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RESEARCH ARTICLE

Attributes that Influence Consumers' Preferences for Choosing Locally Grown Food Sources During and After the COVID-19 Pandemic

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Abstract
The objective of this study is to identify attributes that influenced consumers' preferences when selecting locally grown food across different sources during and after the COVID-19 pandemic. We estimated the willingness to pay (WTP) for locally grown food sources. Results showed that respondents valued *Freshness*, *Accessibility*, *Variety*, and *Risk Shift* attributes, respectively. In addition, community-supported agriculture (CSAs) have the lowest WTP among other sources, and respondents valued CSAs' general weaknesses more than their advantages when choosing where to purchase locally grown food. However, we found that increasing community outreach levels positively affects choice probabilities for CSAs over other sources.

Keywords: Community-supported agriculture; consumers' preferences; COVID-19; farmers' market; local food; willingness-to-pay space

JEL classifications: Q13

Introduction

The COVID-19 pandemic in 2020 created uncertainty for the future of locally grown food markets. Thilmany et al. (2021) reported that local food producers and food manufacturers faced severe market disruption during the pandemic, and the authors stated that while both supply and demand for locally grown food were disrupted, local and regional food systems were innovating to overcome the disrupted market demand. For example, e-commerce local food sales increased as an alternative to direct-to-customer sales. Moreover, government agencies, such as the USDA-Agricultural Marketing Services (AMS), provided more flexible food safety and certification oversight for local food producers in order to encourage resilience during the pandemic. Accordingly, these authors suggested that a key role for economists will be identifying and disseminating market updates on the performance and response of various agricultural marketing channels during the disruptions caused by COVID-19.

Similarly, the unexpected increased popularity of community-Supported agriculture (CSA), which has both delivery options and a short supply distance, was observed during the pandemic. National Public Radio (NPR) reported that the number of CSA memberships and waiting lists markedly increased as COVID-19 spread across the United States (DeCeault, 2020; Westervelt, 2020a, 2020b). The increasing demands for CSAs were unanticipated because their popularity had been on a downward trend in the United States since they reached their peak in 2012 (Galt, 2011; Low et al., 2015; Roos, 2020; Woods et al., 2017). However, debate remains as to the reasons for the increased demand for CSAs, and it is unknown what exact factors encouraged consumers to join

them, and more importantly, if the new members will continue their memberships in the long term (DeCeault, 2020; Westervelt, 2020a, 2020b).

The objective of this study is to identify attributes that influence consumers' preferences when selecting locally grown food across different sources. The shift in consumer sourcing of locally grown food offered fresh opportunities for sources, such as farmers' markets and CSAs, to capture market share. But without knowledge of what drove those decisions, maintaining that shift in sourcing is vulnerable to rebalancing of sourcing now that the pandemic has passed. Therefore, we will analyze locally grown food consumers' willingness to pay (WTP) toward locally grown food sources and its determinant factors to see what has changed during and after the pandemic. Furthermore, we will examine consumers' satisfaction factors toward locally grown food sources and at-home food consumption frequency changes as a result of the pandemic. In the end, we will discuss what has changed and what CSAs, which had the lowest WTP among other sources, should focus on to strengthen their marketing.

Literature Review

According to the 2008 Food, Conservation, and Energy Act (2008 Farm Act), the definition of a "locally or regionally produced agricultural food product" is "any agricultural food product that is raised, produced, and distributed in the locality or region in which the final product is marketed so that the total distance that the product is transported is less than 400 miles from the origin of the product, or the State in which the product is produced." In addition, well-recognized locally grown food sources are "direct-to-consumer arrangements such as regional farmers' markets, or direct-to-retail/food service arrangements such as farm sales to schools" (Martinez et al., 2010).

Many studies have shown that locally grown food consumers share common behavioral characteristics which indicate possible attributes that influence consumers' preferences for choosing their food sources. Mirosa and Lawson (2012) stated that the behaviors of consumers who have a strong inclination toward locally grown food are related to eating habits (preference for unprocessed foods), preferred shopping places (specialty shops), and cooking habits (following recipes). In addition, the authors pointed out that locally grown food consumers are more politically liberal, frugal, and interested in produce quality than nonlocally grown food consumers. Similarly, Aprile, Caputo, and Nayga (2015) analyzed locally grown food consumers' preferences and attitudes within five different segmentations. The authors stated that locally grown food consumers have a high interest in food safety, actively finding locally grown food sources, and supporting local community and traditional agriculture. Lastly, Feldmann and Hamm (2015), found that consumers do not perceive locally grown food as expensive produce, unlike organic food. Rather, they are willing to pay a premium for locally grown food. Overall, existing studies show that locally grown food consumers exhibit similar behaviors related to their lifestyle and attitudes.

However, existing studies demonstrate that the level of the common behaviors of locally grown food consumers can vary from locally grown food sources. Curtis (2011) conducted an online survey of CSA members and interviewed consumers at urban farmers' markets in Nevada in order to find the characteristic differences between CSA members and farmers' market consumers. The study showed that CSA members are more educated and are more likely to be employed full-time than farmers' market consumers. In addition, CSA members purchased groceries more often at specialty stores, such as Whole Foods, and were less likely to visit bulk or multipurpose grocery stores than farmers' market consumers. The author also reported that the primary motivations for joining the CSA were purchasing local produce and supporting local farmers, but most CSA members also attended local farmers' markets for social interactions or local events. On the contrary, Pole and Gray (2013) had a different perspective on CSA members' community outreach. That study pointed out that not many people are concerned with building a community

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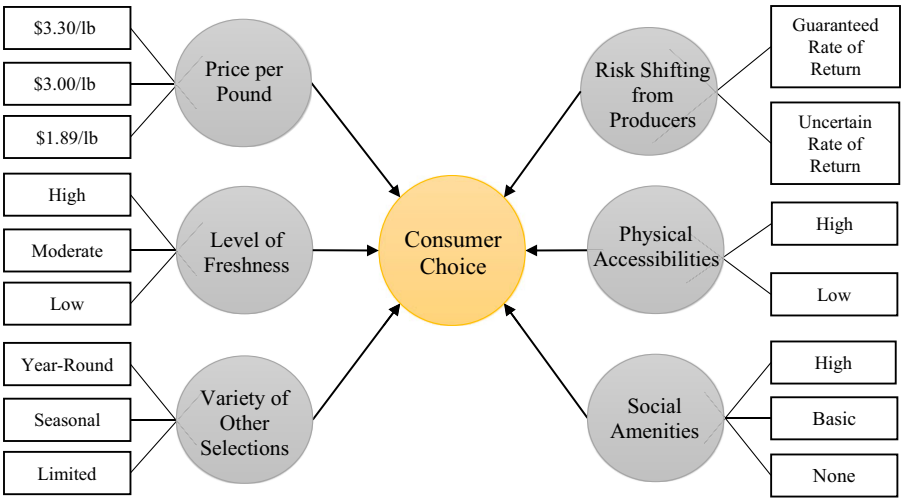

Figure 1. Hypothetical conceptual model for survey respondents to choose their preferences toward locally grown tomato sources.

and they did not prefer to share financial risk, which is required with the CSA preinvestment membership fee. The results showed that the CSAs' main motive, supporting the community and sharing financial risk, may not appeal to consumers if the CSAs are built with the same instrumental and functional model as supermarkets, which emphasizes economic growth over supporting the community.

Overall, while extensive research has been conducted on locally grown food consumers, there is no research about attributes that influence consumers' preferences for choosing locally grown food sources since the COVID-19 pandemic began in 2020. The pandemic has given rise to many uncertainties in the food supply chain, most notably in locally grown food markets, such as farmers' markets, farm stands, and pick-your-own farms, which require many in-person interactions between farmers and consumers. Therefore, it is necessary to identify how locally grown food consumers' behaviors have changed since the pandemic, and which attributes affect locally grown food consumers' preferences toward common locally grown food sources such as local grocery stores, farmers' markets, and CSAs. From this paper, we expect to shed light on the uncertainties of locally grown food consumers' behaviors since 2020.

