DO AUCTIONS LOWER WTP ESTIMATES?
AN ARTEFACTUAL FIELD EXPERIMENT

by
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ABSTRACT

This study compares the willingness to pay (WTP) estimates for a jar of honey from a second price Vickrey auction to the Posted Price setting (also known as the dichotomous choice, or the take-it-or-leave-it) with 115 adult participants. Consumers’ WTP are about 50% lower in the auction compared to the Posted Price. Several potential explanations are proposed for the difference.
Chapter 1

INTRODUCTION

Theoretically incentive compatible auctions are widely used in experimental economics, especially in eliciting consumers’ WTP for goods and services. Posted Price (known as the dichotomous choice) with real payments are also often used as “the true WTP” in the contingent valuation literature. While a great depth of research has been done in each field, much less attention has been paid to the comparison of the relative WTPs from the two mechanisms. Auctions are known to suffer from a number of biases that might lead to over or under bidding; however in Posted Price settings participants might not always follow the dominant strategy. This research explores the topic by making within subject WTP comparisons between a second price auction and Posted Price mechanism. Results suggest that WTP in the auction is significantly lower than the Posted Price. Possible explanations for the difference are provided and tested.
Chapter 2

BACKGROUND

Researchers and decision makers are often interested in how much consumers are willing to pay for products or services in order to estimate welfare and demand elasticity. Such information is used in pricing new products and services, informing policy decisions and legal proceeding.

Obtaining an individual’s true WTP is not an easy task. Many techniques have been adopted to measure WTP for goods without a well-defined or easily observable market, including stated preference methods such as contingent valuation, revealed preference methods such as the notably wide variety of auction formats used in laboratory experiments. The most intuitive way would be to directly ask an individual “How much are you willing to pay for X,” which is similar to open ended contingent valuation questions. However this method has been criticized for generating poor indicators of the actual WTP (Diamond and Hausman 1994), as it differs from the normal price taking setting where consumers react to posted prices (Loomis et. al. 1997). In response to criticisms, a panel convened by the National Oceanic and Atmospheric Administration (NOAA) recommended using dichotomous choice format in contingent valuation surveys (Arrow et. al. 1993).¹

¹ The dichotomous choice is also known as Posted Price, or Take-it-or-leave-it, or discrete referendum design.
In a dichotomous choice contingent valuation question, participants are asked whether they are willing to pay a given dollar amount that (often randomly) varies between individuals for a defined good and the mean WTP could be estimated from these responses (Hanemann 1994). However, due to lack of real economic commitment, the dichotomous choice contingent valuation surveys suffer from hypothetical bias that often leads to overestimation of WTP (e.g., Cummings, Harrison, and Rutström 1995; Johannesson, Liljas, and Johansson 1998; List and Gallet 2001; Murphy et al. 2005; Harrison and Rutström 2008; Murphy, Stevens, and Yadav 2010). In this literature, the estimates from dichotomous choice contingent valuation surveys are usually compared with results from dichotomous choice questions with real economic incentives, which are treated as indicators of real WTP. For simplicity and distinction, the term Posted Price will be used to refer to dichotomous choice format with real economic incentives for the remainder of the present article.

Posted Price closely mimics market settings since participants play as price takers. In this design, one is asked “Are you willing to purchase this item at $X?” The individual will pay $X for the item if they choose “Yes,” and will not pay $X nor get the item if they choose “No.” This is similar to typical market transactions—where consumers make multiple decisions on whether to purchase items at different posted prices. As a result, the design is easily understood by research participants as it is similar to typical market transactions. However, one disadvantage is that since no exact WTP for each participant is elicited, the mechanism is less statistically efficient and requires larger sample size for the same level of precision compared with other methods (Loomis et al. 1997) such as experimental auctions.
Using incentive compatible auction mechanisms (e.g. Vickrey, English, Becker–DeGroot–Marschak (BDM), and random nth price) is an approach more widely used in experimental economics in eliciting valid responses for consumer WTP (Vickrey 1961; Becker, DeGroot, and Marschak 1964; Shogren et al. 2001). An auction is considered to be theoretically incentive compatible if the dominant strategy for participants is to bid their true value. Auctions have the advantage of revealing exact WTPs for each individual. For this reason, they tend to be the preferred methods for experiments, where concerns about participant unfamiliarity with the mechanism are overridden by the immanence of real money at stake. However, how the WTP estimates from experimental auctions compare to the ones from the also incentive compatible Posted Price setting remains open with only very few investigations (Frykblom and Shogren 2000). This study aims to provide a better understanding of how and why these two mechanisms might differ from each other by making within subject comparisons of WTP from Posted Price and auction.
Chapter 3

LITERATURE REVIEW

3.1 Discussions on Posted Price Settings

Experimental auctions expose respondents to an environment similar to open-ended questions, as opposed to the close-ended Posted Price. Past studies on comparisons of open-ended and close-ended questions should be examined. In contingent valuation literature, disagreements exist on how to compare WTP estimates from hypothetical dichotomous choice questions with open-ended survey questions. While the majority of studies found hypothetical dichotomous choice questions reveal relatively higher WTP compared with their open-ended counterparts (Kealy and Turner 1993; Kriström 1993; Ready, Buzby and Hu 1996), some studies did not find similar evidence (Loomis 1990; Loomis et al. 1997), and the NOAA panel suggest the opposite (Arrow et al. 1993). Researchers have not reached agreement on what effects are causing the difference. Some common explanations include the hypothetical bias, the symbolic effect, the anchoring effect, the yea-saying effect and a lack of familiarity to the open-ended questions (Loomis et al. 1997; Frykblom and Shogren 2000):

1. Hypothetical bias reasoning suggests that the hypothetical nature would influence open and close ended questions differently and the latter is likely to be more “realistic” (Arrow et al. 1993).
2. The symbolic effect states that respondents might answer “yes” not because they would pay the asked price, but to register their support or favor for the program (Brown et al. 1996).

3. The anchoring effect (or the starting point bias) argues that respondents’ values might be influenced and biased towards the posted offer in the dichotomous choice questions (Tversky and Kahneman 1974; Herriges and Shogren 1996). While Green et al. (1998) found strong evidence of anchoring, Kriström (1993) observed no such effect by comparing responses of a sample that went through dichotomous choice questions before open-ended questions to a sample that did only open-ended questions. However both of these tests used public goods, and other effects such as symbolic or yea-saying could play a role.

