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A Multi-Store Auction to Measure Willingness-to-Pay for Organic and Local Blueberries¹

Lijia Shi^a, Zhifeng Gao^b, Lisa A. House^{Ⓢc}, and Yan Heng^d

^a*Graduate Student, Department of Marketing, 800 West Campbell Road,
University of Texas at Dallas, Richardson, Texas, 75080. USA*

^b*Associate Professor, Food and Resource Economics Department, PO Box 110240,
University of Florida, Gainesville, Florida, 32611, USA. Email: zfgao@ufl.edu*

^c*Professor, Food and Resource Economics Department, PO Box 110240,
University of Florida, Gainesville, Florida, 32611, USA. Phone: 352-294-7653. Email: lahouse@ufl.edu*

^d*Post-Doctoral Associate, Food and Resource Economics Department, PO Box 110240,
University of Florida, Gainesville, Florida, 32611, USA. Email: yheng@ufl.edu*

Abstract

There are various types of marketing outlets that feature food with different attributes and quality. We conduct a series of BDM auctions at multiple marketing outlets (price-conscious grocery stores, quality-focused grocery stores and farmers' markets), to elicit consumers' willingness-to-pay for organic and local blueberries. The results show that consumers' attitudes and their reported valuation of organic and local production of blueberries vary across different types of marketing outlets. Specifically, auction participants at the quality-focused stores and farmers' markets have higher WTPs for local blueberries while participants at the quality-focused store have higher WTPs for organic blueberries than price-conscious stores. Additionally, in the multivariate regression, we find the impact of the two store types (quality-focused store and farmers' market) on the price premium of organic/local to be equal.

Keywords: BDM auction, Multi-store auction, willingness-to-pay

[Ⓢ]Corresponding author

¹ This project was supported by the Agriculture and Food Research Initiative of the National Institute of Food and Agriculture, Grant #: 2009-55818-05077.

Introduction

The Becker-DeGroot-Marschak auction (BDM) (Becker, Degroot, and Marschak, 1964) is an auction format used at point-of-purchase locations, such as grocery stores. It is widely applied to elicit consumers' perception of food (Wertenbroch and Skiera 2002, Carrigan and Rousu 2008, Silva et al. 2007, Rozan, Stenger, and Willinger 2004, Rousu et al. 2005 and Lusk et al. 2001, etc.). The experimental auctions conducted at shopping locations provide participants with a more realistic choice situation (Carson et al. 1994).

In the literature, most of the auction locations at grocery stores or a marketing outlet were randomly picked by the researchers. For example, in Lusk et al. (2001) and Corrigan and Rousu (2008), the auction locations were at urban retail grocery stores. Lusk and Fox (2003) conducted the auction at the convenience store and bakery on a university campus. However, most researchers provided little to no explanation about how they chose their locations for BDM auctions. Another relevant issue is that the auction location was usually limited to only one type of marketing outlets in the literature, whereas many types of marketing outlets are available.

Among different types of marketing outlets, consumers' expectation varies significantly regarding food quality, availability, store atmosphere, and price ranges. For example, Wolf (1997) concluded that consumers perceived farmers' market produce as fresher looking, fresher tasting, of higher quality and better money value than supermarket produce. Wolf, Spittler, and Ahern (2005) found that consumers attended farmers' markets primarily for high-quality products. Zhu, Singh, and Dukes (2006) concluded that discount stores tended to attract more price sensitive consumers. On the other hand, consumers' selection of different types of store might be an indicator of their preferences and attitudes. Specifically, consumers who like organic food may be more likely to go to a quality-focused grocery store that features organic food, or to marketing outlets like farmers' markets. Consumers who like locally produced food might be frequent shoppers at a farmers' market. Thus, aggregating data of different retail formats might lead to incorrect demand analysis results due to customer self-selection (Hansen and Singh, 2009).

Therefore, one question of interest in this study would be the impact of BDM auction locations on willingness-to-pay (WTP) estimates. To be more specific, using a case of organic and local blueberries, we are interested in whether consumers shopping at farmers' markets are willing to pay more for local food than traditional supermarket shoppers, and whether organic grocery consumers are willing to pay more for organic food than the other consumers. Additionally, do consumers shopping at farmers' markets consider local production of food as a more valuable attribute than organic production of food? Or, would the bids for organic food exceed the bids for locally produced food at a quality-focused grocery store?