Methods and Procedures

Research Design

In November 2021, using *Qualtrics*, we conducted an online survey of 804 locally grown tomatoes customers from across the United States. In order to filter the participants, we provided the screening question, "Are you interested in purchasing locally grown tomatoes?" at the beginning of the survey to ensure that our respondents were only those who were interested in locally grown food. Moreover, we conducted the survey with an evenly predesignated distribution by region and representative of the population (18 years and above) by gender, age, and income. After the screening question, participants were asked questions regarding demographics, personal behaviors, customers' satisfaction factors, and hypothetical discrete choice experiment (DCE) scenarios.

The purpose of a DCE is to build hypothetical scenarios for survey respondents to choose their preferences toward locally grown tomato sources in randomly given scenarios in order to examine attributes that are valued by consumers when it comes to choosing locally grown food (Figure 1). For the DCE, an information set (Appendix A) was shown at the beginning of the survey to help

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Table 1. Example of choice experimental set presented to respondents
Scenario #1 out of 10
*The price you view for the CSA choice includes a prorated membership fee of $1.00/lb of tomatoes

Attributes	Option A	Option B	Option C
Sources	Local Supermarket	Farmers' Market	CSA
Price per Pound	$2.89/lb	$3.00/lb	$4.30/lb
Level of Freshness	Low Level Freshness	Moderate Freshness	High Freshness
Variety of Other Selections	Year-Round Selection	Seasonal Selection	Limited Selection
Risk Shifting from Producers	Uncertain Rate of Return	Guaranteed Rate of Return	Guaranteed Rate of Return
Physical Accessibility	High Accessibility	High Accessibility	Low Accessibility
Social Amenities	Basic Amenities	High Amenities	None

Q10-1. With the given scenario above, suppose you buy one pound of locally grown tomatoes, what would you choose?
○ Option A ○ Option B ○ Option C ○ None of them

participants better understand each source for the locally grown tomatoes. In the information set, we explained the definition of the three possible sources and also provided an explanation of determining factors with different levels. Based on previously published literature, we chose three locally grown food sources (local supermarket, farmers' market, and CSA) and six attributes with different levels, *Price per Pound* (three levels), *Level of Freshness* (three levels), *Variety of Other Selections* (three levels), *Risk Shifting from Producers* (two levels), *Physical Accessibility* (two levels), and *Social Amenities* (three levels), that consumers may consider when choosing where to purchase locally grown food.

Three different hypothetical locally grown Roma tomato prices, $1.89/lb, $3.00/lb, and $3.30/lb, were presented (Appendix A). Since tomatoes are agricultural produce, determining the price for each source is very onerous and can never perfectly reflect the real world because it can vary depending on the source, location, season, or length of contract in the case of CSAs. Therefore, we referred to existing sources' general prices for the three levels of reference prices. For the lowest and mid-range prices, we referenced *Walmart.com* in November 2021 and the general tomato price from the *Indiana Price Reports* (Torres Bravo, n.d.). Lastly, CSAs and farmers' markets have similar price ranges (UW-Madison Center for Integrated Agricultural Systems, 2001), and there is no strong evidence for the CSAs' general price of locally grown tomatoes per pound because they usually sell their produce bundled with other types of produce. Therefore, we added $0.30/lb onto the mid-range price as the hypothetical highest price in this scenario. In addition, we hypothesized a general form of CSA that supplies CSA boxes to its members with an up-front membership fee in this scenario. A CSA's up-front membership fee is around $400-–$700 per harvest season, depending on the location and length of contract (Roos, 2020). Thus, to capture consumers' utility loss from paying sizable up-front membership fees, we imposed a hypothetical CSA prorated membership fee onto the price represented by an additional $1.00/lb to approximate the net cost per pound including the fixed up-front cost. Therefore, the highest possible price option is $4.30/lb ($3.30 + $1 for membership fee), while the lowest price is $1.89/lb. Though there are a number of potential approaches to capture this fee, we chose this approach to avoid respondents having to calculate a net price for the package with their own subjective information about number of boxes, box contents, etc. However, this approach treats the CSA "box" as fixed otherwise and consumer utility may be impacted by the other produce in a box in the real world.

Lastly, Table 1 shows an example of a choice experimental question. We used a fractional factorial design for factor screening experiments, which is useful to identify the factors that have large effects when many factors are initially considered in the early stages of a project (Montgomery, 2017). Consequently, we created five experimental choice sets which included ten sets of randomly created scenarios from a total of 972 individual locally grown food source profiles

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from the possible combination of the number of levels for attributes ($3 \times 3 \times 3 \times 3 \times 2 \times 2 \times 3$) by using SAS 9.4. Because the level of *D*-efficiency is heavily affected by the number of attributes, levels, and alternatives (Vanniyasingam et al., 2016), we obtained a *D*-efficiency of 48.7236 as a result of the experimental design. The choice of 10 questions in a set seen by the respondent is arbitrary, but the aim was to limit respondent fatigue. Lastly, the mixed logit model in WTP space and a panel-data mixed logit choice model were estimated using STATA 17 based on the collected data.

Stated Preference Models

We use the mixed logit model as a discrete choice random utility model (RUM) (McFadden, 1974) to estimate customers' satisfaction determinants and WTP toward locally grown food suppliers' attributes. In order to build the customer's choice model, we impose three assumptions for the RUM (Pugačev, 1965). The first assumption is that customers have a monotonic utility function. Simply put, customer choice is an "all or nothing" discrete event among alternatives to maximize their utility. The second assumption is that an individual's attraction toward a brand or service is indiscernible; therefore, it is a random variable. Lastly, we assume that customers are economically rational, thus, they will choose the alternative with the highest utility.

In the random utility maximization framework, individual customers' *i*'s utility-maximizing behavior can be explained as follows: individual customers i ($i = 1, \ldots, \mathrm{I}$) acquire utility U_{ijt} from choosing alternative j ($j = 1, \ldots, \mathrm{J}$) in the choice set t and choose alternative k if and only if $U_{ikt} > U_{ijt}$ where $\forall j \neq k$. In this case, the representative utility function for customers can be written as $V_{ijt} = V(X_{ijt}, S_i) \forall j$ where X_{ijt} refers to the attributes of alternatives that individual i faces and S_i represents the attributes of individual i (Train, 2009). Because researchers cannot observe individual *i's* actual utility, representative utility (V_{ijt}) and actual utility (U_{ijt}) are unequal. Therefore, this difference derives utility function for research observers which can be shown as $U_{ijt} = V_{ijt} + \epsilon_{ijt}$ where ϵ_{ijt} refers to a random error term that explains unobservable attributes against the customer choice (Train, 2009). Accordingly, we can derive probability and cumulative probability functions that individual customers i choose alternative k in the choice set t, which is

$$\begin{aligned} Pr_{ikt} &= Pr\left(U_{ikt} > U_{ijt} \forall j \neq k\right) \\ &= Pr\left(V_{ikt} + \varepsilon_{ikt} > V_{ijt} + \varepsilon_{ijt} \forall j \neq k\right) \\ &= Pr\left(\varepsilon_{ijt} - \varepsilon_{ikt} < V_{ikt} - V_{ijt} \forall j \neq k\right) \\ &= \int I(\varepsilon_{ijt} - \varepsilon_{ikt} < V_{ikt} - V_{ijt} \forall j \neq k) f(\varepsilon_i) d\varepsilon_i \end{aligned} \tag{1}$$

where I refers to the indicator function that shows 1: true and 0: otherwise, and $f(\epsilon_i)$ represents the density of the unobserved part of individual i's utility (Train, 2009).

Similarly, we can also derive the mixed logit and its probability functions from the utility-maximizing behavior that we explained above. The customer's utility can be represented with a random coefficient model as below:

$$U_{ijt} = \beta_i' X_{ijt} + \varepsilon_{ijt} \tag{2}$$

where i refers to an individual ($i = 1, \ldots, \mathrm{I}$) and j refers to an alternative ($j = 1, \ldots, \mathrm{J}$) within the choice set t. U_{ijt} is a linear function of utility level that consists of observable and unobservable variables. X_{ijt} is an observable vector of explanatory variables that includes the attribute of alternatives and β_i is a stochastic unobservable coefficient to be estimated. ϵ_{ijt} refers to a random error term that explains unobservable attributes against the customer choice. ϵ_{ijt} is an independent and identically distributed (*i.i.d.*) extreme value (Type 1) (McFadden, 1974).

