary habits, etc.

A primary objective of this report is to understand the characteristics and purchasing motivations that separate tart cherry consumers from non-consumers. As such, this section segments the study's results between each respondent's tart cherry consumption history.

3.2 Consumer Ethnocentrism and local food preferences

Following the prior literature, we analyzed the consumer ethnocentrism (CETSCALE) data using two steps (Juric and Worsley 1998; Saffu and Walker 2005; Parts 2007; Lascu et al. 2010; Renko et al, 2012; Jiménez-Guerrero et al. 2014; Makanyeza and Toit 2016; Kilders et al. 2021). In the

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[3] This set-up is commonly referred to as a "labeled" DCE.

first step, we tested whether the scale was internally consistent by performing a Crohnbach-Alpha[4] test on all 17 items of the scale. Consistent with the prior literature, we find a very high internal consistent of the scale as individual values are all above 0.95 and an overall alpha of around 0.96 (Juric and Worsley 1998; Saffu and Walker 2005; Renko et al, 2012; Jiménez-Guerrero et al. 2014; Makanyeza and Toit 2016; Kilders et al. 2021). In a second step, we derived the CETSCORE where results of the Likert scale are translated into points and summed across items (Parts 2007; Lascu et al. 2010). In our case, we translated the five statements ranging from *strongly disagree* to *strongly agree* into one to five points, respectively. This means that the maximum score one could achieve was 85 points, which translates into the respondent strongly agreeing with each of the ethnocentric statements thus indicating the highest level of consumer ethnocentrism.

The same approach was used for the local food preferences scale questions. The 10-item scale adapted from Dukeshire et al. (2011), had an overall alpha of about 0.88, with each item being above 0.85, which again confirms a high internal consistency. Mirroring our calculation of the CETSCALE, we then translated the results of the 5-point Likert scale into points which were summed across statements. Given that the scale consisted of ten statements, this means that respondents could achieve a maximum of 50 points, meaning they have an absolute preference for local food.

3.3 Discrete Choice Experiments

We analyzed the data of the two discrete choice experiments using a Mixed Logit model (MXL)[5] for panel data (Train 2009). The MXL is preferable to more basic models such as the multinomial logit model, as it permits us to account for preference heterogeneity and can further approximate any true underlying random utility models (McFadden and Train, 2000; Train, 2009). To further allow heterogeneity in the price coefficient, we also specified utilities in the WTP-space instead of the preference space (Train and Weeks 2005).

To determine how consumer's WTP for the different drink alternatives varied between tart cherry consumers and non-tart cherry consumers we used a segmented approach, where we estimated one MXL model for tart cherry consumers and one for non-consumers. Subsequently for the unlabeled DCE, we can express the utility U that consumer n derives product alternative j at choice situation t as follows:

$$U_{njt} = \lambda_n\big[-Price_{jt} + ASC_{no-buy} + \omega_{SUG}Sugar_{jt} + \omega_{USA}USA_{jt} + 1_j(\eta_{nt})\big] + \varepsilon_{njt} \qquad (1)$$

where the common price/scale factor is expressed by $\lambda_n = \alpha/\theta$, with α representing the price coefficient and θ signifying the Gumble scale parameter (Scarpa et al. 2005, 2008). The alternative

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[4] The test allows researchers to examine whether a scale and the individual items contained in the scale are reliable and internally consistent (UCLA Statistical Consulting Group n.d.). The test assigns a value between 0 and 1 to each item through correlating the item's score with the total score of each observation. Higher numbers indicate higher reliability (Goforth 2015)

[5] Several models were tested for both the labeled as well as unlabeled DCEs, with the MXL model with an error component leading to the best model fit.

specific constant is represented by ASC_{no-buy}, while the continuous variable $Price_{jt}$ is the price of alternative j in choice task t. Meanwhile, $Sugar_{jt}$ and USA_{jt} are dummy variables equal to one if sugar was added to the product or if it was made in the U.S., respectively; ω_{SUG} and ω_{USA} are the corresponding coefficients of the estimated WTP values. The indicator function $1_j(\cdot)$ equals to 1 when considering one of the two purchase alternatives with η_{nt} being the respondent-specific idiosyncratic error component associated with those two purchase alternatives. Lastly, ε_{njt} is the error term, which is assumed to be distributed extreme value type I.

To explore whether the differences between the two groups were statistically significant we used a pooled data approach where we compared tart cherry consumers and non-consumers. This test of equality across groups follows what was previously done by other food choice studies (see e.g., de-Magistris et al. 2013, Bazzani et al. 2017, and Ortega et al. 2020, Kilders and Caputo 2021) and expands (1) as follows:

$$U_{njt} = \lambda_n \big[-Price_{jt} + ASC_{no-buy} + \omega_{SUG}Sugar_{jt} + \omega_{USA}USA_{jt} + \delta_1(Sugar_{jt} * dt_n) + \\ \delta_2(USA_{jt} * dt_n) + 1_j(\eta_{nt}) \big] + \varepsilon_{njt} \quad (2)$$

where dt_n represents a dummy variable that is equal to 1 if the respondent is a tart cherry consumer and 0 otherwise. In line with previous food choice studies, we assume that the coefficients of the price are distributed log-normal, while the marginal WTP-values (i.e., the elements of ω_{SUG} and ω_{USA}) are assumed to follow a normal distribution (see e.g., Scarpa et al. 2013; Van Loo et al. 2014; De Marchi et al. 2016; Caputo et al. 2017; Caputo et al. 2020).

Correspondingly, for the labeled experiment we again employed a segmented approach and express the utility function as follows:

$$U_{njt} = \lambda_n \big[-Price_{jt} + \alpha_j + 1_j(\eta_{nt}) \big] + \varepsilon_{njt} \quad (3)$$

where α_j represents the alternative specific constants representing the estimated WTP values for j product alternatives: apple, cranberry, grape, blueberry, and tart cherry juice as well as Coca-Cola.

Since we are estimating the models for both the unlabeled as well as the labeled experiment in the WTP-space, we can interpret the coefficients we derive directly as WTP estimates. This means that in the labeled experiment our coefficients represent the total WTP for each product alternative (i.e., the premium inducing a respondent to be indifferent between buying alternative j vs. choosing the no-purchase option).

4. Results

4.1 Sample Characteristics

Table 2 reports the demographics of our sample overall and disaggregated by tart cherry consumers and non-tart cherry consumers. For this study, "Tart Cherry Consumers" indicated that they had consumed either fresh/dried tart cherries or tart cherry juice within the last three months. This classification led to around 56% of respondents being classified as tart cherry consumers.

