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Consumer Demand for Local Honey: An Artefactual Field Experiment

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ABSTRACT

How to best target and attract niche market consumers is an important marketing problem for producers of specialty agricultural products. It is particularly an issue in the honey market where consumers increasingly face media messages regarding threats to honey bee health, honey adulteration, and health benefits of locally produced honey. Using auction experiments, this research evaluates consumer behavior related to informational messages about honey that is produced locally, domestically, and internationally. Results from 115 adult consumers show that consumers' demand for honey varies significantly based on the geographic location of the honey's production, product packaging, and the information they have about the product. Consumers demonstrate greater demand for locally produced honey, especially when provided information about negative aspects of internationally produced honey that include adulteration. This shows that such negative media attention on specialty products offers small producers an opportunity to increase profitability by marketing themselves as a specialized niche alternative.

Key words: Local foods, food safety, experimental economics, consumer behavior

JEL Codes: Q13, D83, C91

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Producers of specialty agricultural products face unique challenges and opportunities. Large domestic and international producers make it difficult for small, labor-intensive operations to compete in conventional markets. At the same time, demand for local and "artisanal" products is growing. This has generated opportunities for specialization in expanding specialty markets. Honey producers are emblematic of these issues. In recent years, consumers have been exposed to messages related to honey products—from concerns about attrition of bee populations from Colony Collapse Disorder to reports of adulterated or unsafe products imported as "honey" from Asia. Local producers can choose from a variety of marketing messages to direct towards consumers. In this research, we focus specifically on information related to the safety and quality of honey products relative to conventional alternatives (Schneider, 2011), purported (but not confirmed) health benefits for those with allergies to local plants (Rajan et al., 2002)[1], and the positive local externality of pollination services (Allsopp, de Lange, and Veldtman, 2008). Given these disparate messages and the limited opportunities honey producers have to deliver such messages, care must be taken to select marketing strategies that most effectively target their consumers.

The United States is one of the major honey producing countries in the world. Information from the U.S. Department of Agriculture's (USDA's) Economic Research Service (ERS) (2013) describes numerous changes in the industry. In 2012, U.S. honey production was 147 million pounds, a 1 percent decrease from 2011, and in general, U.S. honey production has been trending downward over the past two decades. The decline is more dramatic in terms of the number of colonies which has been gradually dropping from 5 million in the 1940s to only around 2.5 million since the late 1990's The decrease in colonies is linked to the presence of *Varroa destructor*, a non-native parasitic mite

that was first detected in U.S. apiaries in 1987. Varroa feeds directly on the hemolymph of the individual bee. With the spread of *V. destructor*, the prevalence of several varroa-vectored viruses has risen (Delfinado-Baker 1989; Allen 1996; vanEngelsdorp 2010). As a result, U.S. honey producers have not been able to meet domestic demand. Imports of honey have steadily increased over the last 25 years, as has the share of imported honey consumed (figure 1). In 2012, the United States imported a record 298.1 million pounds of honey, 67% of total consumption. Major honey exporters include Argentina, Vietnam, India, Brazil, and Canada. China was a major exporter of honey until Chinese honey began to be banned or heavily taxed in many countries beginning in 2000 due to the discovery of adulteration and impurities in the honey, such as antibiotics and heavy metals. It is believed, in light of these bans, that now most Chinese honey is laundered through India, Australia, and Vietnam before arriving in the US (Melnick, 2011; Berfield, 2013).

Local outlets like farmers' markets, roadside stands and direct-to-consumer sales have historically been important marketing channels for honey producers. In recent years, this type of niche marketing has become an important sector of the market for agricultural products. While there is no single official definition for the term "local" in relation to food, it is generally used to describe a process of food production and distribution that is localized, such as in a 100-mile radius, rather than national or international. In 2008, Congress defined "locally" and "regionally" together as "(I) the locality or region in which the final product is marketed so that the total distance that the product is transported is less than 400 miles from the origin of the product; or (II) the state in which the product is produced" (H.R.2419: Food, Conservation, and Energy Act of 2008). Expansion of the local food industry also is reflected in growth of direct-to-consumer sales and the number of farmers' markets in the country. Direct-to-consumer marketing amounted to $1.2 billion in current sales in 2007

compared with $551 million in 1997, and the number of farmers' markets rose to 7,864 in August 2012, a 9.6% increase from 2011 (Martinez, 2010).

Local honey offers a number of advantages over imported honey that can make it particularly attractive to consumers. First is the positive environmental externality of consuming local honey (Allsopp, de Lange, and Veldtman, 2008). Pollination services provided by local bee colonies are essential to local community gardens and fruit trees—honey bees are essential for pollination of over 90 fruit and vegetable crops worldwide. Approximately 10 percent of the total value of food consumed by humans is a result of pollination services by insects, primarily honey bees (Morse and Calderone 2000; Gallai 2008). Local honey may have a more direct benefit to consumers (Häagen-Dazs, 2013). Many consumers believe that the pollen from honey produced locally has properties that can improve allergies and aid in medical treatments (Rajan et al., 2002). Additionally, consumers have recently become more concerned about food safety and more aware of worldwide food safety issues, including potential impurities in Asian honey (Melnick, 2011; Schneider, 2011). Some consumers believe that eating local honey products might be a way to avoid these food safety risks.

Given these trends, this research seeks to answer several important questions that are presented as hypotheses in table 1:

1) Does consumers' WTP for honey vary based on the origin of the honey? Specifically, does consumer WTP increase for local honey when compared to international honey.
2) Does consumer WTP increase for U.S. honey when compared to international honey
3) How is consumers' WTP for international honey affected by negative information about international honey?
4) How does negative information about international honey affect WTP for local and US honey?

5) Is consumers' WTP for honey influenced by information about the benefits of bee pollination?
6) Is consumers' WTP for honey produced locally or in the US influenced by information about the benefits of bee pollination.
7) Is consumer's WTP influenced by potential allergy-treating benefits from eating local honey?
8) Is consumer's WTP influenced by potential allergy-treating benefits dependent upon the location of the honey production?
9) Are consumers' WTP more for honey based on its packaging?

