April 2019 APEC RR19-02

Is this Food "Local?" Evidence from a Framed Field Experiment

Tongzhe Li[1], Ahsanuzzaman[2] and Kent Messer[2]

[1]Department of Economics, University of Windsor, [2]Department of Applied Economics and Statistics, University of Delaware

APEC Research Reports

Department of Applied Economics and Statistics • College of Agriculture and Natural Resources • University of Delaware

APPLIED ECONOMICS & STATISTICS

ABSTRACT

Is This Food "Local?" Evidence from a Framed Field Experiment

Keywords: Local foods; label definition; framed field experiments

In the marketplace, consumers often see foods labeled as "local." But laws regarding what foods can be labeled as local vary, and how consumers perceive the definition of such labels has received little attention. To study this question, we designed a framed field experiment that took advantage of the small distances in the Mid-Atlantic region of the United States and oyster harvesting locations. In this novel study, consumers were presented with purchase decisions for a food that could be accurately characterized by multiple definitions of the term local, some definitions based on mileage and others on political boundaries. We analyze responses from 374 adult consumers to estimate willingness to pay (WTP) for oysters labeled as local using these various definitions. We find that consumers are responsive to the label definitions. Consumers are less willing to pay for local oysters defined as harvested within 400 miles (the USDA definition of a local food) than for local oysters harvested within 100 miles and 25 miles. Consumers' WTP increases when local is defined as being harvested in a region associated with the same state of the purchase decision than when harvested in an adjacent state. Interestingly, the highest WTP is when no specific definition of local is provided to consumers.

ACKNOWLEDGEMENTS

The authors thank Sunny Jardine and Maik Kecinski for their helpful comments and James Geisler, Julia Parker, Francesca Piccone, Kaitlynn Ritchie, Maddi Valinski, Shang Wu, Huidong Xu, Stephen Wemple, and Jake Nelson for their assistance in computer programming, administering the experiment, and other stages of this research.

For additional information on this research course, contact:

Tongzhe Li

Email: tongzhe@uwindsor.ca

Suggested Citation for APEC Research Reports
Li, Tongzhe, Ahsanuzzaman, Messer, Kent D. 2019. "Is this Food "Local?" Evidence from a Framed Field Experiment." Applied Economics and Statistics Report, University of Delaware, RR19-02.

1. Introduction

The food industry has witnessed rapid growth in sales of "local" foods, resulting in a remarkable increase in consumption from $404 million annually in 1992 to more than $1.3 billion in 2012 (Tropp and Moraghan, 2017). The U.S. Department of Agriculture (USDA) established an initiative in 1994 to promote local food systems as a way of providing consumers with access to fresh, healthy foods in their communities and supporting local agricultural producers. As a result, there has been a fivefold increase in the total number of farmers' markets nationwide, from 1,755 in 1994 to more than 8,600 in 2018 (USDA, 2018).

The agricultural economics literature has consistently reported that consumers have greater willingness to pay (WTP) for locally produced (and labeled) food than for non-local food (e.g., Brayden et al., 2018; Fonner and Sylvia, 2015; Hasselbach and Roosen, 2015; Grebitus et al., 2013). Therefore, producers in rural communities can generate greater revenue by marketing their products locally and labeling them as local. However, little is known about what qualifies as local food for most consumers. Producers would benefit from a greater understanding of how far geographically the influence of a "local" label extends and whether it is also useful to associate their products with a particular region such as the state in which it is produced in addition to its localness.

Though numerous studies have investigated consumers' preferences for local foods and have identified a positive relationship between localness and WTP (Wu et al., 2015; Grebitus et al., 2013; Onozaka et al., 2010; Darby et al., 2006; Giraud et al., 2005; Loureiro and Hine, 2002; Jekanowski et al., 2000), none have systematically identified how

consumers perceive the term for food products. As noted by Martinez et al. (2010), there still is no legal or universally accepted definition of local food. In part, it is a geographical concept related to the distance between food producers and consumers and may also be affected by other factors. Furthermore, in relevant consumer-preference studies, there is no consensus on the definition of local food. Sometimes it refers to foods that share particular attributes in terms of the distance (food miles) between where the food was produced and the market (Lim and Hu, 2016; Grebitus et al., 2013). In other studies, the term "local food" has been used interchangeably with "sustainable food" and "food from farmers' markets" in surveys and experiments (Brayden et al., 2018; Tropp and Moraghan, 2017; Adalja et al., 2017; Chen et al., 2017; Adams and Salois, 2010).

This research aims to fill this gap in understanding of consumer perceptions of local food using data from a framed field experiment involving oyster purchase decisions conducted in the mid-Atlantic region of the United States. The mid-Atlantic is an ideal location for this study because the region incorporates several states and bodies of water, allowing a single oyster product to be labeled in different ways without using deception. Furthermore, oysters are an excellent choice for this study since they come from different bodies of water so their locality can be identified in terms of both distance and political boundaries such as states and regions.

Though oysters are still something of a niche product, the oyster aquaculture industry has experienced rapid growth. In 2014, the industry produced $5.5 billion worth of oyster products nationwide (National Oceanic and Atmospheric Administration (NOAA), 2016a) and annual oyster landings from Chesapeake Bay increased by as much as 1,600% between 2006 and 2014 (Kecinski et al., 2017; NOAA, 2016b). Hence, marketing oysters

with appropriate labeling indicating their local origins can potentially have a significant positive effect on the niche oyster market and contribute significantly to local economies.

To elicit consumer preferences for a local food accompanied by different definitions of local on labels, we use a framed field experiment and estimate consumers' WTP in response to treatments that modify how the term "local" is defined. The data were collected using a single-bounded dichotomous-choice format in which individuals made yes-or-no decisions regarding purchasing oysters accompanied by different definitions of local on the labels at various market prices. The experiment was conducted at the Cape May-Lewes Ferry terminal in the U.S. state of Delaware with 374 adult participants revealing their preferences for 8 oysters that varied by harvest location, resulting in 2,992 observations. We use a random-effects logit model to analyze how WTP changes in response to the labels.

Our analysis shows that, on average, consumers are willing to pay a premium of at least $0.45 for an oyster labeled as local and a negative premium of at least $1.04 for oysters labeled as non-local compared to an unlabeled oyster. We further find that participants are responsive to definitions provided on labels. Their average WTP for oysters harvested up to 25 miles and 100 miles away are about the same and decreases for oysters harvested up to 400 miles away. This is an important distinction because the standard for local food established in the 2008 Farm Act uses a limit of 400 miles (Martinez et al., 2010). Our results indicate that consumers' perceptions of local oysters do not extend that far. State and regional boundaries also appear to influence consumers' perceptions of localness in that foods harvested in a state or region outside the purchase point are not necessarily viewed by consumers as local. Our analysis indicates that WTP for local oysters is greatest when the oysters are labeled as harvested from Delaware Bay, followed by

labeling as harvested from the mid-Atlantic region and from New Jersey. Interestingly, however, considering all of the labeled oysters presented in the experiment, WTP is greatest when the label is generic and no definition of what made the product local is provided.

A post-experiment survey was conducted to collect information regarding the participants' demographic characteristics, attitudes regarding preferences for local food, and the underlying reasons for those preferences and attitudes. We find that consumers mainly associate local food with greater freshness, followed by a desire to support local producers. The survey also asked participants about their support of local businesses where they reside and when traveling. The results show strong support for local businesses in both cases. A Wilcoxon signed-rank test shows that their support is strongest when purchasing food at home and is emphasized less when they travel.

2. Related Literature

Studies addressing various food commodities have found that consumers generally are willing to pay price premiums for local foods (Jekanowski et al., 2000) and have strong preferences for foods identified as local, organic, and GMO-free (genetically modified organisms) (Loureiro and Hine, 2002). The premiums apply to both low-end and high-end specialty goods (Giraud et al., 2005). Studies have also shown that consumers' preferences for these foods are related to health concerns, support for local farmers and producers, and environmental concerns (Grebitus et al., 2013; Onozaka et al., 2010; Zepeda and Deal,

2009; Sirieix et al., 2008; Stringer and Umberger, 2008; Thilmany et al., 2008; Toler et al., 2009; Vermeir and Verbeke, 2008).