Table 2. Consumer Demographics

Variable	Total Sample	Tart Cherry Consumers	Non-Tart Cherry Consumers	P-Values[a]
Age				
18-24 years old	10.77%	11.49%	9.83%	
25-34 years old	19.27%	27.87%	8.16%	
35-44 years old	18.87%	21.26%	15.77%	
45-54 years old	17.89%	15.66%	20.78%	0.000
55-64 years old	16.68%	14.08%	20.04%	
65-74 years old	13.04%	8.19%	19.29%	
75 years or older	3.48%	1.44%	6.12%	
Female	50.45%	50.43%	50.46%	0.991
Marital Status				
Single, Never Married	33.93%	37.36%	29.50%	
Married	51.34%	49.86%	53.25%	0.003
Divorced, Widowed, or Separated	14.74%	12.79%	17.25%	
Household Size				
1	19.68%	19.40%	20.04%	
2	38.79%	34.34%	44.53%	
3	20.49%	24.28%	15.58%	0.000
4	12.47%	14.08%	10.39%	
5 or more	8.58%	7.90%	9.46%	
Children present in Household	28.10%	38.07%	15.21%	0.000
Respondent ever received Food Stamps/SNAP	31.82%	36.78%	25.42%	0.000
Region of Origin				
West	37.49%	38.94%	35.62%	
Midwest	18.22%	17.24%	19.48%	0.475
Northeast	13.44%	13.94%	12.80%	
South	30.85%	29.89%	32.10%	
Completed at least 4-years of college	47.85%	50.57%	44.34%	0.030
Income				
Less than $20,000	13.28%	12.93%	13.73%	0.333

$20,000-$39,999	18.38%	16.67%	20.59%	
$40,000-$59,999	14.33%	13.94%	14.84%	
$60,000-$79,999	16.44%	15.66%	17.44%	
$80,000-$99,999	10.36%	11.64%	8.72%	
$100,000-$119,999	8.83%	9.91%	7.42%	
$120,000-$139,999	5.34%	5.89%	4.64%	
$140,000-$159,999	5.02%	5.17%	4.82%	
$160,000 or greater	8.02%	8.19%	7.79%	
Race				
Caucasian	69.64%	64.08%	76.81%	
African American	18.14%	21.98%	13.17%	0.000
Other Race	12.23%	13.94%	10.02%	
Hispanic	13.28%	15.95%	9.83%	0.002
Area of Residence				
Rural	23.32%	22.56%	24.30%	
Suburban	50.45%	47.84%	53.80%	0.012
Urban	25.34%	28.30%	21.52%	
Number of Respondents	1235	696	539	

[a]P-values were derived from Chi-square tests testing the null hypothesis of equality of demographics across consumers and non-consumers.

Several demographic differences exist between the tart cherry consumers and non-consumers in our sample. First, tart cherry consumers were significantly younger than the non-consumer population as nearly half of all tart cherry consumers and fewer than one quarter of non-consumers are aged 25-44. This somewhat contradicts the findings by Lagoudakis et al. (2018), who found that young adults aged 21-34 were the least likely to purchase tart cherries, while adults above 55 were most likely to purchase them. One reason for this difference could be the larger, national sample examined in our study compared to the Michigan centric sample in Lagoudakis et al. (2018). Another reason could be that our definition of tart cherry consumers relied on the consumption of fresh or dried tart cherries, and/or tart cherry juice. Given that tart cherry juice has only experienced a growth of demand in recent years, it could be that older respondents also consume tart cherries but focus on more traditional products such as cherry pie.

The demographic data also indicates that a higher share of tart cherry consumers are parents (38% vs. 15%) and live in households of three or more people (46% vs 35%). This could be motivated by parents purchasing tart cherries and processed tart cherry products for their children due to the associated health benefits and also consuming them themselves.

Furthermore, although no significant differences existed in terms of income between the two groups, about one third of tart cherry consumers had previously received government food assistance benefits compared to one quarter of non-consumers. This could potentially be a result

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of local and statewide support programs such as the Michigan Double Up Food Bucks program, where SNAP recipients receive support or rebates for the purchase of fruit and vegetable products.

Lastly, Hispanic consumers are more likely to be tart cherry consumers. This aligns with findings by Drewnowski and Rehm (2015) who used data from the National Health and Nutrition Examination Survey which explores fruit and fruit juice consumption of children and adults in the U.S. The authors find that total fruit consumption was higher for Mexican Americans and Hispanics than non-Hispanics.

4.2 Consumption and Dietary Habits

Fruit and fruit derivative consumption and expenditure

Figure 1 details fresh fruit, dried fruit, fruit juice and fruit pie consumption over the past three months for tart cherry consumers and non-consumers. Overall, tart cherry consumers were more likely to consume other fruit substitutes. This is particularly pronounced for dried fruits, where at least half of all tart cherry consumers had also eaten other dried fruits at least sometimes in the last three months, while only around 5%-14% of non-consumers ate dried fruits other than raisins (47%), apples (47%) and cranberries (29%).

Likewise, while the consumption of milk, soda pop, and even orange juice is only slightly less among non-tart cherry consumers than tart cherry consumers, non-consumers drank substantially less fruit juice other than orange juice.

Figure 1. Share of respondents that consumed the respective product at least once in the last three months.
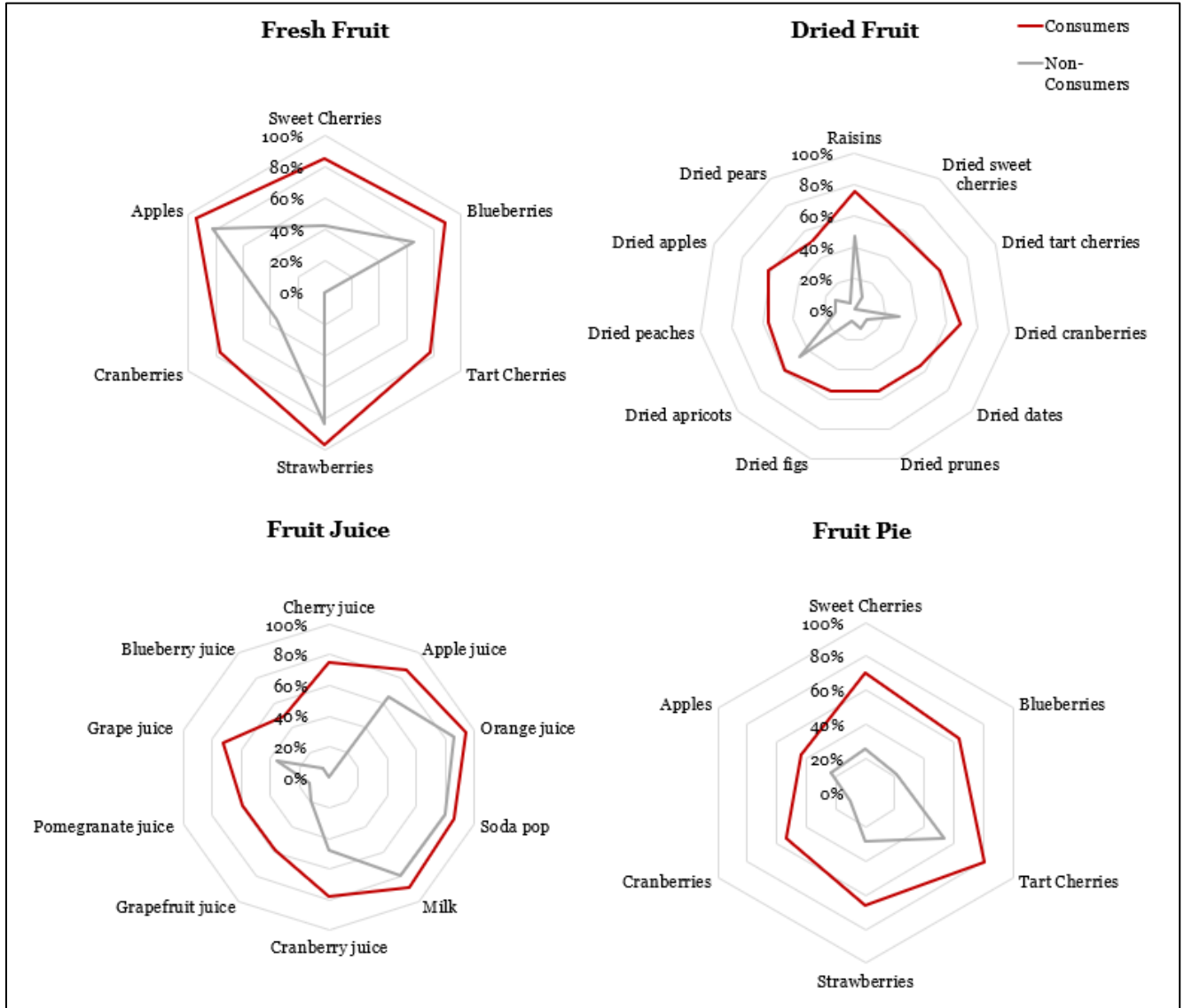
This highlights that tart cherry consumers generally incorporate more fruit and fruit derivative products into their diet. This is also reflected in their higher weekly food expenditure budget for fruit and vegetables (see Figure 2).

