

FOOD INSECURITY AND THE VALUE OF BEST IF USED BY DATES

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ABSTRACT

Food insecurity affected 10.2% of United States households in 2021. While food pantries offer free food to households in need, prior research suggests that stigma may prevent households from utilizing this valuable resource. Discounting foods near to their expiration or best if used by date (BUBD), a practice also known as expiration date-based pricing (EDBP), has received attention for its potential to both reduce food waste and food insecurity. In theory, discounting foods should make them more affordable for food insecure households, however, prior research suggests households tend to hold negative views of foods nearing their BUBD. Thus, food insecure households may not be willing to pay for such foods even if they are discounted. Furthermore, food insecure households are more likely to utilize food pantries in which they receive foods near to their BUBD, and this prior experience may influence their valuation of BUBD. The purpose of this study is to investigate how food insecure households, and food pantry use, influences consumer valuation of bagged salad and turkey lunch meat with different BUBDs. Data for this project came from an online convenience sample collected by Qualtrics in April and May 2022. Respondents were asked to give their open-ended willingness to pay (WTP) for bagged salad and meat lunch contingent on three BUBDs 7, 5, and 3 or 57, 41, and 30 days in the future, respectively. 709 and 591 respondents were included in the analysis of salad and lunch meat WTP, respectively. The results show that consumers tend to have high WTP for bagged salad with more days until their BUBD; for EDBP, consumers need a greater discount as compensation to accept bagged salad or lunch meat with fewer days until their BUBD. However, food pantry experience does not have an impact on how BUBDs affect WTP nor EDBP discounts, which suggest food pantry experience does not affect consumers' valuation for food nearing BUBDs.

TABLE OF CONTENTS

CHAPTER ONE INTRODUCTION	1
CHAPTER TWO LITERATURE REVIEW	5
2.1 Food Pantry Use and Barriers	5
2.2 Consumer Attitudes for Food Nearing Best if Used by Date (BUBD) and Expiration Date Based Pricing (EDBP)	6
CHAPTER THREE RESEARCH FRAMEWORK.....	9
3.1 Conceptual Framework	9
3.2 Hypothesis development	11
CHAPTER FOUR METHOD AND PROCEDURE	14
4.1 Survey data.....	14
4.2 Cragg double hurdle model.....	16
CHAPTER FIVE RESULT	19
5.1 Descriptive Statistics.....	19
5.1.1 Bagged salad	19
5.1.2 Lunch meat.....	21
5.2 Econometric Results	22
5.2.1 Cragg’s double hurdle model on WTP.....	22
5.2.2 Cragg’s double hurdle model on EDBP Discount	24
5.2.3 Low perishability vs. high perishability.....	25
CHAPTER SIX DISCUSSIONS	27
6.1 Research findings.....	27
6.2 Implications.....	28
LIST OF REFERENCES	30
APPENDIX.....	33
Figures	33
Tables.....	42
WTP questions	51
Food Security Survey Module: Six-Item Short Form.....	53
VITA	55

LIST OF TABLES

Table 1 Variable description.....	42
Table 2 Skewness value of WTP distributions by BUBD	43
Table 3 T-Test for Randomization.....	44
Table 4 Descriptive Statistics (Bagged Salad Consumer)	45
Table 5 Descriptive Statistics (Lunch Meat Consumer)	47
Table 6 Regression result Cragg' double hurdle model, WTP (Marginal Effects)	49
Table 7 Regression result Cragg' double hurdle model, Discount (Marginal Effects)	50

LIST OF FIGURES

Figure 1 Kroger brand Hearts of Romaine bagged salad.....	33
Figure 2 Oscar Mayer brand turkey lunch meat	33
Figure 3 Density plot: WTP of Kroger brand Hearts of Romaine bagged salad by BUBD	34
Figure 4 Density plot: Discount needed to buy Kroger brand Hearts of Romaine bagged salad by BUBD	35
Figure 5 Density plot: WTP of Oscar Mayer brand turkey lunch meat by BUBD.....	36
Figure 6 Density plot: Discount needed to buy Oscar Mayer brand turkey lunch meat by BUBD	37
Figure 7 Farthest WTP vs. Nearest WTP, bagged salad.....	38
Figure 8 Farthest WTP vs. Middle WTP, bagged salad	39
Figure 9 Farthest WTP vs. Nearest WTP, lunch meat.....	40
Figure 10 Farthest WTP vs. Middle WTP, lunch meat.....	41
Figure 11 Bagged salad WTP question.....	51
Figure 12 Turkey lunch meat WTP question.....	52

CHAPTER ONE

INTRODUCTION

Although sharing some similarities with “hunger”, food insecurity is different and defined as a socioeconomic condition of households that have limited access to adequate food due to the lack of financial or other resources (Gundersen and Ziliak 2015). As a result of inadequate food intake, food insecurity has a negative impact on physical and mental health (Gundersen and Ziliak 2015). For example, food insecurity is associated with inadequate nutrient intake, general poor health status, anemia, birth defects, diabetes, behavioral and cognitive problems as well as aggression, anxiety, depression and suicide ideation (Gundersen and Ziliak 2015). What’s more, food insecurity could impair students’ academic performance and social skill development (Jyoti, Frongillo and Jones 2005). According to a USDA survey, in the United States in 2021, 10.2% households were classified as food insecure, and 3.8% households experienced very low food security (Coleman-Jensen et al. 2021).

To alleviate this public health problem, the federal government has implemented several large programs including the Supplemental Nutrition Assistance Program (SNAP), the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and the National School Lunch Program (NSLP) to provide additional food to low-income households and prior research has shown these programs can effectively reduce food insecurity (Gundersen, Kreider and Pepper 2011). The charitable food systems, which includes food pantries, also helps to address food insecurity by distributing free food and it has recently gained attention from academic researchers seeking to understanding its impacts and barriers to utilization (Barrett, Byrne and Whitaker 2021; Byrne and Just 2021). Also, some mobile phone software which enables its users to buy food that near its expiration date at an average of 50% off discount, has

shown at the frontier of combating food insecurity (Visram 2023). In market strategy, expiration date based pricing (EDBP) is defined as a pricing tactic that retailers charge the same perishable product different prices varying by the days until expiration (Theotokis, Pramataris and Tsiros 2012). EDBP could provide discounts as compensation to consumers to accept food nearing its best if used by date (BUBD) is frequently used. This pricing strategy is promising in promoting food security for it makes food nearing a BUBD affordable for households with financial constraints; also, it has been found that it could help reduce food waste that will go to landfill otherwise (Halloran et al. 2014) .

Food pantries are a community-based charitable program that distributes free or low-cost unprepared food directly to those who are in need. Many receive food for distribution from food banks, and donations from members of the public, producers, processors, retailers, and private companies. They donate for reasons such as corporate pride, product exposure, avoiding cost of landfill of unusable food (Teron and Tarasuk 1999). Food is often donated because it is perishable or nearing expiration dates and may not be of good quality (Teron and Tarasuk 1999).

Although food pantries may help to alleviate food insecurity, there are still barriers preventing food insecure households from using food pantries. Apart from frequently studied barriers like social stigma and cultural barriers, some researches have argued that consumers' perception for quality of food offered by food pantry could prevent them from using food pantries, for they might have a low rating of food pantries as a food provider and have a negative perception of food that is from a food pantry (Barrett et al. 2021; El Zein et al. 2018). This underdiscussed barrier, however, may be vital in providing a better food pantry service. Food pantry clients have raised concerns about the low-quality food offerings from food pantries are "bruised", "expired" (Kihlstrom, Long and Himmelgreen 2019). In practice, some food pantries

receive and distribute food donations that near or pass their expiration dates (SPAN, Inc n.d.), which could possibly contribute to the reason why food insecure people don't choose to use food pantry in the future, based on either unsatisfied food pantry experience due to low food quality, or a low value perception for food pantry offerings. This suggests that households who have previously utilized food pantries may have had a negative experience with food nearing its BUBD, which could negatively impact their valuation of such goods. This may decrease their likelihood of utilizing such programs again in the future or purchasing foods that are discounted because they are nearing their BUBD. On the other hand, it has been found that familiarity with suboptimal food could increase consumers' acceptance of food with defects, such as food with short days until BUBD (Aschemann-Witzel 2018; Chang and Su 2022), which shows that possibility that food pantry experience could have positive impact on how consumers perceive food near its BUBD.