4. The yea-saying effect represents a tendency for some respondents to say “yes” no matter if the question is truly of favor or not (Couch and Keniston 1960; Ready, Buzby and Hu 1996). Kanninen (1995) described a statistical approach and concluded 20 percent of the respondents in the sample were yea-sayers; Ready, Buzby, and Hu (1996) evidenced a similar 20-22 percent yea-sayers in their sample. However as noted in Frykblom and Shogren (2000), nay-saying received little attention and seems to have been neglected in contingent valuation literature compared to yea-saying.

5. Unfamiliarity. As the NOAA Panel pointed out, the open-ended question format lacks realism and is sensitive to trivial characteristics of the scenario presented. In contrast, dichotomous choice questions tend to be closer to the actual purchasing environment and are easier to answer accurately (Arrow et al., 1993).
3.2 Discussions on Experimental Auctions

Experimental auctions have long been used in agricultural economics to elicit consumers’ valuations. The most widely used auction formats include the Vickrey auction (or second price sealed bid auction) and the English Auction. In a Vickrey auction, the participants confidentially state their bids, and the administrator ranks the bids from the highest to the lowest. The highest bidder wins the auction and gets the item at the second highest bid. In an English auction, the administrator announces the price for the item in an ascending order, and participants withdraw from the auction whenever they think the announced price exceeds their highest WTP. The last person left in the auction wins the item and pays the price where his/her last competitor withdraws at.

In the context of private value auctions, where each participant knows what the item is worth to him, but uncertain of its value to other participants, both Vickrey and English auctions are theoretically incentive compatible and bidding the true value is the dominant strategy (Vickrey 1961). However, empirically these auction formats suffer from different drawbacks. Multiple studies have shown consistent overbidding in Vickrey auctions using induced values (e.g., Kagel, Harstad, and Levin 1987; Kagel and Levin 1993; Harstad 2000; Cooper and Fang 2008). English auctions are known to suffer less from the overbidding problem (e.g., Kagel, Harstad, and Levin 1987; Harstad 2000; Cooper and Fang 2008), but market feedback is difficult to control and participants’ bids might be affiliated (Lusk, 2003). Although Lusk, Feldkamp, and Schroder (2004) showed English and BDM auctions, which involve a greatly different

---

2 It should also be noted that BDM and random-nth price auction are also often used by researchers.
amount of market feedback, provide the same between subject estimates of WTP, it should still be noted that market feedback could affect bids in many ways. With market feedback, “off-margin” bidders might realize their chances of winning are low, thus the auction might not be incentive compatible due to the low cost of misbehaving (Shogren et al., 2001). Even only with price feedback after each round in multiple round auctions, bids might become affiliated and raise a series of problems (Corrigan et al., 2012). This study implements a variation of the second price Vickrey auction which combines the ascending price feature from the English auction and the sealed bid nature from the Vickrey auction (Bernard 2006; Dillaway et al. 2011). This mechanism is shown to keep the benefits of both the Vickrey and English auction, while avoiding the stated disadvantages (Bernard 2006).

3.3 Comparisons of Posted Price and Auctions

Despite the flourishing of literature within each field, surprisingly there has been very limited literature examining the relative WTP from Posted Price and auctions. Frykblom and Shogren (2000) compared a non-hypothetical dichotomous choice question to a Vickrey auction and found no significant difference in WTP estimates. Two explanations for the possible difference were eliminated, leaving anchoring, yea-saying and unfamiliarity to open-ended questions untested. However the study has some drawbacks such as the comparison was between subjects and the experiment was done with student participants on a book related to their majors. Kass and Ruprecht (2006) found evidence that subjects bid lower in a Vickrey auction with value uncertainty, compared to BDM and stated preference methods. But their attempt of explanation is problematic since it relies on risk aversion, which should be equivalent in all formats, not just in Vickrey. A recent study by Berry, Fischer, and
Guiteras (2012) compared BDM with Posted Price and found the bids in BDM were lower than the WTP demonstrated in Posted Price. Similarly to the drawbacks of Frykblom and Shogren (2000), their experiment unit was compounds (extended-family households in rural Africa) and the comparison was also between subjects.

It is worth noting that a similar question has been discussed in the operations management literature, especially in the context of the “Buy it now” vs. “Auction” from Ebay. With different specifications on auction cost, reserve price, participation cost and agent information, “Buy it now” and “Auction” yield different results (e.g., R. Wang 1993; Brorsen Boyer, and Zhang 2012; Grebe, Ivanova-Stenzel, and Kröger 2010; Wang, Montgomery, and Srinivasan 2008). However there has not been an empirical study that compares the behavior of the two formats with appropriate controls.

To our knowledge, this is the first study comparing within subject WTP estimates from a second price private value auction to a Posted Price design. Our experiment allows us to avoid heterogeneity among different subjects and make the comparison more plausible. It is shown that WTP from the commonly used auctions is significantly lower compared to the Posted Price.
Chapter 4
MOTIVATION

4.1 Conceptual Framework

To conceptualize response differences between second price auctions and Posted Price, participant behavioral anomalies are considered as errors relative to standard preference theory as expounded in the Discovered Preference Hypothesis (DPH; Plott, 1996). This casts economic decision making as a process of discovery which assumes that participants have stable underlying preferences consistent with expected utility maximization. Given appropriate feedback, decision making converges to expect utility behavior in a series of three steps, starting with myopic “impulsive” behavior, and gradually becoming more systematic as additional information is obtained through familiarization and feedback. Braga and Starmer (2005) identify an implicit division in Plott’s description of DPH between “institution” preferences, or preferences over strategies to achieve goals in the decision environment, and “value” learning, or more basic preferences over things like basic tastes, risk, or consumption baskets in unfamiliar states of the world. Notably, DPH implies that the utility for money is stable (van de Kuilen, 2009), and is well adapted into a random utility analysis framework in which the distribution of the utility error term evolves conditional on information and feedback from the decision environment (Kingsley and Brown, 2010).