To answer these questions, we designed an "artefactual" field experiment (Harrison and List, 2004) that involved adult participants making decisions on the amount they would be willing to pay for different jars of honey. This research was designed in consultation with small and mid-scale honey producers from the mid-Atlantic United States who were connected to regional extension efforts. The information treatments (see Appendix A) include negative information on international honey and positive information on allergy benefits and pollination.

All of the information treatments but one—information about allergies—had a significant effect, with negative information about international honey having the largest overall effect on willingness to pay (WTP) for local honey. To our knowledge, no previous experimental research has sought to measure how consumers respond to place of origin labeling under different messages about the relative risks and benefits of different product sources. This research sheds light not only on honey consumers, but also speaks more broadly to consumer behavior as domestic agricultural producers seek to differentiate themselves through place of origin labeling and local messaging in the face of increased international competition.

Literature Review

Previous work reflects a rising interests in local food. Adams and Salois (2010) reviewed research comparing consumer preferences for local food and organic food and found that more studies are reporting premiums for local food in recent years. Carpio and Isengildina-Massa (2009) used a contingent valuation framework to show that South Carolina consumers are willing to pay a 27% premium for local produce and 23% premium for local animal products. Also using contingent valuation, Loureiro and Hine (2002) demonstrated that Colorado consumers are willing to pay a higher premium for local than for organic or "GMO-free" potatoes. Darby et al. (2008) conducted face-to-face interviews to show that Ohio consumers do have price premiums for locally produced strawberries compared to strawberries from other states and that state boundaries might serve as a natural point of geographic delineation for "local" production for consumers. Onken, Bernard and Pesek Jr. (2011) held choice experiments via mail and found consumers preferred local or state program promoted versions of strawberry preserves over non-local versions and argued that consumers' definition of local is likely a region smaller than the state border. However, in a survey in Missouri, Brown (2003) argued that consumers did not have a preference towards locally grown food and that consumers treat local as wider concepts that could cross state boundaries.

Experimental auctions using real money and goods will typically offer more valid estimates for consumer's WTP than stated preferences contingent valuation methods which tend to suffer from hypothetical bias (List and Gallet, 2001). Second price auctions are generally accepted as incentive compatible, meaning that they create incentives for consumers to elicit their true willingness to pay for the product on auction. In practice some studies report overbidding or underbidding issues in second price auctions (Kagel and Levin, 1993; Harstad, 2000), Lusk and Shogren (2007) showed this mechanism is incentive compatible when participants are informed their best strategy is to bid

truthfully (Grebitus, Lusk and Nayga Jr., 2013). Although experimental auctions are broadly used in estimating consumers' WTP, only a few studies have implemented these techniques when measuring consumers' WTP involving local food. A recent study from Grebitus, Lusk and Nayga Jr. (2013) using Vickrey auctions concluded that German consumers' WTP for apples and wine decreases in miles the product traveled, indicating a preference for local production. Yue and Tong (2009) conducted non-hypothetical choice experiments and found that consumers had similar WTP premiums for local attribute and organic attribute. Overall studies agree that consumers are willing to pay more for local products but the premium varies by state and product (Grebitus, Lusk and Nayga Jr., 2013).

Our research differs from previous studies in that we explicitly compare local products, U.S. products and international products at the same time, as well as how sensitive the WTP difference between these are to marketing information. This is an emerging issue since local farmers are not only facing domestic competition, but also meeting challenges from imported products. While there are a number of studies on consumers' WTP for foreign food products (Alfnes and Rickertsen, 2003; Loureiro and Umberger, 2007), much less is known about consumers' preferences for local food when directly compared with international alternatives, and what affects these preferences. This study contributes to the literature not only by providing estimates on Mid-Atlantic consumer WTP premium for local food, but also examines consumers' preferences towards local food compare with domestic and international alternatives, and provides insights on how these WTP respond to using informational labeling.

Experimental Design

This research was conducted in an experimental economics laboratory at a large public university in the northeastern United States. Adult participants were recruited from the local community via

several sources, including the laboratory's website, announcements at local churches, university staff newsletters, and a broadcast email to university staff members. Adult consumers were recruited rather than students to make the sample more representative of consumers generally and to ensure that the participants were experienced buyers (e.g., Gracia, Loureiro, and Nayga 2011; Chang, Lusk, and Norwood 2009; List 2003). In total, there were 115 participants in this research.

In the experiment, we provided fifteen 12-ounce jars of honey, each a unique combination of the origin of production (local, domestic, or international) and packaging (see figure 2) [2]. Participants bid on all fifteen honey products in a sealed bid, ascending price auction. All of the labeled jars were placed on the experiment administrator's desk in front of the participants. In addition, a set of the jars was within the reach of each participant, and they were encouraged to view and handle the jars.

The experiment involved four treatments, three information treatments and a no information control treatment. Information was varied between sessions, so that each participant received only one of the four treatments. In the information treatments, participants received one page of information related to one of the three topics—pollination benefits of local honey, potential allergy-treating effects of local honey, and potential risks associated with consuming international honey (see Appendix A). The administrator read the information on the handout to participants after a brief introduction to the experiment but prior to participants making any decisions.

At the beginning of each session, each participant was randomly assigned to a computer equipped with a privacy screen to ensure confidentiality. Participants were asked to start reading the instructions for the experiment (Appendix B). They were not permitted to talk to each other but were encouraged to ask the administrator questions at any time during the experiment. A presentation was then given to explain the steps in the experiment and how to use the computer program. Participants were told that they would be given $18, which consisted of a $3 show-up fee and $15 that was

available for purchasing a jar of honey, and that money they did not spend was theirs to keep. Participants were given the money and winnings at the end of the 45-minute experiment.

Of the fifteen bids, one was randomly selected at the end of the session to determine the honey product that would be purchased (distributed to participants). This binding decision was selected in a process in which a volunteer participant randomly selected a labeled ball (#1-15) from a cage. Each ball was labeled with a number that represented one of the jars of honey. The ball selection process was demonstrated at the beginning of the session, and the administrator explained explicitly that only the decision associated with the selected labeled ball would be used to determine participants' cash earnings. The administrator also pointed out that the likelihood of each decision being selected was the same and that participants would not pay for the other fourteen nonbinding decisions. It was emphasized that each decision should be treated independently so that they had a full $15 to use when making each decision. No feedback was provided to participants until the auction for the selected honey was implemented at the end of the experimental session.