Figure 2. Respondent's weekly expenditure for fruit and vegetables
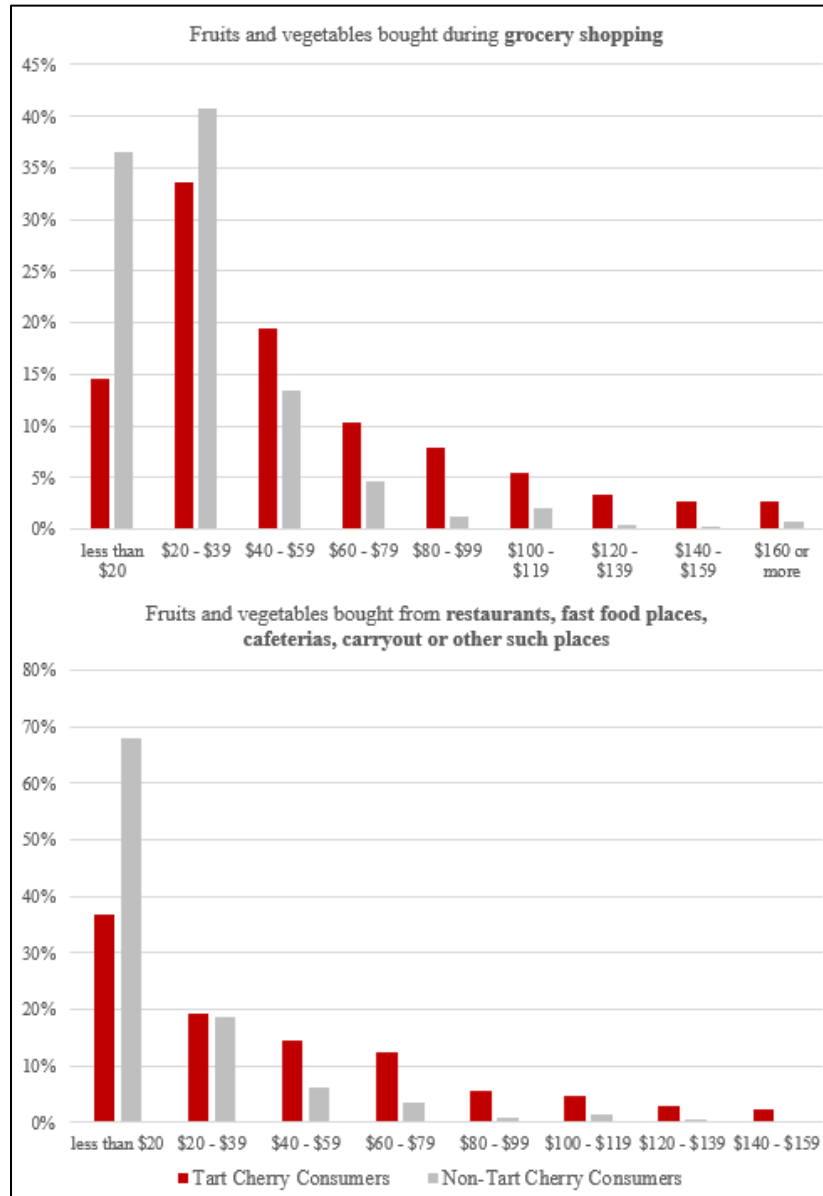
A higher share of non-tart cherry consumers spends up to $39 a week on fruits and vegetables both when grocery shopping and when consuming fruit and vegetables away from home than tart cherry consumers. Furthermore, 51% of tart cherry consumers spend at least $40 per week on fruits and vegetables when grocery shopping compared to only 22% of non- tart cherry consumers. Thus, not only do tart cherry consumers tend to consume more fruit and fruit derivative products, but they also allocate a larger budget to the purchase of fruits and vegetables.

Diet Plan and Food Values

The differences between the two groups continue when looking at the respondent's diet plan. Specifically, we asked respondents to indicate if they considered themselves to either be a flexitarian, a vegetarian, a vegan, or none of the above. We find that while both groups predominantly fell in the "none of the above" category, a substantially higher share of respondents in the tart cherry consumer group considered themselves as either vegan, vegetarian, or flexitarian. This means a higher share of tart cherry consumers (33%) at least partially avoids meat or other animal products compared to non-tart cherry consumers (13%).

