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RESEARCH ARTICLE

Are consumers no longer willing to pay more for local foods? A field experiment

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Abstract

Government programs promoting locally produced foods have risen dramatically. But are these programs actually convincing consumers to pay more for locally produced food? Studies to date, which have mostly relied on hypothetical stated preference surveys, suggest that consumers will pay premiums for various local foods and that the premiums vary with the product and presence of any geographic identity. This study reports results from a large field experiment involving 1,050 adult consumers to reveal consumers' willingness to pay (WTP) premiums for "locally produced" foods – mushrooms and oysters. Despite strong statistical power, this study reveals no positive effect of the locally produced label on consumer WTP. These null results are contrary to most of the existing literature on this topic. The finding that consumers are not willing to pay more for local foods has important implications for state and federal agencies that promote labeling campaigns that seek to increase demand and generate premiums for locally produced foods.

Keywords: field experiment; local foods; willingness to pay

JEL Codes: Q18; Q13; D12; C93

Research highlights

- Federal and state programs promoting local food have grown significantly.
- Estimates of consumers' willingness to pay (WTP) premiums for local food are largely based on hypothetical surveys.
- We investigate consumer WTP for local foods in a large-scale field experiment.
- Our experiment finds no effect of a generic locally produced label on consumer WTP.
- Consumer WTP declines as the perceived distance of local increases.

Introduction

Recent trends in the U.S. food system point to increasing interest among consumers in locally produced food (Carpio and Isengildina-Massa 2009; Grebitus et al. 2013;

Martinez and Park 2021). While the 2008 Farm Bill defines a product as local if the total distance that the product is transported does not exceed 400 miles from the origin or if the food product is raised, produced, and distributed in a particular state (Food, Conservation and Energy Act of 2008; Thilmany McFadden 2015; Li et al. 2020a) according to the U.S. Department of Agriculture (USDA), there is no formal or universally agreed-upon distance that defines a food as local (Thilmany McFadden 2015; Low et al. 2015; Martinez 2016). In the absence of a formal definition, U.S. consumers have tended to associate the term with in-state and regional geographic boundaries and/or as their having a personal connection to the production system (Thilmany McFadden 2015; Martinez 2016; Li et al. 2020a). In response to these perceptions, 47 states have invested in policies and marketing campaigns to support and promote local food (see Table 1) since their production typically is small in scale and involves greater costs per unit than industrial production. In addition, millions of federal dollars from the Farm Bill are supporting these systems through marketing and promotion, business assistance and agricultural research, rural and community development, and nutrition and education programs (Martinez et al. 2010; Johnson and Cowan 2019).

There is no question that federal and state initiatives promoting local food systems are growing. The question is whether U.S. consumers are currently willing to pay *more* for local food than for food produced and transported over long distances – whether they value the localness of the food they consume, and, as a result, whether producers of local food are likely to earn more money per item sold by marketing their foods as local. Understanding whether a price premium exists for local products is important to inform marketers and policymakers. The existence of premiums should entice producers to market local foods since they will generate greater revenue and capture higher profits. It should also encourage retailers to purchase and market local foods, even if they cost more than similar food produced in other locations. This increase in demand for local foods, if it exists, can be important for the viability of local food systems since the production of local food is often small-scale.

Our study investigates whether a local label inspires Mid-Atlantic consumers to pay a premium for mushrooms and oysters in the Mid-Atlantic. We elicit revealed preferences in a large-scale field experiment using the incentive-compatible Becker-DeGroot-Marschak (BDM) auction mechanism. This research contributes to the discussion about the definition of localness to reveal whether a generic local label can generate additional profits for producers and retailers.

Localness has been defined in various ways in the literature. The terms "locally grown" or "locally produced" have been used most often, but studies have also explored defining localness in "food miles" and "food distance" (Adalja et al. 2015; de-Magistris and Gracia 2016; Li et al. 2020a) and preferring to "buy the product from a farmer [I] know" (Adalja et al. 2015). Li et al. (2020b) tested several definitions of local oysters and found that none produced significantly greater WTP. Kecinski et al. (2017) inferred preferences for local foods using product attributes that specified oyster brand and harvest location. The authors found that consumers did not exhibit preferences for oysters harvested from specific locations. Rather than specifying a harvest location or distance, this study tests the impact of a generic label, "locally produced," on WTP for mushrooms and oysters. This generic description reflects the current state of the market in which there is no universal definition of local food (Martinez et al. 2010). Additionally, we elicit consumer perceptions of local by asking adult consumers to specifically state how far away food production can be (in miles) for them to consider the production as local.

Our study contributes broadly to the literature using revealed preference methods with a large sample size to study local labels. Printezis et al. (2019) found that 80% of studies in their meta-analysis relied on hypothetical choice experiments. Most of the