The objective of this study is to estimate and compare consumers' valuation of organic and local blueberries from different types of retail stores. To achieve the objective, we conducted a series of BDM auctions at three different types of marketing outlets: price-conscious grocery stores that focus on delivering products at the lowest price, quality-focused grocery stores that focus on high quality food, and farmers' markets that feature locally produced food. Since to our knowledge, no studies have yet conducted auctions at different types of retail stores to compare

the results, our study would contribute to the literature by filling the gap and provide useful information for future auction studies.

Our results confirmed that the difference of store selection exists and could be driven by consumer characteristics. Such results indicate that the store types can be used to capture unmeasurable attitude differences among consumers or as a criterion to classify different consumer groups. Moreover, our study brings attention to the issue of how WTP estimates are impacted by researchers' choice of auction locations.

Literature Review

While auctions in labs have been conducted widely to elicit consumers' perception on non-market goods (e.g., food safety or environment conservation), auctions in real contexts have been gaining popularity in empirical studies of consumer behavior and the elicitation of market goods. Field auctions have numerous advantages over lab auctions. For example, the target population can be easily captured and the point-of-purchase locations provide auction participants more realistic circumstances. Additionally, the compensation and recruiting fees are usually considerably less than a lab auction (Lusk and Fox 2003, Lusk et al. 2001). Corrigan and Rousu (2008) suggested that participants understood the mechanism of BDM auctions, which supported the possibility of the unbiasedness of bids. Wertenbroch and Skiera (2002) also found no overbidding in BDM auctions.

The BDM auctions have been widely applied in literature. Lusk et al. (2001) examined consumer WTP values for a higher level of tenderness in beef steaks, and they conducted auction at three urban retail grocery stores that were owned by large regional chain in the Midwestern area. Corrigan and Rousu (2008) tested whether field auction provide an unbiased WTP estimate at two grocery stores owned by Weis Markets chain in Pennsylvania. Lusk and Fox (2003) conducted the auction for new cookies at the convenience store and bakery on a university campus. In Silva et al. (2007), the auction for grapefruit took place at selected grocery stores in College Station, Texas. However, most studies picked auction locations by researchers with little information about how the auction locations were chosen. Moreover, even though some studies explained the location choices (e.g., Rousu et al. 2005), the experiments were usually conducted at only one type of marketing outlet.

Previous studies have provided some insights. Darden and Schwinghammer (1985) found that quality perception depended on store format. Wolf (1997) compared produce at farmers' markets versus supermarkets, and he concluded that consumers perceived farmers' market produce as fresher looking and tasting, of higher quality and better money value. Wolf, Spittler, and Ahern (2005) found that the primary reason to shop at farmers' markets was for high-quality products. On the other hand, different store selection would be related to different consumer characteristics. For example, Wolf (1997) found demographic differences between consumers shopping at farmers' market and general produce purchasers. Wolf, Spittler, and Ahern (2005) found that farmers' market consumers were more likely to be married, female, and have postgraduate degree. Zhu, Singh, and Dukes (2006) found that price sensitive consumers were more likely shop at discount stores.

Our study would contribute the auction literature by conducting field experiments using a multi-store auction approach, and the results will reveal the importance of store selection in auction experiments.

Auction Procedure

This study used four types of blueberries in auction: organic and locally produced blueberries, organic blueberries produced in the U.S., conventional blueberries produced in the U.S., and conventional and locally produced blueberries. Before the auction, each auction participant received an instruction sheet with detailed auction procedure. After they read the instructions, the auctioneer explained the auction procedure and answered any auction-related questions from the participants.

The auction procedure involved four steps:

1. The auctioneer endowed each participant with \$7 cash and told the participants that the cash could be used to pay for the blueberries if they won the auction or was theirs to keep if they did not win. Then each participant was asked to write down his/her bids for the four types of blueberries simultaneously, which were in one-pint clamshell packages. The auctioneer told the participants that their bids should be exactly equal to their willingness-to-pay for the blueberry packages.
2. After the participants placed the bids, they were asked to randomly draw a letter, which indicated the blueberry type, to determine which blueberry package was actually auctioned. Therefore, the participants only had the opportunity to “win” one type of blueberries.
3. After the auctioned blueberry type was determined, participants drew a random price.
4. If a participant’s bid for the selected blueberries was higher than the randomly drawn price, the participant “won” the auction and purchased the blueberries at the price he/she drew. If a participant’s bid for the selected blueberries was lower than the randomly drawn price, the participant did not “win” the auction and therefore did not purchase the blueberries.

