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RESEARCH ARTICLE

Not All Juices are the Same: The Superior Perception of and Preference for Florida Orange Juice

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Abstract

The Florida orange juice industry has experienced great challenges—declining orange juice consumption and a domestic supply shortage that has led to increasing imports over the past decade. As growers look for a foothold, the question remains whether it is better to continue promoting orange juice (OJ) sales by focusing on the Florida "brand" or whether orange juice, in general, should be promoted using a federal marketing program. This study aims to identify the value of promoting "Florida" on OJ products to help the industry understand the potential benefits of enhancing the image of "Florida" in consumers' perceptions of OJ.

Introduction

The US orange juice industry has experienced dramatic changes in the past decade. Florida accounts for 90% of domestically produced orange juice, while production has declined from about 900 million gallons during the 2010–11 season to less than 400 million gallons during the 2018–19 season (Florida Department of Citrus, 2020a). The reduced supply is largely attributed to Huanglongbing (commonly referred to as citrus greening), a disease that is causing orange producing acreage and yield losses (Dala-Paula et al., 2019; USDA NASS, 2021). Hurricane Irma further damaged this struggling industry in 2017 by reducing orange production in Florida (Spreen, 2020). To compensate for the lower production, processors in both Florida and other states have used imported juice, mainly from Brazil and Mexico, to meet demand; however, forecasting and contracting for imports has led to a higher than usual inventory, causing downward pressure on prices received by Florida growers (Spreen, 2020). Given such challenging situations, Florida orange growers and the orange juice industry are eager to explore possible strategies to sustain their position in the market. In this study, we examine how important source of orange juice, particularly being from Florida, is to consumers.

The share of Florida orange juice in the US market significantly decreased from nearly 90% during the 2010–11 season to less than half in the 2018–19 season (Florida Department of Citrus [FDOC], 2020a). Imports have served to meet the demand for orange juice in the US market by keeping overall orange juice prices low amid domestic orange supply shortages. However, the decreased Florida orange production, coupled with higher production costs, has made it difficult for domestic growers to compete with orange juice imports, particularly in the concentrate orange juice market. Moreover, the total presumed consumption of orange juice decreased from

1.13 billion gallons to less than 700 million gallons during the 2018–19 period, making the situation even harder for Florida growers (Florida Department of Citrus, 2020a; Heng et al., 2019).

Literature has shown that generic advertising of orange juice is an effective tool to increase demand for orange juice in general (Brown and Lee, 1997; Capps, Bressler, and Williams, 2004; Heng et al., 2019). In the current US market, the vast majority of not-from-concentrate (NFC) orange juice, the premium form of orange juice, contains at least some Florida-sourced oranges. In other words, all the NFC orange juice products that command premium pricing in the US market contain at least some Florida orange juice, up to 100% Florida juice. However, the amount of Florida orange juice can be very limited because of the desire to blend it with cheaper imports to maintain a low-priced in the market, particularly in the case of reconstituted orange juice (Recon). The Florida Department of Citrus (FDOC) has conducted various advertising activities to promote Florida orange juice under generic marketing programs funded by Florida grower and processor taxes. Previous studies have shown that the FDOC promotions have played an essential role in promoting orange juice (Capps, Bressler, and Williams, 2004; Heng et al., 2019). Meanwhile, there is increased attention to the free-rider problem with increased imports: competitive imports also benefit from the FDOC promotion activities (News Service of Florida, 2020).

Although consumers have stated their preference for orange juice from Florida, and many believe that their currently purchased orange juice is from Florida (Heng, House, and Yoon, 2021), it remains a question whether orange juice consumers are willing to pay more for orange juice labeled "Florida." Therefore, this study aims to answer the question with four objectives: (1) identify the proportion of consumers who perceive Florida orange juice as superior to other orange juice; (2) explore demand drivers behind orange juice and orange juice labeled "Florida," (3) investigate consumer willingness-to-pay (WTP) a premium for Florida orange juice; and (4) identify individual characteristics affecting for different levels of Florida oranges. A nationwide survey was conducted to explore consumers' preferences for different levels of "Florida" involved in orange juice production and to identify their corresponding WTP.

Our results indicate that more than 40% of the respondents indicate a preference for a 52 ounce carton of orange juice produced with oranges from Florida; 35.3% are willing to pay more for 100% Florida orange juice; and 47.4% are more willing to purchase 100% orange juice from Florida. The estimated premium for 100% FL orange juice is $1.87, indicating that consumers are willing to pay a premium to buy 100% FL orange juice instead of orange juice products with no indication of Florida. The results suggest that orange juice promotions with "Florida" would elicit higher premiums from consumers than origin-neutral orange juice advertising, bringing higher returns to orange growers in Florida. In addition, the premium of $0.40 for orange juice products involving Florida ("at least 50% from Florida," "Bottled in Florida") reveals that orange juice growers and producers across the states in the US could benefit from using the Florida image in their products, even when it is not fully produced with oranges from Florida.