Table 1. State marketing campaigns for local foods

State	Local food marketing program
Alabama (AL)	Sweet Grown Alabama
Alaska (AK)	Alaska Food Policy Council, Alaska Grown
Alaska (AK)	Alaska Grown
Arizona (AZ)	Arizona Grown
Arkansas (AR)	Arkansas Grown
California (CA)	California Grown
Colorado (CO)	Colorado Proud
Connecticut (CT)	Connecticut Grown, Buy Local Eat Local Fairfield Connecticut
Delaware (DE)	Delaware Grown
Florida (FL)	Fresh From Florida
Georgia (GA)	Georgia Grown
Hawaii (HI)	Made in Hawaii – Local Food, Hawaii Seals of Quality, Buy Local, It Matters!
Idaho (ID)	Famous Idaho Potatoes/Grown in Idaho, Idaho Preferred
Illinois (IL)	The Illinois Product Logo Program, Buy Fresh Buy Local Illinois
Indiana (IN)	Indiana Grown
Iowa (IA)	Choose Iowa
Kansas (KS)	Local Food and Farm Task Force, From the Land of Kansas
Kentucky (KY)	Buy Local Program, The Kentucky Proud Program
Louisiana (LA)	Certified Logo Program, Louisiana Grown
Maine (ME)	Real Maine
Maryland (MD)	Maryland's Best
Massachusetts (MA)	Massachusetts Grown . . . and Fresher
Michigan (MI)	Michigan Apples, Michigan Grown
Minnesota (MN)	Minnesota Grown
Mississippi (MS)	Genuine MS
Missouri (MO)	Missouri Grown
Montana (MT)	Made in Montana (Grown in Montana Logo)
Nebraska (NE)	Buy Fresh Buy Local Nebraska, Nebraska Thursdays
Nevada (NV)	Buy Nevada
New Hampshire (NH)	"New Hampshire's Own" Dairy Program, NH Made
New Jersey (NJ)	New Jersey Fresh
New Mexico (NM)	New Mexico – Taste the Tradition/Grown with Tradition
New York (NY)	New York State Grown and Certified

(*Continued*)

Table 1. (*Continued*)

State	Local food marketing program
North Carolina (NC)	Got To Be NC
North Dakota (ND)	Pride of North Dakota
Ohio (OH)	Ohio Proud
Oklahoma (OK)	Made in OK
Oregon (OR)	N/A
Pennsylvania (PA)	PA Produce-Homegrown Happiness, PA Preferred
Rhode Island (RI)	RI Grown/Get Fresh Buy Local
South Carolina (SC)	Certified South Carolina
South Dakota (SD)	N/A
Tennessee (TN)	Pick Tennessee Products
Texas (TX)	Go Texan
Utah (UT)	Utah's Own
Vermont (VT)	N/A
Virginia (VA)	Virginia's Finest
Washington (WA)	Washington Apples
West Virginia (WV)	West Virginia Grown
Wisconsin (WI)	Something Special from Wisconsin, Buy Local, Buy Wisconsin
Wyoming (WY)	Grown in Wyoming

incentive-compatible experiments in the meta-analysis pointed to a premium on local foods. However, with the exceptions of a few studies that used a within-subject design (Adalja et al. 2015; Kallas et al. 2019; Sanjuán-Lopez and Resano-Ezcaray 2020; Li et al. 2020b) many of those studies that used incentive-compatible mechanisms analyzed relatively small samples and many investigated markets outside of the U.S. (see Table 2). Printezis et al. (2019) compared the original study results to results produced when controlling for publication bias and methodological variation and found that the WTP premiums identified in the studies did not disappear when controlling for those factors. Rather, the magnitudes of the premiums changed significantly. Overall, they found a range of premiums for local foods of $1.70 to $2.08 per pound. However, this range of premiums decreased to just $0.29 to $0.40 after correcting for publication bias. Thus, while much of the previous literature points to local premiums, current estimates may be exaggerated due to publication bias and the use of relatively small sample sizes in existing incentive-compatible studies (Ferraro and Shukla 2022; Printezis et al. 2019). Our research provides further evidence that the price premium for locally labeled foods may not be as large as previously claimed and perhaps this premium currently does not exist at all.

Related literature

Comprehensive reviews of literature related to consumers' WTP more for local foods have recently been conducted by Printezis et al. 2019 and Enthoven and Van den Broeck 2021.

Table 2. Previous incentive-compatible studies investigating the local label

Year	Authors	Participants	Country	Product type	Method	WTP Local Premium
2009	Yue and Tong	343	USA	Tomatoes	Discrete choice with three alternatives	Yes
2011	Costanigro et al.	300	USA	Apples	Discrete choice method with three alternatives	Yes
2012	Gracia et al.	77	Spain	Lamb ribs	Simultaneous experimental fourth price auction	Yes
2013	Grebitus	47	Germany	Apples	Second price auction	Yes
2014	Gracia	133	Spain	Lamb ribs	Discrete choice with three alternatives	Yes
2015	Adalja et al.	685*	USA	Ground beef	Frame field experiment with conjoint choice method	Yes
2016	Gracia A and de-Magistris	155	Spain	Lamb ribs	Simultaneous experimental fourth price auction	Yes
2016	de-Magistris and Gracia	171	Spain	Almonds	Discrete choice method with three alternatives	Yes
2016	Wageli, Janssen, and Hamm	597	Germany	Milk, pork cutlets, and eggs	Discrete choice method with three alternatives	Yes
2017	Bazzani et al.	80	Italy	Applesauce	Discrete choice method	Yes
2017	Kecinski et al.	155	USA	Oyster	Single-bounded dichotomous choice from a framed field experiment	No
2019	Fan et al.	80	USA	Broccoli	BDM auction	Yes
2019	Kallas et al.	210*	Argentina	Honey	Discrete choice method	Yes
2020	Sanjuán-López A. and Resano-Ezcaray H.	208*	Spain	Saffron	Discrete choice method without status quo	Yes
2020a	Li et al.	374	USA	Oyster	Closed-ended single-bounded dichotomous choice	Yes
2020b	Li et al.	758*	USA	Oyster	Single-bounded dichotomous choice from a framed field experiment	Yes

Note: *indicates the study used a within-subject design.