Prior studies of local food have mostly focused on identifying factors that strongly influence consumers to choose those foods in general and estimating their WTP for them. Those results provide evidence that consumers have greater WTP for local food (Hu et al., 2009) and are willing to pay a premium for foods produced relatively close to the point of purchase (Lim and Hu, 2016; Grebitus et al., 2013). Grebitus et al. (2013), for example, estimated German consumers' WTP for apples and wine that had been transported various distances before being sold. They found that German consumers were willing to pay more for foods that had been transported fewer miles, which they called "local food" but had not labeled the food as local in the experiment. Other studies have suggested consumers are more willing to pay for foods from specific geographic locations (the consumers' county, state, and/or province or country of residence) using data derived from experiments (Lim and Hu, 2016; Wu et al., 2015) and from other methods such as surveys (Burnett et al., 2011; Carpio and Isengildina-Massa, 2009; Skuras and Vakrou, 2002). These studies have led to the general conclusion that some segments of consumers are willing to pay a premium for local products defined in geographic terms such as the distance traveled to the point of purchase (Grebitus et al., 2013; Buchardi et al., 2005; Brown, 2003; Umberger et al., 2002; van der Lans et al., 2001; Loureiro and McCluskey, 2000). Their WTP a premium is attributed to their perceptions of the physical attributes of those foods, such as relative nutritional value, and to their concerns about food safety and the availability of special varieties of products such as meats, seedless fruits, and vegetables (Campbell et al., 2004; Loureiro and Umberger, 2007).

Research into consumer preferences related to local food has also shown that many consumers prefer foods produced in particular areas. Among the products determined to be affected by labeling the origin of production are wine (Skuras and Vakrou, 2002); fresh produce labeled as locally grown and with geography-based labels that associate the produce with a region such as the consumer's home state, broader regions such as the Midwest, and the consumer's county (Burnett et al., 2011; Carpio and Isengildina-Massa, 2009); state-labeled Kentucky blueberry products (conventional and organic) and Colorado potatoes (Hu et al., 2009; Loureiro and Hine, 2002); strawberries and other berries labeled as grown locally relative to berries labeled as grown in the United States (Darby et al., 2006); and honey labeled as local (Wu et al., 2015). Loureiro and Hine (2002), for example, compared Colorado consumers' WTP for organic, GMO-free, and Colorado-grown foods and found that they were willing to pay greater premiums for Colorado-grown potatoes than for organic and GMO-free potatoes. In general, U.S. consumers' preferences for locally grown food are attributed to it being perceived as better tasting, fresher, and more healthful, reflecting biases in favor of their communities, ethnocentrism, and/or hometown pride and greater environmental sustainability of local production.

Among recent studies are several that have used experimental economics to examine consumers' preferences for oysters with different production attributes (Li et al., 2017, 2018; Li and Messer, forthcoming; Kecinski et al., 2017, 2018; Morgan et al., 2009). Kecinski et al. (2018) found that information regarding oysters' pollution-reducing abilities increased the premium consumers were willing to pay for oysters from water containing relatively low levels of excess nutrients and decreased the premium they would pay for oysters from relatively polluted, high-nutrient waters. Li et al. (2017), on the other hand,

when estimating factors affecting oyster choice, found that older participants and participants who were relatively selective about the shell color and smell of oysters presented were less willing than other consumers to pay for the oysters while consumers who valued size, species, and harvest location were relatively more willing to pay. Other related studies include Morgan et al. (2009), which investigated the effects of positive and negative information treatments and post-harvest processing on demand for oysters, and Kecinski et al. (2017), which estimated consumers' preferences for oysters using various brand names, production methods (aquacultured and wild-caught), and harvest locations. The results of Morgan et al. (2009) were counterintuitive, indicating that consumers who preferred raw oysters were more likely than consumers who preferred cooked oysters to consume them after receiving negative information about risks associated with eating raw oysters. The results from Kecinski et al. (2017) suggested that the methods used to produce the oysters (aquacultured versus wild-caught and water nutrient levels) were a more important factor in consumers' decisions than the oysters' origins and brand names.

To date, no research has investigated what local seafood means to consumers and only a few studies have addressed the definition of local for other fresh foods. Lim and Hu (2016) and Grebitus et al. (2013), for example, attempted to define consumers' preferences for local food, finding that geographic-based labeling could open potential niche markets for food products. However, the definition of local in both studies extended beyond a national boundary, and they did not address consumers' perceived definitions of local. Such perceptions can be especially important in relatively large states in which hundreds of miles can separate markets and in relatively small states and along state borders where regional definitions can have a significant influence. This research is an effort to fill this gap

by beginning to define what consumers view as local food using both the distance between production and markets and political boundaries such as community, county, region, and state.

3. Experimental Design

We conducted a framed field experiment to elicit consumer WTP for oysters with different labels describing the location of their production. The experiment was conducted at the Cape May-Lewes Ferry terminal in the U.S. state of Delaware, where ferries connect two popular beach cities: Cape May, New Jersey, and Lewes, Delaware (see Figure 1). Two ferries conduct 85-minute crossings between 7:00 a.m. and 9:10 p.m. each day in the summer season so the terminal attracts a large number of people, allowing us to recruit a sufficient number of representative adult participants. Administrators recruited participants by contacting adult passengers personally and by distributing flyers. Individuals who agreed to participate in the study signed a consent form approved by the University of Delaware Institutional Review Board. We recruited 374 adult consumers who made eight yes/no decisions, providing 2,992 observations.

In the experiment, choice tasks elicited consumer WTP by providing them with opportunities to buy various types of local oysters, and a survey collected information on participants' demographic characteristics and oyster preferences. Both were completed on iPad Pro tablet computers using Willow, a Python-based program for economic experiments. The experiment took 10 to 15 minutes to complete, and the participants were each endowed with $10 in cash compensation that they could keep or use to purchase

oysters (see Appendix A for the experiment roadmap protocols). We created a market interface similar to an online shopping portal in which individuals were shown descriptions of the oysters available for purchase and market prices. Participants therefore made single-bounded dichotomous choices by selecting yes or no to the offer to purchase each set of oysters at the price indicated. Professional oyster shuckers set up inside a tent at the ferry terminal to present and process oysters purchased by participants in the experiment.

To provide a realistic market setting, we offered each participant eight oyster products that varied only in the labeling provided regarding the origin of the oysters, resulting in eight within-subject variations. The baseline control product was an (1) unlabeled oyster. Others were presented with labels—(2) "local," (3) "non-local," (4) East Coast, (5) West Coast, (6) harvested from high-nutrient water, (7) harvested from medium-nutrient water, and (8) harvested from low-nutrient water.

We are particularly interested in delineating consumers' perceptions of what defines an oyster as local so we further included seven between-subject treatments for the oysters labeled as local by providing different descriptions of a local product:

1. No explanation of what local means.
2. Local defined as harvested within 25 miles (of the purchase point).
3. Local defined as harvested within 100 miles.
4. Local defined as harvested within 400 miles.
5. Local defined as harvested in New Jersey.
6. Local defined as harvested in the mid-Atlantic region.

7. Local defined as harvested in Delaware Bay.[2]

This between-subject design allowed us to estimate differential WTP for oysters based on the harvest location to determine which oysters consumers viewed as local. Table 1 provides the hypotheses tested in the study, first for the within-subject treatments and then for the between-subject variations.

The market prices shown to participants for each type of oyster were randomly drawn from a normal distribution with a mean of $1.50 and standard deviation of $0.50. The oyster labels and price ranges for the oysters were determined after consulting with local oyster producers and stakeholders to present a realistic market.