Our investigation provides several contributions to the literature on BUBD with implications for food assistance policy and programs. Although foods near their BUBD may be frequently found in food pantries, it is unclear how household's past utilization of food pantries influences their current valuation of food near its BUBD. Using bagged salad and turkey lunch meat as food product for hypothetical experiments, the objective of this study is to find out whether food pantry experience would impact on consumers valuation for food nearing BUBD, and what role BUBD plays in valuation and EDBP practice. This may have implications for both future food pantry utilization but also utilization of EDBP. In the short run, EDBP programs may help to reduce food waste and address food insecurity by discounting foods making them more affordable for low-income households. However, such households must also be willing to purchase foods many perceive as being of lower quality.

The remaining of this study is structured as follows: in next section we review barriers to food pantry use, and consumers' behavior towards food nears its expiration date, and EDBP; in conceptual framework, we set up the conceptual model that depicts how would BUBD possibly affect consumer's WTP; in methods and procedures, we describe the data used in our research and the methods used for estimation; finally we report and discuss results and implications.

CHAPTER TWO

LITERATURE REVIEW

2.1 Food Pantry Use and Barriers

Food pantries play a key role in addressing food insecurity in the United States. Consider Feeding America, the largest food bank network in the United States, that provided 6.6 million meals in 2020 through 60,000 food pantries, along with meal programs and partner agencies through Feeding America's network (Feeding America 2021). Empirical evidence has found that food pantry utilization could help reduce food insecurity more effectively than other short-term food assistance (Martin et al. 2013)

While food pantries have successfully served their communities, there remain barriers that prevent food pantry clients or potential clients from obtaining food resources. Some barriers result from accessibility. Lack of information about food pantries' existence, location or operation hour is one of reason that prevent food pantry use (Marriott et al. 2022). Geographical location could also pose transportation difficulty (Byrne and Just 2022; Marriott et al. 2022). What's more, food pantry's limited operation hour restricts them from providing more food (Marriott et al. 2022). Some other barriers are found at the food pantry level. Food pantry clients concerns related to utilizing food pantries include lack of cooking skills and limited food (Kihlstrom et al. 2019). Additionally, Spanish speaking clients experience language barriers and lack culturally appropriate food options (Remley et al. 2010; Marriott et al. 2022). Social stigma might be one of the most common reasons for not using food pantries. Clients might feel embarrassed or be worried about people knowing they visited a food pantry (Marriott et al. 2022). Feelings like shame and awkwardness might because food pantry use reflects their social economic position (Byrne and Just 2022). The level of social stigma was correlated with

ethnicity such that that white people experience higher levels of stigma compared with people of color (Marriott et al. 2022). Additionally, Byrne et al.'s discrete choice experiment tested whether for SNAP-eligible individuals will perceive food differently based on its source, and they found consumers have a negative quality perception when told food was from food pantry, however, this negative perception could be compensated when the pictures and brand names of the food pantry food was shown to them (Barrett et al. 2021).

Product stigma, which is defined as negative perceptions of food could also contribute to limited food pantry utilization, however, this stigma has received less attention in the academic literature (Barrett et al. 2021). Perishable food like bagged salads and lettuce were reported to be the food that most likely to be thrown away by food pantry clients and one of the reasons is “expired”, though they were grateful for free food (Kihlstrom et al. 2019). Such negative prior experiences at food pantries may influence household's currently valuation of foods with varying BUBD but this question has not yet been investigated.

2.2 Consumer Attitudes for Food Nearing Best if Used by Date (BUBD) and Expiration Date Based Pricing (EDBP)

Consumers' attitude is closely related to food's expiration date. Generally, consumers tend to have a higher WTP for perishable food that has more days until expiration, which results from the trade-off between perceived risk and price advantage (Tsiros & Heilman, 2005). Even though this result seems to be reasonable and align with economic intuition, it is not supported by Chang and Su's study, in which farthest shelf life has a negative effects on consumers' WTP (Chang & Su, 2022). Consumers' negative attitude towards food nearing its expiration date is primarily a result of an understanding that food with fewer days left before expiration is usually less fresh, poorer quality and lower perceived value(Y. Li, Wang, Liu, & Cheng, 2021; Ortega, Wang,

Olynk, Wu, & Bai, 2012). However, expiration date is not always a negative sign and will devalue food products. When there is no expiration date shown on the perishable food product, consumers' perceived value decreases as food's age increases; when expiration date is shown, consumers are more willing to consume food near but before expiration date compared to the case where expiration date is absent (T. Li, Messer, & Kaiser, 2020). This research displays the signal function of expiration date as a guarantee of quality and safety.

In response to the reduction in consumers' demand resulting from the diminishing perceived value, it is common to reduce product's price in marketing (Chung and Li 2013). Because consumers' perceived quality decreases as the days before expiration date get shorter (Aschemann-Witzel, Giménez and Ares 2018), EDBP is often used in perishable food retailing as a promotion strategy, for it could improve retailers' revenue (Scholz and Kulko 2021). Chung and Li's study have found that EDBP can improve consumers' satisfaction, compared to the practice that impose a higher discount when the expiration date is imminent (Chung and Li 2013). Besides its promotion function, EDBP has also been discussed as a method of reducing food waste (Halloran et al. 2014; Scholz and Kulko 2021), for it helps to transfer food that otherwise goes to landfill to consumers. Although a price discount may lead to a negative quality perception (Grewal et al. 1998), it has been found that EDBP doesn't undermine consumers' value perception when consumers were familiar with this pricing strategy, and it can even have a positive effect on consumers' perception on food's brand image (Theotokis et al. 2012). A similar conclusion was also drawn by (Aschemann-Witzel 2018). In practice, the way time is framed in EDBP, can also affect how it works. Consumers have a higher WTP for food when time is framed in "delay", such as "expire in XX days", compared to when time is framed in "date", such as "expire on day/month/year" (Song et al. 2021). However, research using a survey

of Egyptian consumers argues that EDBP as a promotion strategy, does not really affect consumers' impulse buying behavior, and other promotion strategies are needed to sell food approaching expiration date (Amr Yassin and Soares 2020).

CHAPTER THREE

RESEARCH FRAMEWORK

3.1 Conceptual Framework

To motivate our investigation and empirical strategy we utilized Hanemann's discrete continuous choices model (Hanemann 1984), which depicts two stages in the consumer's decision making process: first the decision to purchase anything, and conditional on any purchase how much to purchase. Both of discrete choice and the continuous choice are based on utility maximization (McFadden 1973). For illustration, we use bagged salad as the food product since this product was used in our empirical application, however, this conceptual framework could be extended to other food products like lunch meat, which is another food product included in our study.