In general, previous literature has found a premium for local food over nonlocal food (Loureiro and Hine 2002; Carpio and Isengildina-Massa 2009; Campbell et al. 2010; Onozaka and McFadden 2011; Carroll et al. 2013; Hempel and Hamm 2016; Pritnezis et al. 2019; Enthoven and Van den Broeck 2021). Several studies have identified premiums for locally produced fruits and vegetables (Jekanowski et al. 2000; Loureiro and Hine 2002; Brown 2003; Giraud et al. 2005; Darby et al. 2008; Sirieix et al. 2008; Thilmany et al. 2008; Campbell et al. 2010; Nganje et al. 2011; Onozaka and McFadden 2011; Grebitus et al. 2013; Hempel and Hamm 2016; Printezis and Grebitus 2018) and value-added processed products like maple syrup (Giraud et al. 2005), wine (Jekanowski et al. 2000; Grebitus et al. 2013), bread (Hasselbach and Roosen 2015), honey (Wu et al. 2015), beer (Hasselbach and Roosen 2015), flour (Hempel and Hamm 2016), blueberry jam (Hu et al. 2012), and strawberry preserves (Onken et al. 2011). Other studies found local premiums for animal products (Wang et al. 1997; Jekanowski et al. 2000; Doyon et al. 2008; Umberger et al. 2009; Caroll et al. 2013; Chang et al. 2013; Tempesta and Vecchiato 2013; Adalja et al. 2015; Hasselbach and Roosen 2015; Hempel and Hamm 2016; Willis et al. 2016) and seafood (Giraud et al. 2005).

There is some evidence that price premiums may be due to other factors associated with local products. For example, the premium was high for local foods only when consumers were not from farm households (Brown 2003) or when consumers perceived local farmers as struggling, marginalized, and deserving of special attention (Toler et al. 2009). Local premiums sometimes reflected the status of value-added high-end luxury products (Giraud et al. 2005) or highly consumed products (Tempesta and Vecchiato 2013). Printezis and Grebitus (2018) found that local products sold at the grocery store elicited premiums not found at farmer's markets. Moreno and Malone (2021) found that consumers' preferences for local food varied depending on the type of food item considered and whether the item had a local identity – it was associated with the area in some way, such as being a crop the state is known for producing (i.e., maple syrup in Vermont).

Like much of the previous literature on local food systems, the aforementioned studies frequently rely on hypothetical choice experiments (Printezis et al. 2019; Enthoven and Van den Broeck 2021). The literature on incentive-compatible revealed preference studies on preferences for local food products is limited. Such studies commonly used lab experiments, artefactual experiments, or nonhypothetical choice experiments. Most incentive-compatible studies were conducted in the United States (Yue and Tong 2009; Costanigro et al. 2011; Adalja et al. 2015; Kecinski et al. 2017; Fan et al. 2019; Li et al. 2020a; 2020b; Wu et al. 2015) or Europe (Gracia et al. 2012; de-Magistris and Gracia 2016; Wägeli et al. 2016; Bazzani et al. 2017; Sanjuán-López and Resano-Ezcaray 2020) and rarely in other parts of the world like South America (Kallas et al. 2019). In many cases, the incentive-compatible research has also found that consumers are willing to pay a premium for local foods including fresh produce and nuts (Yue and Tong 2009; Costanigro et al. 2011; Grebitus et al. 2013; de-Magistris and Gracia 2016; Fan et al. 2019; Sanjuán-López and Resano-Ezcaray 2020; Moreno and Malone 2021), processed foods such as applesauce (Bazzani et al. 2017) and wine (Grebitus et al. 2013), and animal products (Gracia et al. 2012; Adalja et al. 2015; Gracia and de-Magistris 2016; Wägeli et al. 2016; Kallas et al. 2019; Li et al. 2020a; 2020b). However, other studies have found that only small segments of consumers are willing to pay more (Adalja et al. 2015; de-Magistris and Gracia 2016; Li et al. 2020a).

To our knowledge, no incentive-compatible study has investigated consumer preferences for mushrooms. However, a stated preference study found evidence of a premium on local mushrooms (Chakrabarti et al. 2019). Recent studies on consumer WTP

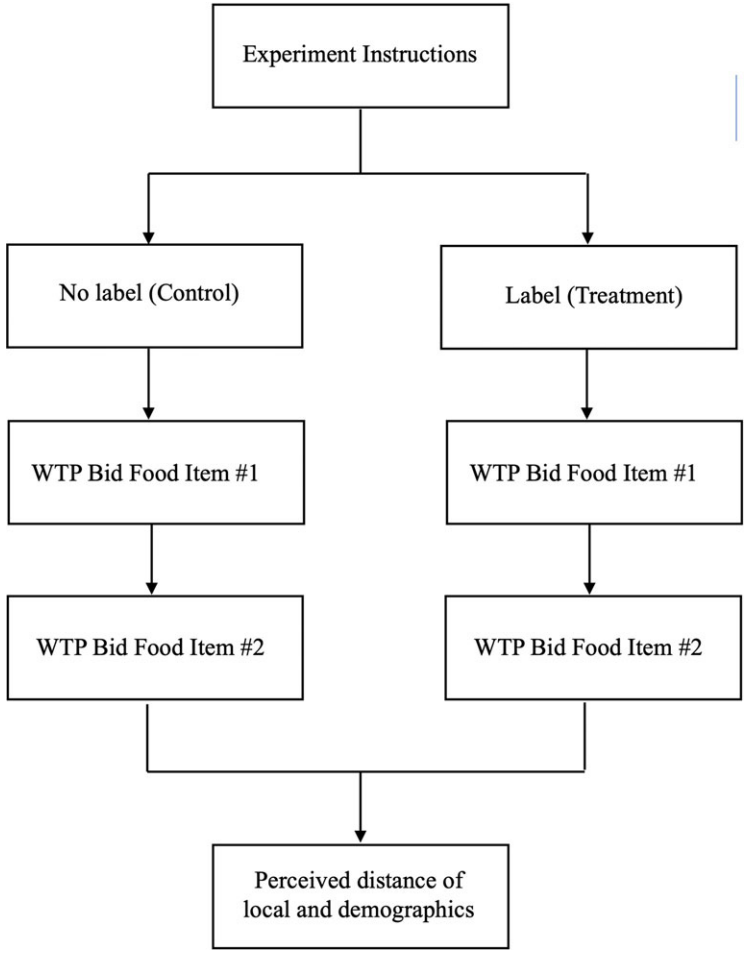

Figure 1. Diagram of experimental flow.
Note: Food item refers to oysters or mushrooms; the presentation of food items was randomized to avoid order effects.