The market experiments used for value elicitation typically provide very little in the way of direct feedback for participant choices until after all participant choices
have been made. In this environment, with very little information concerning value outcomes over participant choices, it is reasonable to suppose that participants making decisions in “impulsive mode” might be very sensitive to information provided through the framing of the decision. Several hypotheses along this theme are proposed to explore possible causes of behavioral discrepancy between second price auctions and Posted Price.

Formally, suppose that each participant, \( i \), for item \( j \), for choice opportunity \( k \) has the following utility:

\[
u_{i,j,k} = \alpha_{i,j} + \varepsilon_{i,j,k}.
\]

Note that for each item and participant \( \alpha_{i,j} \) is constant over decision opportunities. No restrictions are placed on \( \varepsilon_{i,j,k} \) in terms of distribution, or even mean, however we posit that the distribution can be affected at the time of a decision by information provided in the choice opportunity framing, so that the participant has a prior error distribution walking into the experiment, \( \varepsilon_{i,j} \), and an error distribution for each choice opportunity conditional on the information provisioned in the structure from both the current decision as well as feedback from any prior decisions, \( j < k \),

\[
\varepsilon_{i,j,k} = \varepsilon_{i,j} | \Omega_{i,k}.
\]

where \( \Omega_{i,k} \) represents all information available to a participant for decision \( k \). According to DPH, as \( \Omega_{i,k} \) increases with information from prior decisions, \( \varepsilon_{i,j,k} \), will go to zero, and the participant will play a strategy consistent with \( u_{i,j,k} = \alpha_{i,j} \) with certainty.

If participants are risk-averse, this uncertainty in values would suggest that they will demand a risk premium in their responses; however this premium would be uniform across both offer types, so would be expected to affect strategies equally and
not be evidenced in the results of a within subjects, homegrown value experiment. Therefore risk neutrality is assumed, so that the usual equilibrium strategies will hold. For the second price auction, for participant i, good j, and offering k, the equilibrium strategy will be to bid the expected value conditional on information at the time of offering:

$$\text{bid}_{i,j,k} = E(u_{i,j,k}|\Omega_{i,k}).$$

For the Posted Price, the participant would be expected to accept (\(\text{accept} = 1\)) when the posted price offering \(\text{pp\_offer}_{i,j,k}\), does not exceed their conditional expected value, and in the negative (\(\text{accept} = 0\)) otherwise:

$$\text{accept}_{i,j,k} = \begin{cases} 
1 & \text{if } \text{pp\_offer}_{i,j,k} \leq E(u_{i,j,k}|\Omega_{i,k}) \\
0 & \text{if } \text{pp\_offer}_{i,j,k} > E(u_{i,j,k}|\Omega_{i,k}) 
\end{cases}.$$

Note that this accommodates both institutional and value uncertainty. We can assume that the players are aware of the equilibrium strategies, however may rationally adopt a strategy that is off of the equilibrium if \(\Omega_{i,k}\) contains information or beliefs about the institutional setting that systematically shift \(\epsilon_{i,j,k}\). Therefore, for our purposes under this paradigm, investigating value response anomalies is equivalent to considering the conditional effect of different information on the error term.\(^3\) Specifically the following hypotheses are tested in the next section.

---

\(^3\) In this paradigm, information is valuable in terms of a decrease in future variance of epsilon for a risk-averse agent. Therefore, a rational agent would have to have an optimal sampling strategy to best explore the outcome space – i.e. there is a potential tradeoff between rent and future variance, and an agent might play far from their expected utility rational equilibrium in order to maximize entropy, depending on their priors. We posit that, depending on the learning model one assumes, this could lead to rational strategies that are exceptionally sensitive to minor information changes during the so-called impulsive phase of DPH strategy.
4.2 Hypotheses

First, are WTP estimates from Posted Price equal to the ones from second price auctions?

\[ H_0: \text{WTP}_{\text{Posted Price}} = \text{WTP}_{\text{Auction}} \]

Second, if the answer is no (\( \text{WTP}_{\text{Posted Price}} \neq \text{WTP}_{\text{Auction}} \)), is it due to biased statistical estimations, instead of behavioral factors?

If WTP estimates from these two formats are actually the same but became inconsistent due to different statistical procedures, the inconsistency should not exist if the same procedure is used to calculate WTP. Assume participants’ bids \( \text{bid}_{i,j,k} \) accurately reflect their true WTP, they should accept \( (\text{ShouldAccept}_{ijk} = 1) \) in the Posted Price if the posted price offer \( PP_{\text{offer}}_{i,j,k} \) does not exceed their bid, and do not accept \( (\text{ShouldAccept}_{ijk} = 0) \) otherwise:

\[
\text{ShouldAccept}_{i,j,k} = \begin{cases} 
1 & \text{if } PP_{\text{offer}}_{i,j,k} \leq \text{bid}_{i,j,k} \\
0 & \text{if } PP_{\text{offer}}_{i,j,k} > \text{bid}_{i,j,k}
\end{cases}
\]

Since \( \text{ShouldAccept}_{ijk} \) and the real posted price results \( \text{accept}_{i,j,k} \) are both binary, the same statistical approach could be applied to calculate WTP estimates.\(^4\) If participants’ behavior is consistent and any difference is a result of estimation methods, the confidence intervals (C.I.) from the \( \text{ShouldAccept} \) should be significantly different from the one from Auction. It would further validate this hypothesis if the \( \text{ShouldAccept} \) C.I. is significantly different from estimates from the Posted Price. Specifically, the following equations are tested:

\[
H_0: \text{WTP}_{\text{ShouldAccept}} \neq \text{WTP}_{\text{Auction}}
\]

\[
H_0: \text{WTP}_{\text{ShouldAccept}} = \text{WTP}_{\text{Posted Price}}
\]

\(^4\) See detailed discussion on econometric modeling in Chapter 6.
Third, if the above hypotheses are rejected, the difference should not be due to statistical biases. What behavioral factors could be at fault?