The experiment used a version of a second-price Vickrey auction, where an ascending price was shown to the participants (Bernard 2006; Dillaway et al., 2011). Participants were informed in both oral and written instructions that their optimal strategy was to bid their actual highest willingness to pay for each item. Examples were shown to demonstrate how bidding more or less than their true valuation of the honey product could be detrimental to their winnings. Participants' bids were confidentially submitted and recorded using Microsoft Excel with Visual Basic for Applications (Dillaway et al., 2011; Messer et al., 2008). Each participant's screen displayed a number representing the ascending "market price" of the item. Initially, the number was $0.00 and the screen displayed two buttons: "Start the Clock" and "Withdraw Now". The item on auction was also shown on the screen. If the participant wished to bid $0.00 for the item, they would click "Withdraw Now".

Otherwise, they could click "Start the Clock" and the amount shown on the screen for the price would increase in one-cent increments in a uniform time interval until the participant clicked "Withdraw Now". The participant would then either confirm their bid if they were satisfied with it, or reset the clock and repeat the process otherwise. Upon confirmation by the participant, the bid was recorded in the database and displayed on the administrator's computer. The order of the bids for the various jars of honey was varied to control for potential order effects.

To enable participants to learn about the auction mechanism and become familiar with the computer software they first completed two low-stakes rounds: one involving a pencil and one a pen (Kanter, et al, 2009; Liu et al, 2013). Participants were given an additional $3 and the range of bids was restricted to $0 and $1.50 for each of these low-stakes items. In each of the low-stakes auctions, the amount of the winning bid and the second highest bid were announced to aid in comprehension of the auction mechanism.

Based on the binding decision, the computer program calculated each participant's earnings (remaining cash) and product purchased (if any) and displayed them on that participant's screen to assist them in filling out receipts. Lastly, participants were asked to fill out an online survey with questions on demographics, characteristics, and attitudes about honey.

Results

Table 2 presents the socio-demographic characteristics of the participants. Average age was about 42 years. Most of the participants were female, which is representative of the fact that most of the participants were primary shoppers in the family. Average household income was $70,000 to $80,000 and average number of years of education was 16. The relatively high level of income and education of the sample may reflect the population typical of a university community. About 50% of

participants reported that they or another member of their households have allergy problems and 56% believed that consuming local honey helps allergies. The survey asked participants to describe the size of containers of honey typically purchased and the number of those containers purchased in a year, which were used to calculate their annual purchases of honey (*AnnualPurchase)*. Some participants may have opted not to purchase honey in the experiment session simply because they already had enough honey at home. This factor was captured with the variable *HaveEnoughHoney*. The variables related to participant attitudes about honey and the auction are summarized in table 3. In general, consumers cognitively have a better impression of honey from local regions and smaller-scale producers and are concerned about food safety.

Figure 3 presents average bids by the origin of the honey and information treatment. In general, consumers were willing to pay the most for local honey, somewhat less for U.S. honey, and the least for international honey. To analyze the results more formally, we used a two-limit Tobit model since consumers' bids were limited to a range of \$0 to \$15. For subject *i* and item *j*, y_{ij}^* is limited to 0 to 15 and linearly depends on a set of variables via the parameters (vectors) β, γ, δ, and ω. The Tobit model is expressed as

$$y_{ij}^* = \alpha + \beta Origin_{ij} + \gamma Treatment_{ij} + \delta Origin * Treatment_{ij} + \omega X_{ij} + U_i + u_{ij}$$

where α is the average bid for the entire population, U_i is individual random effects, and u_{ij} is the error term of individual *i* for product *j*. The Variables *Origin* are dummies indicating whether the honey is local, domestic, or international in origin, *Treatment* are dummies for the information given in that session (Pollination, International, Allergy, or Noinfo), and *Origin*Treatment* is the interaction term of *Origin* and *Treatment*. X_{ij} denotes jar type, order-control, and socio-demographic variables.

The results of the Tobit regression are shown in table 4. Of the total of 1,725 bids, 238 (13.8%) were censored at $0, and none were censored at $15. The dummy variables for the no information treatment, international honey, and the Queenline jar style were the baseline variables in the regression and thus the coefficients for the related variables present the estimated deviation from the baseline. As can be seen through inspection of Model 1 and Model 2 in table 2, including the demographic and attitude variables did not lead to substantial changes in the coefficients and standard errors of the variables. This is consistent with the conclusions of Umberger and Feuz (2004).

The results show that consumers were willing to pay more for local honey compared to international honey. In model 1, without any information provided, in expectation consumers are willing to pay $5.28 for a jar of international honey packed in a Queenline jar. Holding others constant, their willingness to pay increases by $0.97 (18%) if it was a jar of local honey ($p = 0.000$). This leads to a rejection of hypothesis 1 and we conclude that in general consumers are willing to pay more for local honey compared to international honey. Similarly, holding all else constant, consumers are expected to pay $0.48 (9%) more for U.S. honey compared to international honey ($p = 0.003$). This allows us to reject hypothesis 2. Rejecting both of these hypotheses leads us to conclude that consumers WTP for honey varies based on the origin of honey.

Examining the effect of the information treatments, it is observed that negative information on international honey depressed WTP for honey from all sources by $2.08 ($p = 0.000$). However, under this information, consumers are willing to pay $2.78 more for local honey compared to international honey for a premium of $0.70 ($p = 0.000$). This is in addition to the $0.97 premium they had been willing to pay for local honey with no information. These results let us reject hypotheses 3 and 4, concluding that negative information on international honey does have an impact on consumers' WTP for honey and the effect varies by origin. For the information treatment on pollination benefits

of local bee, the information did not have a significant influence on the overall WTP, therefore we would not be able to reject hypothesis 5. However, given the pollination information, consumers are willing to pay $1.07 more for local honey ($p = 0.000$) and $0.67 more for U.S. honey ($p = 0.002$) compared to international honey. As a result we reject hypothesis 6 and conclude that consumers' WTP for local and U.S. honey are influenced by information on the benefits of bee pollination. For the information treatment on potential allergy treating benefits of local honey, the information did not affect the overall WTP for honey, nor did the information change the premium consumers are willing to pay for local and U.S. honey compared with international honey. Consequently, we would not be able to reject hypotheses 7 and 8.