for oysters showed local premiums in stated preference studies (Chen et al. 2017; Tian et al. 2021), but the evidence from incentive-compatible revealed preference studies is mixed (Kecinski et al. 2017; Li et al. 2020a).

Methods

Experimental design

The diagram in Fig. 1 illustrates the flow of the experiment used in this study. To elicit revealed preferences in response to labeling food as local, we implemented a large-scale field experiment that employed the incentive-compatible BDM auction mechanism to measure consumer WTP for local mushrooms and oysters (Becker et al. 1964). Participants were given an account balance of $10 and asked to make purchasing decisions

for white button mushrooms and raw oysters by stating the highest amount of money they would pay for the product (aka., their WTP).[1] The products were presented in bundles that had a market value of approximately $5, and participants' offers were bounded between $0 and $10. The upper bound was based on the market value of the food items ($5) and the project budget.

We specifically chose to study premiums for mushrooms and oysters because of their histories and connections to the local region in our study. The mushroom industry is well established in the Mid-Atlantic states, which currently account for 64% of the total volume of national sales of fresh mushrooms (USDA NASS 2021). Despite its established presence (Kennett Square in southeastern Pennsylvania along the Delaware border is colloquially known as the "Mushroom Capital of the World"), little is known about consumers' WTP for mushrooms labeled as local. Oysters from the Delaware Inland Bays, on the other hand, are a relatively new product as oysters produced in the area declined dramatically due to disease and overharvesting and are just recently coming back due to aquaculture methods (Kecinski et al. 2017). However, oysters are generally produced in great numbers in the region, especially in the Chesapeake Bay (primarily Maryland and Virginia).

This study was approved by the Institutional Review Board at the University of Delaware. Data were collected between June 1 and October 31, 2019, at six locations in the Mid-Atlantic region of the United States – a local creamery, a state fair, a ferry terminal, a university campus laboratory, Osher lifelong learning institute, and university-sponsored community event promoting coastal research. Participants were recruited through community flyers and convenience sampling in person at public events. In total, 1,050 adults aged 22 years or older participated in the study.[2]

The experiment presented each participant with the opportunity to purchase mushrooms and oysters. We randomly assigned participants in a session to the local-label treatment and control groups. Participants in the treatment group viewed bundles labeled simply as "locally produced" with no definition of local provided. For example, when stating WTP for oysters, participants in the treatment group were asked to "*please indicate the maximum amount you would be willing to pay (from $0.00 to $10.00) for 2 locally produced oysters*" (see Appendix A). Identical items were presented to the control group with no labels.

As is common with economic experiments that use the BDM protocol, participants were informed[3] that, after the purchase decisions were made, the experiment administrators would randomly select one of the food items for implementation at a randomly generated price. Participants who expressed WTP equal to or greater than the randomly generated price purchased the selected item. They received the product and the balance of the funds in cash if they were successful bidders. Participants who expressed that WTP was lower than the randomly generated price did not purchase the food item and received the entire $10 balance.

Because we used a generic definition of local, we asked participants to define local food in a follow-up question after the experiment: "*Up to what distance (in miles) do you consider food to be locally produced?*" The post-experiment survey also collected demographic characteristics (see Appendix A).

[1]This study is part of a larger experiment on peer effects for food items consumed in group settings (Langer et al. 2022). Thus, the participants also made bids on a third food item, chocolate fondue. The order in which the products were presented to participants was randomized to account for potential order effects.

[2]The original study recruited 1,062 participants. However, responses for the variable measuring perceived distance of locally produced were missing for 12 participants. Thus, the total available data for this study were 1,050.

[3]The experiment instructions are provided in Appendix A.

Power analysis

This study is part of a larger experiment in which the label treatment was randomized by group to measure peer effects (Langer et al. 2022). To determine the target sample size, we used a power simulation for a cluster-randomized crossover study with multiple regressions.[4] Following Reich et al. (2012), power was determined using a simulation of Cohen's F^2, which relies on the use of a predicted R^2 – the proportion of variations in outcomes explained by the treatments in multiple regression (treatments).[5] Based on our regression analysis of pilot data ($N = 52$) collected in the same manner as in the full experiment, we assumed $R^2 = 0.45$ in the cluster-randomized power analysis. The analysis determined that a sample of 1,060 participants was required to identify a statistically significant treatment effect for at least one treatment with power equal to 0.80 when groups were assigned to clusters of four. Because the power analysis was clustered in groups of four, the calculated sample size is a conservative estimate of the sample required for this portion of the larger study that assigned the local-label treatment to individuals. Therefore, we also conducted a statistical power analysis for two unbalanced sample *t*-tests.[6] Of the 1,050 participants in the study, we assigned 455 participants to the treatment group and 595 to the no-label control group. In this analysis, the required statistical power of the local-label experiment was 0.89 with 95% confidence to detect a minimum effect of 0.2 for our two unbalanced sample groups. We chose the conservative estimate of 0.2 following Cohen's small effect size for the *t*-test (Cohen 1988).