Findings from our study contribute to the development of the Florida orange juice industry by providing effective marketing strategies amid the decreased marketing budget the FDOC is facing due to the drastic decline in orange production. In addition, the remaining citrus growers, faced with increased production costs due to citrus greening, have supported reduced box taxes that fund the marketing activities. The box taxes received by FDOC under generic marketing programs have decreased from 23 cents per box prior to 2015 to 12 cents per box in 2021 (Turner, 2020). To overcome these difficult circumstances, some Florida orange growers and processors recently explored the option of a federal program (Neff, 2020), which would require not only Florida but all orange growers and importers to pay the same tax to continue marketing orange juice.

One noted constraint of the federal program is to promote the orange juice category in general, which eliminates the opportunity to promote orange juice using the "Florida" brand (Indian River Citrus League, 2020; Neff, 2020), or to promote the premium type of orange juice (NFC) that
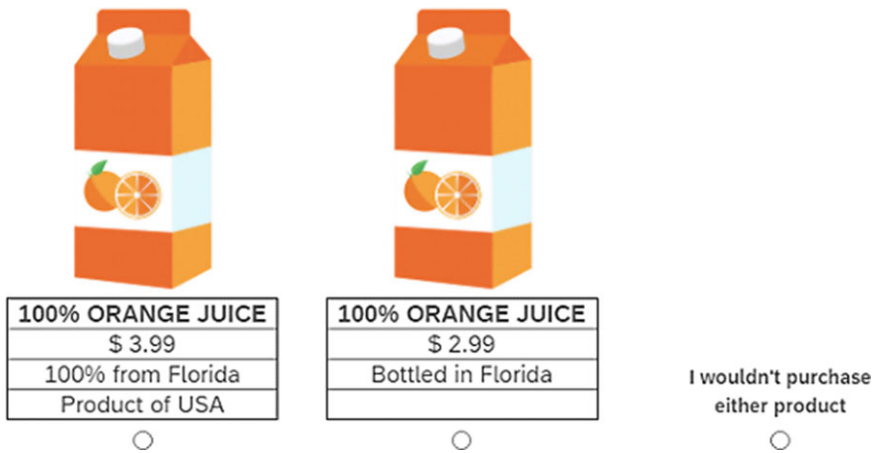
Figure 1. Example of the choice experiment.

would provide higher returns back to Florida growers. As such, Florida growers were interested in learning whether promoting origin-neutral orange juice without the "Florida" brand would weaken the "Florida" image and further stimulate the demand for cheaper imports. Therefore, understanding the value of the word "Florida" on orange juice products was an essential component during the exploratory phase of pursuing a federal program.

Survey and Experiment Design

A nationwide survey was designed and launched online in July of 2020. The survey targeted respondents 18 years or older who were the primary household grocery shoppers (purchased groceries at least 50% of the time). The online survey was administrated by a professional survey company (Toluna) to collect a representative sample in the United States. The survey was administered under IRB # 202001684, approved as exempt on June 23, 2020.

The survey questions were designed to collect information from the respondents about their previous purchases of orange juice, knowledge, and preferences about the origin of orange juice, personal lifestyle, and sociodemographics. Since the survey was implemented during the COVID-19 pandemic, the survey also included questions regarding respondents' recent purchase changes to capture the potential impact of the pandemic.

The survey included a choice experiment (CE) to reveal respondents' underlying preferences. The respondents were asked a set of choice questions where they chose the preferred product from two orange juice options and an opt-out option in each question. The CE was designed to understand consumers' preferences for involving "Florida" in the orange juice production procedure. Respondents were asked to consider the choice as if they were at a supermarket to purchase a carton of NFC orange juice (52 oz) from the refrigerated section. Each orange juice option is described as a combination of different levels of price, levels of "Florida" involvement in production, and the country of origin. All other attributes were assumed to be the same across different options. An example of the choice experiment seen by the respondents is displayed in Figure 1. The price levels for a carton of orange juice are $2.99, $3.99, and $4.99. The median price reflects the price for a carton of orange juice based on the Nielsen Topline Reports (FDOC, 2020b) and personal communication with FDOC staff to adjust for pricing of multiple sizes and with promotions. The higher and lower price levels represent about a 30% increase and decrease from the median price. The levels of involvement of "Florida" in the production procedure include "100% from Florida," "At least 50% from Florida," "Bottled

Table 1. Attributes and levels of orange juice products

Attributes	Levels			
Price per NFC OJ (52 oz)	$2.99	$3.99	$4.99	
Percentage of Florida oranges in OJ	100% from Florida	At least 50% from Florida	Bottled in Florida	No indication
Country of origin	Product of USA		No indication	

Table 2. Sample characteristics

Variable	Description	Percent (%)	US Population (%)
Gender	Female	56.73	51.30
Age	18–24	9.04	11.77
	25–34	20.09	17.88
	35–44	19.49	16.44
	45–54	13.73	16.03
	55–64	16.41	16.66
	65 and above	21.23	21.21
Education	Higher than high school graduate	66.24	61.08
Income	Under $34,999	14.80	16.67
	$35,000–$49,999	17.88	11.94
	$50,000–$74,999	26.19	17.37
	$75,000–$99,999	18.02	12.83
	$100,000–$149,999	13.73	15.72
	$150,000 or more	9.38	15.66
Race	White	78.90	75.00

in Florida," and no label. The levels of country of origin include "Product of USA" and no label. The full set of attributes and levels are summarized in Table 1. Based on a total of 24 (3×4×2) product profiles, the full factorial design generates choice sets of 276. Therefore, the fractional factorial design is utilized to generate 13 choice sets that maximize the D-efficiency (calculated value 94%) of attribute combinations by SAS OPTEX procedure. The choice sets were presented to respondents in random order.