Figure 3. Respondent's diet plan
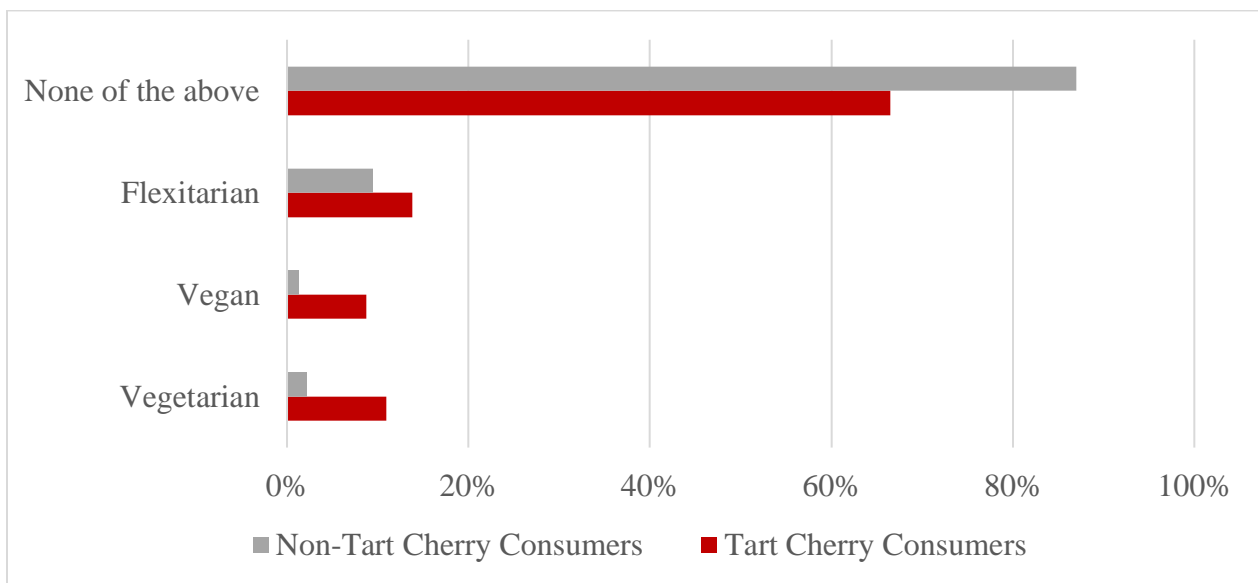
To explore whether these dietary differences translate into differing perceptions of food attributes, we then developed a modified "food values scale" (Lusk and Briggeman, 2009). That is, instead of specifying a food product, we were interested in potential differences in what consumers value intrinsically in their food choices more broadly. Our scale asked respondents to choose four out of twelve food attributes that they consider to be most important and four that they consider to be least important. Figure 4 displays the relative importance of the twelve attributes for both tart cherry consumers and non-consumers.

Figure 4. Relative importance of different food related attributes.
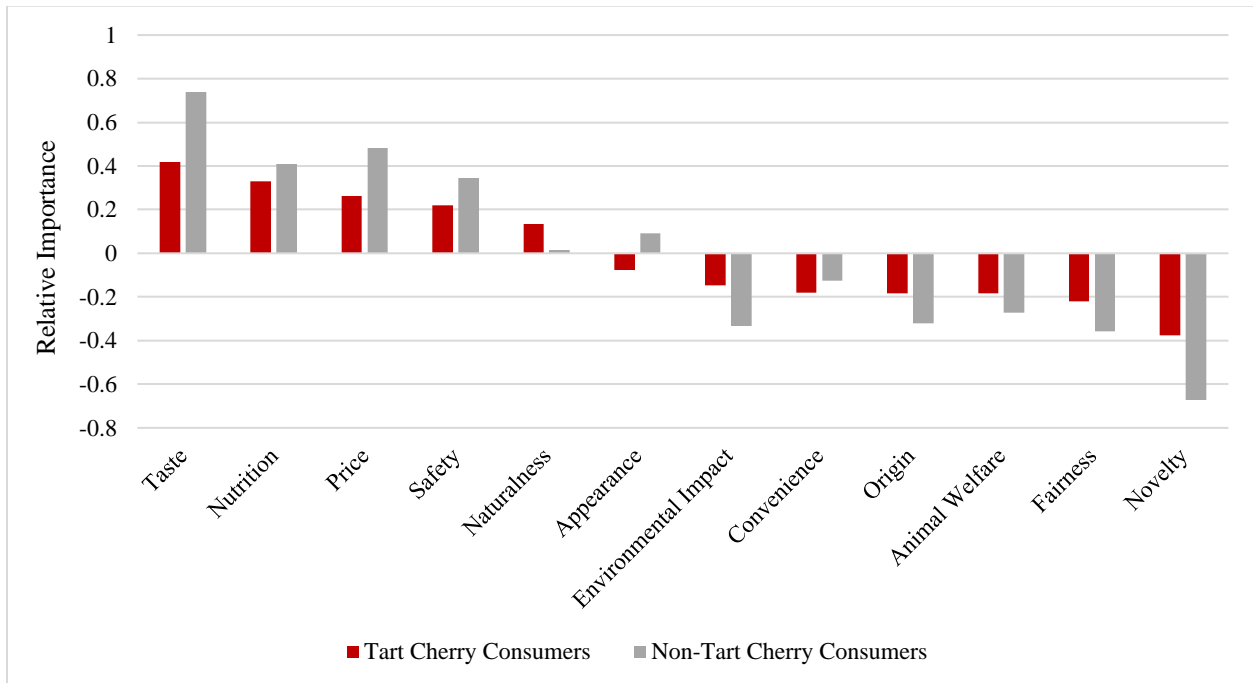
Note: The relative importance of the individual attributes was derived by assigning +1 to an attribute that was indicated as being most important to a respondent, while assigning -1 to those that were indicated as least important.

As can be seen there are significant differences between tart cherry consumers and non-tart cherry consumers. In fact, a significance tests of means find that for all attributes, except nutrition and convenience, the difference between the two groups is statistically significant.

Consistent with prior literature, our results indicate that most respondent's place the highest importance on the taste of a food product (Malone and Lusk, 2017). Yet, while the nutritional component ranks as the second most important aspect for tart cherry consumers in terms of relative importance, non-tart cherry consumers considered the price of a food item to be more important. The overall relative importance of taste, nutrition, price, and safety is higher for non- tart cherry consumers than consumers. Similarly, while tart cherry consumers have little appreciation for the appearance of a product but value naturalness, non-tart cherry consumers are relatively neutral on average towards the naturalness attribute but appreciate the appearance of a product. Irrespectively, both groups do not consider origin, animal welfare, fairness, and novelty to be important, with the disregard particularly for novelty being more pronounced among non-consumers. The low importance of tart cherry origin is especially important to note as the discussion around domestically grown cherries versus cherries grown overseas continues (Campbell 2019; Lagoudakis et al. 2020; Moreno and Malone 2021).

4.3 Consumer Knowledge and Attention to Packaging

Consumer Knowledge and Awareness

Though there are broad differences in consumer food purchasing attitudes, there is also value in understanding consumer perceptions and awareness of tart cherry products more specifically.

To learn about consumer awareness of tart cherries, we first asked respondents to indicate how challenging they think it would be to find a tart cherry product at a specialty store, grocery store, large retailer, convenience store, or online. To ease classification of stores, we provided examples for each of those categories (e.g., Amazon as an online retailer, Meijer and Publix as a Grocery store). Results are presented in Figure 5.