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However, when we impose that ϵ_{ijt} is an independent and identically distributed (*i.i.d.*) extreme value (Type 1), two limitations arise: (i) the *i.i.d.* restricts the possibility that unobserved information may induce correlation across the alternatives in each choice situation, and (ii) imposing the assumption of independently distributed errors across alternatives (the independence of irrelevant alternatives: IIA) (Weeks, 2003). To address the limitation of the choice model, we divide the error term into two uncorrelated parts: one is correlated over alternatives and heteroskedastic, and the other is *i.i.d.* over alternatives and individuals as below (Hensher and Greene, 2003):

$$U_{ijt} = \beta_i^{'} X_{ijt} + [\eta_{ijt} + \varepsilon_{ijt}] \tag{3}$$

The error term of the mixed logit model consists of η_{ijt}, a random term with zero mean (general distribution) and ϵ_{ijt}, *i.i.d.* distribution (McFadden and Train, 2000). This implies that η can take on a number of distribution forms based on the characteristics of variables. For example, if it is unknown if a certain variable would affect the customer positively or negatively, normal distribution can be used, but if a certain variable is assumed to affect customers in an assured way (e.g., price), taking a lognormal distribution can be considered instead (Weeks, 2003).

The conditional choice probability function, with mixed distributions along with a given value of η and *i.i.d.* extreme value, is below (Hensher and Greene, 2003):

$$L_i(\eta) = exp(\beta_i^{'} X_{ijt} + \eta_{ijt}) / \Sigma_{j=1}^{J} exp(\beta_i^{'} X_{ijt} + \eta_{ijt}) \tag{4}$$

However, since η is not a given value, unconditional choice probability would be a logit form of integrated overall values of η weighted by the density of η below:

$$Pr_i = \int L_i(\eta) f(\eta|\Omega) d\eta \tag{5}$$

where $f(\eta|\Omega)$ refers to the density of η with the fixed parameters Ω of the distribution. Accordingly, since the choice probability $L_i(\eta)$ is a mixture of logit with mixed distribution, we call this form a mixed logit model (Hensher and Greene, 2003).

In terms of WTP in discrete choice models, Train and Weeks (2005) introduced that utility parameters in the logit model can be presented as an individual's WTP. They described the model that uses normal and lognormal distributions for individual attributes utility parameters as "models in preference space," whereas the model that uses distributions for WTP was called "models in WTP space." In addition, they pointed out that the models in the WTP space are more suitable than the models in the preference space in terms of calculating WTP along with relaxing the first RUM assumption that individuals have a monotonic utility function (Chavez et al., 2020). Train and Weeks (2005) showed that we can simply manipulate the utility function to transform into the WTP space by dividing the attributes by the individual *i*'s scale parameter (k_i). Firstly, we divide the attribute variables into price and non-price variables as below:

$$U_{ijt} = -\alpha_i P_{ijt} + \beta_i^{'} X_{ijt} + \varepsilon_{ijt} \tag{6}$$

where *i* refers to an individual ($i = 1, \ldots, I$) and *j* refers to an alternative ($j = 1, \ldots, J$) within the choice set *t*. α_i and $\beta_i^{'}$ are individual specific coefficients for price (P_{ijt}) and other non-monetary attributes (X_{ijt}), respectively. ϵ_{ijt} is the *i.i.d.* extreme value distributed with $Var(\epsilon_{ijt}) = k_i^2(\pi^2/6)$. Next, we divide the attributes variable by k_i:

$$U_{ijt} = -\gamma_i P_{ijt} + \lambda_i^{'} X_{ijt} + \varepsilon_{ijt} \tag{7}$$

where $\gamma_i = (\alpha_i/k_i)$ and $\lambda_i = (\beta_i/k_i)$. This can be re-written as WTP space form:

$$U_{ijt} = -\gamma[P_{ijt} + \delta' X_{ijt}] + \varepsilon_{ijt} = -\gamma[P_{ijt} + WTP_i^{'} X_{ijt}] + \varepsilon_{ijt} \tag{8}$$

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where $\delta = (\lambda_i/\gamma_i)$. In this case, the choice probability function with individual i choosing the utility-maximizing alternative j at time t can be written as below:

$$Pr_{ijt} = exp(-\gamma[\mathrm{P}_{ijt} + \mathrm{WTP}_i' X_{ijt}])/\Sigma_{j=1}^{\mathrm{J}} exp(-\gamma[\mathrm{P}_{ijt} + \mathrm{WTP}_i' X_{ijt}]) \quad (9)$$

Lastly, our panel-data mixed logit model consists of four components:

$$U_{ijt} = \alpha_{ijt} W + \beta_{ijt} X_i + \delta_{ijt} Z_i + \varepsilon_{ijt} \quad (10)$$

where i refers to an individual ($i = 1, \ldots, \mathrm{I}$) and j refers to an alternative ($j = 1, \ldots, \mathrm{J}$) within the choice set t. U_{ijt} refers to the individual i's utility from choosing j among the choice set t. α_i are fixed coefficients on W, a vector of alternative specific variables. β_{ijt} are random coefficients on a vector of alternative specific variables X_i. δ_{ijt} are fixed alternative specific coefficients on a vector of case-specific variable Z_i. Lastly, ϵ_{ijt} is an error term that has a Type 1 extreme value distribution. Accordingly, the choice probability function of random parameter X_i with individual i choosing alternative j at time t can be written as below:

$$Pr_{ijt}(X) = \exp(\alpha_{ijt} W + \beta_{ijt} X_i + \delta_{ijt} Z_i)/\Sigma_{j=1}^{J} exp(\alpha_{ijt} W + \beta_{ijt} X_i + \delta_{ijt} Z_i) \quad (11)$$

Unconditional choice probability Pr_{ijt} is obtained by integrating over the mixing distribution of $f(X)$:

$$Pr_{ijt} = \int Pr_{ijt}(X) f(X) d(X) \quad (12)$$

We can estimate the integral of dimension d by simulation (Drukker & Gates 2006; McFadden & Train, 2000). The simulated-likelihood (L_i) for the individual i is

$$\mathrm{L}_i = \prod_{t=1}^{T} \sum_{j=1}^{J} d_{ijt} \widehat{Pr}_{ijt} \quad (13)$$

where d_{ijt} shows the chosen alternative at t with the value of 1 or 0 otherwise, and $\hat{\mathrm{P}}_{ijt}$ refers to the simulated probabilities, which are

$$\widehat{Pr}_{ijt} = \frac{1}{N} \sum_{n=1}^{\mathrm{N}} Pr_{ijt} X^n \quad (14)$$

where X^n refers to the random parameters drawn from $f(X)$ with the number of random draws n ($n = 1, \ldots, \mathrm{N}$).

Results

Basic Demographic Information of Respondents

Figure 2 shows a map of survey respondents based on the location from where they completed their survey; it shows that the survey respondents were widely dispersed across the United States. Moreover, Table 2 depicts the basic demographic information of survey respondents with data from the US Census. As mentioned before, there was an even predesignated distribution by region and respondents of the population by gender, age (over 18 years), and income for respondents to minimize collecting biased data. On average, the respondents were around 46 years old, employed full-time, Caucasian, completed more than a high school education, and had three or less children. Women made up 53.23% of the total respondents. While most of the respondents were employed, nearly 20% of respondents were retired. The income of respondents was widely distributed from $15,000 to $149,999.