To control sample quality, several validation questions were used in the survey to test whether respondents paid attention to questions in the survey (Gao, House, and Xie, 2016; Gao, House, and Bi, 2016; Jones, House, and Gao, 2015). For example, among a set of 5-point Likert scale questions, we asked respondents to choose "Strongly Agree" in a specific question. If a respondent failed the validation question, they would be removed from the survey. Additionally, we used a "cheap talk" script before the choice experiment to ask respondents to make a choice as if they were in a real market to reduce the hypothetical biases.

Table 2 presents the demographic characteristics of 1,495 respondents who participated in the survey. A comparison of the sample to the US population demographics is provided. Compared to the recent American Community Survey (United States Census Bureau, 2019), our sample has a slightly higher proportion of people who are female, white,

middle-aged (25–44 years old), educated higher than high school, have a mid-level income ($75,000–$99,999) than the national population (which is expected given our sample was primary grocery shoppers only).

Econometric Models

Multinomial Logit Model

Several econometric models can be used to estimate results from choice experiments. The multinomial logit (MNL) model is the basic choice model based on the utility maximization theory and random utility theory (Lancaster, 1966; Mcfadden, 1980). Suppose individual i chooses among J alternatives, and the utility is linear in the attributes, the individual utility function can be written as

$$U_{ij} = \beta' x_{ij} + \varepsilon_{ij} \quad j = 1, \ldots J, \tag{1}$$

where x_{ij} is a vector of alternative attributes and β is a parameter vector measuring consumer preference for attributes, and ϵ_{ij} is assumed to be identically independently distributed (i.i.d.) with type 2 extreme value distributions. Under this specification, the probability that individual i chooses the jth alternative is acquired as follows, which can be estimated with the maximum likelihood method. The MNL model assumes a homogeneous preference and independence of irrelevant alternatives (IIA) across individuals.

$$\text{Prob}\,(y_i = j) = \frac{exp\,(\beta' x_{ij})}{\sum_{k=1}^{J} exp\,(\beta' x_{ik})} \tag{2}$$

The Random Parameters Logit Model

The random parameter logit (RPL) model relaxes the homogenous preference and IIA assumptions of the MNL model as consumer preferences are usually heterogeneous, and the IIA is not a realistic behavioral assumption (Train, 2002). Mathematically, individual i's utility of consuming alternative j can now be written as

$$U_{ij} = \beta'_i x_{ij} + \varepsilon_{ij} \quad j = 1, \ldots J, \tag{3}$$

Specifically, β_i is a vector of preference parameter of an individual i and can be estimated as $\beta_i = \beta + \eta \upsilon_i$, where β is the mean effect of an attribute, η is the triangular matrix that represents the covariance of random parameters, and υ_i is iid with certain distributions (Train, 2002). Assuming the preference parameters β_i follows a certain distribution and $f(\beta_i)$ is the probability density function of β_i, the probability of individual i choosing jth alternative can now be written as

$$\text{Prob}\,(y_i = j) = \int \frac{exp(\beta'_i x_{ij})}{\sum_{k=1}^{J} exp(\beta'_i x_{ik})} f(\beta_i) d\beta_i \tag{4}$$

Moreover, the random coefficients estimated from the model could be correlated. For example, consumers who prefer 100% Florida orange juice could also prefer products from the USA. To investigate the potential correlated effects, we allow correlations in preference parameters across attributes in the RPL model. Specifically, let $\beta_i \sim N(\overline{\beta}, \Omega)$ be the vector of attributes coefficients, and it can be expressed as $\beta_i = \overline{\beta} + LM$, where L is a lower triangular Cholesky factor of Ω, and M is a vector of independent standard normal deviates (Revelt and Train, 1998). The covariance matrix Ω can capture the correlated preference if the off-diagonal values of Ω are not zero (Revelt and Train, 1998).

WTP is the monetary value that a consumer is willing to pay to keep a utility unchanged when there is a change in an attribute. When calculating WTP values, the price parameter can be

assumed to be a fixed parameter in the RPL model, and the non-price attributes are assumed to follow a normal distribution (Hensher, Rose, and Greene, 2005). The WTP by individual i for an attribute k can be calculated as the negative ratio of the attribute coefficient to the price coefficient:

$$\text{WTP}_{ik} = -\frac{\beta_{ik}}{\beta_{i\_\text{price}}} \tag{5}$$

where β_{ik} is the individual i's preference parameter of attributes k (Train, 2002).

Generalized Mixed Logit Model

Although the RPL model relaxes the IIA assumption and accounts for consumer's heterogeneous preferences, recent literature has pointed out that the WTP calculation from the RPL model has some potential issues. The major issue is that it is hard to identify a proper distribution of the price coefficient in the preference space, which makes the estimation of WTPs difficult, or yields unrealistic WTPs (Train, 2002). Assuming the price coefficient as nonrandom is a common practice to guarantee that the WTP of a non-price attribute follows the same distribution of the non-price attribute (Train, 2002). However, a fixed price coefficient indicates that the price sensitivity is the same across respondents, which is unrealistic and could yield inappropriate interpretation and conclusions. It is also known that specifying price coefficients as a log-normal distribution could lead to unreasonably large WTP estimates (Train, 2002). Instead, a WTP space model that is nested in the Generalized Mixed Logit Model (GML) can define the distribution of the WTPs directly (Fiebig et al., 2010, Greene, 2012). The GML model controls for heterogeneous preferences and considers scale heterogeneity that arises from different levels of randomness in individual choice-making behaviors.