Figure 5. Relative ease with which respondents consider tart cherries can be found in the respective outlet.
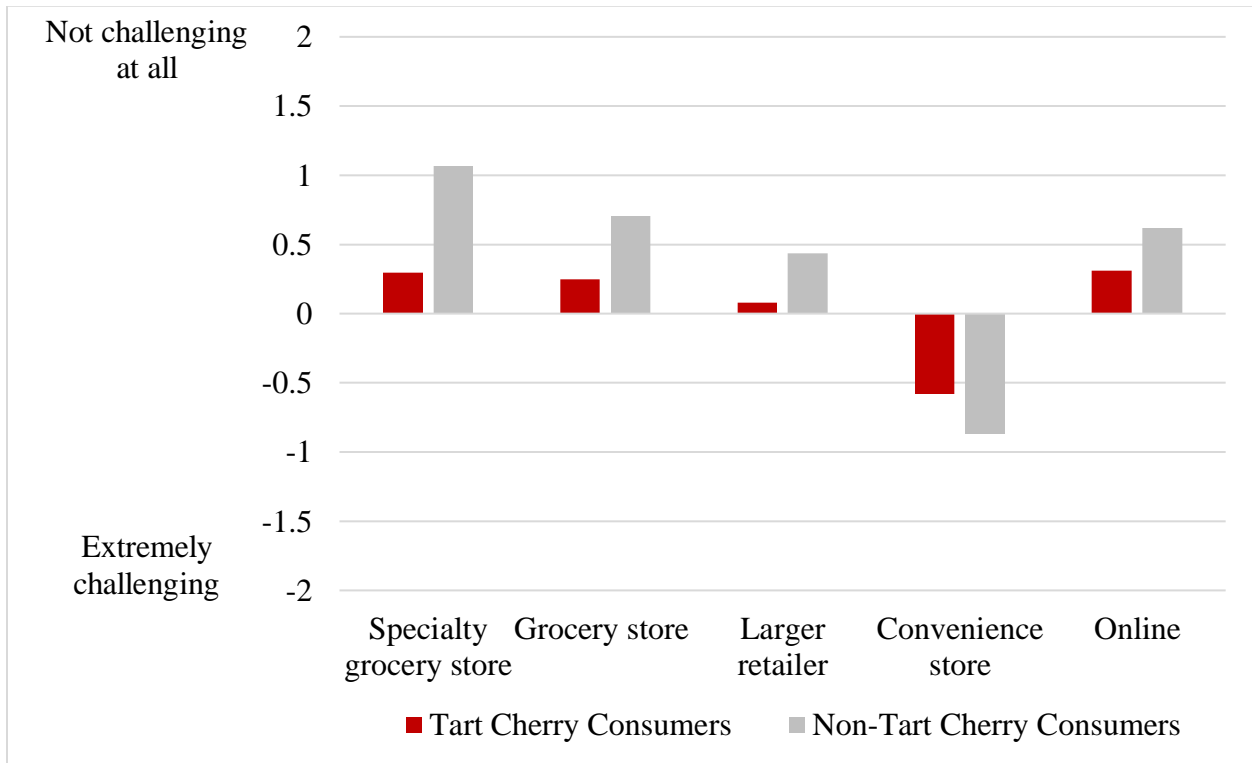
Note: We translated the 5-point Likert scale into relative values, where the answers *extremely challenging* and *very challenging* were coded as -2 and -1, respectively, while *slightly challenging* and *not challenging at all* were coded as +1 and +2, respectively. The neutral answer *moderately challenging* was coded as 0.

For all retail options aside from the convenience store, non-tart cherry consumers assumed it to be substantially easier to find tart cherries in a store if they were looking for it than tart cherry consumers. All differences were statistically significant across the two groups. In other words, on average people who already eat tart cherries experience difficulties in locating the product, while

people who do not eat tart cherries think that it is easier to find them. Possibly, one marketing strategy to increase sales among tart cherry consumers could thus be a more prominent placement of the product in stores to ease accessibility and increase visibility. Especially among large retailers this could be a viable approach to make the product stand out among the plethora of available options as both consumer groups indicated that it was substantially more challenging to find the product there than in specialty stores (non-tart cherry consumers: 1.06 vs. 0.44; tart cherry consumers: 0.29 vs. 0.08)

That said, tart cherry product sales might be geographically related to where tart cherries are grown (Moreno and Malone 2021). In a second step, we presented respondents with a map of the United States and asking them to click on the location on the map where they thought the majority of tart cherries were grown (see Figure 6).

Figure 6. Heat Map indicating where respondents think most tart cherries come from.
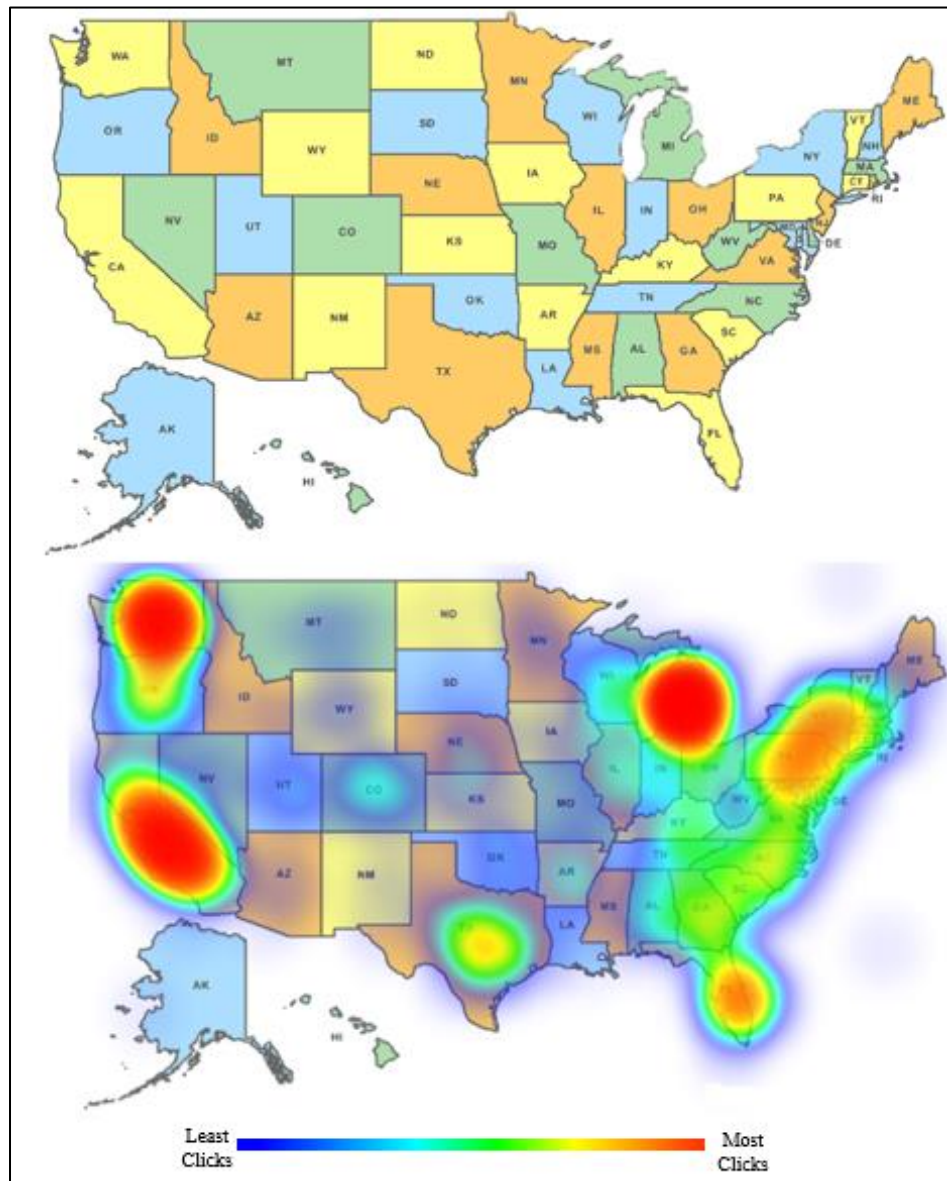
The majority of respondents believe that tart cherries are predominantly grown in Michigan, Washington, and California. The indication of Michigan (yield of 170 million lbs. in 2019) and Washington (yield of 23.5 million lbs. in 2019) as dominant producing regions is indeed correct (USDA NASS 2020b, 2021), but California is in fact not among the main producing states. However, Utah (yield of 54 million lbs. in 2019), the second biggest producer after Michigan as well as Wisconsin (yield of 9 million lbs. in 2019), the fifth biggest producer (Ibid.) were only selected by a very small number of respondents.