Personal Behaviors of the Survey Respondents by Region

Table 3 shows the result of cross-tabulation analysis between regions (North-East, Mid-West, South, and West) and respondents' personal shopping behaviors. According to the results, there were no

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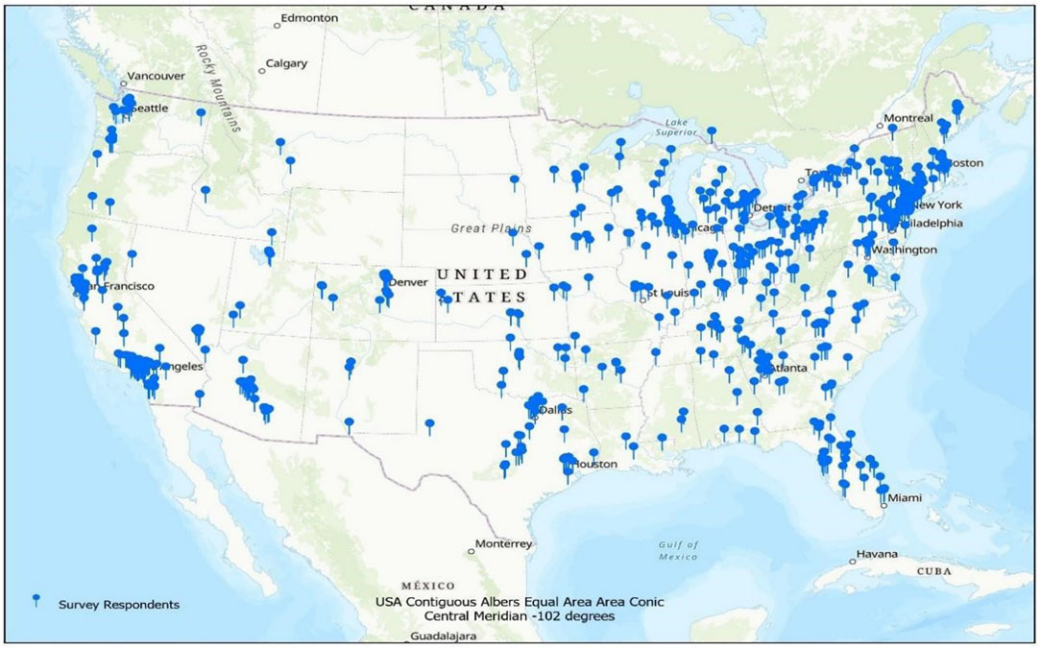

Figure 2. Geographic distribution of survey respondents (n = 804).

statistical relationships between regions and personal shopping behaviors. The respondents answered that they go grocery shopping once a week or once every few weeks. In addition, local supermarkets were the most popular source for typical groceries, whereas local supermarkets and farmers' markets were similarly popular for locally grown food sources. Around 70% of total respondents answered that they have different preferred sources for purchasing locally grown food from their typical grocery source; most of them stated that their most frequent source for locally grown food was farmers' markets. The frequency of choice for CSAs, by contrast, is the least frequently reported source for the locally grown food market, which confirms that the popularity of CSAs is lagging behind other sources (USDA NASS, 2014, 2016, 2022). Overall, while there were no regional characteristics in terms of shopping behaviors, the survey results showed that local supermarkets were the most preferred sources for both typical groceries and locally grown food, but farmers' markets were the most popular alternative source for locally grown food.

Table 4 shows cross-tabulation analysis between regions (North-East, Mid-West, South, and West) and respondents' personal behaviors related to the pandemic. The results show that financial impact and food shortages from the pandemic were statistically related to regions. More than 36% of Western respondents answered that they "Definitely" experienced monetary problems from the pandemic, while less than 20% of those in other regions answered the same. Similarly, even though the majority of total respondents answered that they did not experience food shortages from the pandemic, more than 30% of total Western respondents answered they "Definitely" (11.22%) or "Possibly" (20.19%) experienced food shortages. Notable food shortage problems in the Western region possibly explain why the popularity of CSAs increased in California (DeCeault, 2020; Westervelt, 2020a, 2020b). Lastly, the average frequency of food consumption at home across the United States increased from 71.89% to 78.76% since the pandemic started (Table 4). However, most respondents answered that their changed frequency of at-home food consumption would not continue into the future. This result suggests that both at-home food consumption and the increasing popularity of CSAs may not persist after the pandemic is over.

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Table 2. Basic demographic information of survey respondents

		Respondents	United States*
Categories (n = 804)		Percentage (number of obs.)	
Age (Mean (Standard Dev.))		45.79 (16.58)	38.8**
Gender	Male	46.77 (376)	49.5
	Female	**53.23 (428)**	50.47
Race	African-American	13.93 (112)	13.6
	Asian	5.97 (48)	6.1
	Caucasian	**70.40 (566)**	75.8
	Latino or Hispanic	6.22 (50)	18.9
	Native American	1.00 (8)	1.3
	Native Hawaiian or Pacific Islander	0.62 (5)	0.3
	Two or More	1.00 (8)	2.9
	Other/Unknown	0.87 (7)	–
Regions	North-East	25.62 (206)	17.2
	Mid-West	23.00 (185)	20.7
	West	25.62 (206)	23.7
	South	**25.75 (207)**	38.4
Education	Less than a high school diploma	2.36 (19)	8.9
	High school diploma or equivalent	**46.89 (377)**	27.9
	Bachelor's degree (e.g., BA, BS)	33.71 (271)	23.5
	Master's degree (e.g., MA, MS, MEd)	12.44 (100)	14.4
	Doctorate (e.g., PhD, EdD)	3.90 (31)	
	Prefer not to answer	0.75 (6)	Others***: 25.4

(*Continued*)

Table 2. (*Continued*)

Categories (n = 804)		Respondents	United States*
		Percentage (number of obs.)	
Children	None	**39.05 (314)**	an average of 1.94 children under 18 per family
	One	20.90 (168)	
	Two	22.51 (181)	
	Three	12.69 (102)	
	Four or more	4.60 (37)	
	Prefer not to answer	0.25 (2)	
Employment	Employed full-time (40+ hours a week)	**43.41 (349)**	Total 63.3% of population is employed (81.8% of full time and 18.2% of part-time)
	Employed part-time (less than 40 hours a week)	11.19 (90)	
	Unemployed (currently looking for work)	7.34 (59)	
	Unemployed (not currently looking for work)	9.08 (73)	
	Student	2.11 (17)	
	Retired	19.65 (158)	
	Self-employed	6.72 (54)	
	Prefer not to answer	0.50 (4)	
Income	Under $15,000	8.71 (70)	Median household income: $69,021
	$15,000 to $24,999	11.32 (91)	
	$25,000 to $34,999	14.80 (119)	
	$35,000 to $49,999	10.32 (83)	
	$50,000 to $74,999	16.04 (129)	
	$75,000 to $99,999	7.59 (61)	
	$100,000 to $149,999	**20.27 (163)**	
	$150,000 to 199,999	5.72 (46)	
	More than $200,000	5.22 (42)	

*US Census (2021). ** Median value. *** 10.5% of associate degree and 14.9% of completed some college but not a degree.

Table 3. Survey respondents' shopping behaviors by region

Categories (n = 804)		Mid-West	North-East	South	West	Total
How often do you go grocery shopping?	Everyday	5	7	7	1	20
		25.00	35.00	35.00	5.00	100.00
	Multiple times a week	21	25	16	22	84
		25.00	29.76	19.05	26.19	100.00
	Once a week	85	86	75	91	337
		25.22	25.52	22.26	27.00	100.00
	Once every few weeks	57	67	84	76	284
		20.07	23.59	29.58	26.76	100.00
	Once a month	16	21	24	16	77
		20.78	27.27	31.17	20.78	100.00
Total Pearson Chi^2 = 14.57 Prob = 0.2658		185	206	207	205	803
		100.00	100.00	100.00	100.00	100.00
Where do you typically buy your groceries?	Local supermarket	143	161	153	159	616
		23.21	26.14	24.84	25.81	100.00
	Club store (ex. Costco or Sam's Club)	18	21	25	28	92
		19.57	22.83	27.17	30.43	100.00
	Farmers' market	15	13	15	7	50
		30.00	26.00	30.00	14.00	100.00
	CSA	1	3	3	1	8
		12.50	37.50	37.50	12.50	100.00
	Individual online sellers	5	3	4	4	16
		31.25	18.75	25.00	25.00	100.00
	Other	3	5	5	7	20
		15.00	25.00	25.00	35.00	100.00
Total Pearson Chi^2 = 9.78 Prob = 0.8334		185	204	206	205	800
		100.00	100.00	100.00	100.00	100.00

Categories (n = 804)		Mid-West	North-East	South	West	Total
Is your preferred grocery source different when you choose to purchase locally grown food?	Yes	127	139	156	134	556
		22.84	25.00	28.06	24.10	100.00
	No	58	64	49	70	241
		24.07	26.56	20.33	29.05	100.00
Total Pearson Chi^2 = 5.78 Prob = 0.1230		223	394	176	4	797
		27.98	49.44	22.08	0.50	100.00

(*Continued*)

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Table 3. (*Continued*)