Data and Model

Data were collected in July and August 2011 in Pittsburgh, Pennsylvania and Orlando, Florida. In each city, a price-conscious grocery store, a quality-focused grocery store and a farmers’ market were selected. There were approximately 70 observations collected in each location and the total number of qualified observations was 356. The auctions were conducted at the entrances to the grocery stores and at the front of the farmers’ markets. Shoppers approaching the stores/markets were randomly stopped and invited to participate in an experiment about blueberry consumption. Qualified shoppers (adult, main grocery shoppers in the households, blueberry consumers without food allergies) were given a questionnaire about purchase intention, demographics etc. to complete, and the auction was conducted afterwards.

The partial bids, which are derived from the full bids, are calculated as the estimates of WTP for organic and local blueberries (Alfnes and Rickertsen, 2003; Huffman et al., 2003). The partial bids for organic blueberries are calculated as $(OLbid + ONbid - CLbid - CNbid)/2$, where OLbid, ONbid, CLbid, and CNbid indicate bids for organic local blueberries, organic U.S. produced blueberries, conventional local blueberries, and conventional U.S. produced blueberries, respectively. Similarly, the partial bids for local blueberries are calculated as $(OLbid + CLbid - ONbid - CNbid)/2$.

To further explore the impacts of auction locations as well as demographics on the partial bids, a multivariate regression is used, and can be specified as follows:

$$(1) WTP_{iorg} = \beta_0 + \beta_1 X_i + \beta_2 FM_i + \beta_3 Qualityfocused_i + \beta_4 Florida_i + \varepsilon_i$$

$$(2) WTP_{ilocal} = \gamma_0 + \gamma_1 X_i + \gamma_2 FM_i + \gamma_3 Qualityfocused_i + \gamma_4 Florida_i + \tau_i$$

X_i is the vector of independent variables including demographics and attitude information.

The demographics describe age, gender, income, education level and the number of children in the household. The attitude independent variables include how well the participants like fresh blueberries and whether they agree to the statement “Organic blueberries are healthier than other blueberries”. FM_i and $Qualityfocused_i$ are dummy variables indicating store types and $Florida_i$ indicates Florida auction participants. For identification purpose, price-conscious store and Pennsylvania are omitted. ε_i and τ_i are error terms. Correlation between WTPs for organic and local is allowed.

Results

The summary of participant demographics at each marketing outlet is shown in Table 1. Demographics differ by location, with the price-conscious marketing outlet featuring consumers who tended to be younger, had lower income, had a lower education level, and were more likely to be Black or African American. They also tended to have more children than consumers at the other two marketing outlets. The participants at the farmers’ markets had the highest average income and education level. The variation in demographics at different marketing outlets indicates that the different bids may occur at different locations.

Summary statistics of the bids for the four types of blueberries at each marketing outlet are shown in Table 2. Significant differences are listed in the last row. Farmers’ markets have higher bids for conventional local blueberries (CLbid) than price-conscious stores. Both farmers’ markets and quality-focused stores have higher bids for organic U.S. produced (ONbid) and organic local blueberries (OLbid) than price-conscious stores. The reason why consumers at farmers’ markets also have higher bids for organic fruit might be that those who shop at farmers’ markets generally have higher quality demand for food and some of them are trying to buy organic food at farmers’ markets. No significant differences are found between store types in the bids for conventional U.S. produced blueberries (CNbid). This result indicates that the differences between store types in the bids for the other types of blueberries are due to attitude difference toward those value-added attributes.

Table 1. Demographics of Participants at Each Marketing Outlet

Independent Variables	Price-Conscious	Farmers' Market	Quality-Focused
Female	79.41%	69.05%	78.13%
Age	40	45	50
Caucasian	38.24%	80.16%	82.81%
Hispanic	3.92%	2.38%	4.69%
Asian	1.96%	3.17%	2.34%
Black or African American	49.02%	5.56%	7.81%
Other races	6.86%	8.73%	2.34%
Income(\$34,999 or below)	46.08%	23.02%	18.75%
Income(\$35,000-\$99,999)	44.12%	43.65%	47.66%
Income(\$100,000 or above)	6.86%	30.95%	28.91%
Income(don't know)	2.94%	2.38%	4.69%
College 4-year degree + post-graduate	20.59%	58.73%	53.13%
Some college-including 2-year degree	39.21%	30.95%	33.59%
High school degree or less	40.20%	10.32%	13.28%
No child at home	43.14%	69.84%	69.53%
One or two children	42.16%	25.40%	25.00%
More than two children	14.71%	4.76%	5.47%

Note: The median of age is used.