As discussed in Chapter 3.1, several reasons may lead to WTP difference in the two formats in contingent valuation. It is reasonable to expect similar effects in Posted Price and Auction. Since real economic incentives are used, the hypothetical bias is eliminated as an explanation. Besides, the symbolic effect should not be causing any difference since the item is a private good with no symbolic characteristics to vote for. Therefore, the following explanations are examined respectively:

1. The anchoring effect.

Is participants’ value information affected by the Posted Price, leading bids anchored to the posted price offers? In terms presented above, does $E(\varepsilon_{i,j})$ differ from $E(\varepsilon_{i,j}|p_{i,j,k})$? If this is the case, posted price offers would have an effect on the bids in the auction if respondents participated Posted Price before Auction, and should not have an effect if they participated Posted Price after Auction. Specifically, regressing bids on posted price offerings for both Posted Price before and after the Auction:

- $H_0: \beta_{PP\_after\_Auction}=0, PP\_offer \neq 0$
- $H_0: \beta_{PP\_after\_Auction}=1, PP\_offer = 0$

2. Yea-saying effect.

Is yea-saying overstating Poste Price WTP estimates? Past research argues that the higher WTP from close-ended questions is due to the higher proportion of yea-saying behavior and if open-ended questions force yea-sayers form values, it could be a more accurate method (Ready, Buzby, and Hu 1996).

Therefore, we test if the probability of making a yea-saying error is larger than nay-saying? In terms, does $\Pr(\text{Accept}=1, \text{ShouldAccept}=0) > \Pr(\text{Accept}=0,$
ShouldAccept=1)? And is the WTP disparity between Posted Price and Auction smaller for ones who experienced Auction first compared to the rest of respondents?

In terms, does WTP_{A, First, Posted Price} – WTP_{A, First, Auction} < WTP_{PP, First, Posted Price} – WTP_{PP, First, Auction}?

3. Unfamiliarity.

Is participants’ institutional information affected by the auction format? Since auctions are unfamiliar to most of the experiment participants, it is reasonable to expect behavioral dispersion from the dominant strategy. For example, participants might be confused by the second price mechanism even though instructions and explanations have been given because it is different from their everyday experience. If this is the case, we would expect to see some experience effect as auction rounds progress. Even though participants do not receive direct feedback after each auction round, there is the possibility of Ω_{i,k} evolving due to increased opportunity for introspection, belief reinforcement, or a similar mechanism. In other words, does

\[ E(\varepsilon_{i,j} | \Omega_{i,k}) = E(\varepsilon_{i,j} | \Omega_{i,k+h}) \] for any h, k?

H₀: \( \beta_{Auction, RoundNumber} = 0 \)

H₁: \( \beta_{Auction, RoundNumber} \neq 0 \)

As shown in Figure 1, the following questions will be addressed:
These hypotheses are tested using the design outlined in the next section.
Chapter 5

EXPERIMENTAL DESIGN

The previously mentioned hypotheses are explored in an experiment about purchasing honey products. All of the sessions were conducted from December 2012 to February 2013 in the Laboratory of Applied and Experimental Economics at the University of Delaware. 115 adult participants were recruited from the local community through various sources including the University online newspaper, email to staff members, local church meetings and the lab website. Efforts were made to recruit real consumers, instead of students, to make our sample more representative and ensure participants are experienced buyers (e.g., Gracia, Loureiro, and Nayga 2011; Chang, Lusk, and Norwood 2009; List 2003). Fifteen sessions were held and participants received $20.00 in cash or products for the one hour study.

In the experiment, participants were randomly assigned to sit at independent computer terminals equipped with privacy screens to ensure confidentiality. Participants were asked to start reading instructions of the experiment once they were seated. A presentation was then given to the participants explaining the steps and how to use the computer program. No communications among participants were permitted throughout the experiment. However, they were encouraged to ask questions at any time during the experiment.

The experiment involved investigating the effects of labeling and packaging on consumers’ WTP for honey products under different information treatments. Specifically, honey from three production origins (local, US and international) were
evenly distributed into five types of jars with different shapes but the same volume, making 15 different jar/origin combinations of honey products. In the auction part participants bid on all these 15 honey products; while in the Posted Price rounds they only made five decisions on US honey. The comparison was focused within US honey, which is more commonly sold in grocery stores, and more familiar to the general audience compared to international or local. Each of the honey jars contained 12 ounces of honey. One set of jars was labeled jar1 – jar5 and placed on the administrator’s desk in front of the participants. Also, every participant had a set of jars within their reach and they were encouraged to take a look at those jars.

Three information treatments were conducted where every participant received a one-page handout with information from various sources related to one topic. The same information was also printed on tags that were tied to every honey jar placed within the participants’ reach. Specifically, the information treatments focused on the pollination benefits of consuming local honey, the allergy treating effects of local honey and the potential risks of consuming international honey. A forth treatment with no information was included as the control group. The administrator read the information to the participants after a brief introduction of the experiment but prior to making any decisions. Figure 2 explains the design of the experiment.
Participants were informed that they would be given $15.00 to purchase a jar of honey. Any money not spent was theirs to keep. Participants received their money and products at the end of the session.

Both written and oral instructions about the experiment were provided to the participants. Out of the 20 rounds (15 auctions and 5 Posted Price), only one round was randomly selected at the end of the session to determine which product to be distributed and cash earnings calculated (e.g., Hayes et al. 1995; Lusk, Feldkamp, and Schroder 2004; List and Lucking-Reiley 2000). This binding round was chosen by a volunteer selecting a bingo ball from a bingo ball cage that contained twenty balls, each representing one round. Demonstrations on how a bingo ball would be chosen to determine the binding round was given to the participants prior to making any decisions. It was also explained explicitly in the presentation and instructions that the
decision of each round should not affect one another and that it is in their best interest to bid as close to what the item is worth to them as possible.\(^5\)

The order of Posted Price and the auction was randomly determined before the session. Two orders (Primary Order and Reverse Order) on the sequence of the products that were presented were implemented. Figure 3 demonstrates the Primary Order while Figure 4 summarizes the Reverse Order. Whether the order was primary or reverse was also determined randomly before the session.

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\(^5\) Explaining to participants their dominant strategy in homegrown experiments is regarded as “best practice” and is widely used (e.g., Rutstrom, 1998; Lusk, Feldkamp, and Schroeder 2004).
Assume Posted Price is before the auction. In the Posted Price part, the participants were asked “Are you willing to purchase a Jar Y of US honey at $X?” The price of the item randomly varied for each decision and was distributed uniformly from $0 to $15. It was made clear to the participants that by clicking “yes”, it indicated that they were willing to pay $X to purchase a Jar Y of US honey and be paid $(15.00 - X), given that was the binding round; by clicking “no”, it indicated that they were not willing to pay $X to purchase a Jar Y of US honey, and be paid $15.00, given that was the binding round.