Furthermore, we examine the effect of packaging on consumers' WTP. The results suggest that compared to the most commonly used Queenline jar, almost every other shape of jars generated a WTP premium. Holding others constant, consumers are willing to pay $0.48 (9%; $p = 0.000$) more for the Bail shaped jar, $0.41 (8%; $p = 0.000$) more for the Bear shaped jar and $0.31 (6%; $p = 0.002$) more for the Teardrop shaped jar. The hexagonal jar is less significant, but still has a marginal effect of $0.17 (3%; $p = 0.097$). These results lead us to reject hypothesis 9 and come to a conclusion that consumers' WTP are influenced by packaging and consumers are willing to pay more if they like the jars. Given these results, honey producers should pay more attention to their packaging in order to attract niche market consumers. Taken the costs of each type of jars into consideration (figure 2), the Bear jar would generate the largest profit.

Since approximately 14% of the observations were zero bids, we were interested in factors that lead to consumers' lack of interest in an item. We thus investigated the effect of the predictors on the probability of submitting a zero bid, which was captured in the linear probability models model presented in table 4. Consumers were about 7% less likely to submit a zero bid for both local ($p =$

0.013) and U.S. honey (p = 0.006) than for international honey, a result that is consistent with the Tobit analysis results in that consumers have higher willingness to pay for local and U.S. honey. Once again, the negative international information treatment is the only one that has an across the board significant impact, with a nearly 30% increase (p = 0.000) in the probability of a zero bid. The interaction terms for information treatment and origin are significant. Local and US honey show countervailing effects, with a 31% decrease in the probability of a zero bid for local and a 26% decrease for US (both p = 0.000), suggesting that the bulk of the effect of the negative information treatment falls in the international honey. Tests that the sum of the international information term and the interactions are equal to zero fail to reject for both local (p = 0.77) and US (p = 0.616) honey. Interestingly, the interaction of allergy-treating information and origin in this analysis is significant with an 11% decrease (p = 0.005) for both local and us honey, but pollination information is insignificant (p = 0.481). Perhaps some participants who did not want to buy honey initially changed their minds when they learned that honey could benefit their health while information on pollination benefits, which is only an indirect benefit to individual participants, failed to sway them.

Conclusion

This research demonstrates the effects of information treatments on consumers' wiliness to pay for different honey produced in different locations. We find that consumers are generally willing to pay more for local and U.S. honey compared to international honey. We also found that this increase in WTP is sensitive to information. Negative information on international honey and positive information on local honey both increase consumers' WTP. This suggests that there is an opportunity for small scale producers to increase their profitability by providing information messaging as part of their marketing. In addition, WTP is responsive to the type of jar used. Interestingly, consumers were willing to pay the least for the Queenline style jar that traditionally has been used by many producers.

Instead, the results suggest there is the opportunity for honey producers to gain price premiums by marketing their honey as a more artisanal product and seeking ways of differentiating the product and developing niche markets, such has been done with other agricultural commodities such as coffee, cocoa, and olive oil.

Our results identify two marketing and advertising strategies for local and regional honey producers— discussing the benefits of consuming local honey and emphasizing the potential risks associated with international honey. Producers who carefully select packaging for their honey products and the information they provide on labels and in advertising could obtain price premiums and generate greater profits at relatively low costs. This study focused on labeling based on information and origin, but did not address many new programs that have been emerging in recent years catering to honey producers that certify practices. The landscape of grocery store shelves is seeing increasing amounts of honey labeled "Organic," "True Source," and "Producer Purity Certified," not to mention production practices like "Raw" or "Unfiltered." What these mean to the consumer and how additional information on these will lead consumer purchasing habits is unclear. Additional development of research in these topics will further allow small honey producers to differentiate themselves in an increasingly complex market, and guide the adoption of marketing and production practices to increase their long term viability.

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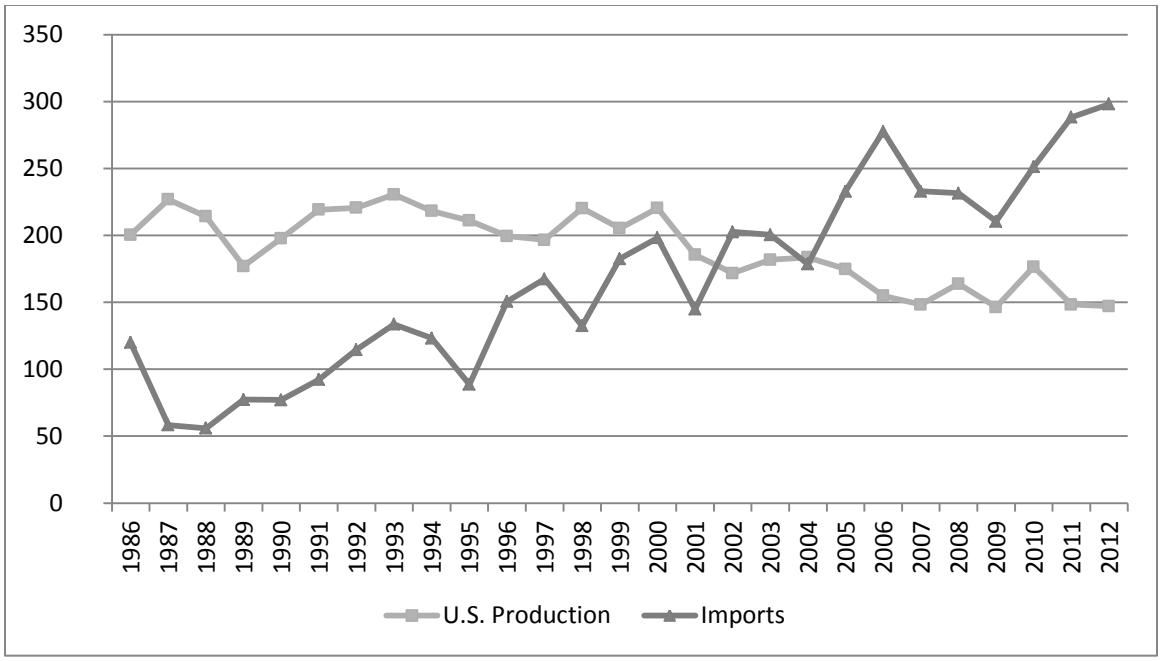