By implementing a between-subject design, our study evaluates the isolated decision to produce a locally labeled product that might occur in a retail setting for new and emerging products such as a restaurant or café where there is no "nonlocal" option available. Additionally, in most grocery store settings foods labeled as local are displayed alone and not alongside a similar product that was not grown locally.[7] We would note that other studies of consumer preferences have used within-subject designs because they tend to have stronger statistical power and because they can simulate a market setting where similar products that differ primarily by the production processes are displayed side by side, which can impact consumers' reference points (e.g., conventional milk, rBST-free milk, and organic milk in Kanter et al. 2009).

Data

Table 3 presents summary statistics of the participants in the experiment. On average, participants perceived foods as local when they were produced within 42.3 miles. Almost 57% of the participants were women, and the average participant age was 45. About one-third (35%) of the participants preferred not to identify their political affiliations; the other 65% were distributed almost equally to conservative, moderate, and liberal. White participants represented 77% of the sample, a figure comparable to the weighted average white population of 74% in Delaware, Maryland, and Pennsylvania, the resident states of most of our participants (U.S. Census Bureau 2021). Almost 60% of the participants had at

[4]The cluster-randomized power analysis was conducted using *power.sim.normal()* in R. See Reich et al. (2012) for more details and the R code.

[5]Cohen's F2=R21-R2 where is the measures of variation in outcome variables accounted for by explanatory variables. Independent variables in our case are the treatments in consideration.

[6]We used the *pwr* package in R to calculate power using the *pwr.t2n.test()* function.

[7]Note that some grocers, such as Whole Foods, and seafood retailers sometimes sell a variety of oysters that are labeled based on the location where they were harvested. We do not know of a similar setting for the selling of mushrooms.

Table 3. Summary statistics

Variable	Mean	Standard deviation
Perceived distance of local (miles)	42.31	79.18
Age	44.80	17.52
Female (=1)	0.57	0.50
Education (highest level)		
Less than high school diploma	0.01	0.08
High school diploma	0.11	0.31
Some college, no degree	0.18	0.38
Associate degree	0.09	0.29
Bachelor's degree	0.32	0.47
Master's degree	0.20	0.40
Professional/doctoral degree	0.07	0.25
Household income ($1,000)	73.85	54.01
Political affiliation		
Conservative	0.23	0.42
Moderate	0.21	0.41
Liberal	0.20	0.40
Prefer not to answer	0.35	0.48
Race		
White	0.77	0.42
Asian	0.10	0.29
Black	0.05	0.23
Latino	0.04	0.19
Other race	0.01	0.11
State		
Delaware resident	0.71	0.46
Maryland resident	0.10	0.30
Pennsylvania resident	0.08	0.27
Other state resident	0.12	0.32
WTP for food items (average)		
Oysters	3.23	2.79
Mushrooms	3.39	2.23

least a bachelor's degree. Thus, our sample participants had more education on average than the populations of the three states studied: residents age 25 or older holding at least a bachelor's degree made up 32.7% of the population in Delaware, 40.9% in Maryland, and

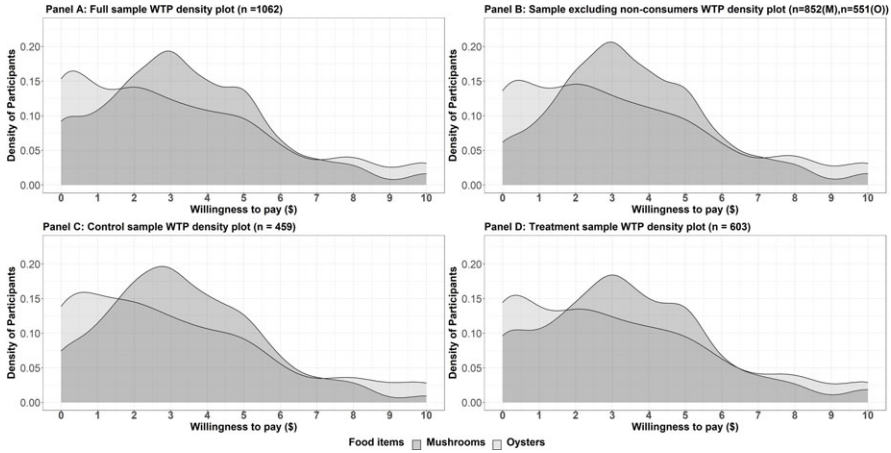

Figure 2. Density plot of willingness to pay of participants for oysters and mushrooms.

32.3% in Pennsylvania (U.S. Census Bureau 2021). The sample's mean household income was $73,850, which is slightly higher than the median household income for Delaware ($69,110) and Pennsylvania ($63,630) but slightly lower than for Maryland ($87,060) (U.S. Census Bureau 2021). Most of the participants (71%) resided in Delaware.

To understand participants' familiarity with the food items offered in this experiment, we asked how often they consumed oysters and mushrooms. The sample consisted of a greater number of nonconsumers of oysters (48.2%) than nonconsumers of mushrooms (20%) (see Figure B1 in Appendix B). The fact that a significant portion of the sample does not consider themselves to be consumers of oysters is not surprising, especially since in this research the oysters were being served raw (as is common in high-end restaurants and retail outlets). Interestingly, the percentages of participants who reported "almost never" consuming oysters (17.2%) were similar to the percentage of participants who reported "almost never" consuming mushrooms (13.4%). Future research on consumer demand for locally labeled foods could explore how these labels impact consumers who do and do not consider themselves regular consumers of these foods.