The utility function in this framework can be captured by:

$$U = u(X_j, \psi, Z, S)$$

Where X was set as a vector of N brands of salad where X refers to the quantity of bagged salad purchased, and only the j_{th} brand of salad was selected; ψ refers to an index of food attributes; Z refers to the consumption of all other food, while S refers to consumer characteristics including food pantry experience. To introduce random components, the food attribute index could take the form of $\psi = (b, \epsilon)$, where b refers to food attributes including days until BUBD, an *overall likeness* that testify whether consumer like the salad, and ϵ refers to the random components that unobservable yet have effect on utility. However, in our study, we present consumers only one brand of bagged salad, and they first make the choice that whether to buy, therefore we alternate the utility function to:

$$U = u(X, \psi, Z, S)$$

Consequently, the framework is constrained by financial resources:

$$px + p_z x_z = y$$

$$x \geq 0$$

$$z \geq 0$$

where y refers to household income, which serves as a resource constraint for both how much food a household could buy and the level of food insecurity, since food insecurity is caused by the lack of resource to access enough food; p and p_z represent the prices of salad and all other food, respectively. And when the utility function is specified as:

$$U = u[x, \psi x, \psi \zeta(x), Z, S]$$

Where ζ refers to an indicator and is equal to 1 when $x > 0$, otherwise is equal to 0. This specification yield an useful property that when the utility function is maximized, it will lead to only one corner solution that one brand of bagged of salad will be selected in purchase (Hanemann 1984). And Muellbauer's work demonstrated this particular specification will give an indirect utility function (Muellbauer 1976):

$$v(p, \psi, y) = v(p/\psi, y)$$

Muellbauer suggested when a non-zero quantity of salad is selected, p/ψ is the lowest, which indicates a trade-off between salad price and food attributes.

While this framework is often used to study purchasing behavior, the price variable could also be considered a household WTP, and then the model describes a consumer's decision-making process in which they decide if and how much their WTP is for food product. In the process of utility maximization, consumers will make trade-off between price, and food

attributes. In our analysis, this price was given by the consumer, which was consumers' willingness to pay, and the consumers make trade-off between their WTP and food attributes such as BUBD. While prior food pantry experience, which could possibly affect consumers' perception for food attributes such as BUBD, could further affect their WTP. This conceptual framework is well suited to study EDBP because the discount consumer face is based on the attributes of bagged salad, thus households must first decide if they are willing to accept EDBP discount and make the purchase decision, then decide how much the discount they need to purchase the salad.

3.2 Hypothesis development

Consumers' value perception is closely related to food's BUBD. Even though retailers would maintain food at a relative constant quality, majority of consumers still believe that the quality of perishable food stales when it approaches its expiration date (Tsiros and Heilman 2005). As a measure of food quality, consumers are expected to prefer food with more days until BUBD, and thus are willing to pay more for food with longer days until BUBD. On the other hand, perishable food like bagged salad and lunch meat has a shorter storage life. Even if quality is not consumers' major concern, longer days until BUBD enables them to store food longer and adds more flexibility to their food and diet managements. As a result, we hypothesises that consumers would have a greater WTP for food with longer days until BUBD.

$$H_1 : WTP_{long\ BUBD} > WTP_{short\ BUBD}.$$

Apart from BUBD, whether consumers have food pantry utilization experience could also be a determinant of consumers' WTP towards food nearing BUBD. Some researchers have found that though consumers who have used food pantry were grateful about free food, they could have a bad experience because of receiving expired food in food pantry (Kihlstrom et al.

2019). Their unpleasant experiences in food pantry with expired food would possibly drive food pantry clients away from using it again, and these experiences could further affect how they perceive BUBD as a food attribute, and make them develop a negative valuation for food nearing BUBD. Accordingly, they will have a low WTP based on such an experience.

However, food pantry experience could possibly promote the use of food pantry and improve consumers' acceptance for food nearing BUBD. The main reasons consumers avoid using food nearing BUBD is low quality perception and perceived risk even the food is still safe for human to eat (Tsiros and Heilman 2005; Sen and Block 2009). However, when consumers get familiar with EDBP practices, they are more likely to choose food nearing expiration (Aschemann-Witzel 2018), and it is because the familiarity with EDBP practice could attenuate the negative value perception (Theotokis et al. 2012). In the process of using food pantry, consumers will inevitably encounter food nearing BUBD, and consumers will be more open for food nearing BUBD as they get more familiar with this food attribute. Hence, food pantry experience could be a source of learning about BUBD, and people who have previously used food pantry, are more likely to choose food nearing BUBD compared to those who haven't, and they will have a relatively high WTP for expiry food. Although what effect would prior food pantry experience have on WTP towards food nearing BUBD is remain unclear, we expect food pantry experience will influence how consumers value BUBD, and further affect their WTPs.

H_2 : Prior food pantry experience influences WTP for food nearing BUBD.

EDBP discount provides consumers with a price-quality trade-off. For those who are willing to purchase food nearing BUBD, they need a price discount as compensation to accept food with quality defects, in another words, fewer days before BUBD. The fewer the days left

before BUBD, the greater EDBP discount is needed to compensate for the lost quality. Derive from this reasoning, we expect that consumers need a greater discount as compensation to accept food with fewer days until BUBD.

H_3 : $Discount_{shortBUBD} > Discount_{longBUBD}$.

It has been found that food type could affect how consumers perceive the value of food (Aschemann-Witzel, Giménez and Ares 2020). In our study, we included two food product, bagged salad and lunch meat, two products that were very different in perishability. Lunch meat could be stored for a longer time and was less perishable than bagged salad. Study has shown that there was a difference in WTP between meat (chicken and beef) and fresh vegetables (carrot and lettuce) across all BUBD levels, and vegetables were more sensitive to the change of days before expiration, compared to meat (Tsiros and Heilman 2005). When focusing only on perishability as a food attribute, consumers have a higher perceived value for low perishability food, compared to high perishability food (Chang and Su 2022). The different value perception towards highly perishable food and less perishable food might come from perceived food safety risk. Highly perishable food is easier to deteriorate or spoil, which might cause food safety issue (Li et al. 2021). Also, food with low perishability allows consumers have a higher flexibility on their food and cooking management. Hence, we assume that perishability plays a role in consumers' value perception for food approaches BUBD.

H_4 : consumers have different value perception for bagged salad than turkey lunch meat.

CHAPTER FOUR

METHOD AND PROCEDURE

4.1 Survey data

Data used in this study was collected in April and May 2022 via an online survey administered by Qualtrics. To qualify for the study, respondents must live in the United States, be at least 18 years old, and be the person who does the majority of the food shopping in their households. The appropriate human subject protocols were followed in this study, and institutional review board approvals were obtained (UTK-IRB-20-06141- XM).

The survey collected individual and household demographics, food security information, and respondents' WTP for bagged salad and lunch meat based on different BUBD. The United States Department of Agriculture Economics Research Service (USDA-ERS) six-item short form food security survey module was used to assess food security of respondents (Economic Research Service 2012). These questions are provided in the appendix. Surveyed respondents were first asked common questions about individual and household demographics, then they were asked to give their frequency of consuming salad and lunch meat. Respondents needed to report that they had consumed either of those products to be sorted into the survey. Respondents will be evenly randomized into salad or lunch meat section, if the quota of the section has not been met. And then they were asked to give their WTPs for Kroger brand Hearts of Romaine bagged salad, or Oscar Mayer brand lunch meat. For bagged salad, based on market observations in grocery stores in Knoxville area, Tennessee, consumers were asked to give their WTPs for salad with 3 days, 5 days, and 7 days until BUBD, respectively; similarly for lunch meat, based on the market observation in Knoxville area, consumers were asked to give WTPs for lunch meat with 30 days, 41 days, and 57 days until BUBD, respectively. For simplicity, we use *nearest*,

middle, farthest BUBD to refer to salad and lunch meat with 3/30, 5/41, 7/57 days until BUBD.