Figure 1. U.S. honey domestic production and imports (millions of pounds)

1. Queenline
Cost: $1.61

2. Bear
Cost: $1.30

3. Hexagon
Cost: $1.25

4. Teardrop
Cost: $1.38

5. Bail
Cost: $3.15

Figure 2. Honey jars used in the experiment (12 ounces)[3]

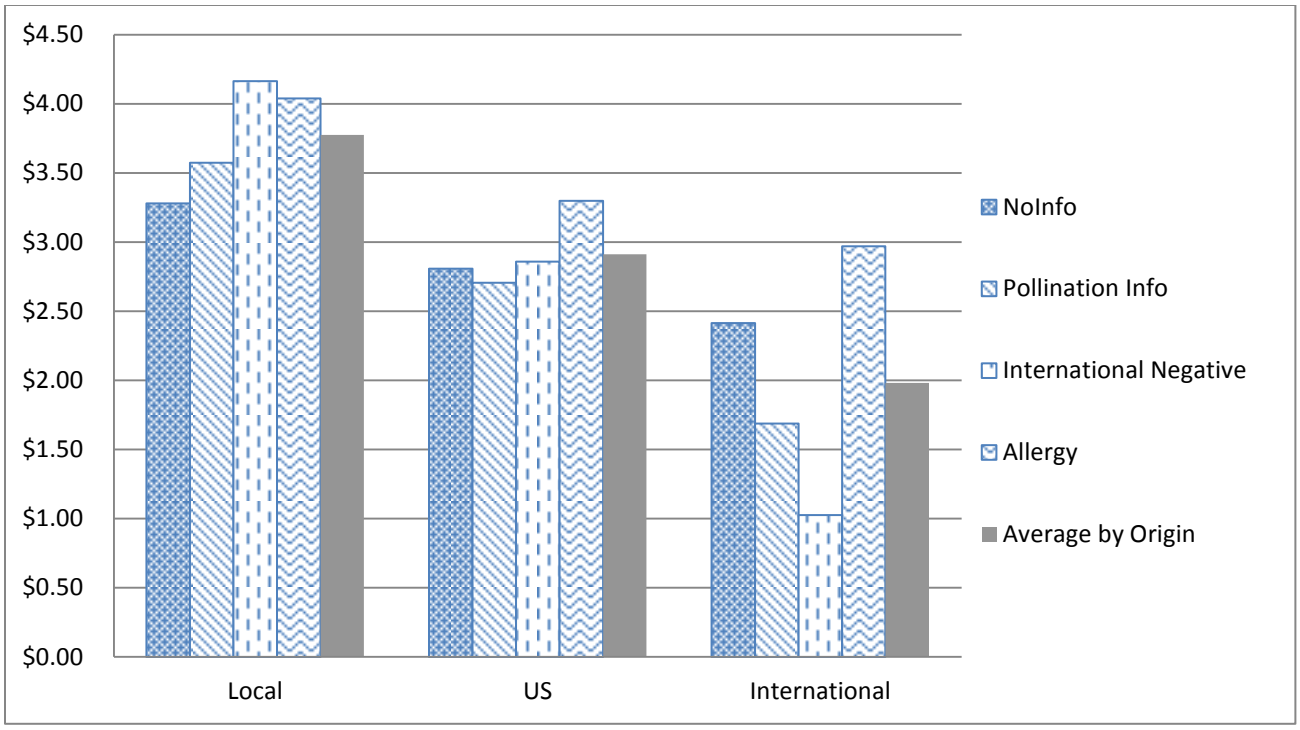


Figure 3. Average bids by origin of honey and information treatment

Table 1. Research Hypotheses

	Question	Hypothesis	Result
1)	Are consumers willing to pay more for local honey compared to international honey?	H_0: $WTP_{Local} = WTP_{International}$	Reject – Consumers have higher WTP for local compared to international honey
2)	Are consumers willing to pay more for U.S. honey compared to international honey?	H_0:$WTP_{US} = WTP_{International}$	Reject – Consumers have higher WTP for U.S. compared to international honey
3)	Is consumer WTP for interinational honey influenced by negative information?	H_0: $\beta_{International\_Info}=0$	Reject – Consumer WTP is influenced by international information and the influence varies with honey origin
4)	Are the influences different based on the origin of the honey?	H_0: $\beta_{International\_Info*Local}=\beta_{International\_Info*US}=0$	
5)	Is consumers' WTP for honey influenced by information about the benefits of bee pollination?	H_0: $\beta_{Pollination\_Info}=0$	Do Not Reject.
6)	Is consumers' WTP for local or US honey influenced by information about the benefits of bee pollination?	H_0: $\beta_{Pollination\_Info*Local}=\beta_{Pollination\_Info*US}=0$	Reject – Consumer WTP for local and US honey increase with information about pollination
7)	Is consumer's WTP influenced by potential allergy-treating benefits from eating local honey?	H_0: $\beta_{Allergy\_Info}=0$	Do not reject
8)	Is consumer's WTP influenced by potential allergy-treating benefits dependent upon the location of the honey production?	H_0: $\beta_{Allergy\_Info*Local}=\beta_{Allergy\_Info*US}=0$	
9)	Is consumer WTP for honey influenced by the jar shape?	H_0: $\beta_{Queenline}=\beta_{Bear}=\beta_{Hexgon}=\beta_{Teardrop}=\beta_{Sealedtop}$	Reject – Consumer WTP is influenced by jar shape