Visual Importance of Packaging

Not only is there value in understanding consumer awareness of tart cherry products, there is also value in understanding consumer perceptions of tart cherry package labeling. To this end, we presented respondents with an image of a tart cherry juice label and the front of a dried cherry packaging. We then asked respondents to indicate which part of the label they considered most important for their product specific purchasing decision.

Figures 7 and 8 present our findings in the form of "heat maps," which reveal that the largest percentage of respondents focused on the "All Natural" part of both labels. This is in line with our food values findings, where naturalness was the 5th or 6th most important attribute, but the most important attribute among those present on the product labels. As such, including a label of other important attributes might represent a promotional opportunity (e.g., taste, nutrition, price, and safety). Moreover, tart cherry juice respondents also indicated that they focus on the product content description ("100% Tart Montmorency Cherry Juice") and that the item is "Ready to Drink."

Figure 7. Heat Map indicating which parts of the tart cherry juice label respondents indicated to be most important for their purchasing decision.
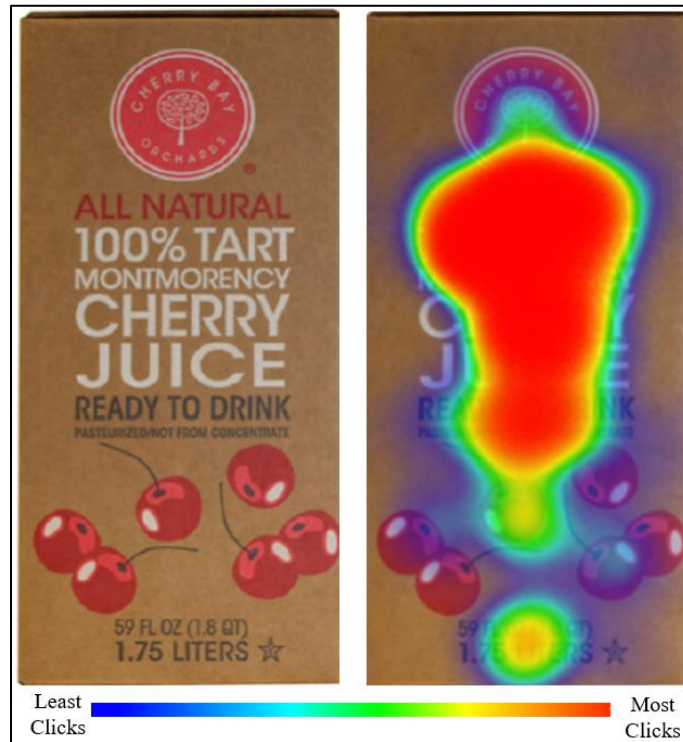

Figure 8. Heat Map indicating which parts of the dried cherry label respondents indicated to be most important for their purchasing decision.

4.4 Consumer Ethnocentrism and Preferences for Local Food

The recent agribusiness marketing literature has focused heavily on consumer preferences for "localness," which might represent one strategy for increasing sales of tart cherry products in the states who produce the majority of tart cherries (Moreno and Malone, 2021). To assess this potential, we explored preferences for local products via a modified Likert scale, revealing that tart cherry consumers and non-tart cherry consumers have similar preferences for "local" food products. However, when taking a closer look at the distribution of those scores (see Figure 9), one can see that while most respondents fall into a range of 30-39 points in both groups, a higher share of respondents identified as tart cherry consumers scored above 40 points than non-consumers.

Figure 9. Cumulative scoring of respondents for the local preference scale.
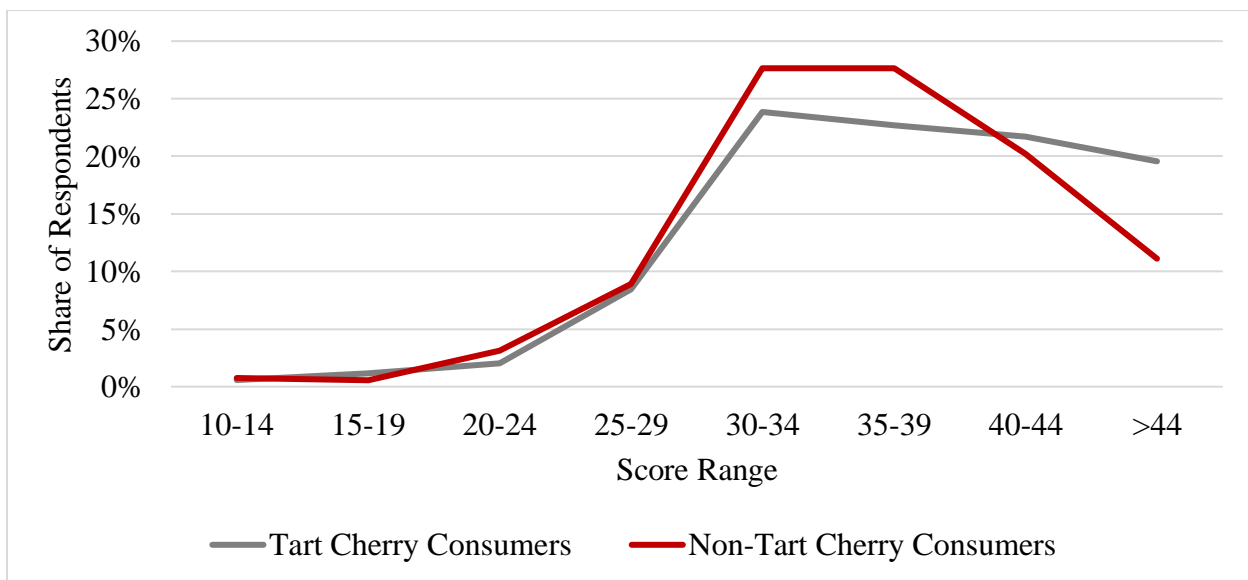
Interestingly, when we look at the CETSCORE instead (see Figure 10), we can see that for both groups around 28% of respondents scored in the 45-54-point range, which can be interpreted as a moderate level of consumer ethnocentrism. That said, a smaller share of non-tart cherry consumers scored above 64 points. Both the differences in the CETSCORE and the score derived for the local preferences were statistically significant. This indicates that a certain subset of tart cherry consumers put a greater level of importance on where the cherries were produced, which could represent an additional marketing opportunity. This finding is especially interesting as the prior food value scale indicated that origin was among the least important food values. Thus, opinions on food values appear to be dependent on the product that is under consideration, and/or the importance diminishes when other product attributes are also present.