The questions regarding WTP are shown in the appendix. However, for both bagged salad and turkey lunch meat datasets, the distributions of WTPs at different BUBD levels are highly skewed. To estimate how skewed the distributions were, we use formula $\frac{\sum_{i=1}^N (x_i - \bar{x})^3}{(N-1)s^3}$ to calculate skewness value. For salad, the skewness values of WTPs at nearest, middle, farthest BUBD are 14.24, 18.84, 25.10, respectively; while for lunch meat, the skewness of WTPs at nearest, middle, farthest BUBD are 25.22, 27.87, 27.37, which are all highly right-skewed (See Table 2). This skewness of these distributions is mainly due to the abnormal WTPs which are much higher than the market price of salad and lunch meat. To reduce the skewness caused by outliers, we trimmed the data if WTPs were greater than 90 quantile. Trimmed data are much more balanced as the skewness values of salad WTPs at nearest, middle, farthest BUBD levels reduce to 0.54, 0.25, 0.30; while skewness of lunch meat WTPs reduce to 2.00, 0.75, 0.82 (See Table 2).

To calculate the EDBP discount, we used the WTP with farthest BUBD as the baseline WTP, and then calculated the discount needed to accept food with fewer days until BUBD by the formula:

$$discount = \frac{WTP_{baseline} - WTP_{fewer\ BUBD}}{WTP_{baseline}} \times 100.00\%$$

For example, the discount that consumers needed to accept bagged salad with 3 days until BUBD can be obtained through: $Discount_{salad3BUBD} = \frac{WTP_{7BUBD} - WTP_{3BUBD}}{WTP_{7BUBD}} \times 100.00\%$. In empirical analysis, we generate three observations from each respondent by BUBD. See variable definitions in Table 1.

4.2 Cragg double hurdle model

We employed Cragg's double hurdle model in our analysis here, the first hurdle estimates the probability of observing a positive WTP, and the second hurdle estimates the WTP level given a positive outcome in the first hurdle (Cragg 1971). In practice, we used the probit model to estimate the probability of having a positive count in the first stage, and we used truncated normal regression in the second stage. The model setting enables us to analyze data with excessive zeros counts, for it allows two types of zeros: the first type of zero counts indicates consumers are not a part of bagged salad or lunch meat market, and their expenditure will also be zero; the second type of zeros suggests currently consumers are not a part of bagged salad or lunch meat market due to current financial constraint, however, they might not be the zero type (Engel and Moffatt 2014). This feature can help account for selection bias problems in data with large number of zeros.

In analyzing, we first estimated the probability of a consumers having a positive WTP for bagged salad or lunch meat using probit model:

$$\Pr(WTP > 0|X) = \alpha X_i + \epsilon_i$$

where X_i refers to the covariates.

$$WTP_i = \beta X'_i + u_i, \text{ if } WTP_i > 0$$

$$WTP_i = 0, \text{ if } WTP_i \leq 0$$

Another feature of this model is X_i is allowed to be different from X'_i , which permits a more flexible estimation. However, we will use the same covariates for both stages of estimation.

In estimation, we set regression equations as:

Step 1: $\Pr(WTP_{iBUBD} > 0|X)$

$$\begin{aligned}
&= NearestBUBD_i + MiddleBUBD_i + FoodPantry_i + FoodPantry_i \\
&\quad * NearestBUBD_i + FoodPantry_i * MiddleBUBD_i + FoodInsecure_i \\
&\quad + VeryInsecure_i + OverallLikeness_{iBBD} + UsingSalad_i \\
&\quad + Consumer Characteristics + u_{iBUBD}
\end{aligned}$$

Step 2: WTP_{iBUBD}

$$\begin{aligned}
&= NearestBUBD_i + MiddleBUBD_i + FoodPantry_i + FoodPantry_i \\
&\quad * NearestBUBD_i + FoodPantry_i * MiddleBUBD_i + FoodInsecure_i \\
&\quad + VeryInsecure_i + OverallLikeness_{iBBD} + UsingSalad_i \\
&\quad + Consumer Characteristics + u_{iBUBD}, \text{ if } WTP_{iBUBD} > 0
\end{aligned}$$

where WTP_{iBBD} is respondent i's WTP for bagged salad with different *BUBDs*.

In regression, we include BUBD dummy indicators, and we set *FarthestBUBD* as the baseline it in our regression. *NearestBUBD_i* is a dummy variable and equal to one if respondents are asked to give WTPs for salad with 3 days until BUBD, or for lunch meat with 30 days until BUBD. *MiddleBUBD_i* is a dummy variable and equal to one if respondent was asked to give WTP for salad with 5 days until BUBD, or for lunch meat with 41 days until BUBD. *FoodPantry_i* is a dummy variable and equal to one if respondent has ever used food pantry at least once.

We also included consumers' food security status and we set *FoodSecure* as the baseline. *FoodInsecure_i* is a dummy variable and equal to one if respondent is food insecure. *VeryInsecure_i* is a dummy variable and equal to one if respondent is very food insecure. *OverallLikeness_{iBUBD}* is a dummy variable and equal to one if respondent likes the salad or

lunch meat. $UsingSalad_i$ is a dummy variable and equal to one if respondent uses bagged salad or lunch meat once a week or more frequently. *Demographics* is respondent's individual and household demographics, including age, gender, marital status, education, employment status, whether having child(ren), household income, race, and region.

CHAPTER FIVE

RESULT

5.1 Descriptive Statistics

Finally, a total number of 709 and 591 observations were randomized to answer the bagged salad and turkey lunch meat questions, respectively. Both samples show that about 80% of respondents have never used food pantry, while about 20% respondents have used food pantry at least once. To evaluate whether respondents were adequately randomized into bagged salad and lunch meat section, we conduct t-tests to evaluate the randomization. Table 3 reported the results of t-tests, we could find the means of consumer characteristics were close in magnitude. However, demographics like age, whether having children, whether is low household income, whether is high household income, whether graduated from college, whether belongs to white, black, Hispanic and other race group, are significantly different between bagged salad and lunch meat sample, which indicates the randomization was not a complete one and respondents from two datasets distributed differently.

5.1.1 Bagged salad

Table 4 presents the descriptive statistics for bagged salad respondents. Considering the WTP by food pantry utilization experience, food pantry user and non-food pantry user showed the overall mean WTPs were of \$3.19 (SD=1.61) and \$2.73 (SD=1.42), respectively, which suggested food pantry users tend to have a higher WTP compared to non-food pantry users. This pattern could be found across all three BUBD levels. When examining WTP by BUBD, the mean WTPs were of \$2.27 (SD=1.40), \$2.86 (SD=1.26) and \$3.32 (SD=1.53) for nearest, middle and farthest BUBD, respectively, and the ANOVA test shown that at least one BUBD group' WTP was significantly different from others (p-value = 0.000). The means of WTP indicated consumers

were willing to pay more for food with more days until BUBD, and this aligned with H1 that consumers have a higher WTP for food with more days until BUBD. This pattern could also be seen in both food pantry users subsample and non-food pantry users subsample. Also, bagged salad WTP (by BUBD) density plot (Figure 3) displayed there were distinct distribution differences across three BUBD groups, and the consumers tended to have a higher WTP for food with more days until BUBD. Apart from that, Figure 3 showed the WTP distributions were skewed because of not only high WTP, but also zero WTP, especially nearest BUBD group in which 9.45% of the respondents reported zero WTPs, while 1.97% and 0.14% of the respondent reported zero WTPs for salad with middle and farthest BUBD.

For EDBP discount, we set the farthest BUBD as the baseline, and consumers needed discounts of 15.98% (SD=0.76), 6.40% (SD=0.38) price off to accept food with 3 days, 5 days until BUBD, respectively, which supported H3 that consumers needed a greater discount to accept food with fewer days until BUBD. This pattern, however, was only consistent in non-food pantry users subsample. This might suggest these two types of consumers hold different attitudes towards food nearing BUBD, and consumers without food pantry experience were much more sensitive to BUBD variation. Overall likeness shows that the percentage of respondents who like bagged salad increased as the days until BUBD increased. This rule, nevertheless, didn't apply to food pantry users who had the lowest likeness percentage for salad with middle BUBD.