Let us start with the utility function in preference space:

$$U_{ij} = \beta_i' x_{ij} + \varepsilon_{ij} \tag{6}$$

$$\beta_i = \sigma_i[\beta + Lv_i], v_i \sim N(0, 1) \tag{7}$$

$$\sigma_i = \exp(-0.5\tau^2 + \tau w_i), w_i \sim N(0, 1) \tag{8}$$

where σ_i is the random scale parameter and the scale heterogeneity is captured through τ, and L and ϵ_{ij} are the same as in the RPL model. To estimate the model in WTP space, we can rewrite equation (6) as

$$U_{ij} = \beta_{i\_\text{price}}\left[\text{price}_{ij} + \frac{\beta_{i1}}{\beta_{i\_\text{price}}}x_{ij1} + \frac{\beta_{i2}}{\beta_{i\_\text{price}}}x_{ij2} + \ldots + \frac{\beta_{ik}}{\beta_{i\_\text{price}}}x_{ijk}\right] + e_{ij} \tag{9}$$

where β_{i_price} is the price coefficient, β_{ik} is coefficient of nonprice attributes, and the WTP can now be defined as $\text{WTP}_{ik} = -\frac{\beta_{ik}}{\beta_{i\_\text{price}}}$.

Both RPL model in preference space and GML in WTP space are estimated using simulated maximum likelihood method with 100 Halton draws, assuming correlations between the random parameters (Greene, 2012). Hensher and Green suggest 25 intelligent draws can produce stable results and 100 draws are a "good" number (Hensher and Greene, 2003). Using the parameter estimates of the GML model in WTP space, Bayesian procedures can be used to estimate individual-level parameters or WTP_{ik} (Train, 2002, Greene, 2012). The individual WTP can be used as dependent variables to investigate how other factors such as demographics, purchase behaviors, and perceptions influence consumer WTP for different types of orange juice.
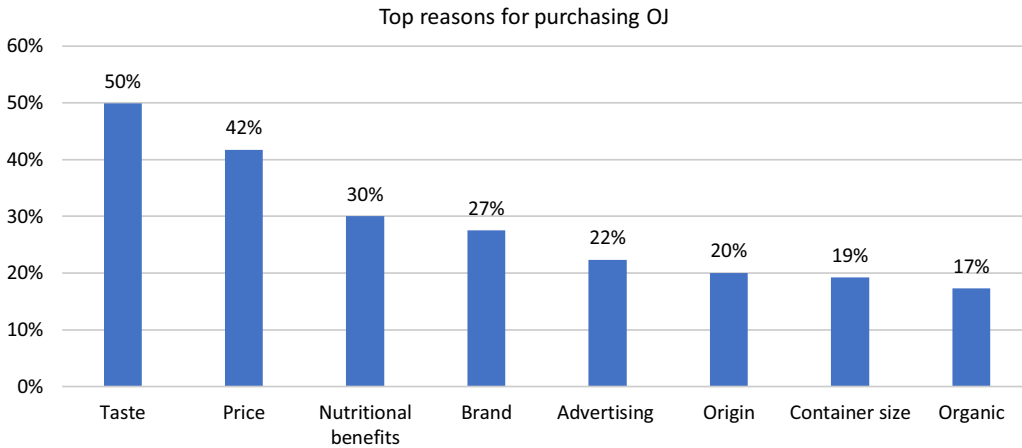
Top reasons for purchasing OJ

Figure 2. Reasons for purchasing OJ.

Results

Key Demand Factors for Orange Juice and Consumer Preference for Florida Orange Juice

The following is a discussion of orange juice consumption behavior results and choice experiment analysis. Within the sample, about 52.2% of the respondents indicate that they purchased orange juice in the previous 30 days, of which 62.4% indicate they buy orange juice on a weekly basis. When respondents are asked to identify the top factors that go into their orange juice purchase decision, the most selected factors include taste, price, and health/nutrition benefits (Figure 2). Over half of the respondents indicate that they would probably/definitely purchase orange juice on the next grocery trip.

Since this survey was implemented during the COVID-19 pandemic, we asked respondents whether their orange juice purchases had changed compared to the previous year. Among all respondents, 29.0% report that their orange juice purchase increased, 18.0% report that their orange juice purchase decreased, and 53.1% report that their orange juice purchase did not change compared to last year. If a respondent reported a change in the orange juice purchase, a follow-up question was asked about the reasons for the change, with results showing the top reasons including "Trying to eat healthy" (63.9%), "Supporting a good immune system" (52.9%), and "I like the nutritional attributes" (52.6%). Overall, the health benefits from orange juice are the top factor driving consumers' increased purchases. Another 27.8% of the respondents selected "Concern about Covid-19" as the reason for purchasing more orange juice. Regarding why a respondent indicated that they purchased less orange juice, the top reasons include "Concern about the sugar content" (35.1%), "Price" (24.3%), and "Not on top of my mind" (20.9%).