Categories (n = 804)		Mid-West	North-East	South	West	Total
Alternative locally grown food sources from usual grocery sources	Local supermarket	45	44	46	35	170
		26.47	25.88	27.06	20.59	100.00
	Club store (ex. Costco or Sam's Club)	6	4	12	5	27
		22.22	14.81	44.44	18.52	100.00
	Farmers' market	73	84	87	85	329
		22.19	25.53	26.44	25.84	100.00
	CSA	2	1	4	1	8
		25.00	12.50	50.00	12.50	100.00
	Individual online sellers	0	0	3	3	6
		0.00	0.00	50.00	50.00	100.00
	Other	1	6	3	4	14
		7.14	42.86	21.43	28.57	100.00
Total Pearson $Chi^2 = 18.37$ Prob = 0.2439		185	206	206	205	802
		100.00	100.00	100.00	100.00	100.00
Overall preferred locally grown food sources for the respondents	Local supermarket	90	96	84	99	369
		24.39	26.02	22.76	26.83	100.00
	Club store (ex. Costco or Sam's Club)	10	12	17	10	49
		20.41	24.49	34.69	20.41	100.00
	Farmers' market	78	87	91	85	341
		22.87	25.51	26.69	24.93	100.00
	CSA	2	3	5	2	12
		16.67	25.00	41.67	16.67	100.00
	Individual online sellers	2	1	3	4	10
		20.00	10.00	30.00	40.00	100.00
	Other	3	7	6	6	22
		13.64	31.82	27.27	27.27	100.00
Total Pearson $Chi^2 = 11.94$ Prob = 0.8501		185	204	206	205	800
		100.00	100.00	100.00	100.00	100.00

Note 1: First row has the number of observations and the second row has percentages.
Note 2: "Prefer not to answer" was exempted for this table.

Customers' Satisfaction Factors that Affect Choosing Locally Grown Food Sources

We categorized customers' satisfaction factors when choosing locally grown food sources into four groups: *Accessibility*, *Product*, *Service*, and *Intangible Values* (Table 5). Each category had three to four factors that survey respondents rated with a five-point Likert scale. From the survey results, the respondents most highly valued the factors in the "Product" category, which included *Price* (3.87), *Items in Stock* (4.09), *Quality (Freshness)* (4.35), and *Variety* (4.05). *Quality (Freshness)* was

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Table 4. Survey respondents' personal behaviors related to COVID-19 by region

Food consumption frequencies at home*	Mean	Standard dev.
Before the COVID-19 pandemic started, what percentage of your food consumption was prepared at your home? (0%: Never ate food prepared at my home 100%: Always ate food prepared at my home)	71.886	20.422
Since the COVID-19 pandemic started, what percentage of your food consumption is now prepared at home? (0%: Never eat food prepared at my home 100%: always eat food prepared at my home)	78.764	20.033

Categories (n = 804)		Mid-West	North-East	South	West	Total
Have you or your family been directly financially impacted by the COVID-19? (for example, unemployment or monetary loss from reduced working hours)	Definitely	34	40	27	74	175
		18.38	19.61	13.11	36.10	21.88
	Possibly	29	18	18	37	102
		15.68	8.82	8.74	18.05	12.75
	Unsure	9	22	24	8	63
		4.86	10.78	11.65	3.90	7.88
	Probably Not	49	45	47	30	171
		26.49	22.06	22.82	14.63	21.38
	Definitely Not	64	79	90	56	**289**
		34.59	38.73	43.69	27.32	**36.13**
Total Pearson Chi^2 = 65.72 Prob = 0.0000		185	204	206	205	800
		100.00	100.00	100.00	100.00	100.00
Since the COVID-19 pandemic started, have you experienced a shortage of any of your preferred produce at your typical grocery purchasing location?	Definitely	21	20	17	23	81
		11.35	9.71	8.21	11.22	10.09
	Possibly	25	20	21	42	108
		13.51	9.71	10.14	20.49	13.45
	Unsure	14	13	28	27	82
		7.57	6.31	13.53	13.17	10.21
	Probably Not	50	73	55	66	244
		27.03	35.44	26.57	32.20	30.39
	Definitely Not	75	80	86	47	**288**
		40.54	38.83	41.55	22.93	**35.87**
Total Pearson Chi^2 = 37.70 Prob = 0.0002		185	206	207	205	803
		100.00	100.00	100.00	100.00	100.00

(*Continued*)

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Table 4. (*Continued*)

Categories (n = 804)		Mid-West	North-East	South	West	Total
If your frequency of food preparation at home has changed since the COVID-19 pandemic started, do you expect your new habits to continue into the future?	Definitely	7	12	6	4	29
		3.78	5.83	2.91	1.95	3.62
	Possibly	10	11	12	20	53
		5.41	5.34	5.83	9.76	6.61
	Unsure	31	38	36	37	142
		16.76	18.45	17.48	18.05	17.71
	Probably Not	74	84	88	86	**332**
		40.00	40.78	42.72	41.95	**41.40**
	Definitely Not	63	61	64	58	246
		34.05	29.61	31.07	28.29	30.67
Total Pearson Chi^2 = 10.36 Prob = 0.5844		185	206	206	205	802
		100.00	100.00	100.00	100.00	100.00

Note: First row has the number of observations and the second row has percentages and "Prefer not to answer" was exempted.
*Paired t-test result is p = 0.000 for the null hypothesis "mean difference of these pairs equals zero."

Table 5. Customers' satisfaction factors related to choosing locally grown food sources

Categories	Factors	Mean (n = 804)	Standard dev.
Accessibility (average 3.46 out of 5)	Distance	3.476	1.114
	Hours of operation	**3.504**	1.103
	No exclusive membership	3.400	1.324
Product (average 4.09 out of 5)	Price	3.871	1.047
	Items in stock	4.088	0.918
	Quality (freshness)	**4.353**	0.939
	Variety	4.052	0.898
Service (average 2.93 out of 5)	Reliable refund policy	3.214	1.257
	Sale events/coupons	**3.282**	1.208
	Delivery service	2.765	1.371
	Social entertainment events	2.458	1.372
Intangible values (average 3.15 out of 5)	Food-related activities (cooking or sharing food with others)	2.650	1.323
	Community outreach	2.922	1.308
	Eco-friendly consumption	3.287	1.241
	Trusting relationship with local farmers	**3.760**	1.067

Note: 1: Not important, 2: Less important, 3: Somewhat important, 4: Important, and 5: Very important.

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chosen as the most valuable factor among all other satisfaction factors in this survey. In addition, the respondents valued *Accessibility* second, *Intangible Values* third, and *Service* fourth, all determined by their average Likert scores. *Hours of Operation* was chosen as the most valuable factor in *Accessibility*. Moreover, *Trusting Relationship with Local Farmers* (3.76) and *Sale Events/ Coupons* (3.28) were the most valuable factors in the *Intangible Values* and *Service* categories, respectively.

The results suggest some reasons for the trend of the decreasing number of CSAs. Some factors in the *Product* category, which contain the most important values for choosing locally grown food sources, are generally known as weaknesses of CSAs. For example, local supermarkets are generally superior to CSAs in terms of *Items in Stock*, *Variety,* and even *Price* factors. Meanwhile, the least preferred factors, *Community Outreach* (2.92), *Delivery Service* (2.76), *Food-related Activities* (2.65), and *Social Entertainment Events* (2.46), are considered traditional strengths of CSAs. These results show that customers appear to value the weak aspects of CSAs, whereas they do not value the strong aspects of CSAs when considering where to purchase locally grown food.

Mixed Logit Estimation in WTP Space

Table 6 shows the results of the mixed logit model estimation in WTP space for purchasing locally grown tomatoes. Each attribute consists of two or three levels, such as *Sources* (local supermarkets, farmers' markets, and CSAs), *Freshness* (low, moderate, and high), *Variety* (limited, seasonal, and year-round selection), *Risk Shifting* (uncertain rate of return and guaranteed rate of return), *Physical Accessibility* (low and high), and *Social Amenities* (none, basic, and high). To identify a detailed WTP for each attributes' ascending level, we set *CSA*, *Freshness_Low*, *Variety_Limited*, *Risk Shift_Uncertain Rate of Return*, *Accessibility_Low*, and *Amenities_None* as a baseline for each attribute. The price variable was assumed to be log-normally distributed, whereas other variables, *Freshness_Mid*, *Freshness_High, Variety_Mid*, *Variety_High, Risk Shift_High*, *Accessibility_High*, *Amenities_Mid,* and *Amenities_High,* were specified covariates that had random coefficients. Lastly, to obtain optimized results, 1,000 Halton Sequences were used for the simulation.