To ensure incentive-compatibility in the single-bounded dichotomous-choice design, one of the eight purchasing decisions was randomly selected at the end of the experiment for implementation. Participants who opted not to purchase the oyster in that round received the full $10 compensation and no oysters. Participants who chose to purchase the oyster in that round received the balance of the $10 compensation fee remaining after deducting the cost of the oyster and the oysters they purchased.[3] As shown in the experiment instructions (see Appendix B), participants could purchase three, six, nine, or twelve of each type of oysters at the posted price, and oysters they received at the

[2] Delaware Bay is shared by the state of Delaware and the state of New Jersey. At the time of this study, no oysters were harvested in the state of Delaware, but Cape May Salts were aquacultured in Delaware Bay on the New Jersey side. Since no deception is allowed in experimental economics, we described this product as harvested in Delaware Bay.

[3] The amount of money retained after purchasing oysters depended on the price of the oysters and the quantity chosen. A participant who chose to purchase nine oysters at $1.50 each incurred a total cost of $13.50. The initial balance of $10 was deducted from the cost of oysters purchased and the additional $3.50 had to be paid out of pocket by the participant, which was explained at the beginning of the experiment.

end of the experiment were provided in bags on ice to take home or prepared for consumption on-site, either raw (on the half-shell) or fried.

4. Econometric Methodology

To estimate consumers' preferences for various types of local oysters using a take-it-or-leave-it approach, we use a closed-ended single-bounded dichotomous-choice model introduced by Bishop and Heberlein (1979). Let p be the posted oyster price randomly drawn from a set of oyster market prices with $p \sim N(1.5, 0.5^2)$. The consumer considers her WTP and confronts a price p, thus producing the following outcomes:

$$D = \begin{cases} 0 & if\ WTP < p \\ 1 & if\ WTP \geq P \end{cases} \tag{1}$$

in which $D = 1$ indicates that the participant chooses to purchase the oyster offered at price p and $D = 0$ indicates that the participant chooses not to purchase the oyster. Generally, Lancaster's (1966, 1971) consumer theory and random utility theory (McFadden, 1974) are the basis for modeling consumers' preferences using data from a dichotomous-choice experiment. Consequently, we use a random utility model to determine the participants' WTP for oysters with each local attribute while controlling for other factors, including the participants' demographic characteristics.

Let the utility of individual i purchasing an oyster $j \in J$ be

$$v_{ij}(p, \Psi^{\omega}, \mathbf{P}, \mathbf{A}, \mathbf{M}) = \mu + \delta p_{ij} + \gamma'_{ij}\boldsymbol{\beta} + \boldsymbol{\tau}\, L_{\mathrm{r}} + \lambda \mathbf{Z}_i + \epsilon_{ij} \tag{2}$$

where p_{ij} is the price of oyster j for individual i and γ'_{ij} represents the attributes of the oyster in the purchase decision. The oyster information attributes in the model are an

oyster with no label and oysters labeled as local, non-local, and as local with various harvest distances and geographic regions defining their localness, from the East Coast, from the West Coast, and from waters containing low, medium, and high levels of nutrients. The variable L_r captures the effects of the between-subject variation in preferences for local oysters presented with different definitions (r): harvested from within 25 miles, 100 miles, and 400 miles and produced in the mid-Atlantic, Delaware, and New Jersey. $L_r = 0$ when the product is non-local. $\mathbf{Z}_i$ is the set of individual i's demographic and preference characteristics that determine indirect utility, and ϵ_{ij} is the stochastic component of utility $v_{ij}(p, \Psi^{\omega}, \mathbf{P}, \mathbf{A}, \mathbf{M})$. Finally, δ, $\boldsymbol{\beta}$, and λ represent changes in utility associated with changes in the oyster price, oyster attributes, and individual demographic characteristics respectively while $\boldsymbol{\tau}$ represents the vector of changes in utility associated with the definitions of local. The demographic characteristics analyzed were age, level of education, income level, gender, and whether the participant was the household's primary shopper.

Equation 2 shows that $v_{ij} \geq v_{il}$ when individual *i* chooses the oyster with attribute *j* for all $j \neq l$ and $l \in J$. That is, an individual's indirect utility from consuming the oyster with attribute *j* is at least as great as the indirect utility from consuming an oyster with attribute l for all $j \neq l$ and $l \in J$. Let Y_i be the random variable that indicates that individual *i* has chosen oyster *j*. Assuming that the *J* stochastic errors in equation 2 for each individual are independently and identically distributed (IID) with a type-I extreme-value distribution, the probability of a participant choosing the oyster with attribute *j* can be expressed as

$$\Pi_{ij} = \Pr(Y = D) = \begin{cases} F\left(v_{ij}(p, \Psi^{\omega}, \boldsymbol{P}, \boldsymbol{A}, \boldsymbol{M})\right) \\ 1 - F\left(v_{ij}(p, \Psi^{\omega}, \boldsymbol{P}, \boldsymbol{A}, \boldsymbol{M})\right) \end{cases} \quad \text{for } D = \begin{cases} 0 \\ 1 \end{cases} \tag{3}$$

where $F(\cdot)$ is a cumulative distribution function characterizing the stochastic component of $v_{ij}(p, \Psi^{\omega}, \mathbf{P}, \mathbf{A}, \mathbf{M})$ in equation 2. The log-likelihood function for estimating the parameters of interest in equation 2 (δ, $\boldsymbol{\beta}$, $\boldsymbol{\tau}$, and λ) can be expressed as

$$lnL = \sum_{i=1}^{n} I_{D=1} \ln F\left(\mu + \delta p_{ij} + \gamma'_{ij}\boldsymbol{\beta} + \boldsymbol{\tau} L_{\mathrm{r}} + \lambda \boldsymbol{Z}_i\right) + I_{D=0} \ln\left[1 - F(\mu + \delta p_{ij} + \gamma'_{ij}\boldsymbol{\beta} + \boldsymbol{\tau} L_{\mathrm{r}} + \lambda \boldsymbol{Z}_i)\right] \quad (4)$$

where $I_{D=\{0,1\}}$ is an indicator variable representing whether individual *i* purchases the oyster with attribute *j* ($D = 1$) or not ($D = 0$). If the stochastic components of the utility function in equation 2 have a standard type-I extreme-value distribution with density

$$f\left(\epsilon_{ij}\right) = \exp(-\epsilon - \exp(-\epsilon)), \quad (5)$$

the following logit model is the natural candidate for estimating WTP:

$$\pi_{ij} = \frac{\exp\left(\mu + \delta p_{ij} + \gamma'_{ij}\boldsymbol{\beta} + \boldsymbol{\tau} L_{\mathrm{r}} + \lambda \boldsymbol{Z}_i\right)}{\sum \exp\left(\mu + \delta p_{ij} + \gamma'_{ij}\boldsymbol{\beta} + \boldsymbol{\tau} L_{\mathrm{r}} + \lambda \boldsymbol{Z}_i\right)}. \quad (6)$$

5. Results

Table 2 summarizes the demographic characteristics collected from the 374 adult participants using the survey. Their average age was 47.8 years with a median age of 48.0 years, which is similar to the median age calculated from the U.S. Census Bureau's Population Estimate Program for adults nationwide. A little more than half (56%) of the participants were female, and 67% of the participants were their households' primary shoppers. The distribution of their household incomes was skewed, indicating that individuals who participated in the study at the venue in which the data were collected had relatively higher incomes than the population in general. The participants' political

affiliations were diverse; nearly equal numbers of participants described themselves as conservative, moderate, and liberal (33%, 31%, and 28% respectively). In terms of education, 83% indicated that they had completed at least some college courses and 58% had an undergraduate or post-graduate degree.

Summary statistics for the participants' consumption patterns are provided in Table 3. Of the 374 participants,[4] 25% were trying oysters for the first time. A majority of the participants (56%) had eaten at least one oyster in the preceding year. On average, the participants ate out in restaurants frequently (fifteen days in a month) and ate seafood nine days in a month. They also reported consuming seafood frequently when they ate out in restaurants.

The survey also collected information regarding participants' concerns about the origin and other characteristics of food they purchase by asking them to rate statements on a Likert scale of 1–9 for the importance of the source location and 1–5 for the other concerns (1 always represented "least important" and the highest score indicated "greatest importance"). Those results are also presented in Table 3. On average, the participants' emphasis on where oysters they purchased were harvested fell in the medium range (average score of 5.24 on a 1–9 scale). They put somewhat greater emphasis on reading food labels (3.84 on a 1–5 scale), looking for information regarding their food (3.66 on a 1–5 scale), and a desire to have federal definitions for food labels (3.81 on a 1–5 scale), which was reflected in the average score for being nutrition and health conscious (3.90 on the 1–5 scale).