Among respondents who report that they purchased orange juice in the previous 30 days, nearly 50% believe that the oranges in their orange juice came from Florida. When asked about the preferred origin of oranges, 42.8% of all the respondents express a preference for Florida-produced oranges, followed by 25.6% of respondents that prefer "Anywhere in the U.S." We further asked respondents who stated a preference for Florida-produced orange juice why they preferred Florida. Results show that the top reasons for preferring Florida orange juice include "Florida orange juice tastes better," "Florida orange juice is better quality," and "Try to support domestic farmers" (Figure 3). In addition, 35.3% of respondents strongly agreed (selected 6 or 7 on a 7-point scale) that "I am willing to pay more for 100% orange juice from Florida," 35.5% strongly agreed "It is not acceptable if Florida orange juice is no longer available," and 47.4% of the respondents strongly agreed that "I am more willing to purchase 100% orange juice if it is from Florida".
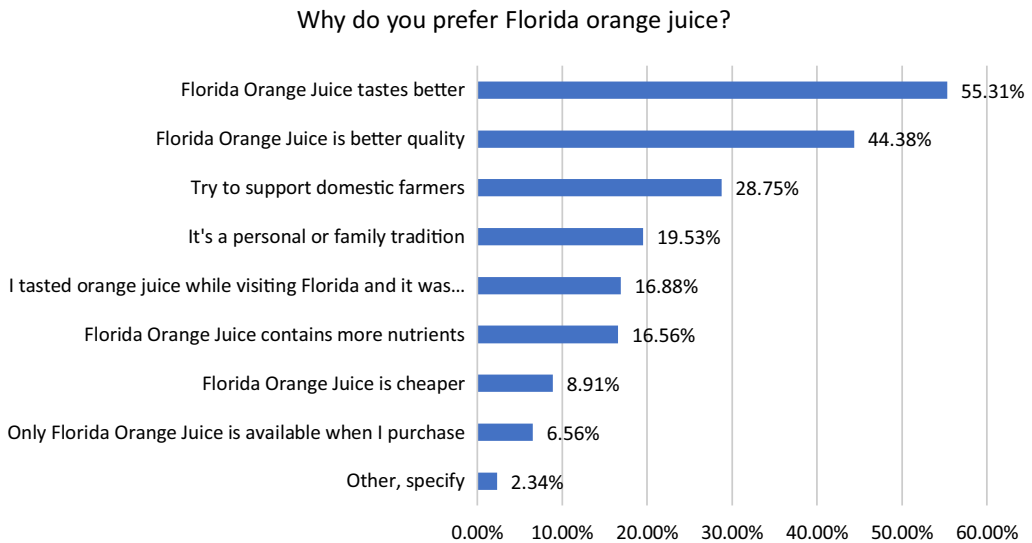
Why do you prefer Florida orange juice?

Florida Orange Juice tastes better	55.31%
Florida Orange Juice is better quality	44.38%
Try to support domestic farmers	28.75%
It's a personal or family tradition	19.53%
I tasted orange juice while visiting Florida and it was…	16.88%
Florida Orange Juice contains more nutrients	16.56%
Florida Orange Juice is cheaper	8.91%
Only Florida Orange Juice is available when I purchase	6.56%
Other, specify	2.34%

Figure 3. Reasons for preferring Florida OJ.

Table 3. Results of MNL, RPL, and GML models

	In Preference Space		In WTP space
	MNL	RPL	GML
Price	−0.19 (0.01)***	−0.23 (0.02)***	−1.00 (norm.)
100% from FL	0.92 (0.03)***	1.00 (0.05)***	1.87 (0.07)***
At least 50% from FL	0.30 (0.03)***	0.29 (0.04)***	0.45 (0.09)***
Bottled in FL	0.33 (0.03)***	0.23 (0.05)***	0.40 (0.09)***
Product of USA	0.001 (0.03)	0.02 (0.04)	0.05 (0.07)
Opt-out	−1.01 (0.05)***	−1.33 (0.06)***	−3.19 (0.05)***
Standard deviation parameter			
100% from FL		1.28 (0.05)***	1.23 (0.12)***
At least 50% from FL		0.85 (0.04)***	0.50 (0.09)***
Bottled in FL		1.46 (0.05)***	0.62 (0.11)***
Product of USA		1.06 (0.05)***	0.15 (0.12)
Scale parameter (τ)			1.08 (0.04)***
Log likelihood	−19,885.83	−18,284.67	−16,910.84
AIC	39,783.7	36,601.4	33,855.7

***Indicates statistically significant at 1% level. Standard errors in parentheses.

Model Estimation Results

The MNL, RPL, and GML are estimated using NLOGIT 5, and the estimation results are summarized in Table 3 (Greene, 2012). The MNL model provides a baseline for our estimates, although it assumes a homogeneous consumer preference. The significance of standard deviation parameters in the RPL model suggests heterogeneity in respondents' preferences for considered