Household income also presented different distributions when they were with or without food pantry experience. The income of households with food pantry experience centralized at low- and middle-income levels, while the income of those who were without food pantry experience centralized at middle and high income levels. Another variable worth noting is food security status. About 80% of the non-food pantry users were food secure, while 2/3 food pantry

users were food insecure or very food insecure. What's more, non food pantry users were more educated than food pantry users. According to the definition of food insecurity, we could take a glimpse how financial resource constraint limited household from being food secure and they had to turn to food pantry for food.

5.1.2 Lunch meat

Table 5 shows consumers have a quite different attitude towards lunch meat than bagged salad. Considering WTP by food pantry use experience, food pantry users and non-food pantry users show the mean WTPs were of \$5.03 (SD=3.08) and \$4.46 (SD=2.23). Similar with salad section respondents, it suggested food pantry users were more likely to have a higher WTP compared non-food pantry users, and this behavioral pattern could be found across all three BUBD levels.

However, when examining WTPs by BUBD, consumers reported WTPs that were close in magnitude across three BUBD levels. They had mean WTPs for food with nearest, middle, farthest BUBD of \$4.59 (SD=2.57), \$4.55 (SD=2.17), \$4.58 (SD=2.53), respectively. The lunch meat WTP (by BUBD) density plot (Figure 5) also showed that there wasn't significant difference in mean of WTPs across three BUBD groups, this was supported by ANOVA test that all three groups were not significantly different from others (p-value = 0.9498). In terms of zero WTP, by BUBD, 1.18%, 0.17% and 0.17% respondents report zero WTPs for lunch meat with nearest, middle, farthest BUBD. This provide some evidence for H4 that for BUBD food with different perishability, consumers have different perceived values. For bagged salad, the means of WTP at different BUBD levels varied by BUBD; however, for lunch meat, the means of WTP at three BUBD levels didn't seem to be different from each other.

The means EDBP discount of lunch meat, however, were negative for both food pantry and non-food pantry users, which indicated consumer and were even willing to pay more to

lunch meat with fewer days until BUBD, which contradicts H3. For overall likeness variable, consumers also displayed that they liked lunch meat with nearest BUBD more than the middle and the farthest BUBD. Similar to respondents from bagged salad survey, households with food pantry experience centralized at low and middle income levels, while households who had never used food pantry centralized at middle and high income levels. Non-food pantry users were more educated and less food insecure, compared with food pantry users.

5.2 Econometric Results

5.2.1 Cragg's double hurdle model on WTP

Table 6 displayed the regression results of Cragg's double hurdle model on WTP, and marginal effects were reported. The left panel reported the results of bagged salad model with Cragg's first stage in column 1 and second stage in column 2, and the right panel reported the results of lunch meat model with Cragg's first stage in column 3 and second stage in column 4.

For bagged salad, set the farthest BUBD as the baseline, we could find from the first stage regression that consumers were significantly less likely to purchase salad with fewer days until BUBD; while in second stage, the fewer the days until BUBD, the less they were willing to pay for bagged salad. This results provided empirical support for H1 that consumers have higher WTP for salad with more days until BUBD.

Food pantry experience had a positive significant effect on the probability of purchasing salad as well as on WTP. But when we examined how BUBD affected WTP assuming consumers were with or without food pantry experience, it showed the result is not significant and food pantry experience didn't really have impact on WTP, and H2 didn't hold for bagged salad section respondents. This meant that food pantry experience didn't change how consumers

value BUBD as a food attribute, and they act no differently from non-food pantry users facing food nearing BUBD.

Although being food insecure could lower the likelihood of one's buying bagged salad, the result was only significant at 10% level, and it had not significant effect on WTP. What's more, being very food insecure was proved to have no significant influence neither over the likelihood of purchase nor WTP.

Apart from that, overall likeness was found to have a positive effect on consumers' purchasing probability as well as how much consumers were willing to pay. This result denoted that when consumers liked the salad, they were more likely to make the purchase decision and pay more for it. Some other characteristics, like age, gender, household income also played a role. Cragg's second stage regression implied old consumers had a lower WTP, while male consumers had a higher WTP for bagged salad. As for household income, compared with low income households, high income and medium income households were more inclined to buy bagged salad.

Lunch meat Cragg's double hurdle model, however, since no more than 2% respondents gave zero WTP across three BUBD levels, didn't work out for its first stage. Hence, we would only focus on its second stage results.

In its second stage regression, BUBD didn't show significant effects on WTP, and H1 didn't hold for lunch meat model. This might due to lunch meat had much longer shelf life and less perishable than bagged salad, consumers weren't as sensitive to BUBD as in bagged salad model. Similarly, from the interaction term, we could tell that having or not having food pantry experience didn't have impact on how BUBD affects consumers' WTP for lunch meat, and H2

wasn't proofed in lunch meat model, neither. Overall likeness, however, showed similar positive effect as in bagged salad model that consumers were willing to pay more if they liked the product. Other than food attributes, old consumers exhibited a lower WTP for lunch meat; but household that had child or had a medium income, showed a higher WTP for lunch meat.

5.2.2 Cragg's double hurdle model on EDBP Discount

Table 7 reported the regression results of Cragg's double hurdle model on EDBP discount, and marginal effects were reported. The left panel reported the results of bagged salad model with Cragg's first stage in column 1 and second stage in column 2; and the right panel reported the results of lunch meat model with Cragg's first stage in column 3 and second stage in column 4.

In EDBP discount model, we first set the WTP with farthest BUBD as baseline, then calculated the farthest-to-middle BUBD and farthest-to-nearest BUBD discounts that needed as exchange for food product with fewer days until BUBD. In regression, we omitted the farthest-to-middle BUBD discount as baseline.

For bagged salad model, the first stage results revealed that compared to the farthest-to-middle BUBD discount, consumers were more likely to accept EDBP discount when a the farthest-to-nearest BUBD discount was given; and they needed a greater discount to accept bagged salad with shorter BUBD level. And H3 was supported by this result.

Food pantry experience, however, was not significant in both stages of bagged salad. And the interaction term in the second stage indicated food pantry experience wouldn't have impact over how BUBD affected EDBP discount. Yet Overall likeness was found to decrease the probability of accepting EDBP discount, also decrease the discounted need to accept food with fewer BUBD. It implied that when consumers really like bagged salad, they'd rather choose not

to use EDBP discount, and they would like to pay more. Besides, male as a gender indicator showed man had a lower probability of accepting EDBP discount. Also, compared with low income households, middle and high income households needed a smaller discount to accept discounted food.

From lunch meat model, we could draw very similar conclusions that consumers needed a greater discount to accept food with fewer days, compared to the farthest-to-middle BUBD discount; and H3 also held in this model. And food pantry experience, also had no effect on the EDBP discount, nor had effect on how BUBD would affect EDBP discount. Different from bagged salad model, when consumer like lunch meat, they had a higher likelihood of accepting EDBD discount. Age also played a role in the acceptance of EDBP discount. The younger the consumers, the more likely they would accept a discount.

5.2.3 Low perishability vs. high perishability

Comparing the second stage regression results of WTP model across perishability, we found that consumers' WTP for lunch meat was not affected by BUBD, while their WTP for bagged salad was significantly related to BUBD. The comparison across perishability revealed that perishability level could be another important food attribute that has impact on consumers value perception, and it supported H4.