A second price Vickrey auction was used after adding some elements of the English Auction following Bernard (2006). Specifically, a number representing the price the participant is willing to pay for the item (known as the bid) was shown on the screen in front of each participant. Once the auction started, the number increased from $0 to the maximum allowed. Whenever the participant felt the number reached what he/she was willing to pay for that product, he/she could click “Withdraw from
auction” button to stop the ascending number. Another box would then pop up asking the participant to confirm the number as his/her bid. The participant could either restart the ascending number from $0 and bid again, or could confirm and submit the bid. The auction stopped either when each participant had withdrawn from the auction, or when the market price reached the pre-set upper limit. The bids of each participant were stored in a database and the auction proceeded to the next round.

To help participants better understand the bidding procedure, prior to bidding on honey, two practice rounds were held similar to Liu et al. (2013) and Kanter, Messer, and Kaiser (2009). Participants were given an additional $3.00 in the practice rounds and were asked to submit bids on a Ticonderoga pencil and a Z-Grip ball pen where the range of bids were restricted between $0.00 and $1.50 for each item. In the practice auction, the winner and the second highest bid were announced after each round. It was emphasized to the participants that since the winner only pays the second highest bid, it was in their best interest to focus on determining their own value of the item and bid as closely as possible.

After the practice rounds, participants were asked to submit bids on honey products following the same procedure, except with an initial balance of $15.00. The sequence of the products that went on auction followed the pre-determined primary/reverse order as shown in Figure 3 and Figure 4. Participants were provided with the list of past items and bids they submitted for each. After each round, no price feedback was given to the participants with regard to the winner or the winning to reduce price feedback (Corrigan et al. 2012). Only the winner of the binding round was announced at the end of the experiment.
At the end of the session, a volunteer was asked to draw a bingo ball from the bingo ball cage. Each of the 20 bingo balls represented one of the 20 rounds and a chart about the correspondence of rounds and products was shown to the participants. Based on the binding round, the computer program calculated the earnings and products (if any) the participants would get and displayed them on the screen of each participant to help them fill out receipts. At the end of the session, the participants were asked to fill out a survey on the internet.
Chapter 6

ECONOMETRIC MODELS

6.1 Tobit

Since the bids of the consumers were limited within a $0 to $15 range, a two limit random effects Tobit model is appropriate to analyze consumers’ WTP. The dependent variable is a latent variable $y_{ij}^*$ and can be specified as follows:

$$
\begin{align*}
y_{ij} &= \begin{cases} 
  y_{ij}^* & 0 < y_{ij}^* < 15 \\
  0 & y_{ij}^* \leq 0 \\
  15 & y_{ij}^* \geq 15
  \end{cases} 
\end{align*}
$$

For subject $i$ and item $j$, $y_{ij}^*$ is limited from 0 to 15 and linearly depends on $X_{ij}$ via a parameter (vector) $\beta$. The following random-effects Tobit model is used,

$$
y_{ij}^* = \alpha + \beta X_{ij} + U_i + u_{ij}
$$

$$
= \alpha + \beta_1 PP_{\text{after Auction}}_{ij} + \beta_2 Reverse_{ij} \\
+ \beta_3 jar2_{ij} + \beta_4 jar3_{ij} + \beta_5 jar4_{ij} + \beta_6 jar5_{ij} + U_i + u_{ij}
$$

where $\alpha$ is the average bid for the entire population, $U_i$ is the individual random effects, and $u_{ij}$ is the error term of individual $i$ for product $j$. Variables $jar2$ – $jar5$ are dummies indicating what jar is been auctioned. Variable $PP_{\text{after Auction}}$ and $Reverse$ are dummies controlling for order effects. $PP_{\text{after Auction}}$ equals one when the Posted Price part is after the auction, equals zero otherwise; $Reverse$ equals one when the session used the Reverse Order and equals zero when Primary Order was used. (For details, refer to Chapter 5).
6.2 Logit

For the data from the Posted Price part, the dependent variable \( \text{accept} \) is binary. Denote the probability of subject \( i \) accepting the posted price for product \( j \) as \( \pi(X_{ij}) \), where \( X_{ij} \) is the explanatory vector. Then

\[
\text{logit}(X_{ij}) = \ln \left( \frac{\pi(X_{ij})}{1 - \pi(X_{ij})} \right)
\]

\[
= \beta_0 + \beta_1 PP_{\text{offer}}_{ij} + \beta_2 PP_{\text{after Auction}}_{ij} + \beta_3 Reverse_{ij} + \\
\beta_4 jar2_{ij} + \beta_5 jar3_{ij} + \beta_6 jar4_{ij} + \beta_7 jar5_{ij} + U_i + u_{ij},
\]

where \( PP_{\text{offer}}_{ij} \) is the posted price offer for individual \( i \) of item \( j \). As before, \( jar1 \)-\( jar5 \) are dummies representing each jar, \( PP_{\text{after Auction}} \) is equal to 1 when the Posted Price is after the Auction and \( Reverse \) is equal to 1 when the Reverse order is used in the session. After estimating the logit, the probability of accepting the posted price offer given a vector of \( x \) can be easily calculated using the inverse function:

\[
\pi(x) = \frac{1}{1 + e^{-\left( \beta_0 + \beta_1 PP_{\text{offer}}_{ij} + \beta_2 PP_{\text{after Auction}}_{ij} + \beta_3 Reverse_{ij} + \\
\beta_4 jar2_{ij} + \beta_5 jar3_{ij} + \beta_6 jar4_{ij} + \beta_7 jar5_{ij} + U_i + u_{ij} \right)}}
\]

Based on the estimates from the Logit model, WTP point estimates and 95% confidence intervals were calculated using a Krinsky Robb parametric bootstrap following the wtp procedure in Stata (Hole 2007).
Chapter 7

RESULTS

7.1 Summary Statistics

Table 1 demonstrates socio-demographic characteristics of the sample. The average participant’s age was about 42 years old. Most of the participants were female, which in a way corresponds to the fact that most of the participants were primary shoppers of the family. Average household income was between $70,000 to $80,000 and average year of education was 16. The relatively high education of the sample could be reflective of the population in the university town.