Table 2. Demographic Variables

Variable	Description	Mean	SD
Male	1 if subject is male; 0 if female	0.23	0.42
Age	Age in years	41.93	14.27
White	1 if subject's race is white; 0 otherwise	0.74	0.44
Education	Years of education	16.39	2.85
Income	Household yearly income in thousand dollars	76.09	48.37
Married	1 if subject is married; 0 otherwise	0.54	0.50
Primaryshopper	1 if subject is household's primary shopper; 0 otherwise	0.77	0.42
Children	Number of children under 18 in household	0.50	0.80
Vegetarian	1 if subject is a vegetarian; 0 otherwise	0.07	0.25
HaveAllergy	1 if someone in household has allergy problems; 0 otherwise	0.50	0.50
BelieveHelpAllergy	1 if subject believes local honey helps treat allergies; 0 otherwise	0.56	0.50
Diabetes	1 if subject has diabetes; 0 otherwise	0.04	0.20
Supermarket	1 if subject's primary source of honey is a supermarket; 0 otherwise	0.58	0.49
AnnualPurchase	Quantity of honey purchased each year in ounces	32.89	34.14
HaveEnoughHoney	Subject reports having enough honey at home (1-5 scale)	2.52	1.47

Table 3. Attitude Variables (Listed from Highest to Lowest in terms of Importance or Agreement)

Variable	Description	Mean	SD
Please rate the importance of each factor for you to consume honey: 1=Least Important, 5=Most Important			
taste	I think it tastes good.	4.18	0.78
health	I think it is good for health.	3.78	1.13
ingredient	I mainly use it as an ingredient.	3.57	1.12
environhelp	I think it helps the environment.	3.23	1.13
Please rate how important the following information might have been in influencing your willingness to pay for honey: 1=Least Important, 5=Most Important			
notrealhoney	Some reports say that some imported honey on the market is not even real honey.	4.02	0.98
tapflowers	Honey bees must tap two million flowers to make one pound of honey.	3.83	0.98
labelnottrue	Honey might not be from the location that is stated on the label.	3.74	1.10
largeimport	67% of honey on the U.S. market is imported from over 15 countries.	3.71	0.98
workbee	An average worker honey bee can make 1/12 teaspoon of honey in her lifetime.	3.06	1.09
footprintlow	Local honey has the lowest carbon footprint of any sweetener.	2.84	1.06
Please rank your level of agreement with each of the following statements: 1=Strongly Disagree, 5=Strongly Agree			
LOCAL HONEY			
localeconomy	Buying local honey supports local business and economy.	4.72	0.54
localbee	Local bee colonies help the pollination of local plants and crops.	4.44	0.84
localenviron	Local honey producing is environmentally beneficial to the local community.	4.34	0.80
localbetterinter	Honey produced locally is of better quality than honey imported from other countries.	3.86	0.96
localbetterus	Honey produced locally is of better quality than honey	3.64	0.94

	produced in other regions of the United States.		
localallergy	Local honey aids in allergy treatment, desensitizing you to the local pollen.	3.63	1.00
localtaste	Local honey tastes better.	3.62	0.95
localpure	Local honey is purer than other types of honey.	3.42	0.88
ATTITUDES ABOUT BEES AND HONEY PRODUCTION			
concernsafety	I am very concerned about my food safety.	4.05	1.03
smallbetter	I think small producers have better quality honey than large companies.	3.83	0.96
auctiondeal	I think the purchase of the honey in the auction was a good deal.	3.65	1.10
organichoney	I am willing to buy organic honey at a higher price than ordinary honey.	3.58	1.27
govkeepsafe	I think the government is doing a good job in keeping the food market safe.	3.01	1.08
honeysaferisk	I believe there are big safety risks in the U.S. honey market.	2.90	0.95
honeymorerisk	I think the honey market has more risk than other food markets.	2.90	0.87
enoughhoney	I did not submit a high bid in the auction because I already have enough honey at home.	2.52	1.47
afraidbee	I am afraid of bees because they might sting me.	2.49	1.47
largebetter	I think honey from large retailers is better than honey from farmers' markets.	2.13	1.05
nolocalbee	I would prefer not to have beekeepers in my local community.	1.76	1.11

Table 4. Willingness to Pay for Honey

	WTP Bid Amount - Random Effects Tobit		Likelihood of Zero WTP - Random Effects LPM	
	(Model 1)	(Model 2)	(Model 3)	(Model 4)
Local Honey	0.9748 ***	0.9756 ***	–0.0714 **	–0.0714**
	(0.1575)	(0.1575)	(0.0286)	(0.0286)
U.S. Honey	0.4759 ***	0.4762 ***	–0.0786 ***	–0.0786***
	(0.1576)	(0.1576)	(0.0286)	(0.0286)
Bear Jar	0.4144 ***	0.4145 ***	–0.0464 **	–0.0464**
	(0.0998)	(0.0998)	(0.0182)	(0.0182)
Hexagon Jar	0.1659 *	0.1661 *	–0.0261	–0.0261
	(0.1001)	(0.1001)	(0.0182)	(0.0182)
Teardrop Jar	0.3069 ***	0.3069 ***	–0.0319 *	–0.0319 *
	(0.0999)	(0.1000)	(0.0182)	(0.0182)
Bail Jar	0.4816 ***	0.4820 ***	–0.0464 **	–0.0463 **
	(0.0997)	(0.0997)	(0.0182)	(0.0182)
International Info	–2.0819 ***	–1.6196 ***	0.2973 ***	0.2000 ***
	(0.5498)	(0.5618)	(0.0737)	(0.0641)
Pollination Info	–0.7702	–0.7336	0.0029	–0.0483
	(0.5892)	(0.6047)	(0.0792)	(0.0687)
Allergy Info	0.5073	0.5265	0.0478	–0.0294
	(0.5645)	(0.6147)	(0.0807)	(0.0661)
Local × International Info	2.779 ***	2.7764 ***	–0.3161 ***	–0.3161 ***
	(0.2198)	(0.2120)	(0.0392)	(0.0392)
U.S. × International Info	1.8965 ***	1.8952 ***	–0.2652 ***	–0.2652 ***
	(0.2200)	(0.2200)	(0.0392)	(0.0392)
Local × Pollination Info	1.0726 ***	1.0724 ***	–0.0288	–0.0286
	(0.2220)	(0.2221)	(0.0405)	(0.0405)
U.S. × Pollination Info	0.6772 ***	0.6770 ***	–0.0288	–0.0286
	(0.2224)	(0.2224)	(0.0405)	(0.0405)
Local × Allergy Info	0.2546	0.2550	–0.1138 ***	–0.1138 ***
	(0.2222)	(0.2222)	(0.0409)	(0.0409)
U.S. × Allergy Info	0.0107	0.0116	–0.1140 ***	–0.1140 ***
	(0.2222)	(0.2223)	(0.0409)	(0.0409)
C	5.2832	6.1120	0.2495	0.0288
Experimental Controls	X	X	X	X
Demographic and Attitude Controls		X		X
Log-Likelihood	-2,824.29	-2,806.91		
Overall R^2			0.1473	0.2246
Wald χ^2	910.73	950.77	356.11	111.43
χ^2 p-value	0.0000	0.0000	0.0000	0.0000
Total observations	1725	1725	1725	1725
Uncensored Observations	1487	1487		
Left Censored Observations	238	238		