Figure 2 shows that the participants' WTP values are frequently censored at the left (at $0) and the right (at $10) and that censoring is more common for oysters than mushrooms. Panel A represents all participants; Panel B represents the subset created by excluding nonconsumers (participants who reported never consuming the item). Panels A and B show that left censoring is more common than right censoring even when nonconsumers are excluded. Panels C and D present density plots of WTP for the no-label control group versus the treatment group.

Empirical methods

To measure the effect of the local label on WTP, we estimate a two-limit Tobit regression model (censored normal regression) since our data are truncated at the lower ($0) and upper ($10) bounds (Wang et al. 1997; Greene 2012). For individual i

$$y_i^* = \boldsymbol{\beta}'\mathbf{x}_i + e_i \tag{1}$$

where y_i^* is the latent variable of WTP, $\boldsymbol{\beta}$ is a vector of coefficients to estimate, $\mathbf{x}_i$ is a vector of independent variables including the label treatment, and $e_i \sim N(0, \sigma^2)$ represents

residuals that are assumed to be independently and normally distributed with mean zero and variance σ^2. By denoting observed WTP as y_i, the model can be presented as

$$y_i = \begin{Bmatrix} 0 & if\ y_i^* \leq 0 \\ \boldsymbol{\beta}'\mathbf{x}_i + e_i & if\ 0 < y_i^* < 10 \\ 10 & if\ y_i^* \geq 10 \end{Bmatrix}. \tag{2}$$

We estimate the parameters using the corresponding maximum likelihood procedure (Maddala 1986; Wang et al. 1997):

$$L(\beta, \sigma) = \prod_{y_i=0} \Phi\left(\frac{-\beta' x_i}{\sigma}\right) \prod_{y_i=y_i^*} \frac{1}{\sigma}\phi\left(\frac{y_i - \beta' x_i}{\sigma}\right) \prod_{y_i=10} \left[1 - \Phi\left(\frac{10 - \beta' x_i}{\sigma}\right)\right] \tag{3}$$

where $\phi(\cdot)$ and $\Phi(\cdot)$ represent the standard normal density function and distribution function, respectively.

The expected value of latent variable y* is $E\left[y_i^* | \mathbf{x}\right] = \boldsymbol{\beta}'\mathbf{x}$. The coefficient vector $\boldsymbol{\beta}$ thus contains the marginal effects of the independent variables on the latent variable y^* and is represented as $\frac{\delta E[y^*|x]}{\delta X} = \boldsymbol{\beta}$. The marginal effect of the independent variables on dependent variable y (WTP) is the product of $\boldsymbol{\beta}$ and the probability that y^* is greater than 0 but less than 10 (Greene 2012).

$$\frac{\delta E[y|x]}{\delta x} = \boldsymbol{\beta} * Prob\left[0 < y^* < 10\right] \tag{4}$$

The Tobit estimates for participants who had the lowest and highest WTP could be inaccurate because marginal effects for the extreme quantiles are likely to be different than the conditional mean (Gustavsen and Rickertsen 2011), which is assumed to represent the preferences of the entire sample. If the coefficients for various quantiles of participant choices are diverse, the results could fail to reflect the true heterogeneity of preferences.

Since some of the participants reported WTP at the lower and upper bounds (see Fig. 2), the conditional mean may not be truly representative of the sample. To investigate this further, we conducted censored quantile regressions (CQRs) to estimate a coefficient for each quantile (Buchinsky 1998), determining whether estimates of WTP at the extremes are different from estimates at mean and median WTP. Furthermore, unlike the Tobit estimator, CQR estimates are consistent in the presence of heteroskedasticity and nonnormally distributed errors (Powell 1986). Thus, CQR[8] provides a further robustness check on the estimated WTP.

In addition to the base programs in R, we use the *pwr* and *censReg* packages for the empirical analysis (Team 2017).

Results

Table 4 presents the results of the Tobit regressions analyzing the effect of the local label on consumer WTP for oysters and mushrooms. Though we find no statistical evidence that consumers are willing to pay a premium for locally produced oysters and mushrooms, we find a statistically significant negative relationship between the perceived distance defining local production and WTP for oysters. A one-mile increase in the distance perceived as local decreases WTP for oysters by $0.005. Interaction of the local label with perceived distance has no effect on WTP.

[8]The CQR was estimated using the *censReg* package in R (Team, 2017).

Table 4. Tobit regression results: effect of local label on willingness to pay for oysters and mushrooms

	(1)		(2)	
	Oysters		Mushrooms	
Variable	Coefficient	Marginal effect	Coefficient	Marginal effect
Local label	−0.105	−0.084	−0.075	−0.068
	(0.245)	(0.196)	(0.175)	(0.16)
Perceived distance of locally grown	−0.005**	−0.004*	−0.002	−0.002
	(0.002)	(0.002)	(0.001)	(0.001)
Local label x Perceived distance	0.003	0.002	0.001	0.001
	(0.003)	(0.002)	(0.002)	(0.002)
Coast-day site	0.661	0.529	0.448	0.409
	(0.67)	(0.537)	(0.483)	(0.441)
Ferry site	0.007	0.006	0.360	0.329
	(0.707)	(0.566)	(0.508)	(0.464)
U-dairy site	0.243	0.195	0.493	0.45
	(0.517)	(0.414)	(0.373)	(0.341)
State fair site	−0.116	−0.093	−0.06	−0.055
	(0.514)	(0.411)	(0.371)	(0.339)
Age	0.007	0.005	0.010**	0.009*
	(0.007)	(0.005)	(0.005)	(0.004)
Female	0.310	0.249	0.052	0.048
	(0.217)	(0.174)	(0.157)	(0.143)
Conservative	−0.088	−0.070	−0.169	−0.154
	(0.337)	(0.27)	(0.242)	(0.221)
Moderate	0.776**	0.621*	0.273	0.249
	(0.331)	(0.265)	(0.238)	(0.217)
No political affiliation	0.160	0.128	−0.008	−0.008
	(0.314)	(0.251)	(0.226)	(0.206)
Asian	1.429***	1.144***	−0.126	−0.115
	(0.404)	(0.324)	(0.291)	(0.266)
Black	1.728***	1.384***	−0.174	−0.159
	(0.472)	(0.378)	(0.339)	(0.31)
Latino	0.178	0.143	−0.153	−0.14
	(0.566)	(0.453)	(0.408)	(0.372)
Other race	−0.711	−0.570	0.294	0.268
	(1.00)	(0.801)	(0.71)	(0.649)