[4] Two participants (0.53%) did not provide information about their oyster consumption behavior so the proportions explained here do not add up to 100%.

To identify their reasons for supporting local food, we asked participants about their perceptions of several aspects of local food production: support of local farmers, community interaction, sustainability, environmental issues, and the foods' freshness, nutritiousness, and tastiness (see Table 4) using a 1–5 Likert scale. The participants placed the greatest emphasis, on average, on freshness (4.32), followed by supporting local farmers (4.01) and perceptions of better taste (3.96). Pairwise correlations show that a preference for local food has the greatest correlation with freshness (0.51), followed by supporting local farmers (0.47), better taste (0.42), and nutritiousness of the food (0.41) and the least correlation with concern about environmental issues (0.31).

These results indicate that consumers mainly associate local food with greater freshness. The results of the Wilcoxon signed-rank test further suggest that participants' perceptions that local foods are fresher stands out significantly in explaining their preferences for local food, followed by a desire to support local farmers ($Z = -6.95$, $p = 0.000$) and perceptions of the food as better tasting ($Z = -7.25$, $p = 0.000$) and more nutritious ($Z = -9.76$, $p = 0.000$).

A final section of the survey asked participants about their support of local food producers and businesses where they reside and when traveling. The results, shown in Table 4, show strong support for local farmers both where they live and when traveling with the average scores for both exceeding 4.0 on a 1–5 Likert scale in which 1 represented "strongly disagree" and 5 represented "strongly agree." Tests of the equality of the means suggest that support for local businesses in their own communities is statistically stronger than support for local businesses when traveling (Wilcoxon signed-rank test $Z = -6.33$, $p = 0.000$).

To understand the likelihood of participants purchasing the oysters and estimate their WTP for each type, we apply a random-effects logit model to evaluate factors that could affect their decisions using two versions of equation 2, one that includes the demographic characteristics represented by vector **Z** and one that omits them. The results of this analysis are presented in Table 5. As expected, both models show that price has a negative effect on participants choosing to purchase oysters. The analysis further indicates that participants were more likely to purchase East Coast oysters and less likely to purchase West Coast oysters than oysters with no label. In terms of the nutrient level of the water, a high nutrient level had no significant impact on participants' likelihood of purchasing compared to unlabeled oysters. They were less likely to purchase oysters from moderate-nutrient waters and even less likely to purchase oysters from low-nutrient waters. The results of the model that included demographic characteristics indicate that a higher level of education is associated with greater WTP for oysters while female participants and those trying oysters for the first time have relatively low WTP.

Turning to our primary question regarding the effects of different definitions of local on labels, we find that both models indicate that participants are more likely to purchase oysters labeled as local and less likely to purchase oysters labeled as non-local (2% and –2% respectively) relative to oysters with no label, indicating a general preference for locally produced oysters. This finding is in line with results of similar studies for other goods such as honey (Wu et al., 2015), beef (Lim and Hu, 2016), apples (Grebitus et al., 2013), and wine (Grebitus et al., 2013).

Following Hanemann (1984), we estimated average WTP using the formula

$$Average\ WTP = \frac{1}{\hat{\delta}}\left(\hat{\mu} + \hat{\beta}\bar{X} + +\hat{\boldsymbol{\tau}}\bar{L} + \hat{\gamma}\,\bar{Z}\right) \quad (7)$$

in which the delta method was used to calculate confidence intervals. To estimate average WTP (equation 7), all of the explanatory variables were used in both models. Table 6 presents the resulting estimates of average WTP, which range from \$1.15 to \$1.46.

We also estimated each variable's marginal effect on participants' WTP using

$$MEWTP = -\frac{\beta_k}{\delta} \quad (8)$$

in which β_k is the coefficient of the corresponding variable and δ is the coefficient of the price variable (Hole, 2007). The delta method was used to calculate the confidence intervals for the estimates of WTP to determine the statistical significance of the marginal effects. The results, which are also presented in Table 6, indicate that West Coast oysters suffered a negative price premium of \$0.67 to \$0.69 relative to oysters with no label. Labeling the oysters with the nutrient level of the water in which they were produced led to no change in WTP for oysters from high-nutrient waters and reductions in WTP for oysters from moderate- and low-nutrient waters (at least –\$0.73 and –\$1.31 respectively). Consumers' WTP for oysters labeled non-local declined by at least \$1.04 relative to oysters with no label, and their WTP for oysters labeled with any of the definitions of local increased by \$0.45.

Table 7 reports the results of our analysis of the effects of the various distances (25, 100, and 400 miles) and geographic harvest areas (mid-Atlantic, New Jersey, and Delaware Bay) as definitions of local on consumers' likelihood of purchasing each type of oyster. The

baseline for comparison is the generic local label with no further information provided. Therefore, the coefficients measure how each label definition of local changes participants' preferences for the oysters. Negative signs on the coefficients indicate that participants were more likely to purchase the generically labeled oysters than the oysters with the meaning of local defined for them. The relative magnitudes of the coefficients determine the relative effect each variable has on consumers' choices and WTP, allowing us to compare consumer perceptions of the localness of each harvest category. Statistical non-significance indicates that consumers' preference for oysters labeled with a particular definition of local was the same as their preference for generically labeled local oysters. The significance of the negative coefficients (Table 7) for oysters harvested up to 400 miles away and from the mid-Atlantic region and New Jersey reveals consumers' differential preferences for the other types of local oysters.

Estimates of consumers' WTP for each type of oyster, presented in Table 8, show that WTP is statistically indifferent between the baseline control group and treatment groups in which participants learned that "local" meant that the oysters had been harvested within 25 miles and 100 miles of the purchase point and for oysters harvested in Delaware Bay. Participants were less likely to purchase oysters described as harvested within 400 miles of the purchase point and as harvested in the mid-Atlantic region and New Jersey; their WTP for those oysters (see Table 8) declined by at least $1.45, $1.70, and $0.93 respectively.

Collectively, these results indicate that the participants viewed oysters harvested within 25 and 100 miles of the purchase point and oysters harvested from Delaware Bay as local products. Oysters from up to 400 miles away and oysters harvested in New Jersey

were not perceived as local. In terms of distance (food miles), then, we conclude that food products can safely be considered as local when they come from 100 miles away or less and that the 400-mile standard established in the 2008 U.S. Farm Bill does not align with consumers' perceptions. In terms of regional boundaries, the positive result for oysters from Delaware Bay and negative result for oysters from New Jersey are particularly interesting. The bay is bordered by both Delaware and New Jersey and the New Jersey border is within just 15 miles of the experiment site. These results indicate that consumers are more willing to pay for local products associated with their home state than for products from other states even when the state border is within just a few miles.

The results of the analysis fail to reject the null between-subject hypothesis that the effect of labeling the oysters as generically local is the same as the effects of defining local as harvested within 25 miles, within 100 miles, and from Delaware Bay. That is, the participants appear to have equally valued these oysters. This result is consistent with findings from several studies of the effects of the state or region in which food was produced (Kecinski et al., 2017; Wu et al., 2015; Burnett et al., 2011; Hu et al., 2009) and the distance between production and purchase (Lim and Hu, 2016; Grebitus et al., 2013). Therefore, we conclude that consumers' revealed-preference definition of local oysters is oysters harvested in consumers' own locality or state and/or harvested within 100 miles of the purchase point.

6. Conclusion

Efforts by grocery stores, restaurants, and other venues to market foods as "locally grown" have been increasing in response to consumers' growing interest in local food. Economic studies have provided concrete evidence of consumers' WTP premiums for local food and documented the significant potential for producers to profit by exploiting this niche market. But to take full advantage of this opportunity for commercial purposes, producers, retailers, and marketers need a more-accurate understanding of what local food means to consumers. This study sought to clearly test how consumers perceive various definitions of "local" applied to fresh food products. Using a framed field experiment, we analyzed consumers' WTP for oysters labeled with various definitions of local in terms of distance traveled from production to purchase and geographic boundaries such as regions and states and compared those values to their WTP for oysters with no label, oysters labeled as non-local, and oysters generically labeled as local with no definition provided.