Table 4. Willingness-to-pay from RPL and GML models

Attribute	Model	Mean WTP($)	Confidence Interval
100% from Florida	RPL	4.39 (0.29)***	[3.83, 4.96]
	GML	1.87 (0.07)***	[1.72, 2.01]
At least 50% from Florida	RPL	1.27 (0.18)***	[0.92, 1.63]
	GML	0.45 (0.09)***	[0.28, 0.62]
Bottled in Florida	RPL	1.02 (0.21)***	[0.60, 1.44]
	GML	0.40 (0.09)***	[0.23, 0.57]
Product of USA	RPL	0.11 (0.18)	[−0.25, 0.47]
	GML	0.05 (0.07)	[−0.09, 0.18]

Note: Estimates for the RPL model are from 250 simulated WTPs derived from the Krinsky and Robb method.
***Indicates statistically significant at 1% level. Standard errors in parentheses.

attributes. Therefore, the MNL model is less preferred in this case. In the GML model, the scale parameter is statistically significant at 1% level, suggesting heterogeneity in scale and a model accounting for scale heterogeneity is preferred. Moreover, the GML model has the smallest AIC and the absolute value of log likelihood among all three models. Thus, the GML is considered the best performer in this case.

Across all three models, the coefficients of all attributes are consistent. All coefficients have expected signs and are statistically significant except for the attribute "Product of USA." The negative price coefficient suggests that higher prices generate disutility. All attributes related to "Florida" have positive coefficients and are significant at 1% level. Results indicate that respondents have a generally greater preference for orange juice "100% from Florida" than those "At least 50% from Florida" or "Bottled in Florida." Finding different WTP estimates of the Florida levels that are statistically significant also confirm a higher premium for 100% from Florida (Table 4).

Willingness-to-Pay

The WTP estimates from both the RPL and GML models are displayed in Table 4. In the WTP space, the price coefficient is normalized to −1, and the attribute coefficients can be directly interpreted as WTP values. As the GML model has a clear advantage in controlling extreme values and yielding more reasonable magnitudes, we interpret the estimated WTPs using the GML model from the WTP space. On average, respondents are willing to pay a premium of $1.87 for a carton of 100% Florida orange juice relative to orange juice products with no indication of Florida, a value that is nearly 50% of the median price ($3.99/carton) in the choice experiment. Moreover, such a premium for 100% Florida orange juice is more than four times the premium respondents were willing to pay for a carton of orange juice at least 50% from Florida ($0.45/carton). Respondents were also willing to pay about $0.40 per carton for orange juice bottled in Florida. Such results suggest that although consumers were willing to pay a premium for involving "Florida" in any production procedure, the premium gained by 100% Florida orange juice is significantly larger than any other options. Interestingly, the WTP for "Product of USA" is not statistically significantly different from no indication. This could be because when "Florida" has appeared on orange juice products, whether it is from the US is no longer a key factor considered by the respondents.

Table 5. Results from the WTPs model

	100% Florida Coeff (St. Err)	At Least 50% Florida Coeff (St. Err)	Bottled in Florida Coeff (St. Err)	Product of the USA Coeff (St. Err)
Age	−0.073***	−0.059***	−0.105***	−0.071***
	(0.01)	(0.00)	(0.01)	(0.01)
Income	0.004*	−0.0003	0.0001	0.003
	(0.00)	(0.00)	(0.00)	(0.00)
Female	−0.268	−0.452***	−0.761***	−0.333*
	(0.23)	(0.15)	(0.26)	(0.19)
Degree	0.242	0.196	0.349	0.234
	(0.24)	(0.16)	(0.28)	(0.20)
White	0.505*	−0.148	−0.16	0.31
	(0.28)	(0.19)	(0.32)	(0.24)
Weekly shopping	1.149***	0.746***	1.360***	1.049***
	(0.27)	(0.18)	(0.31)	(0.23)
Monthly shopping	1.264***	0.992***	1.769***	1.209***
	(0.29)	(0.20)	(0.34)	(0.25)
FL perception	1.110***	0.097*	0.320***	0.818***
	(0.08)	(0.05)	(0.09)	(0.07)
Intercept	1.170**	3.409***	3.938***	−1.503***
	(0.57)	(0.38)	(0.65)	(0.48)
Observations	1,493	1,493	1,493	1,493
R2	0.219	0.153	0.166	0.22
Adjusted R2	0.215	0.148	0.161	0.216

*Indicates statistically significant at 10% level.
**Indicates statistically significant at 5% level.
***Indicates statistically significant at 1% level. Standard errors in parentheses.

Individual Characteristics Affecting WTP for Different Levels of Florida Oranges

We further investigated sociodemographic factors influencing the WTPs for Florida indications using an Ordinary Least Squares regression (OLS). WTP_{ik} is the WTP of individual i for a product k with three different Florida attribute levels generated from the GML model. X_i is a vector of individual characteristics.

$$\mathrm{WTP}_{ij} = \beta_0 + \beta_j' Z_i + e_{ij}$$

OLS is an appropriate method for this analysis because WTP_{ik} follow normal distribution based on the specification of the GML model in WTP space. Results from the final model are shown in Table 5, which includes demographics, shopping frequency, and perception of Florida orange juice. The demographics include age (years of age), income (mid-point of each income category), gender (female = 1, otherwise = 0), education level (higher than high school degree = 1, otherwise = 0), and race (white = 1, otherwise = 0). The orange juice shopping frequency is classified as shopping weekly, shopping monthly, and less frequently. The perception

of Florida orange juice was measured by the 7-point Likert scale questions regarding respondents' perceptions and attitudes on Florida orange juice. The overall Florida perception variable is calculated as a mean of the scores from these questions. The higher value of the perception variable indicates a better perception of Florida orange juice.