Results show that the WTP for the CSA was the lowest among the locally grown food sources, while other local sources showed a statistically higher WTP than the base choice of CSAs. To be more specific, the WTP for locally grown tomatoes from supermarkets is \$0.814/lb higher than for CSAs, while the WTP of farmers' markets is \$1.308/lb higher than CSAs. Moreover, the WTP for *Freshness* is the highest among other attributes, which aligns with the results from the previous section that *Quality* (*Freshness*) is the most valuable factor when choosing locally grown food sources. Respondents are willing to pay \$0.728/lb and \$1.330/lb more for the "'Moderate" and "High" levels of freshness than the "Low" freshness level. The second highest WTP attribute is *Accessibility*, in which respondents are willing to pay \$0.092/lb more for "High" accessibility. The third highest WTP attribute is *Variety*. The WTP for the "Seasonal Selection" is \$0.143/lb less than the "Limited Selection," but the WTP for "Year-Round Selection" is \$0.083/lb higher than the "Seasonal Selection" ($p = 0.065$). This result suggests consumers only have preference for "year-round" selection and do not differentiate between seasonal and limited selection. In either case, the WTP differentials are small compared to the other attributes. The fourth highest WTP attribute is *Risk Shift*, which shows that respondents are willing to pay \$0.066/lb more for the "Guaranteed Rate of Return" than "Uncertain Rate of Return" ($p = 0.067$). Lastly, the WTP space estimation results show that the *Social Amenities* are not statistically significant when considering their effects on respondents' locally grown food source choices.

Based on consumer WTP for attributes, CSAs appear to be in a relatively weak position in terms of consumer preferences (Table 6). The results suggest that the additional \$1.00/lb for CSAs as a prorated up-front membership fee was not the preferred price for the respondents when choosing where to buy locally grown tomatoes. In other words, the exclusive membership policy of CSAs could be a constraint factor for people when purchasing locally grown food. Since the

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Table 6. Estimation results of mixed logit with WTP space

	Coef.	Std. err.	*z*	*P* > z	[95% conf.	Interval]
Mean						
ASC	−11.223***	0.882	−12.730	0.000	−12.951	−9.495
Supermarket	0.814***	0.089	9.160	0.000	0.640	0.988
Farmers' Market	1.308***	0.106	12.290	0.000	1.099	1.516
Freshness_Mid	0.728***	0.054	13.530	0.000	0.623	0.834
Freshness_High	1.330***	0.075	17.740	0.000	1.183	1.477
Variety_Mid	−0.143**	0.046	−3.110	0.002	−0.233	−0.053
Variety_High	0.083	0.045	1.850	0.065	−0.005	0.171
Risk Shift_High	0.066	0.036	1.830	0.067	−0.005	0.137
Accessibility_High	0.092**	0.038	2.420	0.015	0.018	0.166
Amenities_Mid	−0.063	0.044	−1.420	0.155	−0.150	0.024
Amenities_High	−0.018	0.047	−0.390	0.697	−0.109	0.073
Price	0.093	0.060	1.540	0.123	−0.025	0.211
SD						
ASC	−5.263	0.458	-− 11.490	0.000	−6.161	−4.366
Supermarket	1.615	0.101	15.940	0.000	1.416	1.813
Farmers' Market	1.116	0.071	15.730	0.000	0.977	1.256
Freshness_Mid	−0.560	0.070	− 8.030	0.000	−0.696	−0.423
Freshness_High	1.280	0.068	18.770	0.000	1.146	1.413
Variety_Mid	−0.065	0.085	−0.760	0.445	−0.231	0.101
Variety_High	−0.398	0.080	−4.950	0.000	−0.555	−0.240
Risk Shift_High	−0.027	0.077	0.360	0.723	−0.177	0.123
Accessibility_High	−0.092	0.146	−0.630	0.529	−0.377	0.194
Amenities_Mid	−0.010	0.059	−0.180	0.861	−0.125	0.105
Amenities_High	0.150	0.073	2.070	0.039	0.008	0.293
Price	0.992	0.062	16.070	0.000	0.871	1.113
Log-likelihood = −7631.4929						
Prob. > chi^2 = 0.0000						

*** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$.
Note: ASC refers to a dummy variable identifying the alternative specific constant of the "none of them" option.

majority of CSAs require members to pay a sizable up-front fee, this result sheds some light on why the number of CSAs is diminishing. In addition, the WTP space results suggest that consumers do not value the strengths of CSAs, while the relative weaknesses of CSAs, compared to other sources, seem to be preferable. For example, *Risk Shift* is a predominant strength of CSAs compared to other sources, but it has the lowest WTP among other statistically meaningful attributes. Meanwhile, other attributes that are relatively weak in CSAs, such as *Variety* and *Accessibility,* have high WTP values. Therefore, the WTP space results suggest that different business strategies are required if CSAs are to maintain their business in the long run.

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Expected Choice Probabilities for Choosing CSAs

To find potential strengths of CSAs, we estimated a panel-data mixed logit model with the choice experiment variables and customers' satisfaction factors (from Table 5) to capture the marginal probabilities of choosing CSAs, relative to other sources, based on attribute characteristics. For the panel-data mixed logit model, we assumed that all individuals had the same preferences with respect to the *Price* variable, but the other preferences with respect to other determinant factors were heterogeneous; thus, we modeled the *Price* variable as a fixed coefficient and other heterogeneous preferences with a random coefficient. Moreover, we specified customers' satisfaction variables (1 = Not Important to 5 = Very Important) as constant case-specific variables to examine which ones were statistically significant influences for determining where to purchase locally grown tomatoes. Lastly, we set the CSA choice as a base outcome to compare against other sources, such as supermarkets or farmers' markets. Subsequently, we found what satisfaction variables made survey respondents more likely to choose CSAs.

The paneldata mixed logit model results (Appendix B) show that the *Price*, *Freshness*, and *Variety* variables were statistically significant when choosing the source for locally grown tomatoes; thus, lower prices, higher freshness, and a wider range of options affected their choice for where to purchase locally grown tomatoes. When comparing supermarkets and CSAs, three satisfaction variables, *Quality*, *Food Activities*, and *Community Outreach*, were statistically significant. Respondents who rated *Quality* and *Food Activities* as important are more likely to choose supermarkets over CSAs, whereas people who highly value *Community Outreach* are more likely to choose CSAs over supermarkets, holding others constant. The significance of *Food Activities* provides a different perspective from an existing study (Hunt, Gieger-Oneto, and Varca, 2012) that stated CSA members have behavioral involvement in food-related activities, which is correlated with product satisfaction. This result suggests that food activities may not be the strongest enticement factor for potential CSAs members anymore. In addition, when comparing farmers' markets and CSAs, the *Food Activities* and *Community Outreach* variables were also statistically significant. This result suggests that people who think of *Food Activities* as important are more likely to choose farmers' markets over CSAs, whereas people who think *Community Outreach* is important are more likely to choose CSAs over farmers' markets, holding others constant.

Accordingly, we estimated the marginal probabilities of choosing CSAs based on the level of *Community Outreach*, which was a statistically significant variable across the alternative choices in the panel-data mixed ogit model (Table 7). The expected choice probabilities for specified *Community Outreach* levels show that increasing preference for *Community Outreach* decreased the probability of choosing supermarkets and farmers' markets, whereas it increased the probability of choosing CSAs. To be more specific, for individuals who had the lowest concern (Not Important) for *Community Outreach*, only around 7% would choose a CSA; however, the possibility of choosing CSAs increases to 11% when people state their opinion as being "Very Important." In addition, having a lower concern for *Community Outreach* had a higher impact on farmers' market customers than supermarket customers. While the probability of choosing supermarkets varied around 40% depending on the level of *Community Outreach*, the probability of choosing a farmers' market varied from 45 to 51% based on the level of *Community Outreach* concern. This result suggests that the customers who choose local supermarkets may have relatively consistent reasons to visit local supermarkets over other sources, whereas the choice probabilities for farmers' markets have higher elasticity with respect to the level of concern for *Community Outreach*. This implies that customers may consider farmers' markets as a more direct substitute for CSAs than local supermarkets.