(*Continued*)

Table 4. (*Continued*)

	(1)		(2)	
	Oysters		Mushrooms	
Variable	Coefficient	Marginal effect	Coefficient	Marginal effect
Less than high school diploma	0.814	0.652	1.449	1.323
	(1.311)	(1.05)	(0.95)	(0.868)
Some colleges, no degree	−0.908**	−0.727*	−0.346	−0.316
	(0.388)	(0.311)	(0.279)	(0.255)
Associate degree	−0.972**	−0.778*	−0.361	−0.329
	(0.454)	(0.363)	(0.327)	(0.298)
Bachelor's degree	−1.129***	−0.904**	−0.503*	−0.459
	(0.37)	(0.296)	(0.266)	(0.243)
Master's degree	−0.877**	−0.702*	−0.179	−0.163
	(0.41)	(0.329)	(0.296)	(0.27)
Professional/doctorate degree	−0.919*	−0.736	−0.412	−0.376
	(0.541)	(0.433)	(0.389)	(0.355)
Household income	0.0002	0.0002	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.001)
Maryland	−0.170	−0.136	0.287	0.262
	(0.464)	(0.372)	(0.334)	(0.305)
Pennsylvania	−0.073	−0.058	−0.338	−0.308
	(0.404)	(0.324)	(0.291)	(0.266)
Other state	0.273	0.219	−0.212	−0.194
	(0.34)	(0.273)	(0.244)	(0.223)
Constant	3.015***		3.083***	
	(0.729)		(0.525)	
Sigma	3.300***		2.405***	
	(0.085)		(0.057)	
Observations	1050		1050	

Standard errors in parentheses
***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

We further find some associations between WTP for the oysters and several demographic characteristics. Individuals who politically identified as moderate were willing to pay $0.78 more for oysters on average than individuals who identified as liberal. Individuals with the highest levels of education were less willing to pay for oysters than individuals who had only a high school diploma, and Asian and Black consumers were willing to pay more for oysters than white consumers. The results for mushrooms reveal no statistically significant relationships between consumer demographics and WTP. We also find that income plays no significant role in WTP for oysters and mushrooms. In both

Table 5. Regression result from censored quantile regression: effect of local label on willingness to pay (pooled observations)

	Coefficient at percentile (P) of willingness to pay				
Variable	P = 0.05	P = 0.25	P = 0.5	P = 0.75	P = 0.95
Local label	0.0619	0.0919	−0.0183	−0.0351	−0.4860
	(0.0351)	(0.1823)	(0.2849)	(0.4176)	(0.3976)
Perceived distance of locally grown	0.0002	−0.0014***	−0.0016	−0.0019	−0.0044*
	(0.0001)	(0.0003)	(0.0051)	(0.0522)	(0.0022)
Local label x perceived distance	−0.0002	−0.0001	0.0000	0.0016	0.0017
	(0.0002)	(0.0005)	(0.0135)	(0.0533)	(0.0023)
Constant	−0.2081***	1.3607***	3.0519***	5.0378***	8.7471***
	(0.0233)	(0.14)	(0.1731)	(0.2044)	(0.2919)

Standard errors in parentheses.
***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

cases, the marginal effects of the independent variables on WTP are similar to the coefficient estimates from the models.

Because perceptions of oysters as local can vary by attributes such as distance to the coast, we controlled for experiment-site fixed effects. We find no significant differences in WTP associated with the field sites, including the ones in coastal areas, relative to individuals who completed the experiment in lab settings.

To test the sensitivity of our results, we also ran Tobit regressions for the sample excluding participants who never consumed the food item and for a model in which all individual observations were pooled rather than disaggregated by food item. Those results are consistent; we once again find no evidence of an effect of the local label (see Tables B2 and B3 in Appendix B).

Robustness tests

Table 5 presents the CQR estimates for participants at the 5th, 25th, 50th (median), 75th, and 95th percentiles of WTP using a reduced-form model and pooling the data from all participants. As shown in the table, we find no difference in treatment effects for the lowest and highest quantiles and no significant treatment effect in any of the percentiles. Furthermore, we find that the distance perceived as local does not consistently predict WTP for all quantiles. The perceived distance is significant for the 25th and 95th percentiles but is not significant for the median participant or for the 75th percentile.

Overall, the results of our statistically powered incentive-compatible field experiment and associated robustness checks consistently show that the generic "locally produced" label had no effect on Mid-Atlantic consumers' WTP for mushrooms and oysters and that the distance perceived as local was negatively associated with WTP for them. We thus find that generic labeling of mushrooms and oysters as locally produced and potentially even labels identifying these products as produced in a consumer's home state could fail to generate price premiums.