We draw two primary conclusions from the results. First, consumers are willing to pay a premium for oysters labeled generically as "local" and are less willing to pay for oysters labeled generically as non-local than for unlabeled oysters. This suggests that consumers value local foods and tend to reject foods identified as non-local, preferring, in the case of oysters, to purchase a product of unknown origin over a non-local product. Second, consumers' WTP for locally harvested oysters is negatively related to the distance between the harvest and purchase points and to geographic boundaries such as outside the state in which the oysters are purchased.

Data collected using a survey of participants' perceptions of local food indicate that consumers support local food mostly because of its relative freshness, confirming the

findings of prior studies of other food products (Grebitus et al., 2013; Chinnakonda and Telford, 2007). The qualities consumers primarily associate with local food are greater freshness and healthfulness and better taste. They also value supporting local farmers, sustainable agricultural practices, and environmental quality.

In sum, our results for consumers' preferences for local oysters align with those of prior studies of various fresh foods. In general, consumers are willing to pay a premium for food labeled as local and are less willing to pay for non-local food than for food of unknown origin. Furthermore, we have established some parameters for what local food means to consumers. Participants in the experiment were consistently willing to pay more for local food labeled generically and as grown within 25 and 100 miles of the purchase point relative to unlabeled and non-local food. They also were willing to pay more for local food associated with the state in which they purchased it (Delaware in this case) even though the borders of two of the other states considered (Pennsylvania and Maryland) were less than 150 miles from the purchase point and one (New Jersey) was just 15 miles from the purchase point.

Opportunities for future study include testing consumer responses to other types of fresh foods, analyzing their perceptions of the localness of oysters and other foods produced between 100 and 400 miles from the purchase point, and measuring the effect of geographic regions and/or states that have gained a particularly positive reputation for the food product. Studies conducted outside the mid-Atlantic region could determine whether consumers in other parts of the country have approximately the same definitions of local. One of the interesting results of this study was that simply labeling a product as "local" with no further explanation resulted in slightly greater (though statistically insignificant) WTP

relative to the product that defined local as harvested within just 25 miles. Subsequent studies designed to provide greater statistical power could draw further inferences regarding whether consumers' WTP a premium for local food is always greatest when local is left undefined.

References

Adalja, A., J. Hanson, C. Towe, and E. Tselepidakis (2017). An Examination of Consumer Willingness to Pay for Local Products. *Agricultural and Resource Economics Review* 44(3): 253–274.

Adams, D.C., and M.J. Salois (2010). Local versus Organic: A Turn in Consumer Preferences and Willingness-to-pay. *Review of Agriculture and Food Systems* 25(4): 331–341.

Bishop, R.C., and T.A. Heberlein (1979). Measuring Values of Extramarket Goods: Are Indirect Measures Biased? *American Journal of Agricultural Economics* 61(5): 926–930.

Brayden, W.C., C.L. Noblet, K.S. Evans, and L. Rickard (2018). Consumer preferences for seafood attributes of wild-harvested and farm-raised products. *Aquaculture Economics and Management* 22(3): 362–382.

Brown, C. (2003). Consumers' Preferences for Locally Produced Food: A Study in Southeast Missouri. *American Journal of Alternative Agriculture* 18(4): 213–224.

Buchardi, H., C. Schröder, and H.D. Thiele (2005). Willingness-to-pay for Food of the Own Region: Empirical Estimates from Hypothetical and Incentive Compatible Settings. Selected paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Providence, Rhode Island, July 24–27.

Burnett, P., T.H. Kuethe, and C. Price (2011). Consumer Preference for Locally Grown Produce: An Analysis of Willingness-to-pay and Geographic Scale. *Journal of Agriculture, Food Systems, and Community Development* 2(1): 269–278.

Campbell, R.G., B.L. Nelson, R.C. Ebel, W.A. Dozier, J.L. Adrian, and B.R. Hockema (2004). Fruit Quality Characteristics that Affect Consumer Preferences for Satsuma Mandarins. *HortScience* 39(7): 1664–1669.

Carpio, C.E., and O. Isengildina-Massa (2009). Consumer Willingness to Pay for Locally Grown Products: The Case of South Carolina. *Agribusiness* 25(3): 412–426.

Chen, J.Q., M.C. Haws, Q.S.W. Fong, and P. Leung (2017). Locally Grown Oysters in Hawaii: Chef Preference and Local Premium? *Journal of the World Aquaculture Society* 48(6): 972–980. DOI: www.doi.org/10.1111/jwas.12430.

Chinnakonda, D. and L. Telford (2007). Local and Regional Food Economies in Canada: Status Report (Ottawa: Agriculture and Agri-Food Canada).

Darby, K., M.T. Batte, S. Ernst, and B. Roe (2006). Willingness to Pay for Locally Produced Foods: A Customer Intercept Study of Direct Market and Grocery Store Shoppers. Selected paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Long Beach, California.

Fonner, R., and G. Sylvia (2015). Willingness to Pay for Multiple Seafood Labels in a Niche Market. *Marine Resource Economics* 30(1): 51–70. DOI: www.doi.org/10.1086/679466.

Giraud, K.L., C.A. Bond, and J.J. Bond (2005). Consumer Preferences for Locally Made Specialty Food Products across Northern New England. *Agricultural and Resource Economics Review* 34(2): 204–216.

Grebitus, C., J.L. Lusk, and R.M. Nayga Jr. (2013). Effect of Distance to Transportation on Willingness to Pay for Food. *Ecological Economics* 88: 67–75.

Hanemann, W.M. (1984). Welfare Evaluation in Contingent Valuation Experiments with Discrete Responses. *American Journal of Agricultural Economics* 66(3): 332–341.

Hasselbach, J.L., and J. Roosen (2015). Consumer Heterogeneity in the Willingness to Pay for Local and Organic Food. *Journal of Food Products Marketing* 21(6): 608–625.

Hole, A.R. (2007). A Comparison of Approaches to Estimating Confidence Intervals for Willingness to Pay Measures. *Health Economics* 16: 827–840.

Hu, W., T. Woods, and S. Bastin (2009). Consumer Acceptance and Willingness to Pay for Blueberry Products with Nonconventional Attributes. *Journal of Agricultural and Applied Economics* 41(1): 47–60.

Jekanowski, M.D., D.R. Williams II, and W.A. Schick (2000). Consumers' Willingness to Purchase Locally Produced Agricultural Products: An Analysis of an Indiana Survey. *Agricultural and Resource Economics Review* 29(1): 43–53.

Kecinski, M., K.D. Messer, L. Knapp, and Y. Shiraji (2017). Consumer Preferences for Oyster Attributes: Field Experiments on Brand, Locality, and Growing Method. *Agricultural and Resource Economics Review* 46(2): 315–337.

Kecinski, M., K.D. Messer, and A.J. Peo (2018). When Cleaning Too Much Pollution Can Be a Bad Thing: A Field Experiment of Consumer Demand for Oysters. *Ecological Economics* 146: 686–695.

Lancaster, K.J. (1966). A New Approach to Consumer Theory. *The Journal of Political Economy* 74(2): 132–157.

Lancaster, K.J. (1971). *Consumer Demand: A New Approach.* Columbia University Press, New York.

Li, T., M. Kecinski, and K.D. Messer (2017). Heterogeneous Preferences for Oysters: Evidence from Field Experiments. *Agricultural and Resource Economics Review* 46(2): 296–314.

Li, T., M. Kecinski, and K.D. Messer (2018). Behavioral Responses to Science-based Eco-labeling: Gold, Silver, or Bronze. *Applied Economics* 50(39): 4250–4263.