Discussion

Figure 3 shows the summary of this study's key findings. We investigated customers' shopping behaviors since the pandemic started and asked which factors they value when choosing locally

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Table 7. Expected choice probabilities for specified community outreach levels

	Margin.	Delta method std. err.	*z*	*P* > *z*	[95% Conf.	Interval]
CSA						
Not important	0.067	0.006	10.90	0.000	0.055	0.079
Less important	0.077	0.004	18.84	0.000	0.069	0.084
Somewhat important	0.087	0.003	28.45	0.000	0.081	0.093
Important	0.097	0.006	17.58	0.000	0.087	0.108
Very important	0.109	0.010	10.89	0.000	0.089	0.128
Supermarket						
Not important	0.414	0.013	31.11	0.000	0.388	0.440
Less important	0.411	0.008	51.86	0.000	0.395	0.426
Somewhat important	0.406	0.005	75.6	0.000	0.396	0.417
Important	0.400	0.009	46.02	0.000	0.383	0.417
Very important	0.392	0.014	27.29	0.000	0.364	0.420
Farmers' market						
Not important	0.506	0.014	37.38	0.000	0.480	0.532
Less important	0.493	0.008	61.55	0.000	0.478	0.509
Somewhat important	0.480	0.005	88.85	0.000	0.469	0.490
Important	0.464	0.009	52.27	0.000	0.446	0.481
Very important	0.445	0.015	30.11	0.000	0.416	0.474
None of them						
Not important	0.013	0.003	4.95	0.000	0.008	0.018
Less important	0.019	0.002	8.49	0.000	0.015	0.024
Somewhat important	0.028	0.003	10.29	0.000	0.022	0.033
Important	0.039	0.006	6.51	0.000	0.027	0.051
Very important	0.054	0.012	4.40	0.000	0.030	0.078

grown food sources. Accordingly, we conducted a nationwide online survey of 804 randomly chosen locally grown food customers to implement DCEs for the WTP to find consumers' preferences toward locally grown food sources since the pandemic began. In addition, expected choice probabilities for choosing CSAs were estimated based on the result of the panel-data mixed logit choice model to scrutinize the relationship between consumers' satisfaction factors and their locally grown food source choice.

As a result, we found that farmers' markets have the highest WTP among other locally grown food sources, such as local supermarkets and CSAs. Specifically, we found that the overall WTP toward CSAs, which had an additional $1.00/lb as a prorated membership fee in the choice experiments, was the lowest among other locally grown food sources, suggesting that the exclusive up-front fee was not preferable for the respondents. Furthermore, the results from the estimated panel-data mixed logit choice model suggest that the variables that were generally considered advantages of CSAs over other sources (Hunt et al., 2012; Sharp, Imerman, and Peters, 2002) were no longer exclusive to CSAs. For example, the customers who valued *Quality* and *Food Activities*

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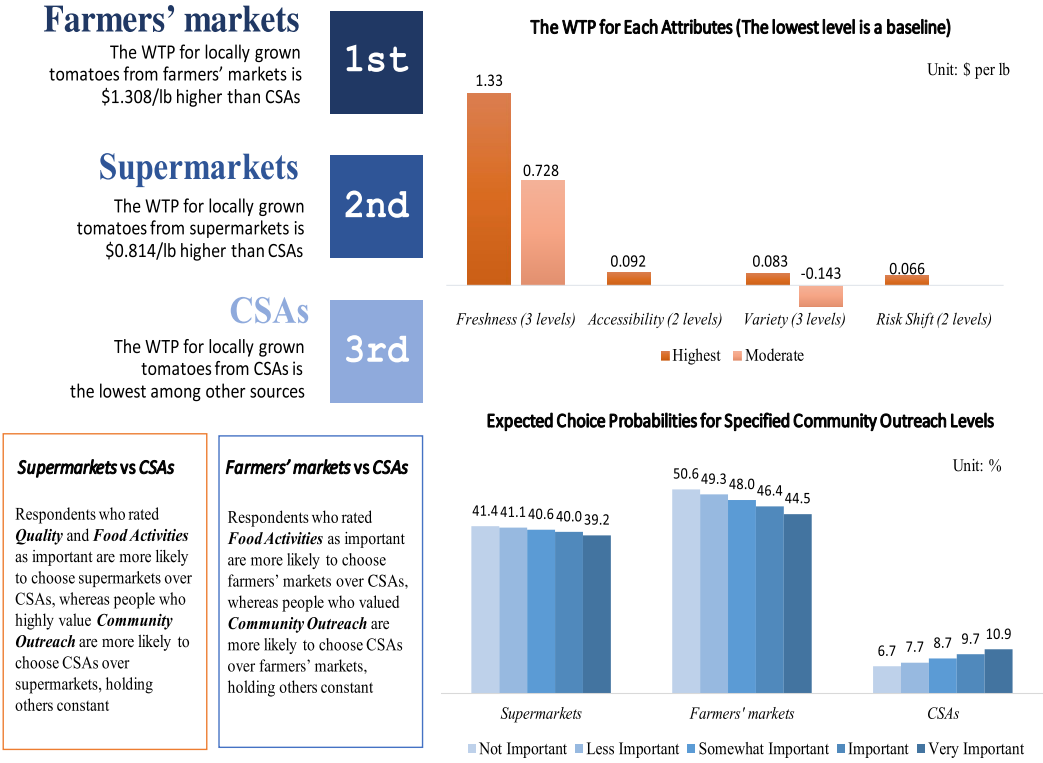

Figure 3. Summary of key findings.

were more likely to choose local supermarkets over CSAs, and those who valued *Food Activities* were more likely to choose farmers' markets over CSAs.

The result findings suggest that the unexpected interest in CSAs during the pandemic will be temporary, and they will likely continue diminishing; therefore, they should implement different marketing strategies in order to survive in the locally grown food market. CSAs' unique strengths in the past, such as offering fresh locally grown food based on short food miles, providing utilities related to community support, and building trusting relationships with farmers to its customers, have become diluted by many other alternatives that now offer similar services. Now, customers can easily purchase locally grown food at local supermarkets with plenty of other selections without the costly up-front membership fee. Similarly, farmers' markets emulate CSAs' once unique characteristics of directly supporting communities and building in-person relationships with farmers. Thus, both local supermarkets and farmers' markets have competitive advantages (i.e., economies of scale and network of local externalities) over CSAs on top of offering similar provisions as CSAs do for locally grown food customers.

One possible explanation for these results is that CSAs have not yet changed their original business model from 1986 to keep pace with customers' ever-changing needs; they have simply continued to provide predesignated raw ingredients to their members. Even though the average frequency of at-home food consumption has increased since the pandemic started, most of the respondents answered they will not continue their new food consumption habits in the future. Because the overall frequency of at-home cooking is decreasing (Ferdman, 2015; Saksena et al., 2018), it is understandable that the demand for raw ingredients from CSAs is diminishing. However, our research findings show that people who like food activities, such as cooking and sharing food with family or friends, prefer to choose local supermarkets or farmers' markets over CSAs, which generally have a larger variety of options, accessibility, or social amenities than CSAs. This result indicates that even though CSA

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members are known for having behavioral involvement in food-related activities, such as preparation, learning how to cook, and sharing food with others (Hunt et al., 2012), CSAs are not the preferred option for those who are dedicated to at-home cooking. Therefore, at this point in time, we do not see any strong competitive advantages of CSAs over other alternatives.

One encouraging discovery for CSAs is that they still have the advantage of community involvement. Increasing the level of *Community Outreach* positively affected the probability of choosing CSAs over supermarkets or farmers' markets, respectively, though the frequency of choice remained lower than those alternatives. Thus, these results suggest that CSAs should focus on promoting the worth of community outreach or develop their business in areas that value supporting the local communities by offering distinctive utilities to potential locally grown food customers.