Notes: ***, **, * represent significance at the 1%, 5%, and 10% levels, respectively. Estimates include subject random effects. Experimental Controls include several order effects. Demographic and Attitude Controls are summarized in tables 2 and 3.

Appendix A - Information Sheets

The following information is the same as the tags on the jars of honey on your desk:

Below are sources of information that describe the potential advantages of purchasing **locally produced honey**:

Source 1: American Beekeeping Federation

"As honey bees gather pollen and nectar for their survival, they pollinate crops such as apples, cranberries, melons and broccoli. Some crops, including blueberries and cherries, are 90-percent dependent on honey bee pollination; one crop, almonds, depends entirely on the honey bee for pollination at bloom time.

For many others, crop yield and quality would be greatly reduced without honey bee pollination. In fact, a 1999 Cornell University study documented that the contribution made by managed honey bees hired by U.S. crop growers to pollinate crops amounted to just over $14.6 billion. "

Source 2: www.helphoneybees.com *(accessed on 11/02/2012)*

"One out of every three bites of food an average American eats is directly attributed to honey bee pollination.

Honey bees are responsible for the pollination of more than 100 crops, including fruits, vegetables, nuts and seeds, and provide 80 percent of the country's pollination services."

Source 3: Charles Breinig, The Pennsylvania Beekeeper *(Jan 2012, Vol. 1)*

"Honey Bees are beneficial and critical to local community gardens and fruit trees. Local Garden clubs realize that without the Honey Bee many flowers will not be pollinated, and the diversity of our flowers and vegetables would diminish. Honey Bees are not just beneficial, they are critical to local vegetable gardens, fruit trees, and flowers.

Having local beekeepers is just as important to local flower gardeners and vegetable gardeners, as having water and compost. Local Beekeepers are an insurance policy against devastating losses by large commercial growers, and provide a unique opportunity to maintain and ensure genetic diversity."

The following information is the same as the tags on the jars of honey on your desk:

Below are sources of information that describe the potential issues with **internationally produced honey:**

Source 1: **Andrew Schneider, "Asian Honey, Banned in Europe, Is Flooding U.S. Grocery Shelves", Food Safety News** *(August 15, 2011)*

"The U.S. consumes about 400 million pounds of honey a year. However, the USDA says U.S. beekeepers can only supply about a 48 percent of what's needed here. The remaining 52 percent comes from 41 other countries.

- The U.S. imported 208 million pounds of honey over the past 18 months.
- Almost 60 percent of what was imported – 123 million pounds – came from Asian countries – traditional laundering points for Chinese honey. This included 45 million pounds from India alone.

A third or more of all the honey consumed in the U.S. is likely to have been smuggled in from China and may be tainted with illegal antibiotics and heavy metals. A Food Safety News investigation has documented that millions of pounds of honey banned as unsafe in dozens of countries are being imported and sold here in record quantities."

Source 2: **Andrew Schneider, "Tests Show Most Store Honey Isn't Honey", Food Safety News** *(November 7, 2011)*

"The food safety divisions of the World Health Organization, the European Commission and dozens of others also have ruled that without pollen there is no way to determine whether the honey came from legitimate and safe sources.

Food Safety News found U.S. groceries flooded with Indian honey banned in Europe as unsafe because of contamination with antibiotics, heavy metal and a total lack of pollen which prevented tracking its origin.

Food Safety News purchased more than 60 jars, jugs and plastic bears of honey in 10 states and the District of Columbia. Test found that:

- 76 percent of samples bought at groceries had all the pollen removed;
- 100 percent of the honey sampled from drugstores like Walgreens, Rite-Aid and CVS Pharmacy had no pollen.
- 77 percent of the honey sampled from big box stores like Costco, Sam's Club, Walmart, Target and H-E-B had the pollen filtered out. "

The following information is the same as the tags on the jars of honey on your desk:

Below are sources of information that describe the potential advantages of purchasing **locally produced honey**:

Source 1: ***Greenster.com*** *(April 29, 2008)*

"Honey for allergies. So many of us suffer from allergies and may feel like our only resort is to down Claritin or Sudafed or other medications. These options can become expensive, and are likely to have negative side effects on our body, especially if they are taken long-term. For example, mild side effects from Sudafed can include insomnia, rash, and restlessness. Serious symptoms can include a pounding heartbeat, flu symptoms, severe dizziness and increased blood pressure. I don't know about you, but when I'm feeling terrible from my allergies, I don't want to end up feeling even worse from my medicine!

Luckily, medicine isn't our only option for allergy relief. Honey from local bees can help with your hay fever symptoms without the side effects and cost of medicine. How does this work? Your hay fever allergies are caused by pollen in your local area. The bees collect this pollen from the local plants, and small amounts of it are transferred to their honey. When you ingest this honey in small amounts, it works like a series of allergy shots, by slowly building up your tolerance to the allergen, and decreasing your allergy symptoms. The best way for this to work is to ingest 2-3 teaspoons of the honey daily for a few months before pollen season.

Honey can also help your allergies in the short term, as it is known to have an anti-inflammatory effect. Take a spoonful before outdoor activities and it might help with your allergies for the day."