Table 1 Sample Demographic Characteristics

<table>
<thead>
<tr>
<th>Variable Definition</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.77</td>
<td>0.42</td>
</tr>
<tr>
<td>Female 1 = female 0 = male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>41.93</td>
<td>14.27</td>
</tr>
<tr>
<td>Years of Education</td>
<td>16.39</td>
<td>2.85</td>
</tr>
<tr>
<td>Household Yearly Income</td>
<td>$76,086</td>
<td>48,373</td>
</tr>
<tr>
<td>Primary Shoppers</td>
<td>0.77</td>
<td>0.42</td>
</tr>
</tbody>
</table>

7.2 Hypothesis Testing

7.2.1 Test for WTP Difference

\[ H_0: \text{WTP}_{\text{Posted Price}} = \text{WTP}_{\text{Auction}} \]

Table 2 demonstrates results from the Tobit model. PP_after_Auction is significant, meaning that consumers’ bids are $0.74 higher when the Posted Price is
after the auction. The constant term suggests that participants’ WTP for a jar1 of honey is $2.37 with a confidence interval of [1.76, 2.98] when Posted Price is before the auction and Primary Order in use.

Table 2 Two-limit Tobit results, WTP for honey

| Marginal Effect | Std. Err | P>|z| |
|-----------------|----------|------|
| PP_after_Auction | 0.744    | 0.375| 0.047|
| Reverse Order   | -0.307   | 0.379| 0.419|
| jar2            | 0.374    | 0.092| 0.000|
| jar3            | 0.043    | 0.092| 0.639|
| jar4            | 0.183    | 0.092| 0.048|
| jar5            | 0.355    | 0.092| 0.000|
| _cons           | 2.369    | 0.313| 0.000|

Table 3 displays the results from the Logit regression, treating accept the posted price offer (accept) as the dependent variable. Variable PP_offer is significant at the 5% level, which means that holding other effects constant, an increase of $1 in the posted price will decrease the logit estimator of accepting the item by 0.71. Therefore the odds ratio of accepting the item is exp(-0.71)= 0.49 times of the odds ratio if the cost did not increase $1; in other words, the odds ratio of accepting the item decreases 51% when the Posted Price increases by $1.

Table 3 Logit Model results

| Marginal Effect | Std. Err | P>|z| |
|-----------------|----------|------|
Following the Logit regression, the \textit{wtp} procedure in STATA (Hole 2007) provides us with the 95% confidence intervals of the WTP estimates. Variable \textit{PP\_offer} was used as the cost coefficient and \textit{\_cons} as the attribute. To elicit the confidence intervals, the Krinsky Robb (parametric bootstrap) method was chosen (see a discussion of different methods in Hole 2007). The estimated WTP and their confidence intervals from both the auction and Posted Price offerings are summarized in Table 4. Consumers’ WTP in the Posted Price is significantly higher than in the auction and we do not see any overlapping in the tails. The WTP from Auction is about $1.5 smaller, which is about 50% of WTP from Posted Price.

Table 4 Calculated WTP from Posted Price and Auction

<table>
<thead>
<tr>
<th></th>
<th>WTP estimates and 95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WTP estimate</td>
</tr>
<tr>
<td>\textit{Posted Price} (from Logit and \textit{wtp})</td>
<td>4.866</td>
</tr>
<tr>
<td>\textit{Auction} (from Tobit)</td>
<td>2.369</td>
</tr>
</tbody>
</table>
7.2.2 Test for Statistical Estimation Bias

As explained in the motivation part, the difference could be a result of different approaches that were used. A dummy variable ShouldBuy is generated, which equals 1 if the bid is greater than the posted price, and equals 0 otherwise (Table 5).

Theoretically, ShouldBuy is the result of the Posted Price questions if the bid was the participant’s true WTP.

<table>
<thead>
<tr>
<th>Definition</th>
<th>ShouldBuy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bid in Auction &gt; Posted Price</td>
<td>ShouldBuy = 1</td>
</tr>
<tr>
<td>Bid in Auction &lt; Posted Price</td>
<td>ShouldBuy = 0</td>
</tr>
</tbody>
</table>

Theoretically, ShouldBuy is the result of the Posted Price questions if the bid was the participant’s true WTP. However, both the paired t-test and the non-parametric Wilcoxon signed rank test reject the null hypothesis that ShouldBuy is equal to Accept at the 1% level (Table 6).

<table>
<thead>
<tr>
<th>T-test</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ShouldBuy</td>
<td>0.165</td>
<td>0.0189</td>
<td>0.135, 0.196</td>
</tr>
<tr>
<td>Accept</td>
<td>0.290</td>
<td>0.0155</td>
<td>0.253, 0.328</td>
</tr>
<tr>
<td>diff</td>
<td>0.125</td>
<td>0.0171</td>
<td>0.0915, 0.159</td>
</tr>
<tr>
<td>t-statistic</td>
<td>7.305</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To further demonstrate the difference, ShouldBuy is viewed as the result of the Posted Price questions if consumers WTPs were consistent in the Posted Price and the Auction. The Logit regression results are presented in Table 7.
Table 7 Logit Model results of ShouldBuy

| Marginal Effect | Std. Err | P>|z| |
|-----------------|----------|------|
| **PP_offer**    | -2.704   | 0.940 | 0.004 |
| **PP_after_Auction** | 2.523    | 1.560 | 0.106 |
| **Reverse Order** | -1.120   | 1.328 | 0.399 |
| **jar2**        | 0.901    | 1.303 | 0.490 |
| **jar3**        | 0.343    | 1.338 | 0.798 |
| **jar4**        | -0.084   | 1.195 | 0.944 |
| **jar5**        | -0.0073  | 1.243 | 0.995 |
| **_cons**       | 5.838    | 2.546 | 0.022 |

Wald chi²: 8.51
Prob > chi²: 0.2896
Log likelihood: -100.958

Again using the `wtp` procedure in STATA (Hole 2007) WTP and confidence intervals are calculated and summarized in Table 8 with the ones from Posted Price and Auction.