Nevertheless, this study has possible limitations to generalize the findings. Firstly, the WTP results could differ depending on chosen hypothetical attributes and their levels. For example, the value of an additional $1.00/lb for CSAs as a prorated up-front membership fee might be too big or small for respondents depending on their level of WTP for supporting local farmers. Similarly, the concept of imposing an extra cost on CSAs to reflect a prorated up-front membership fee might negatively affect their actual WTP. Because CSA members usually acquire tomatoes through CSA boxes that also include other produce, customers might feel differently about their WTP for tomatoes per pound with an additional cost than simply paying a large one-time fee for regularly delivered CSA boxes that include tomatoes. We observed a very limited number of current CSA members, but this is likely a reflection of the membership in the population. The research findings could possibly change if we had limited the respondents to only current CSA members or included a set amount of current CSA members.

Data availability statement. The survey of this paper has been reviewed and approved by the Texas Tech University Institutional Review Board for the Protection of Human Subjects (IRB2021-796). The data used in this paper was gathered through *Qualtrics*.

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(*Continued*)

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Competing interests. Author Frank Seo and Author Darren Hudson declare none.

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Appendix A

In the following choice set, you will be asked about purchasing locally grown Roma tomatoes (grown within your state or less than 150 miles from the seller) to examine your precise preferences.

In this scenario, there are three locally grown food sources: local supermarket, farmers' market, and CSA (community-supported agriculture).

- *Local supermarket*: This refers to retail chain supermarkets, such as Walmart, Kroger, and Albertsons.
- *Farmers' market*: By the USDA's definition, "a farmers' market is a common area where several farmers gather on a recurring basis to sell a variety of fresh fruits, vegetables, and other farm products directly to consumers."
- *CSA*: By the USDA's definition, "Community Supported Agriculture consists of a community of individuals who pledge support to a farm operation so that the farmland becomes, either legally or spiritually, the community's farm, with the growers and consumers providing mutual support and sharing the risks and benefits of food production."

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Table A1. Definition of the levels for six attributes

Attributes	Low	Moderate	High
Price per Pound*	$1.89/lb	$3.00/lb	$3.30/lb
Level of Freshness	Low-Level Freshness: Commercially produced tomatoes that are harvested prior to prime ripeness, potentially use chemicals to enhance ripeness at the store	Moderate Freshness: Vine-ripened tomatoes that are not harvested for optimal freshness, but for optimal market timing	High Freshness: Vine-ripened tomatoes that are selected for optimal freshness for delivery to consumers
Variety of Other Selections	Limited Selection: There are not many local produce options or customers can only purchase predetermined produce boxes which cannot be customized	Seasonal Selection: Customers can only purchase locally grown foods that are in season, which may be limited	Year-Round Selection: There are many local produce options all year
Risk Shifting from Producers	Uncertain Rate of Return: Farmers grow and deliver produce with little to no guaranteed rate of return subject to market prices, supply, and demand	–	Guaranteed Rate of Return: Producers are either provided with guaranteed revenue contracts or provided with up-front fees that aid or shift the financial risk of planting crops for local consumption
Physical Accessibility	Low Accessibility: The business hours are very limited, and they are rarely open during weekdays, or the number of grocery pick-up sites is limited	–	High Accessibility: There are many branches everywhere and they have long business hours
Social Amenities	None: There are no physical social amenities	Basic Amenities: The facility has basic physical access, such as parking, restrooms, and curbside delivery	High Social Amenities: The facility has social entertainment along with everything from the low and moderate sections

* The CSA choice includes an additional prorated membership fee of $1.00/lb of tomatoes

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Appendix B

Table B1. Result of panel-data mixed logit model with customers' satisfaction factors

	Coef.	Std. Err.	*z*	*P* > *z*	[95%Conf.	Interval]
Alternatives						
Price***	−0.561	0.023	−24.48	0.000	−0.606	−0.516
Freshness***	0.451	0.031	14.54	0.000	0.390	0.512
Variety***	0.067	0.018	3.68	0.000	0.031	0.102
Risk_shift	0.007	0.030	0.22	0.826	−0.053	0.066
Accessibility	0.060	0.033	1.82	0.068	−0.005	0.123
Amenities	−0.002	0.019	−0.12	0.908	−0.040	0.035
SD						
Freshness	0.684	0.031			0.627	0.747
Variety	0.193	0.032			0.140	0.266
Risk_shift	0.003	0.233			1.34e − 78	5.15e + 72
Accessibility	0.154	0.120			0.033	0.711
Amenities	0.190	0.028			0.141	0.254
CSA			Base alternative			
Supermarket						
Distance	0.053	0.057	0.93	0.355	−0.059	0.164
Hours	0.064	0.061	1.04	0.297	−0.056	0.184
No_membership	−0.004	0.042	−0.09	0.929	−0.085	0.078
Price	−0.064	0.060	−1.07	0.286	−0.183	0.054
Stock	−0.072	0.076	−0.95	0.344	−0.221	0.077
Quality*	0.149	0.073	2.04	0.041	0.006	0.292
Variety	−0.010	0.071	−0.15	0.883	−0.151	0.130
Refund	0.061	0.051	1.19	0.235	−0.040	0.161
Sale_event	−0.100	0.052	−1.91	0.056	−0.202	0.002
Delivery	−0.012	0.051	−0.23	0.820	−0.111	0.088
Social_event	−0.086	0.057	−1.53	0.127	−0.198	0.024
Food_activities***	0.248	0.060	4.18	0.000	0.131	0.364
Outreach**	−0.160	0.057	−2.80	0.005	−0.272	−0.048
Eco_consumption	0.080	0.053	1.49	0.136	−0.025	0.184
Trust	−0.083	0.057	−1.46	0.145	−0.194	0.029
Constant	0.793	0.265	2.99	0.003	0.274	1.313
Farmers' market						
Distance	−0.017	0.057	−0.30	0.765	−0.128	0.094
Hours	0.099	0.061	1.62	0.104	−0.020	0.218
No_membership	−0.058	0.041	−1.41	0.159	−0.139	0.023

(*Continued*)

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Table B1. (*Continued*)

	Coef.	Std. Err.	*z*	*P* > *z*	[95%Conf.	Interval]
Price	−0.000	0.060	−0.01	0.995	−0.118	0.117
Stock	−0.063	0.076	−0.83	0.405	−0.212	0.086
Quality	0.050	0.073	0.69	0.491	−0.093	0.193
Variety	−0.003	0.071	−0.04	0.969	−0.142	0.136
Refund	0.019	0.051	0.37	0.712	−0.081	0.118
Sale_event	−0.058	0.051	−1.12	0.263	−0.158	0.043
Delivery	−0.049	0.050	−0.97	0.330	−0.148	0.050
Social_event	−0.049	0.056	−0.87	0.383	−0.160	0.061
Food_activities**	0.151	0.059	2.56	0.010	0.035	0.267
Outreach**	−0.179	0.057	−3.14	0.002	−0.291	−0.067
Eco_consumption	0.025	0.053	0.48	0.634	−0.079	0.130
Trust	0.091	0.056	1.61	0.107	−0.020	0.201
Constant	1.354	0.263	5.15	0.000	0.840	1.870
None of them						
Distance	0.115	0.128	0.90	0.367	−0.135	0.366
Hours	0.037	0.128	0.29	0.775	−0.215	0.288
No_membership	−0.052	0.087	−0.59	0.554	−0.222	0.119
Price	0.238	0.129	1.85	0.065	−0.015	0.491
Stock	−0.284	0.165	−1.72	0.085	−0.608	0.039
Quality	−0.114	0.161	−0.71	0.479	−0.430	0.202
Variety	−0.012	0.149	−0.08	0.937	−0.304	0.280
Refund	−0.037	0.106	−0.35	0.729	−0.244	0.170
Sale_event	−0.040	0.103	−0.39	0.696	−0.241	0.161
Delivery	0.075	0.108	0.70	0.485	−0.136	0.287
Social_event	−0.222	0.120	−1.85	0.065	−0.456	0.013
Food_activities	−0.099	0.127	−0.78	0.434	−0.347	0.149
Outreach*	0.255	0.126	2.02	0.043	0.008	0.501
Eco_consumption	0.007	0.120	0.06	0.951	−0.227	0.242
Trust	−0.098	0.123	−0.79	0.427	−0.340	0.144
Constant	−2.150	0.534	−4.02	0.000	−3.197	−1.103
Log-likelihood = −6406.5448						
Prob. > chi^2 = 0.0000						

*** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq .05$.

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