APPENDIX B – Experiment Instructions

Part A - Experiment Instructions

Welcome to an experiment session in consumer decision making. In the course of this session, you will have opportunities to earn up to $18 in cash and products. Please read these instructions carefully and ask the administrator if you have questions. Please do not communicate with other participants during the experiment. As stated in the Consent Form, your participation in this experiment is voluntary and you can withdraw from this experiment at any time.

Part A: For this part of today's session, you will be given $15 cash. You are welcome to keep this money and take it home at the conclusion of this session, or you may use this money to purchase a jar of honey. Any money you do not use to buy a jar of honey is yours to keep.

In this session, you will make **20 decisions** about purchasing different **jars of honey**. However, at the end of the session, only **one** of the 20 decisions will be selected. This selected decision will determine which jar of honey is purchased and your final cash earnings. This decision will be determined randomly at the end of the session by having a volunteer draw a ball from a bag containing 20 balls, labeled 1 to 20. Since each of the 20 decisions is represented by one ball, each decision has an equal likelihood of being selected. Thus, you should treat every decision as if it was the one that will be selected.

Your decision will be referred to as a **bid** and your bid will represent the **highest amount of money you would be willing to pay** for each jar of honey. On your desk and in front of the room, there are displayed five different jars labeled by the numbers 1 through 5. All of the jars contain 12 ounces of honey.

You will submit your bid by using the computer program, as shown below. If you wish to bid $0.00 for the item, simply click the "Withdraw Now" button. If you wish to bid an amount greater than $0.00, then click the button labeled "Start the Clock" and then your computer will show your bid amount that will gradually increase starting from $0.00. When your displayed bid reaches the highest amount you would be willing to pay for this jar of honey, click the "Withdraw from Auction" button. This will stop the clock and a box will then ask you if you like to submit your bid at the current price. If you would like to submit this bid, click "OK". If not, click "Cancel". If you click "Cancel", your bid amount will be re-set $0.00 and the bid will again continue to increase until you click the "Withdraw from Auction" button.

Once all participants have submitted their bids, the administrator will rank them from highest to lowest and sell the item to the person who submitted the **highest bid**. The price that this person pays will be equal to the **second highest bid** that was submitted for this item. To better

understand how this works consider the following hypothetical example in which four participants each $1.50 as the **initial balance** and submitted the following bids for an item:

Bid A	**Bid B**	**Bid C**	**Bid D**
$1.00	$0.25	$0.50	$1.25

After receiving these four bids, the administrator ranks them from the highest to the lowest, as shown below:

Bid D	**Bid A**	**Bid C**	**Bid B**
$1.25	$1.00	$0.50	$0.25

In this case, the participant with the highest bid (Participant D) would purchase the item, but would pay a price equivalent to the second highest bid ($1.00). Thus, Participate D would receive the item and $0.50 cash ($1.50 - $1.00). The other participants who did not purchase the item would receive their initial balance of $1.50.

Note that in this auction, it is in your best interest to submit a bid equal to the highest amount you would be willing to pay for each item, because if you purchase the item, you will pay a price equal to the second highest bid, not necessarily of your bid.

To give you experience with how this auction will work, you will first make a couple of decisions for non-honey products. The first item is a Ticonderoga Pencil. The second item is a Zebra Z-Grip Ball Point Pen. For each of these products you will be given an additional $1.50 and each item will be selected and be used to determine earnings.

Part B – Experiment Instructions

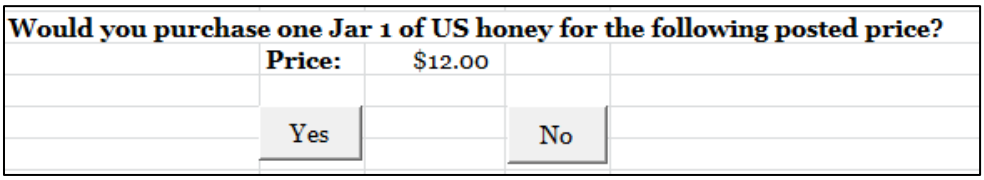
This part will again use an auction and will operate in a similar manner to Part A, except that your decision is now for 15 different jars of honey. You will be given $15.00 for these decisions. In the auction, you can submit any bid between $0.00 and $15.00. As described in Part A, only one of the 20 jars of honey (15 jars in Part B and 5 jars in Part C) will be selected randomly at the end of the session for purchase and will be used to determine your cash earnings.

In this part of the experiment, you will submit bids on three types of honey that differ based on its production location. These are labeled: Local, U.S., and International.
Local honey comes from the local region around Newark, Delaware.
U.S. honey was produced in the United States.
International honey was produced outside of the United States.

Each of these three types of honey is in five different jars, labeled 1 to 5.

Part C – Experiment Instructions

In this part, you will again be making decisions about purchasing jars of honey. However, instead making your decision using an auction, you will now make your purchase decision based on a posted price. For these final five decisions, you will be given a **posted price** for each jar of honey. This honey was produced in the United States. The posted prices for each of these jars of honey will vary and range from $0 to $15. The posted price that you can purchase each jar of honey is shown on your computer spreadsheet (see the hypothetical example below). For these decisions, you will then need to determine whether you want to purchase this jar of honey for that price.



If you want to purchase this honey at this posted price, then click the "Yes" button. By answering Yes", you are indicating that you would pay this price for this jar of honey. Therefore, if this decision is selected you will purchase this jar of honey and your cash earnings will be $15 minus the price.

If you do <u>not</u> want to purchase this honey at this posted price, then click the "No" button. By answering "No", you are indicating that you would not pay this price for this jar of honey. Therefore, if this decision is selected, your cash earnings would be $15.

Footnotes:

1. To the authors' knowledge, none of these reported health benefits have been scientifically shown to be accurate. However, the apparent healthiness of honey is widely believed amongst some consumers and therefore we wanted to specifically test for the importance of these beliefs.

2. As an integrated research-extension project, this research first involved feedback from a regional honey producers' working group consisting of more than 30 beekeepers representing five states. A key concern for these producers was determining to what extent different types of jars could influence consumers' WTP.

3. The costs are prices of each jar purchased at the quantity needed for our experiments (less than 30). Most of the prices are likely to be lower when purchased at larger quantities. There are many other websites that carry similar jars and it is possible to find them at lower prices.