The results in Table 5 show that respondents who are younger, have higher income, are white, do shopping more frequently, and report having a good perception of Florida orange juice are willing to pay a higher positive premium for 100% Florida orange juice. In terms of magnitude, variables of shopping frequency and perception of Florida carry larger impacts than demographic variables influencing respondents' WTPs on 100% Florida orange juice. Respondents who are younger, males, do shopping more frequently and report having a good perception of Florida orange juice are willing to pay more for orange juice partially from Florida, bottled in Florida, or produced in the USA. For these three types of WTPs, shopping frequency has a larger impact than other variables, whereas the impact of Florida perception becomes smaller. Overall, age, shopping frequency, and perception of Florida orange juice significantly affect respondent WTP for all four types of juice examined in this study.

Discussion

Our study differentiates itself from previous research on orange juice demand by focusing on consumer preferences for having Florida on the label, among many factors that affect orange juice demand. Various demand drivers behind orange juice consumption are identified in the literature from retail promotions (e.g., temporary price reduction, displays, features, and coupons), the introduction of new beverages such as low-carb orange juice, flu/cold frequencies, to orange-juice-squeezing-process-observation (Brown and Lee, 2007; Kim, House, and Gao, 2012; Lee and Brown, 1985, 2006, 2009). Recent studies have further investigated orange juice demand drivers and identified imperfect price reversibility along with consumer socio-demographic characteristics, perceptions, health conditions, and different country of origin and production methods (Gao et al., 2019; Heng et al., 2019; Hu et al., 2021; Kim, Zansler, and House, 2018).

Based on this research, and interest from the industry focused on whether generic marketing should be focused on Florida only, or incorporate other orange juice producers, this study adds to the literature by investigating consumer perceptions related to different origin and processing locations. Our findings show consumers still have strong preferences for Florida orange juice, which presents challenges for an industry facing supply-side issues.

Conclusion

The orange juice industry has been an important sector of the Florida economy for a long time. However, the industry has experienced great challenges from both the supply and demand sides in the past decades. The Florida citrus industry recently convened an exploratory committee to explore whether promoting generic orange juice or Florida orange juice would be better for Florida growers. This study aims to identify the value of promoting "Florida" on orange juice products, therefore helping the industry understand the potential benefits of enhancing the image of "Florida" in consumers' perceptions. This is different from studies in the literature that mainly focus on investigating the effectiveness of various orange juice marketing strategies and to find demand drivers behind orange juice consumption (Brown and Lee, 2007; Heng et al., 2019; Hu et al., 2021; Kim et al., 2018).

We find that more than 40% of total respondents prefer Florida-produced orange juice. The top reasons for preferring Florida orange juice include better taste, better quality, and supporting domestic farmers. Over half of the sample state that they are more willing to purchase orange juice from Florida and willing to pay more for Florida orange juice. Our model estimation shows

that respondents are willing to pay the highest premium for 100% Florida-produced orange juice, followed by at least 50% from Florida, and bottled in Florida. The preference for the product of USA is not statistically significant. As a result, promotions for "Florida" orange juice would generate higher premiums than generic orange juice advertising, and this impact is felt most strongly for 100% Florida orange juice.

However, we need to keep in mind that there are many challenges in practice. For example, many respondents do not have a particular preference for Florida origin, and 100% Florida orange juice products have limited shelf space in the current market. On the other hand, although more than 80% of orange juice shoppers in our sample believe their orange juice came from Florida, only about 45% of the orange juice in the US market came from Florida producers in the 2018–19 season (Florida Department of Citrus, 2020a). Such results indicate that many consumers are not aware of the origin of their orange juice and might not have enough experience with identifying Florida products. Moreover, with the current limitation on the supply side, there is not enough Florida orange juice that can be produced to meet the market demand. Overall, our results suggest that keeping generic advertising focused on Florida orange juice would be beneficial to increase consumers' WTP, which would provide higher returns to Florida growers. At the same time, the industry must continue to face challenges head on until supply can be re-established.

There are limitations of our study. For instance, our experiment is hypothetical and presented in an online format. Future research that investigates consumer response to labeling in-store would be valuable, but is challenging as different origins of the product may also coincide with brand differences, making it more difficult to isolate the impact of origin.

References

Brown, M.G., and J.Y. Lee. "Incorporating Generic and Brand Advertising Effects in the Rotterdam Demand System." *International Journal of Advertising* **16**,3(1997):211–20.

Brown, M.G., and J.-Y. Lee. "Impacts of Promotional Tactics in a Conditional Demand System for Beverages." *Journal of Agribusiness* **25**,2(2007):147–62.

Capps, O., D.A. Bressler, and G.W. Williams., "Evaluating the Economic Impacts Associated with Advertising Effects of the Florida Department of Citrus." Prepared for the Advertising Review Committee Association with the Florida Department of Citrus and Florida Citrus Mutual. College Station, TX: Forecasting and Business Analytics, LLC, 2004.