Li, T., and K.D. Messer (forthcoming). To Scan or Not to Scan: That Is the Question of Consumer Behavior and QR Codes on Food Packages. *Journal of Agricultural and Resource Economics.*

Lim, K.H., and W. Hu (2016). How Local Is Local? A Reflection on Canadian Local Food Labeling Policy from Consumer Preference. *Canadian Journal of Agricultural Economics* 64(1): 71–88.

Loureiro, M.L., and S. Hine (2002). Discovering Niche Markets: A Comparison of Consumer Willingness to Pay for Local (Colorado Grown), Organic, and GMO–Free Products. *Journal of Agricultural and Applied Economics* 34(3): 477–487.

Loureiro, M.L., and J.J. McCluskey (2000). Assessing Consumer Response to Protected Geographical Identification Labeling. *Agribusiness* 16(3): 309–320.

Loureiro, M.L., and W.J. Umberger (2007). A Choice Experiment Model for Beef: What US Consumer Responses Tell Us about Relative Preferences for food Safety, Country-of-origin Labeling and Traceability. *Food Policy* 32: 496–514.

Martinez, S., M. Hand, M.D. Pra, S. Pollack, K. Ralston, T. Smith, S. Vogel, S. Clark, L. Lohr, S. Low, and C. Newman (2010). Local Food Systems: Concepts, Impacts, and Issues. *ERR 97*, U.S. Department of Agriculture, Economic Research Service.

McFadden, D. (1974). Conditional Logit Analysis of Qualitative Choice Behavior. In *Frontiers in Econometrics*, ed. by P. Zarembka. New York: Academic Press, 105–142.

Morgan, O.A., G.S. Martin, and W.L. Huth (2009). Oyster Demand Adjustments to Counter-Information and Source Treatment in Response to *Vibrio Vulnificus*. *Journal of Agriculture and Applied Economics* 41(3): 683–696.

National Oceanic and Atmospheric Administration (2016a). Annual Commercial Landing Statistics. Accessed March 2019 at www.st.nmfs.noaa.gov/st1/commercial/landings/annual_landings.html.

National Oceanic and Atmospheric Administration (2016b). Oyster Reefs. Accessed March 2019 at http://chesapeakebay.noaa.gov/oysters/oyster-reefs.

Onozaka, Y., G. Nurse, and D. Thilmany McFadden (2010). Local Food Consumers: How Motivations and Perceptions Translate to Buying Behavior. *Choices* 25(1).

Sirieix, L., G. Gilles, and B. Schaer (2008). Do Consumers Care about Food Miles? An Empirical Analysis in France. *International Journal of Consumer Studies* 32(5): 508–515.

Skuras, D., and A. Vakrou (2002). Consumers' Willingness to Pay for Origin Labelled Wine: A Greek Case Study. *British Food Journal* 104(11): 898–912. DOI: https://doi.org/10.1108/00070700210454622.

Stringer, R.S., and W.J. Umberger (2008). Food Miles, Food Chains and Food Producers: Consumer Choice in Local Markets. Accessed March 2019 at http://www.agrifood.info/Agrifood/connections/2008/Stringer_Umberger.html.

Thilmany, D., C.A. Bond, and J.K. Bond (2008). Going Local: Exploring Consumer Behavior and Motivations for Direct Purchases. *American Journal of Agricultural Economics* 90(5): 1303–1309.

Toler, S., B.C. Briggeman, J. Lusk, and D.C. Adams (2009). Fairness, Farmers Markets, and Local Production. *American Journal of Agricultural Economics* 91(5): 1272–1278.

Tropp, D., and M.R. Moraghan (2017). Local Food Demand in the U.S.: Evolution of the Marketplace and Future Potential. Chapter 1 in *Harvesting Opportunity: The Power of Regional Food System Investments to Transform Communities*, Federal Reserve Bank

of St. Louis, MO. Accessed March 2019 at www.stlouisfed.org/community-development/publications/~/media/Files/PDFs/Community-Development/Harvesting-Opportunity/Harvesting_Opportunity.pdf?la=en#page=43.

Umberger, W.J., D.M. Feuz, C.R. Calkins, and K. Killinger-Mann (2002). U.S. Consumer Preference and Willingness-to-pay for Domestic Corn-fed Beef versus International Grass-fed Beef Measured through an Experimental Auction. *Agribusiness* 18(4): 491–504.

U.S. Department of Agriculture (2018). USDA Farmers Market: 2018 Rules and Procedures and Operating Guidelines. U.S. Department of Agriculture, Washington D.C.

van der Lans, I., K. Ittersum, A. De Cicco, and M. Loseby (2001). The Role of the Region of Origin and EU Certificates of Origin in Consumer Evaluation of Food Products. *European Review of Agricultural Economics* 28(4): 451–477.

Vermeir, I., and W. Verbeke (2008). Sustainable Food Consumption among Young Adults in Belgium: Theory of Planned Behaviour and the Role of Confidence and Values. *Ecological Economics* 64(3): 542–553.

Wu, S., J.R. Fooks, K.D. Messer, and D. Delaney (2015). Consumer Demand for Local Honey. *Applied Economics* 47(41): 4377–4394.

Zepeda, L., and D. Deal (2009). Organic and Local Food Consumer Behavior: Alphabet Theory. *International Journal of Consumer Studies* 33(6): 697–705.

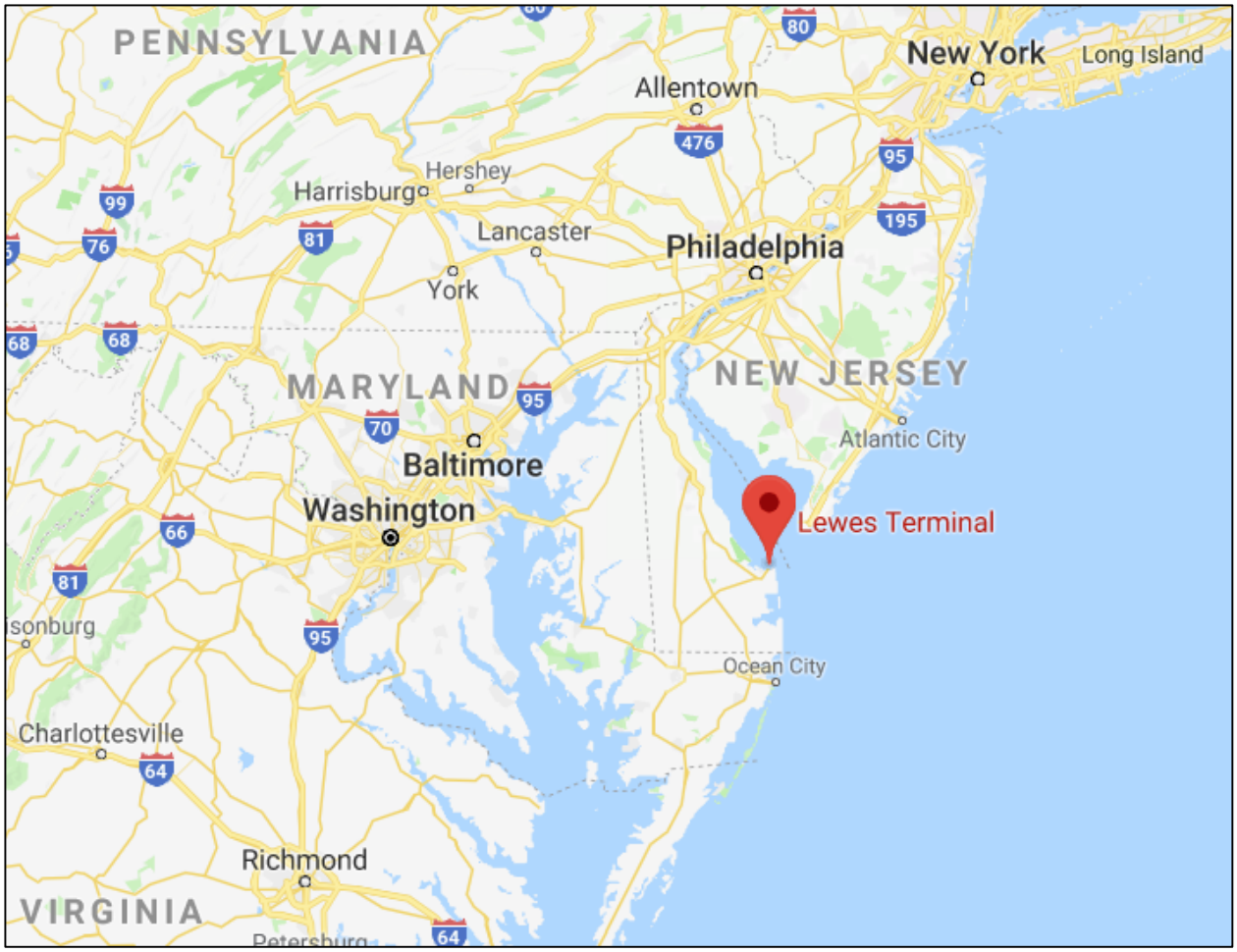

Figure 1: Google map of the locality of the Ferry Terminal in Lewes, Delaware.