Table 8 Compare WTP from Posted Price, Auction and ShouldBuy

<table>
<thead>
<tr>
<th>WTP estimates and 95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTP estimate</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td><strong>Posted Price Results</strong></td>
</tr>
<tr>
<td><strong>Auction Results</strong></td>
</tr>
<tr>
<td><strong>ShouldBuy Results</strong></td>
</tr>
</tbody>
</table>

If the difference observed is a result of the different estimation methods instead of behavioral factors, the following hypotheses should be rejected:

H₀: WTP$_{ShouldAccept}$ ≠ WTP$_{Auction}$

H₀: WTP$_{ShouldAccept}$ = WTP$_{Posted_Price}$

As shown in Table 8, the first hypothesis is rejected, while the WTP in the second equation does have a small overlap in the tails. However, using 95% confidence intervals to compare differences gives very conservative results and small
interval overlapping does not necessarily imply statistical significance, the second equation should also be rejected (Payton, Greenstone, and Schenker 2003). Therefore, the observed lower WTP in the auction is not a result of different statistical approach, but more likely to be caused by behavioral factors.

7.2.3 Tests for Behavioral Factors

Recall that the anchoring effect, yea-saying effect and unfamiliarity could be at fault for the difference in WTP of Posted Price and Auction, each of these explanations is tested following the methods proposed in Chapter 4.

7.2.3.1 Anchoring Effect

If anchoring effect exists, respondents’ auction bids would be anchored to the posted price offers if they participated in the Posted Price before Auction, and should not have an effect if Auction was held before Posted Price. To test for $H_0$: $\beta_{PP\_after\_Auction}=0$, $PP\_offer \neq 0$, regressing bids on posted price offerings when Posted Price is before the Auction (Table 9).

|                | Marginal Effect | Std. Err | P>|z| |
|----------------|-----------------|----------|-----|
| $PP\_offer$    | -.000355        | 0.00983  | 0.971 |
| $Reverse\,Order$ | -1.023          | 0.589    | 0.082 |
| jar2           | 0.459           | 0.117    | 0.000 |
| jar3           | -0.0436         | 0.117    | 0.710 |

The authors concluded using 83% or 84% size for the intervals would generate a test approximately at the 5% level when the standard errors are about equal. Besides, using 95% confidence intervals will give very conservative results, based on both theoretical results for large samples as well as simulation results for a variety of sample sizes.
As shown in Table 9, when participants went through Posted Price first, the posted price offering did not have an effect on their bids. Therefore $H_0: \beta_{PP\text{\_after\_Auction}} = 0$, $PP\_offer \neq 0$ is rejected.

Similarly, to test for $H_0: \beta_{PP\_after\_Auction} = 1$, $PP\_offer = 0$, regressing bids on posted price offerings when Posted Price is after the Auction (Table 10).

Table 10 Test for Anchoring when Posted Price is After Auction

|                  | Marginal Effect | Std. Err | P>|z| |
|------------------|-----------------|----------|-----|
| $PP\_offer$      | 0.00418         | 0.0115   | 0.717 |
| Reverse Order    | 0.269           | 0.497    | 0.589 |
| $jar2$           | 0.303           | 0.136    | 0.026 |
| $jar3$           | 0.115           | 0.136    | 0.397 |
| $jar4$           | 0.246           | 0.137    | 0.073 |
| $jar5$           | 0.361           | 0.136    | 0.008 |
| _cons            | 2.804           | 0.357    | 0.000 |
| Wald chi$^2$     | 9.68            |          |     |
| Prob > chi$^2$   | 0.139           |          |     |
| Log likelihood   | -452.496        |          |     |
| Left-censored observations | 14 |          |     |
| Uncensored observations | 296 |          |     |
| Right-censored observations | 0 |          |     |

As Table 10 demonstrates, posted price offers do not have an effect on bids when Auction is held first. Therefore no matter if Posted Price was held before or after
the Auction, no anchoring effect is observed. This result is consistent with the one from Berry (2012) where they compare BDM with Posted Price.

7.2.3.2 Yea-saying Effect

As mentioned in Chapter 4, some traditional evidence on yea-saying looks for reversals of open-ended and close-ended questions and attributes higher WTP of close-ended format to some respondents accepting high posted price offers but stating lower open-ended answers. However, an important assumption of the method is that WTP in Auction is the true value. A major argument is that yea-sayers respond “yes” to a Posted Price question without actually forming a value, but are forced to form a value in an open-ended question, and sometimes find this value less than the posted price offering they accepted.

For now assume this argument is valid and the difference observed is overestimation of Posted Price due to yea-saying. Therefore, two results should be observed: 1. The proportion of yea-saying is larger than the proportion of nay-saying; 2. Participating in the Auction first would help an individual’s value formation process and mitigate yea-saying. Therefore, the disparity of WTP between Posted Price and Auction should be smaller for ones who experienced Auction first compared to the rest of respondents.

However the result supports neither of these hypotheses.

1. Of all the 480 times when Posted Price is higher than Auction bid, yea-saying occurred 89 times; of the 95 times when Posted Price is lower than Auction bid, nay-saying happened 17 times. A proportion test of equality does not reject the null hypothesis that the two proportions are equal (Table 11). Thus the proportion of yea-saying is not significantly higher than the nay-saying.
Table 11 Proportion Test on Equality of Yea-saying and Nay-saying

<table>
<thead>
<tr>
<th></th>
<th>2 Sample Proportion Test</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>X-Squared</td>
<td>df</td>
</tr>
<tr>
<td>Yea-saying = Nay-saying</td>
<td></td>
<td>0.0221</td>
<td>1</td>
</tr>
</tbody>
</table>

2. Splitting the responses by order and calculating WTP disparities of Posted Price and Auction for both orders suggest no significant decrease in the disparity exists when participants go through Auction first (Table 12). Therefore, no evidence is found to support the hypothesis that Auctions help participants’ value formation better.