Dala-Paula, B.M., A. Plotto, J. Bai, J.A. Manthey, E.A. Baldwin, R.S. Ferrarezi, and M.B.A. Gloria. "Effect of Huanglongbing or Greening Disease on Orange Juice Quality, A Review." *Frontiers in Plant Science* **9**(2019):1976.

Fiebig, D.G., M.P. Keane, J. Louviere, and N. Wasi. "The Generalized Multinomial Logit Model: Accounting for Scale and Coefficient Heterogeneity." *Marketing Science* **29**,3(2010):393–421.

Florida Department of Citrus. *Nielsen Topline Reports*, 2020b.

Florida Department of Citrus. *Citrus Reference Book*. April 2020a.

Gao, Z., L. House, and X. Bi. "Impact of Satisficing Behavior in Online Surveys on Consumer Preference and Welfare Estimates." *Food Policy* **64**,4(2016):26–36.

Gao, Z., L.A. House, and J. Xie. "Online Survey Data Quality and Its Implication for Willingness-to-Pay: A Cross-Country Comparison." *Canadian Journal of Agricultural Economics* **64**,2(2016):199–221.

Gao, Z., X. Yu, C. Li, and B.R. McFadden. "The Interaction Between Country of Origin and Genetically Modified Orange Juice in Urban China." *Food Quality and Preference* **71**,3(2019):475–84.

Greene, W.H. *Nlogit Version 5 Reference Guide*. Plainview, NY: Econometric Software, Inc., 2012.

Heng, Y., L. House, and S. Yoon. "Consumers' Perceptions and Preferences Toward Florida Orange Juice." *EDIS* **2021**,6(December 2021). DOI 10.32473/edis-fe1110-2021.

Heng, Y., R.W. Ward, L.A. House, and M. Zansler. "Assessing Key Factors Influencing Orange Juice Demand in the Current US Market." *Agribusiness* **35**,4(2019):501–15.

Hensher, D.A., and W.H. Greene. "The Mixed Logit Model: The State of Practice." *Transportation* **30**,2(2003):133–76.

Hensher, D.A., J.M. Rose, and W.H. Greene. *Applied Choice Analysis: A Primer*. Cambridge: Cambridge University Press, 2005.

Hu, Y., L.A. House, B.R. McFadden, and Z. Gao. "The Influence of Choice Context on Consumers' Preference for GM Orange Juice." *Journal of Agricultural Economics* **72**,2(2021):547–63.

Indian River Citrus League. *OJ Federal Marketing Order Considered*, 2020. Internet site: https://citrusindustry.net/2020/07/07/oj-federal-marketing-order-considered/ (Accessed April 18, 2022).

Jones, M.S., L.A. House, and Z. Gao. "Respondent Screening and Revealed Preference Axioms: Testing Quarantining Methods for Enhanced Data Quality in Web Panel Surveys." *Public Opinion Quarterly* **79**,3(2015):687–709.

Kim, H., L.A. House, and Z. Gao. "Theoretical and Perceptual Market Values for Fresh Squeezed Orange Juice." *International Journal of Marketing Studies* **4**,2(2012):45–55.

Kim, H., M. Zansler, and L.A. House. "Retail Promotion with Price Cut and the Imperfect Price Responses of Orange Juice Demand in the U.S." *Agribusiness* **34**,2(2018):363–76.

Lancaster, K.J. "A New Approach to Consumer Theory." *The Journal of Political Economy* **74**,2(1966):132–57.

Lee, J.-Y., and M.G. Brown. "Coupon Redemption and the Demand for Frozen Concentrated Orange Juice: A Switching Regression Analysis." *American Journal of Agricultural Economics* **67**,3(1985):647–53.

Lee, J.-Y., and M.G. Brown. "A Study of the Impacts of Low-Carb OJ on the Demand for OJ." *Journal of Food Products Marketing* **12**,4(2006):1–9.

Lee, J.-Y., and M.G. Brown. "Impacts of Flu/Cold Incidences and Retail Orange Juice Promotion on Orange Juice Demand." *Agricultural and Resource Economics Review* **38**,3(2009):338–44.

Mcfadden, D. "Econometric Models for Probabilistic Choice Among Products." *The Journal of Business* **53**,3(1980):S13–29.

Neff, E. "Industry Split on OJ Marketing Order." *Citrus Industry Magazine*, August 19, 2020.

News Service of Florida. "Box Tax Could Increase for Florida Oranges." *Citrus Industry Magazine*, May 20, 2020.

Revelt, D., and K. Train. "Mixed Logit with Repeated Choices: Households' Choices of Appliance Efficiency Level." *Review of Economics and Statistics* **80**,4(1998):647–57.

Spreen, T. "Orange Juice Import Impacts." *Citrus Industry Magazine*, September 30, 2020.

Train, K. *Discrete Choice Methods with Simulation*. 2nd ed. Cambridge: Cambridge University Press, 2002.

Turner, J. "Citrus "Box Tax" Hike Aimed at Surging Juice Sales." *The Ledger*, October 22, 2020.

United States Census Bureau. *American Community Survey 2019*, 2019. Internet site: https://data.census.gov/cedsci/table?d=ACS%201-Year%20Estimates%20Data%20Profiles

USDA NASS. *Commercial Citrus Inventory*, 2021. Internet site: www.nass.usda.gov/fl (Accessed April 18, 2022).