However, when we examined the EDBP discount model across perishability, we found that in both bagged salad and lunch meat model, compared to the farthest-to-middle discount, the farthest-to-nearest discount would significantly increase the probability of consumers' accepting BUBD discount. What's more, in both salad and lunch meat models, consumers needed a greater discount to accept food with fewer days until BUBD. The EDBP models suggested for both less perishable and highly perishable food, EDBP discount still have effect on consumers behavior.

However, to accept food with fewer days before BUBD, a greater discount is needed (23.5%) is needed for bagged salad, relative to lunch meat (16.0%).

CHAPTER SIX

DISCUSSIONS

6.1 Research findings

Our study focuses on how food insecure households value food with different days until BUBD. Because most food pantry users suffered from food insecurity, we shrunk our scope within household with food pantry experience. Specifically, we tested how BUBD and food pantry experience affects consumers' WTP, and corresponding EDBP discount needed to accept bagged salad or lunch meat with fewer BUBD. As a common market strategy, EDBP is promising in reducing food insecurity since it could provide food at a lower price, and food insecure households are able to afford it. However, we were unsure about how food pantry clients would value BUBD as a food attribute, therefore, we need to test out whether food pantry experience makes they value EDBP food differently, and whether they are willing to accept EDBP food. To better under this problem, we brought three problems and proposed hypotheses around them: (1) how BUBD would affect consumers' WTP; (2) whether food pantry experience would have impact on how BUBD affect consumers' WTP; (3) how would BUBD affects consumers' EDBP discount needed to buy food with fewer days until BUBD.

Empirical analysis showed that H1 was supported by bagged salad model on WTP, which suggested the more days until BUBD, consumers were more likely to buy bagged salad as well as have a higher WTP for it. This results was supported by (Tsiros and Heilman 2005). It might be due to the fact that consumers value BUBD as a food attributes, and they are willing to pay more for it because more days until BUBD is usually interpreted as better quality, and it allows food to be stored for a longer period. However, this hypothesis was not supported by the lunch meat model on WTP. This difference between salad and lunch meat might be the result of

different perishable degree. Bagged salad is more perishable thus consumers put a greater emphasis on its freshness, yet lunch meat could be stored for a longer period, and different BUBD levels don't necessarily change how consumers value the lunch meat. Second, we create the interaction terms to verify H2. However, the results revealed that food pantry experience didn't have effect on how BUBD affects consumers WTP, in both salad and lunch meat model. As we proposed that food pantry experience might have positive or negative effects on consumers' valuation, because food pantry clients might have had bad experience in food pantry (Kihlstrom et al. 2019), and devalue BUBD as a food attribute, or they could improve their value perception for BUBD as a result of being familiar with EDBP practice in food pantry (Theotokis et al. 2012). Yet our results didn't support either one, which means food pantry experience didn't make food pantry clients value EDBP food differently. Finally, from the bagged salad and lunch meat models on EDBP discount, we found that consumers need a greater EDBP discount as compensation to accept salad or lunch meat with fewer days until BUBD, which gave empirical evidence for H3. This is also intuitive that consumers are making a trade-off between price and BUBD, in another words, perceived food quality. To accept food with fewer days until BUBD, consumers choose to sacrifice food quality and exchange it for a lower price.

6.2 Implications

Although the food pantry experience didn't really affect how consumers perceive food nearing BUBD, this study suggested EDBP discount strategy is promising in promoting food security in BUBD food market. First, retailers should offer a multiple pricing tactic for food nearing BUBD. Discounting the price of food nearing BUBD could make the food more affordable to households who are really in need, and it could help reduce the food waste that generated if the food is not sold. Furthermore, when given multiple discounts choice that varied by BUBD, consumers were

more likely to accept EDBP discounts. Retailers should pay extra attention to the dynamic change of BUBD levels, for food that is closer to its BUBD, a greater price discount should be offered. However, at the same time, this dynamic pricing operation also poses new challenges to the management cost control. The EDBP practice will incur new costs such as extra labor force, new food labels by BUBD, longer work time input. Therefore, the promoting of EDBP in retailers requires a more efficient workflow to balance the cost generated.

Second, perishability of food should be considered in retailing. Consumers were not sensitive to food with low perishability like turkey lunch meat, relative to more perishable fresh food like bagged salad. The change of days until BUBD from 57 days to 41 days might not make a difference on how consumer perceive the value of turkey lunch meat. While for bagged salad, a change from 7 days to 5 days would significantly decrease consumers' WTP. In practical EDBP, retailers should pay more attention to highly perishable food like fruits and vegetables, because consumers are more sensitive to the change of days until BUBD. While for low perishability food like turkey lunch meat, nuts, canned food, EDBP might not be as effective as for highly perishable food.

Our study provided empirical evidence on how food pantry utilization would influence consumers' valuation for BUBD as a food attribute, and further we validated the feasibility of EDBP discount practice in food assistance program like food pantry. For future research, we will focus on estimating the sensitivity of EDBP discount, as we have notice that non-food pantry users were much more sensitive to the change of BUBD, and they had a greater EDBP discount variation compared to food pantry users. A better understanding of EDBP discount sensitivity at different BUBD levels, could help to design a more precise pricing mechanism which could help sell food nearing BUBD to those who are really in need.

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APPENDIX

Figures



Figure 1 Kroger brand Hearts of Romaine bagged salad.



Figure 2 Oscar Mayer brand turkey lunch meat

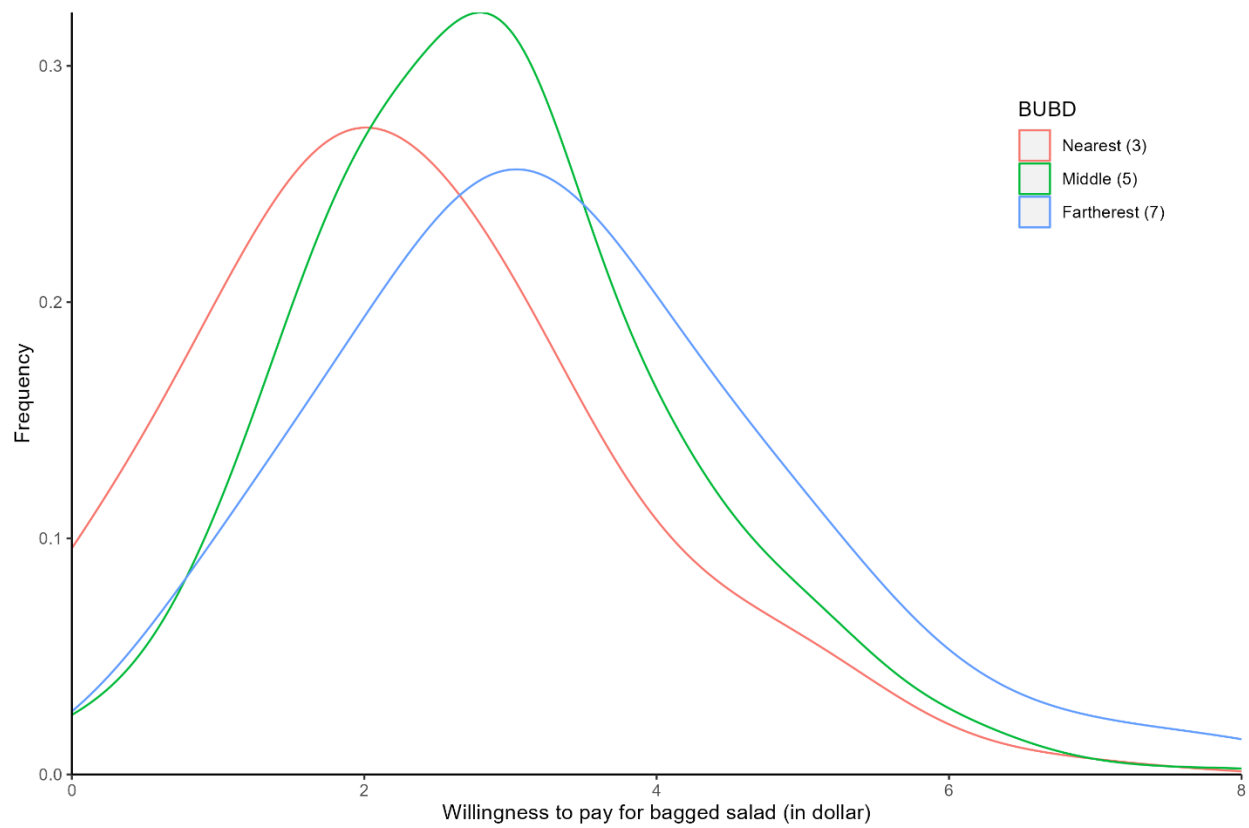


Figure 3 Density plot: WTP of Kroger brand Hearts of Romaine bagged salad by BUBD