Table 2. Summary Statistics of Bids for Blueberries

Store Types	Organic Local (\$)	Conventional Local (\$)	Organic U.S. Produced (\$)	Conventional U.S. produced (\$)
Price-conscious stores (1)	2.93 (1.71)	2.64 (1.25)	2.85 (1.67)	2.59 (1.27)
Farmers' market (2)	4.13 (1.73)	3.39 (1.35)	3.43 (1.54)	2.79 (1.30)
Quality-focused stores (3)	3.89 (1.51)	3.04 (1.26)	3.63 (1.50)	2.61 (1.29)
Significant difference (5% level) Bonferroni test)	(2)>(1) (3)>(1)	(2)>(1)	(2)>(1) (3)>(1)	

Note: The numbers in the parenthesis are standard errors.

In the survey before the auction, information on attitudes toward organic and local fruits was collected. Significant differences are found among the answers from shoppers at different locations. Specifically, shoppers at the quality-focused grocery stores demonstrate more trust in organic fruits than shoppers at the price-conscious grocery stores. They are more likely to agree to a statement that they will pay more for fruits with an organic label than shoppers at the price-

conscious grocery stores (on a 5-point Likert scale). Shoppers from the farmers' markets are generally more likely to indicate that they will purchase local blueberries than consumers from the other two store types (on a 5-point Likert scale).

The means and standard deviations of partial bids for organic and local blueberries at different marketing outlets are shown in Table 3. According to the Bonferroni multiple comparison test, shoppers at the quality-focused stores, which are known for selling organic food, have higher partial bids for organic blueberries than shoppers at the price-conscious grocery stores. There is no significant difference between the partial bids for organic from shoppers at the quality-focused stores and those at the farmers' markets. For local blueberries, participants at the farmers' markets have the highest partial bids among the three marketing outlets and the price-conscious stores have the lowest partial bids. The results are consistent with our expectation that the experiments will yield higher WTP estimates for organic blueberries at quality-focused grocery stores than price-conscious grocery stores and higher WTP estimates for local blueberries at farmers' market than the other marketing outlets. Additionally, the partial bids for organic blueberries are larger than the partial bids for local blueberries, no matter where the auction was conducted. This indicates that consumers generally consider the organic production of blueberries a more important attribute than production location (when comparing local to imported blueberries). The partial bids for organic blueberries have smaller coefficients of variation (COV) than those for local blueberries at price-conscious stores and quality-focused stores. However, the relationship reverses at farmers' markets. This indicates that at farmers' markets, consumers' attitudes toward the local production of blueberries are more consistent than their attitudes toward organic blueberries while the attitudes toward local are more diversified at the other two types of stores.

Table 3. Partial Bids at Different Locations

Store Type	Partial Bids for Organic			Partial Bids for Local		
	Mean(\$)	Std. Dev	COV	Mean(\$)	Std. Dev	COV
Price-conscious (1)	0.28	1.21	4.32	0.07	0.74	23.53
Farmers' market (2)	0.69	1.15	1.67	0.65	0.98	1.50
Quality-focused (3)	0.94	1.53	1.62	0.34	0.77	2.25
Significant difference (5% level) (Bonferroni test)		(3)>(1)		(2)>(3)>(1)		

Multivariate Regression for WTP Estimates

The multivariate regression is used because the partial bids have both positive and negative signs and there is correlation between WTPs for organic and WTPs for local (The Pearson correlation is 0.113 with significance level=0.035). The estimation results are shown in Table 4. Results show that older consumers were willing to pay less for both local and organic blueberries than younger consumers. For local blueberries, the dummy variables representing the locations of the auction are significant, indicating that after demographics are controlled, the partial bids for local at farmers' markets and quality-focused stores are still higher than those at price-conscious stores (All the independent variables have a VIF < 2.5, so we exclude potential collinearity between auction location and demographics as a problem in the regression). Therefore, quality-focused store shoppers also have a preference for locally produced fruit though the WTP estimates for local at farmers' markets are the highest among the three locations. As expected, the participants

who believe that organic blueberries are healthier than conventional blueberries are willing to pay more for organic than the other participants. Females generally place more emphasis on organic production than males. Surprisingly, college education or above has a negative impact on the price premium consumers are willing to pay for organic production. As for store types, both quality-focused stores and farmers' markets (significant at 10% level) shoppers give significantly higher WTPs than the price-conscious stores shoppers. This indicates that consumers shopping at farmers' markets, which feature in selling locally produced food, are also willing to pay more for organic fruit.