Figure 10. Cumulative scoring of respondents for the CETSCALE (CETSCORE)
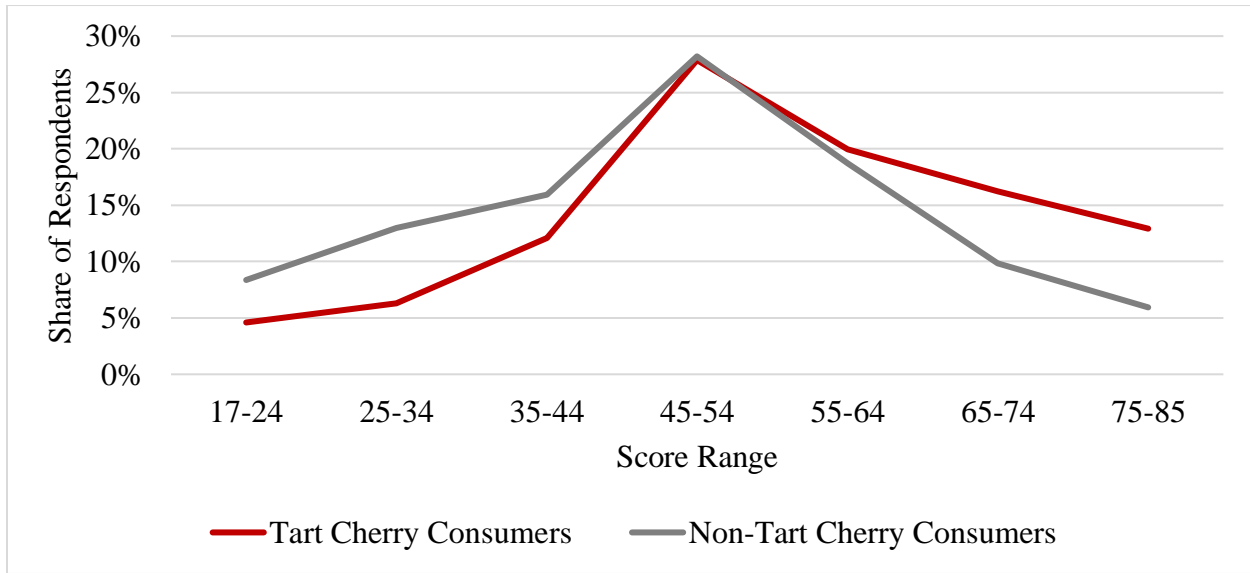
4.5 Choice Experiment

The prior results avoided including the item's price, which is one of the most important attributes contributing to a consumer's decision to purchase food products. Therefore, we considered two different approaches to exploring price premiums for tart cherry products.

Unlabeled Choice Experiment for Tart Cherry Juice

First, we implemented an "unlabeled" choice experiment to explore what attributes are important to consumers when purchasing tart cherry juice. The results from the MXL-EC model are shown in Table 3[6]. We find that that both tart cherry consumers and non-consumers are willing to pay a premium of around $0.25 per 8 oz bottle of tart cherry juice for marketed as "Made in the United States." No significant difference can be found between the two as expressed in the interaction term of the pooled model.

That said, we do find a significant difference between the tart cherry consumers and non-consumers for juice with labels indicating added sugar ($0.42 per 8 oz bottle). We find that tart cherry consumers are less sensitive to the presence of added sugar than non- tart cherry consumers. This aligns with our results from the food value scale, as non-tart cherry consumers valued nutritional aspects more than tart cherry consumers. Another potential reason for this could be that tart cherry consumer's familiarity with the juice means that they prefer to add some sugar to the product.

Overall, results indicate that "Made in the United States" and "Sugar Free" are both attributes that are valued by respondents and that have the potential to generate a premium for tart cherry juice.

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[6] The underlying model estimates are reported in Appendix Table A1.

Table 3. Estimates from the MXL-EC Model in WTP-Space for the unlabeled DCE.

Variables	Pooled Model	Segmented Models	
	Consumer vs. Non-Consumer	Consumers of Tart Cherries	Non-Consumers of Tart Cherries
USA	$0.29	$0.25	$0.26
SUGAR	$-0.79	$-0.49	$-0.61
Treatment Effects			
USA * Treatment	$0.01		
SUGAR * Treatment	$0.42		

Labeled Discrete Choice Experiment Results

In the second discrete choice experiment, we explore consumer preference and WTP for tart cherry juice and other fruit juices. Table 4 below reports the total and marginal WTP estimates from the MXL-EC model for consumers and non-consumers of tart cherries in the labeled DCE[7]. Hereby, total WTP refers to the mean dollar amount that respondents would be willing to pay to be completely indifferent between receiving the beverage and choosing the no-purchase option. Correspondingly, the marginal WTP for a product j versus a product k is derived by subtracting j's total WTP from k's total WTP. Thus, it is the dollar amount at which a respondent is indifferent between product j and k.

Looking first at the total WTP for the different juices, it can easily be seen that the WTP for all beverage options is substantially lower for consumers of tart cherries compared to non-consumers. The biggest difference occurs for tart cherry juice, where the total WTP among non-tart cherry consumers is $2.53 higher than for consumers. This might result from non- tart cherry consumers being uncertain about the usual prices of the juice options given that they also drink less fruit juice as shown above, resulting in a higher reference price. Both uncertainty about prices and respondents internal reference price have shown to impact respondents WTP (Caputo et al. 2018, 2020).

In a direct comparison with the other alternatives, we observe that tart cherry juice is less preferred than most other juice options. For example, the marginal WTP for apple juice relative to tart cherry juice among tart cherry consumers is $0.96 higher and $0.19 higher for non-tart cherry consumers. The only exceptions are tart cherry consumer's and non-consumer's marginal WTP for coca cola (tart cherry consumers: $0.38; non-tart cherry consumers: $0.91) and non-consumers marginal WTP for blueberry juice ($0.21). We also notice that non-tart cherry consumers have a higher marginal WTP for tart cherry juice relative to the other options than tart cherry consumers. This finding might be induced by the overall indifference of non-consumers between the juice alternatives, while tart cherry consumers partake in a more frequent consumption also of other juices (see the results in section 4.2) and thus have a clearer preference ordering. Nevertheless, this finding also highlights that in an actual market environment, tart cherry juice is outperformed

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[7] The underlying model estimates are reported in Appendix Table A2.

by other juice alternatives like apple and cranberry juice, irrespective of whether the respondent consumes tart cherries or not.