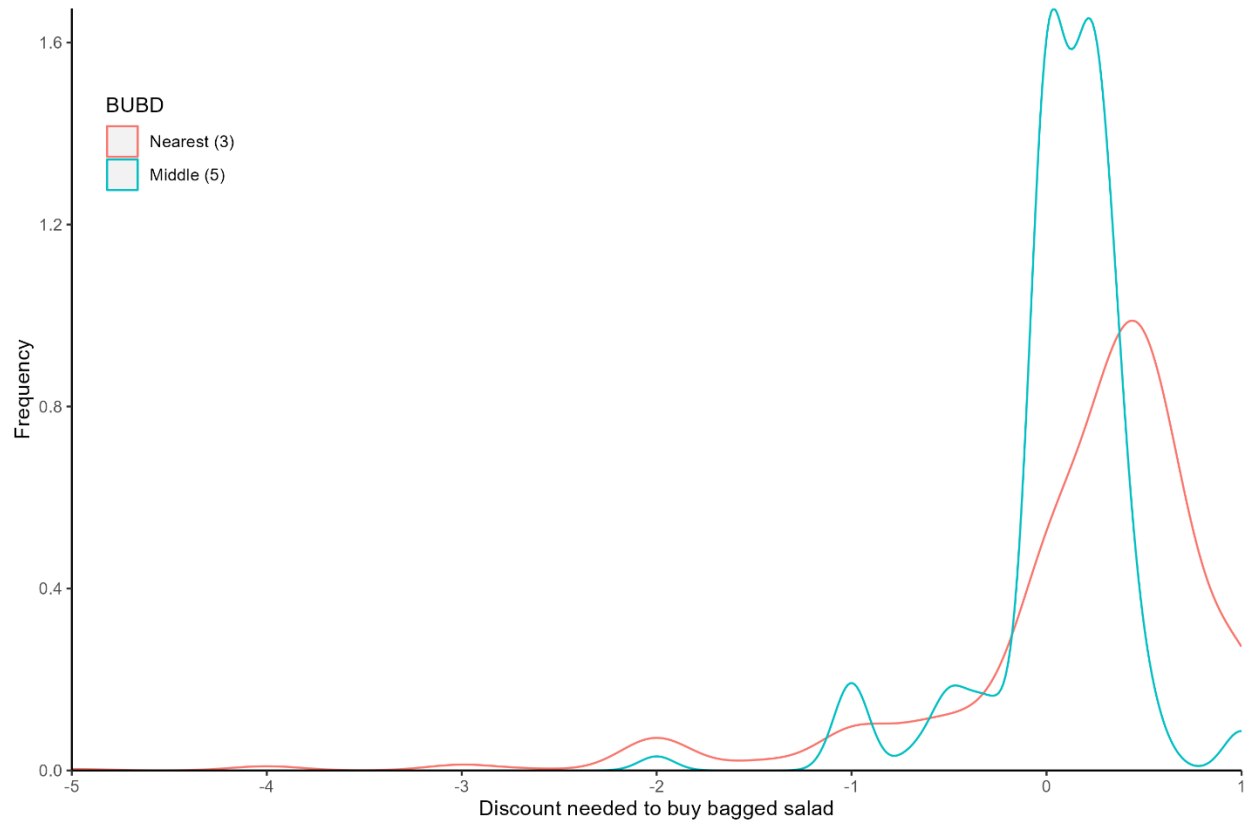


Figure 4 Density plot: Discount needed to buy Kroger brand Hearts of Romaine bagged salad by BUBD