Implications of our findings for policymakers and producers

This experiment mimics the current policy environment where no standard definition of "local" exists, and consumers undoubtedly perceive local labels differently. The design also employs a between-subject design as most settings where food is labeled as local do not have a nonlocal version of the product also for sale in that setting. In this study, consumers were unwilling to pay a premium for "local" products, which suggest that such a generic label is not influencing their buying decisions. Thus, the results cast doubt on the efficacy of publicly funded labeling programs that provide only generic descriptions such as "*Locally Produced*." This potential implication for promotion programs is further supported by the inverse relationship found between the WTP premium and the distance perceived as local. The wider the area described as local, the more WTP declines. Ultimately, local food producers potentially could benefit from policymakers establishing an agreed-on geographic or distance-related definition of "local" that does not extend beyond communities or, at most, regions within a state.

Because there is currently no universally agreed-upon definition of local, many consumers associate the term with geographic boundaries such as states or regions (Thilmany McFadden 2015; Martinez 2016). This perception is supported by the large number of state-level programs that fund marketing and promotion initiatives for products grown within state boundaries. As shown in Table 1, the vast majority (47 of 50) of states currently engaged in at least one local food promotion program. This study shows that such investments in local food promotion policies may not be effective at garnering a market premium and potential premiums decline as the geographic distance widens. Without a market premium, producers may not be able to serve local markets in the long term since the production of local foods is typically small-scale and incurs higher costs per unit than industrial production.

Furthermore, the results could indicate that the initial boost in demand from local food promotion programs may have diminished over time. Trends are indeed shifting as we see recent sales of local edible farm products in the U.S. driven primarily by retailers, institutions, and intermediate markets rather than direct-to-consumer outlets (Martinez 2021). Further research on whether consumer preferences for locally produced food have shifted over time is certainly warranted.

Conclusions

Consumers are increasingly seeing foods labeled as locally produced in retail venues, but whether these labels are benefiting local food systems depends upon two important questions that remain: (1) Are consumers willing to pay a premium for local production and (2) What is the definition of local? Studies that found that consumers were willing to pay premiums for locally produced products were mostly based on hypothetical surveys and the definition of local varied by study. Further complicating our understanding of consumers' WTP premiums is the fact that few incentive-compatible economic field experiments have been conducted so far and, with the exception of a notable few, most existing studies have relied on relatively small sample sizes.

We conduct an incentive-compatible nonhypothetical field experiment with a large sample size of adult consumers in the Mid-Atlantic region of the United States to assess consumers' WTP premiums for locally produced mushrooms and oysters. We used a power analysis to identify the sample size needed to measure the effects of a generic local-label treatment. Participants were randomly assigned to either the local-label treatment group or the no-label control group and were asked to submit their highest WTP for

mushrooms and oysters using funds endowed to them at the beginning of the experiment. We chose mushrooms because an extensive market for local mushrooms was established in the Mid-Atlantic region. We chose oysters because locally produced oysters are a relatively new product in the market.

We find no evidence that labeling these products as "locally produced" generates price premiums. We find that the lack of effect of labeling a food generically as local persisted even when we interacted with the effect of the label with consumers' perceived definitions of local in terms of miles. The consideration that a price premium may not exist is important since the meta-analysis of studies of WTP for local food raised a concern about existing literature as there is evidence of publication bias in favor of nonnull results (Printezis et al. 2019). Publication bias can result in exaggerated effect sizes, especially when coupled with low sample sizes (Ferraro and Shukla 2022).

Our study analyzes a sample size that is large enough to provide adequate statistical power to detect economically significant treatment effects. These findings generally contradict the results of numerous prior studies of foods labeled as local. It is important to note that most of these other studies relied on hypothetical survey methods (Printezis et al. 2019) and, with a few exceptions, the revealed preference for economic experiments on the effects of labeling local production often employed designs with relatively small sample sizes (Table 2). The results are in line with results from a couple of previous studies; generic local food campaigns that fail to identify the outer boundary of the products' local origins are likely to be ineffective in promoting WTP for the products. Because we find a negative relationship between distance perceived as local and WTP, labels indicating that foods come from nearby farms, such as in the county or region, could be more effective.

Note that this study uses a generic local label. Future research could test the effects of different kinds of local labels and scopes of definitions of local as consumers' perceptions of localness are likely to vary in different regions and for types of products. States often promote particular products based on the production volume or quality of product in that region. Future research could also explore whether consumer perceptions vary based on the source of information (e.g., federal USDA marketing efforts, State-level marketing efforts, or directly marketed by retailers).

Finally, studies of the long-term viability of local food systems, in general, are needed. Most existing studies, including this one, have evaluated specific products in particular regions. A nationally representative survey could explore different definitions of local labels for a wide variety of food products to identify common and disparate characteristics of labels that successfully promote demand across regions and products. The continued study of consumer preferences for local foods is especially important for policymakers to understand how to best support local food systems now that preferences may have shifted due to the COVID-19 pandemic. As consumers faced supply chain disruptions, one solution was to turn to local markets. Huang et al. 2021 found that sales of local produce increased among higher and middle-income households during the pandemic; however, in many cases, COVID-19 restrictions led to the closure of farmers' markets, a popular retailer of locally grown food. A longitudinal study tracking the effects of a local label for a series of food products over time would shed light on whether perceptions have changed over time and how the pandemic influenced preferences for local foods.

Ultimately, the results of this study have important implications for policymakers in terms of how best to promote markets for local foods, the likely effectiveness of the types of programs designed to date, and the level of government support potentially required to develop and sustain the systems. At least in the case of mushrooms and oysters in the Mid-Atlantic of the United States, labeling the products as "locally produced" does not appear to be an effective marketing strategy.

Supplementary material. For supplementary material accompanying this paper visit https://doi.org/10.1017/age.2023.27

Data availability statement. The data that support the findings of this study are available from the corresponding author, [KAD], upon request.

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