We further test the attitude difference toward organic and local in each of the specialized market outlets. The null hypothesis (H_0) is specified as: $[wlocal]fmarket = [worg]fmarket$ and $[wlocal]highend = [worg]highend$. The F test result shows that there is no significant difference found between the attitudes toward organic and local in each of the two marketing outlets.

Table 4. Multivariate Regression for Partial Bids

Independent Variables	Local			Organic		
	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t
Age	-0.014**	0.003	0.000	-0.011**	0.005	0.019
Female	-0.017	0.107	0.874	0.282*	0.161	0.081
Income	0.000	0.001	0.642	0.001	0.001	0.483
College or above	0.101	0.135	0.456	-0.358*	0.202	0.077
Some college	0.195	0.129	0.133	-0.210	0.194	0.280
child	-0.054	0.046	0.239	0.054	0.068	0.428
Florida	-0.051	0.093	0.583	-0.018	0.139	0.896
Like	-0.010	0.066	0.883	0.032	0.099	0.749
Farmers' market	0.580**	0.135	0.000	0.345*	0.202	0.088
Quality-focused	0.390**	0.133	0.004	0.619**	0.198	0.002
Health	0.043	0.093	0.639	0.827**	0.139	0.000
Intercept	0.632*	0.346	0.069	0.181	0.518	0.727
Model Fitting Statistics						
Number of Observation	328			328		
R-squared	0.137			0.174		
Prob > F	0.000			0.000		
Test of Equality of Attitudes						
H ₀	F (1,316)			P-Value		
[wlocal]fmarket=[worg]fmarket	1			0.318		
[wlocal]highend=[worg]highend	0.99			0.320		

Note. Dummies for male, Pennsylvania, education level high school or below college and price-conscious store type are omitted for identification; Like: How well the participant likes fresh blueberries (1=dislike very much; 5=like very much); Child: Number of children at home. Health: =1 if the participant agrees to the statement "Organic blueberries are healthier than other blueberries"; =0 if otherwise. ** indicates significance at 5% level. * indicates significance at 10% level.

Conclusions

We conducted a series of BDM auctions at three different types of marketing outlets to elicit consumers' preference for organic and locally produced blueberries. The auctions were conducted at price-conscious grocery stores, farmers' markets and quality-focused grocery stores to determine the differences in bids at different marketing outlets.

Our data show that there are differences in demographics of consumers, as well as their attitudes toward organic and local production of fruits across different marketing outlets. Partial bids for “organic” and “local” are significantly different across different marketing outlets. Specifically, consumers at the farmers’ markets and the quality-focused stores had higher partial bids for local blueberries while consumers at the quality-focused stores had higher partial bids for organic blueberries than consumers at the price-conscious stores. In the multivariate regression, we find that consumer attitudes toward these two value-added food attributes do not demonstrate significant differences between farmers’ markets and quality-focused stores.

The results indicate that if the auction was conducted at only one type of marketing outlet, the WTPs might be underestimated or overestimated. Specifically, if the research topic is to measure how consumers value organic food, the choice of a relatively low-end grocery store might give the researchers lower-than-average WTP estimates. Similarly, if a BDM auction is conducted at a farmers’ market, the WTP estimates for local might be above average. Considering the relatively low explanatory power of demographic information in our regression results, we argue that store type might be an alternative market segmentation tool than demographic information and can provide researchers with valuable attitude indicators. People’s valuation is difficult to measure. However, by observing how they behave (e.g., which type of store they go), we can easily tell the difference in valuation since behavior is driven by attitudes and perception. Therefore, for studies focusing on value-added food attributes, although BDM auctions in grocery stores provide the auction participants point-of-purchase situations, researchers might have segmented the consumers unintentionally by choosing a single type of grocery store. Our studies put forward the importance of location choices, which might be another interesting topic for future studies on value elicitation with BDM auctions.

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