Table 12 Comparing WTP disparities of Posted Price/Auction order effects

<table>
<thead>
<tr>
<th>Posted Price after Auction</th>
<th>WTP estimate</th>
<th>95% CI lower bound</th>
<th>95% CI upper bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posted Price</td>
<td>4.296</td>
<td>2.637</td>
<td>5.955</td>
</tr>
<tr>
<td>Auction</td>
<td>2.837</td>
<td>2.159</td>
<td>3.514</td>
</tr>
<tr>
<td>Disparity 1</td>
<td>1.459</td>
<td>0.478</td>
<td>2.441</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Posted Price before Auction</th>
<th>WTP estimate</th>
<th>95% CI lower bound</th>
<th>95% CI upper bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posted Price</td>
<td>4.632</td>
<td>2.673</td>
<td>6.590</td>
</tr>
<tr>
<td>Auction</td>
<td>2.658</td>
<td>1.970</td>
<td>3.345</td>
</tr>
<tr>
<td>Disparity 2</td>
<td>1.974</td>
<td>0.703</td>
<td>3.245</td>
</tr>
</tbody>
</table>

The result also suggests the proportion of nay-saying is higher than yea-saying when Auction is before Posted Price, while the opposite occurs when Posted Price is before Auction.\(^7\) This is due to both the relative increase in the proportion of nay-

---

\(^7\) When Auction is before Posted Price, nay-saying (13 out of 55) has higher proportion than yea-saying (35 out of 255) at the 10% level (p-value=0.065). When Posted Price is before Auction, yea-saying (54 out of 225) has higher proportion than nay-saying (4 out of 40) at the 5% level (p-value=0.048).
saying and decrease in the proportion of yea-saying, when changing from Posted Price before Auction to Posted Price after Auction.\textsuperscript{8}

Based on the above results, both of the proposed hypotheses are rejected and therefore yea-saying should not be driving the difference participants demonstrated.

7.2.3.3 Unfamiliarity

The participants’ institutional information might be affected by the unfamiliarity of auction format. In other words, if \( E(\varepsilon_{i,j} | \Omega_{i,k}) = E(\varepsilon_{i,j} | \Omega_{i,k+h}) \) holds for any h, k. Specifically, if \( \beta_{\text{Auction, RoundNumber}} = 0 \) is tested. Performing a Tobit model including auction bids from all the honey products, \( \beta_{\text{Auction, RoundNumber}} \) is significantly different from 0, with a coefficient estimate of -0.039 and p-value of 0.000. Thus the null hypothesis that \( \beta_{\text{Auction, RoundNumber}} = 0 \) is rejected and therefore as the auction rounds progress, participants tend to adjust their behavior based on information gathered through the process.

While the reason of this decrease over round is not obvious, we consider if off-margin bidders could have an influence even though very little market feedback was given. For the size of our bids, it should be reasonable to define “on-margin” bidders as those whose bids are higher than market price minus one dollar and the rest as “off-margin” bidders:

On margin: Bid > Market Price - $1;

Off margin: Bid ≤ Market Price - $1.

\textsuperscript{8} When experience Auction before Posted Price, the increase of nay-saying is significant at 10% level, while the decrease of yea-saying is significant at 1% level.
Tobit regression results suggest that bids of “off-margin” bidders decrease $0.079 each round, and bids of “on-margin” bidders increase $0.025 each round, both significant at the 1% level.

Therefore, “on margin” bidders seem to follow the Discovered Preference Hypothesis and learn their WTP gradually and “off margin” bidders found their situation from various information sources even though very little market feedback is provided. However even at the end of the session, “on margin” bidders’ WTP would still not be able to be as high as WTP from Posted Price. Thus this should not be the only explanation; other factors that are not discussed in this paper could also exist.
Chapter 8

CONCLUSION

Second price auctions have become very popular instruments for measuring consumer WTP for good attributes. These mechanisms are more efficient than the Posted Price format that is more familiar to most consumers. Motivated by the Discovered Preference Hypothesis (Plott, 1996), this paper empirically tests several hypotheses concerning the accuracy of second price auction in measuring WTP for a food product compared to Posted Price offers using within subject lab experiments. Bids from the auction are significantly lower than WTP from the Posted Price offering. This result is robust to different modeling specifications. Several possible explanations related to information and framing effects are considered. The difference does not appear to be due to different statistical methods, anchoring effect, yea-saying effect and may more likely to be related to unfamiliarity of the auction. Further research could be useful in more precisely identifying informational factors that drive down responses in auction formats, and whether these do decrease over time as predicted by DPH.

The primary implication of the research is that relatively lower WTP from auctions is suggestive of a possible flaw in auction based value elicitation mechanisms. If the DPH is in fact a valid approach for understanding this phenomenon, a natural conclusion is that participants need to receive more training and feedback for their bidding decisions. However, this approach must be given care as such feedback could serve to inordinately influence the perceived value (i.e. increase error from anchoring
on auction results, or increase misbehaving of “off-margin” bidders). An alternative would be to rely more on dichotomous choice designs, however this would demand much larger (and more expensive) samples for the same level of statistical power. Future studies could focus more on the cause of this inconsistency and consider other potential explanations.
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Appendix A

EXPERIMENT INSTRUCTIONS - POSTED PRICE BEFORE AUCTION

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.

For the first five decisions, you will be given a **posted price** 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. 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 not 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.

**Part B – Experiment Instructions**

In this part, you will again be making decisions about purchasing jars of honey. However, instead of deciding on a posted price, you will make your purchase decision using an auction. 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. 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:

<table>
<thead>
<tr>
<th>Bid A</th>
<th>Bid B</th>
<th>Bid C</th>
<th>Bid D</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00</td>
<td>$0.25</td>
<td>$0.50</td>
<td>$1.25</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Bid D</th>
<th>Bid A</th>
<th>Bid C</th>
<th>Bid B</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.25</td>
<td>$1.00</td>
<td>$0.50</td>
<td>$0.25</td>
</tr>
</tbody>
</table>

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, Participant 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.
Appendix B

PROJECT APPROVAL LETTER FROM IRB
DATE: August 27, 2012

TO: Kent Messer, PhD
FROM: University of Delaware IRB

STUDY TITLE: [371015-1] Consumer's Perception on Honey Attributes

SUBMISSION TYPE: New Project

ACTION: APPROVED

APPROVAL DATE: August 27, 2012
EXPIRATION DATE: August 26, 2013

REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category # 7

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.

Please note that all research records must be retained for a minimum of three years.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.
If you have any questions, please contact Jody-Lynn Berg at (302) 831-1119 or jilberg@udel.edu. Please include your study title and reference number in all correspondence with this office.