Table 4. Total and Marginal WTP Estimates from the MXL-EC Model in the WTP Space

	Tart Cherry Consumers	Non-Tart Cherry Consumers
Total WTP		
Apple Juice vs None	$2.13	$3.89
Cranberry Juice vs None	$1.82	$4.03
Grape Juice vs None	$1.90	$3.92
Blueberry Juice vs None	$1.53	$3.49
Tart Cherry Juice vs None	$1.17	$3.70
Coca Cola vs None	$0.79	$2.79
Marginal WTP		
Tart Cherry vs. Apple Juice	-$0.96	-$0.19
Tart Cherry vs. Cranberry Juice	-$0.65	-$0.33
Tart Cherry vs. Grape Juice	-$0.73	-$0.22
Tart Cherry vs. Blueberry Juice	-$0.36	$0.21
Tart Cherry Juice vs. Coca Cola	$0.38	$0.91
Apple vs. Cranberry Juice	$0.31	-$0.14
Apple vs. Grape Juice	$0.23	-$0.03
Apple vs. Blueberry Juice	$0.60	$0.40
Apple Juice vs. Coca Cola	$1.34	$1.10
Cranberry vs. Grape Juice	-$0.08	$0.11
Cranberry vs. Blueberry Juice	$0.29	$0.54
Cranberry Juice vs. Coca-Cola	$1.03	$1.24
Grape vs. Blueberry Juice	$0.37	$0.43
Grape vs. Coca Cola	$1.11	$1.13
Blueberry Juice vs. Coca Cola	$0.74	$0.70

Note: Values in red are negative values

5. Implications

Overall, we find that tart cherry consumers differ substantially from non-tart cherry consumers in a variety of aspects, but that opportunities exist to increase market penetration of tart cherry products in the United States. The consumer heterogeneity stems from differences in their demographic composition, general consumption of tart cherries as well as other fruits and derivative products, awareness of sales places, ethnocentric tendencies and local preferences. Marketers would benefit from differentiating tart cherry promotional strategies between those consumers who already purchase tart cherry products and those that cannot yet be considered a tart cherry consumer.

As demonstrated in our analysis of the consumption data and the choice experiment, non-tart cherry consumers are relatively indifferent in their consumption of tart cherry juice or other tart cherry products relative to purchasing alternative fruits and their derivative products. This is a particular challenge because the cost of domestic-produced tart cherry juice is likely to remain higher than other substitutable products. While we find that non-tart cherry consumers have a higher total WTP for tart cherry juice and other juice alternatives in the hypothetical DCE, we also observe that they typically drink less fruit juice in general, meaning the indicated WTP might be driven by a lack of knowledge. Therefore, one potential pathway to increasing consumption among this segment could potentially be the overall promotion of fruit juice consumption while simultaneously motivating non-consumers to integrate tart cherries products into their diet.

Not only do tart cherry consumers regularly consume more fruit products, they also dedicate a higher budget share towards purchasing fruits and vegetables. Along with the higher familiarity of these consumers with different juice alternatives, tart cherry consumers displayed a clearer preference for different juice alternatives, though all other juice alternatives outperformed tart cherry juice. That said, the unlabeled DCE indicated that both consumers and non-consumers of tart cherries were willing to pay a premium for attributes such as "Made in the United States" and "Free of Added Sugar." Hence, marketers could explore the promotion of those avenues to increase tart cherry juice sales relative to other similar products.

The analysis of the data also yielded several other findings of note:
- Most tart cherry consumers are under 44 years old.
- Tart cherry consumers perceived tart cherry products to be relatively difficult to find in various outlets compared to non-consumers, which indicates that the visibility of the products in the store environment could be improved.
- Naturalness is key factor for tart cherry purchasing decisions, with the food value analysis also adding price, taste, and nutrition to the list of key attributes. Interestingly, novelty was the least important attribute for both tart cherry consumers and non-consumers.

Collectively, these results demonstrate that producers and processors might benefit from focusing their attention on refining and diversifying the composition, visibility, and general marketing of their existing products in favor of new product developments.

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Appendix

Table A1. Estimates from the MXL-EC Model in WTP-Space for the unlabeled DCE

Variables		Segmented Models		Pooled Model
		Tart Cherry Consumers	Non-Tart Cherry Consumers	Consumer vs. Non-Consumer
USA				
	Mean	0.25*	0.26*	0.29*
		(0.03)	(0.04)	(-0.06)
	SD	0.04	0.07	0.56*
		(0.05)	(0.11)	(-0.04)
SUGAR				
	Mean	-0.49*	-0.61*	-0.79*
		(0.09)	(0.09)	(-0.08)
	SD	1.04*	1.51*	1.29*
		(0.09)	(0.08)	(-0.05)
Price Scale Parameter				
	Mean	-1.83*	-0.70*	-1.06*
		(0.05)	(0.03)	(0.02)
	SD	1.83*	0.70*	1.06*
		(0.05)	(0.03)	(0.02)
No Purchase				
	Mean	-4.40*	-4.62*	-4.46*
		(0.31)	(0.21)	(0.19)
ERC				
	SD	2.93*	4.42*	4.19*
		(0.18)	(0.73)	(0.22)
Treatment Effects				
USA * Treatment				0.01
				(0.07)
SUGAR * Treatment				0.42*
				(0.11)
Model Statistics				
LL		-2783.543	-4639.86	-7590.85
Obs/Choices		4312	5568	9880
Par		10	10	12
BIC/N		1.31	1.68	1.55
AIC/N		1.30	1.67	1.54

Table A2. Estimates from the MXL-EC Model in WTP-Space for the labeled DCE

Variables		Consumers of Tart Cherries	Non-Consumers of Tart Cherries
Apple Juice			
	Mean	-2.13*	-3.89*
		(0.09)	(0.22)
	SD	1.21*	1.64*
		(0.07)	(0.10)
Cranberry Juice			
	Mean	-1.82*	-4.03*
		(0.10)	(0.20)
	SD	1.41*	1.46*
		(0.08)	(0.09)
Grape Juice			
	Mean	-1.90*	-3.92*
		(0.08)	(0.18)
	SD	0.98*	1.10*
		(0.06)	(0.08)
Blueberry Juice			
	Mean	-1.53*	-3.49*
		(0.10)	(0.21)
	SD	0.95*	1.21*
		(0.06)	(0.09)
Tart Cherry Juice			
	Mean	-1.17*	-3.70*
		(0.12)	(0.22)
	SD	1.12*	1.86*
		(0.09)	(0.10)
Coca-Cola			
	Mean	-0.79*	-2.79*
		(0.17)	(0.25)
	SD	1.71*	2.22*
		(0.12)	(0.14)
Price Scale Parameter			
	Mean	-2.43*	-1.03*
		(0.04)	(0.02)
	SD	2.43*	1.03*
		(0.04)	(0.02)
ERC			
	SD	1.38*	2.65*
		(0.08)	(0.17)
Model Statistics			
LL		-4838.94203	-8409.73786
Obs/Choices		4312	5568
Par		14	14
BIC/N		2.27	3.04
AIC/N		2.25	3.03