Table 1: Tested hypotheses

Hypothesis	Results
Within-subject treatments	
H_0: Consumers' WTP for food labeled local and unlabeled food are the same. H_1: Consumers' WTP for food labeled local and their WTP for unlabeled food are not the same.	Reject H_0, $WTP_{Local} \neq WTP_{Unlabeled}$ $(p \leq 0.01)$
H_0: Consumers' WTP for food labeled non-local is same as their WTP for unlabeled food. H_1: Consumers' WTP for food labeled non-local is less than their WTP for unlabeled food.	Reject H_0, $WTP_{Non-local} \neq WTP_{Unlabeled}$ $(p \leq 0.01)$
H_0: Consumers' WTP for food labeled non-local is same as their WTP for food labeled local. H_1: Consumers' WTP for food labeled local is greater than their WTP for food labeled non-local.	Reject H_0 $WTP_{Local} \neq WTP_{Non-Local}$ $(p \leq 0.01)$
Between-subject treatments to define local	
H_0: Consumers' WTP for food labeled local within 25 miles and their WTP for food generically labeled local are the same. H_1: Consumers' WTP for food labeled local within 25 miles and their WTP for food generically labeled local are not the same.	Cannot reject H_0, $(p > 0.1)$
H_0: Consumers' WTP for food labeled local within 100 miles and their WTP for food generically labeled local are the same. H_1: Consumers' WTP for food labeled local within 100 miles and their WTP for food generically labeled local are not the same.	Cannot reject H_0, $(p > 0.1)$
H_0: Consumers' WTP for food labeled local within 400 miles and their WTP for food generically labeled local are the same. H_1: Consumers' WTP for food labeled local within 400 miles and their WTP for food generically labeled local are not the same.	Reject H_0 $WTP_{Local} \neq WTP_{Lcoal400}$ $(p \leq 0.05)$

H_0: Consumers' WTP for food labeled local from mid-Atlantic and their WTP for food generically labeled local are the same. H_1: Consumers' WTP for food labeled local from mid-Atlantic and their WTP for food generically labeled local are not the same.	Reject H_0 $WTP_{Local} \neq WTP_{Lcoal\ MidAtlantic}$ $(p \leq 0.05)$
H_0: Consumers' WTP for food labeled local from Delaware and their WTP for food generically labeled local are the same. H_1: Consumers' WTP for food labeled local from Delaware and their WTP for food generically labeled local are not the same.	Cannot reject H_0 $(p > 0.1)$
H_0: Consumers' WTP for food labeled local from New Jersey and their WTP for food generically labeled local are the same. H_1: Consumers' WTP for food labeled local from New Jersey and their WTP for food generically labeled local are not the same.	Reject H_0 $WTP_{Local} \neq WTP_{Lcoal\ NewJersey}$ $(p \leq 0.01)$

Table 2: Summary of selected survey responses

Variable	
Age (years)	Mean = 47.82
	Percent of respondents
Gender (1=Female; 0=Male)	56.00
Primary shopper (1=Yes; 0=No)	67.38
Highest education levels:	
Some school	2.41
High school graduate	14.44
Some college	25.14
Bachelor's degree	31.02
Advanced or graduate degree	26.74
Household income:	
Less than $10,000	4.55
$10,000 to $24,999	6.15
$25,000 to $34,999	4.81
$35,000 to $74,999	31.29
$75,000 to $99,999	15.78
$100,000 to $149,999	19.25
$150,000 to $249,999	13.37
$250,000 or more	4.81
Political affiliation:	
Conservative	33.16
Moderate	30.48
Liberal	28.34
Other	7.22
Respondents' primary occupation:	
Government employee	68.18
Retired	19.25
Student	5.08
Unemployed	2.14
Stay-at-home parent	5.08

Table 3: Summary of consumption patterns for oysters and other seafood

Variable	Mean/Percentage of respondents
First time oyster consumer (1=Yes; 0=No)	25.4%
Annual Oyster Consumption frequency	
0	43.85%
1–2	28.61%
3–5	17.38%
6–9	7.49%
More than 9	2.67%
Frequency of eating seafood (times per month)	8.98
Frequency of eating at restaurant (times per month)	14.77
Percent seafood eaten when at restaurant	44.67%
How important is oyster harvest location (1–9)	5.24
Read food label when buying food (1–5)	3.84
Look for information on food facts (1–5)	3.66
Need federal definition of food labels (1–5)	3.81
I am nutrition and health conscious (1–5)	3.90

Table 4: Participants' perceptions about local food

Variable	Mean	Std. dev.	Min	Max	CI95
Fresh	4.32	0.90	1	5	±0.09
Support local farmers	4.01	0.94	1	5	±0.03
Better taste	3.97	0.96	1	5	±0.10
Nutritious	3.74	0.99	1	5	±0.10
Sustainability	3.69	0.97	1	5	±0.10
Community interaction	3.67	1.07	1	5	±0.11
Environment	3.67	1.06	1	5	±0.11
Pro local where one lives	4.25	0.91	1	5	±0.09
Pro local when traveling	4.03	0.94	1	5	±0.10

N = 374

Table 5: Logit estimates of oyster purchase decision

	Oyster characteristics			Oyster characteristics and demographics		
Variables	Coeff.	Std. Error	ME	Coeff.	Std. Error	ME
Price	−1.32***	0.21	0.00	−1.41***	0.21	−0.03
West-coast	−0.91***	0.31	−0.02	−0.95***	0.32	−0.02
East-coast	0.46**	0.27	0.02	0.48	0.27	−0.01
Any local	0.7	0.24	0.02	0.64**	0.24	−0.02
Nonlocal	−1.41***	0.34	−0.02	−1.47***	0.35	−0.02
High	−0.12	0.29	0.00	−0.14	0.3	0.00
Moderate	−0.97***	0.32	−0.02	−1.06***	0.33	−0.02
Low	−1.89***	0.4	−0.03	−1.85***	0.41	−0.02
DE resident	−1.14**	0.51	−0.03	−0.7	0.51	−0.02
MD resident	−1.67***	0.77	−0.03	−1.25**	0.76	−0.02
NJ resident	−2.27***	0.57	−0.04	−1.69***	0.6	−0.03
NY resident	−1.27	0.72	−0.02	−0.18	0.75	0.00
PA resident	−1.58**	0.59	−0.03	−1.06**	0.61	−0.02
Female				−0.95**	0.38	−0.03
Primary-shopper				0.53	0.4	−0.01
Frequent consumer				0.59***	0.17	−0.01
First time consumer				−1.74***	0.6	−0.03
Income levels				0.12	0.09	0.00
Education				0.33**	0.14	−0.01
Age				−0.01	0.01	0.00
N	2,992			2,928		

Notes: ***, **, and * indicate statistical significance at 1%, 5%, and 10% respectively. Robust standard errors are estimated. Numbers in parentheses are marginal effects.
ME: Marginal effects

Table 6: WTP for oysters

	Oyster characteristics only			Oyster characteristics and demographics		
Variables	WTP	Lower	Upper	WTP	Lower	Upper
West-coast	–0.69	–1.18	–0.20	–0.67	–1.15	–0.19
East-coast	0.34	–0.07	0.75	0.34	–0.06	0.73
Any local	0.53	0.16	0.90	0.45	0.10	0.80
Nonlocal	–1.07	–1.65	–0.48	–1.04	–1.61	–0.48
High	–0.09	–0.52	0.34	–0.10	–0.52	0.32
Moderate	–0.73	–1.24	–0.22	–0.75	–1.25	–0.26
Low	–1.43	–2.12	–0.74	–1.31	–1.94	–0.69
statedum6	–0.86	–1.66	–0.06	–0.50	–1.21	0.22
statedum11	–1.26	–2.48	–0.04	–0.89	–1.98	0.21
statedum13	–1.71	–2.70	–0.73	–1.19	–2.07	–0.32
statedum14	–0.96	–2.05	0.12	–0.12	–1.17	0.92
statedum17	–1.20	–2.14	–0.25	–0.75	–1.61	0.12
Female				–0.67	–1.20	–0.13
Primary shopper				0.37	–0.18	0.93
Frequent consumer				0.42	0.14	0.69
First time consumer				–1.23	–2.09	–0.38
Income				0.09	–0.05	0.22
Education				0.23	0.04	0.43
Age				–0.01	–0.02	0.01
WTP at means	1.15***	0.37	1.94	1.46***	0.59	2.34

Notes: WTP presented in the means rows are the WTP at the means, and standard errors are calculated using the delta method. ***, **, and * indicate statistical significance at 1%, 5%, and 10% respectively.

Table 7: Random effect logit estimation of local oyster choice with different local definitions

	Oyster characteristics			Oyster characteristics and demographics		
Variable	Coeff.	Std. Error	ME	Coeff.	Std. Error	ME
Price	−1.15*	0.33	−0.05	−1.15*	0.34	−0.05
Local25	−0.61	0.46	−0.02	−0.63	0.47	−0.02
Local100	−0.55	0.39	−0.02	−0.5	0.4	−0.02
Local400	−1.67*	0.51	−0.05	−1.83**	0.51	−0.05
Local-Mid Atlantic	−1.11*	0.41	−0.04	−1.07*	0.42	−0.03
Local-Delaware	−0.35	0.41	−0.01	−0.37	0.42	−0.01
Local-New Jersey	−2.01*	0.49	−0.05	−1.95**	0.51	−0.05
Female				−1.76*	0.56	−0.09
Primary shopper				0.15	0.53	0.01
Frequent consumer				0.68*	0.23	0.03
First time consumer				−2.09*	0.84	−0.06
Income				0.01	0.11	0.00
Education				0.73**	0.22	0.03
Age				−0.02	0.01	0.00
N	1,070			1,050		

Notes: ***, **, and * indicate statistical significance at 1%, 5%, and 10% respectively. Robust standard errors are estimated. Numbers in parentheses are marginal effects.

Table 8: WTP for local oysters with different definitions of local

	Oyster characteristics			Oyster characteristics and demographics		
	WTP	Lower	Upper	WTP	Lower	Upper
Local-25	−0.53	−1.41	0.35	−0.55	−1.45	0.35
Local-100	−0.48	−1.25	0.28	−0.44	−1.21	0.33
Local-400	−1.45	−2.72	−0.19	−1.59	−2.94	−0.25
Local-Mid Atlantic	−0.97	−1.99	0.05	−0.93	−1.96	0.11
Local Delaware	−0.30	−1.04	0.44	−0.32	−1.09	0.45
Local New Jersey	−1.74	−3.25	−0.23	−1.70	−3.27	−0.14
Female				−1.54	−2.77	−0.30
Primary shopper				0.13	−0.78	1.04
Frequent consumer				0.59	0.07	1.12
First time consumer				−1.82	−3.49	−0.15
Income				0.01	−0.18	0.20
Education				0.64	0.12	1.16
Age				−0.01	−0.04	0.01
WTP at means	0.59	−0.69	1.86	0.80	−0.59	2.19

Notes: WTP presented in means rows are WTP at the means, and standard errors are calculated using the delta method. ***, **, and * indicate statistically significance at 1%, 5%, and 10% respectively.

Appendix A – Experiment Design Roadmap

Step 1. Experimental questions design. This step included stakeholder input, such as industry experts, restaurant owners and policymakers.

Step 2. Location scouting: This step also included recommendations from stakeholders. We also arranged for professional oyster shucking services, which accompanied us to each experiment.

Step 3. Design Implementation using dichotomous choice experiments. 374 Participants responded either yes or no to 8 dichotomous choice questions.

a. Participants were set up with $10.
b. Participants preselected the number of oysters they would want to purchase (3, 6, 9 or 12) and how they would like the oysters prepared (raw, fried or in a bag of ice for take-home).
c. Participants made 8 dichotomous choice decisions.
d. Participants filled out a survey
e. Random selection of one of the participant's decision – a roll of the dice determined which one of the eight decisions would be implemented (ensured incentive compatibility).
f. If random draw selected a yes decision, the participants paid for the oysters and would receive the oysters as indicated in their pre-selection (b); if the random draw resulted in a no decision, the participant would receive the $10 and no oysters.

Step 4. Data analysis and preparation of manuscript, outreach activities.

Appendix B – Experiment Instructions

Please read these instructions carefully and do not communicate with any other participants while you are making your decisions.

- **We will give you $10 that you may use to purchase oysters in this study or you may keep.**
- Depending on the choices you make, you may receive a combination of cash and oysters. There is the possibility of you owing us money if the cost of your oysters is greater than $10. In such case, you can pay with cash, check or credit card for the oysters.
- Your decisions are just like the ones you make in a store, you either buy at the listed price or you don't.

Guidelines:

1. Decide how many oysters you want to buy (3, 6, 9 or 12)
2. Decide how you would like your oysters prepared (raw on the half shell, fried, in a bag with ice)
3. Decide if you want to buy the oyster options at the listed price by selecting 'Yes' or 'No'
4. Fill out a short survey
5. Roll a digital die to determine which oyster option will be implemented (only one will be implemented)

Example 1: If you selected 'Yes' for an oyster option that costs $7 and this option is implemented, you will receive the oysters and $3 cash ($10 – $7 = $3).

Example 2: If you selected 'No' for an oyster option and this option is implemented, you will receive $10 and will not receive any oysters.

Example 3: If you selected 'Yes' for an oyster option that costs $15 and this option is implemented, you will receive the oysters and owe $5 ($10 – $15 = –$5).

The Department of Applied Economics and Statistics
College of Agriculture and Natural Resources
University of Delaware

The Department of Applied Economics and Statistics carries on an extensive and coordinated program of teaching, organized research, and public service in a wide variety of the following professional subject matter areas:

Subject Matter Areas

- Agricultural Policy
- Environmental and Resource Economics
- Food and Agribusiness Management and Marketing
- International Agricultural Trade
- Natural Resource Management
- Price and Demand Analysis
- Rural and Community Development
- Statistical Analysis and Research Methods

The department's research in these areas is part of the organized research program of the Delaware Agricultural Experiment Station, College of Agriculture and Natural Resources. Much of the research is in cooperation with industry partners, the USDA, and other State and Federal agencies. The combination of teaching, research, and service provides an efficient, effective, and productive use of resources invested in higher education and service to the public. Emphasis in research is on solving practical problems important to various segments of the economy.

The mission and goals of our department are to provide quality education to undergraduate and graduate students, foster free exchange of ideas, and engage in scholarly and outreach activities that generate new knowledge capital that could help inform policy and business decisions in the public and private sectors of the society. APEC has a strong record and tradition of productive programs and personnel who are engaged in innovative teaching, cutting-edge social science research, and public service in a wide variety of professional areas. The areas of expertise include: agricultural policy; environmental and resource economics; food and agribusiness marketing and management; international agricultural trade; natural resource management; operations research and decision analysis; rural and community development; and statistical analysis and research methods.

APEC Research Reports are published by the Department of Applied Economics and Statistics, College of Agriculture and Natural Resources of the University of Delaware.