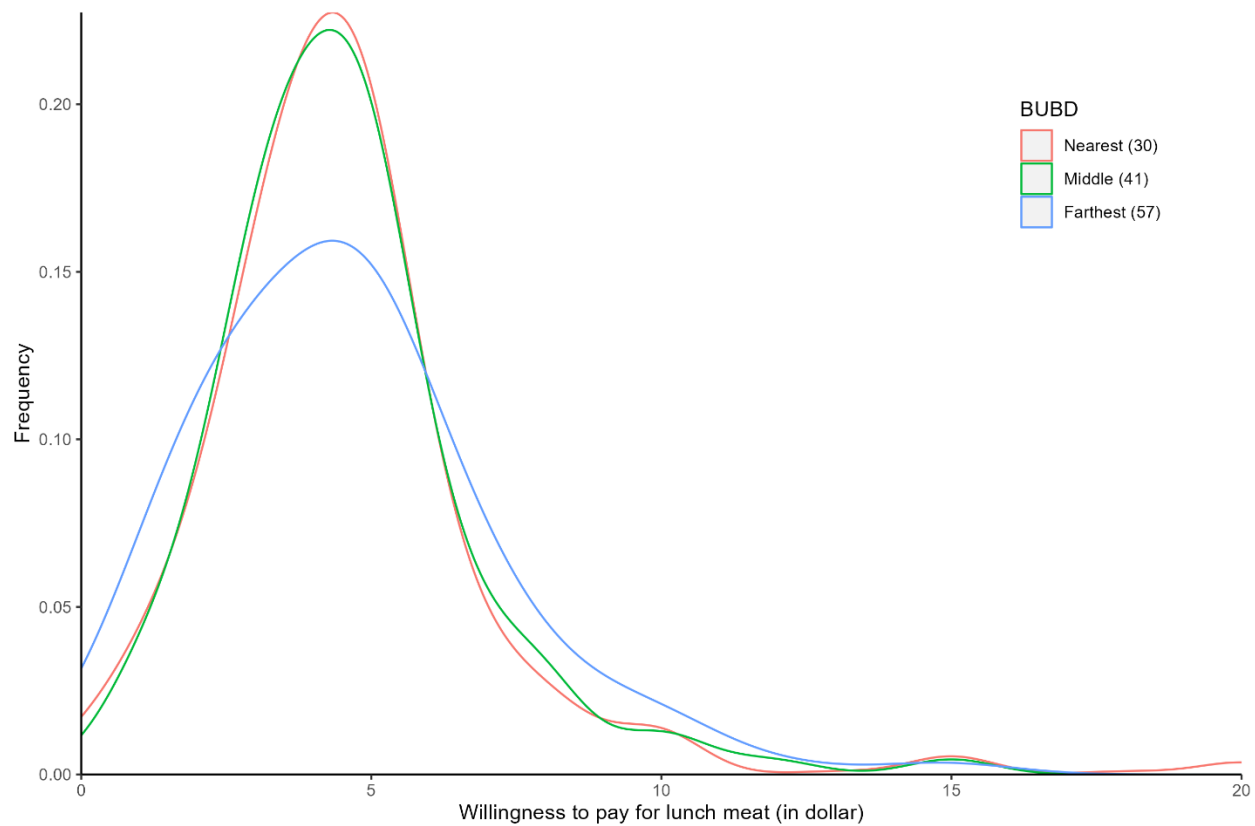


Figure 5 Density plot: WTP of Oscar Mayer brand turkey lunch meat by BUBD

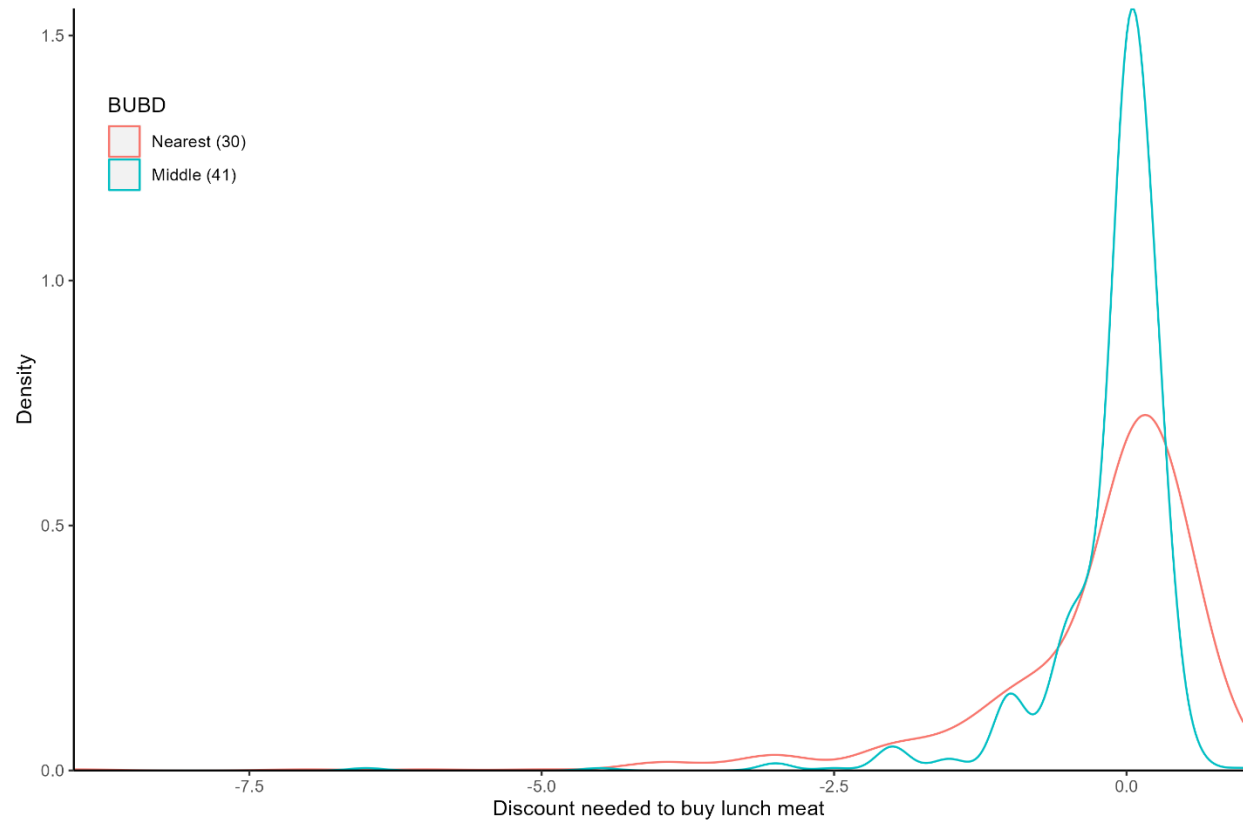


Figure 6 Density plot: Discount needed to buy Oscar Mayer brand turkey lunch meat by BUBD

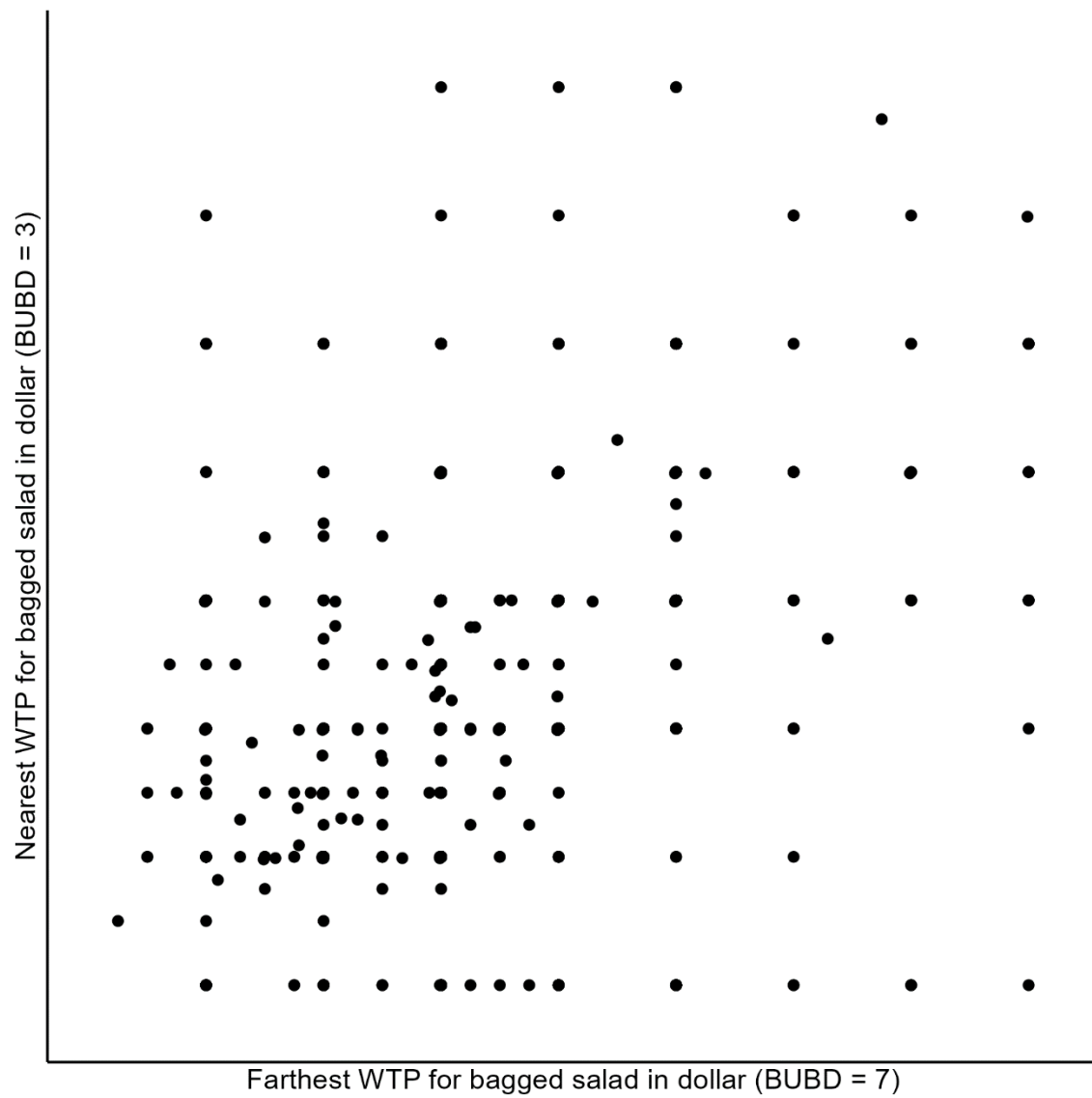


Figure 7 Farthest WTP vs. Nearest WTP, bagged salad

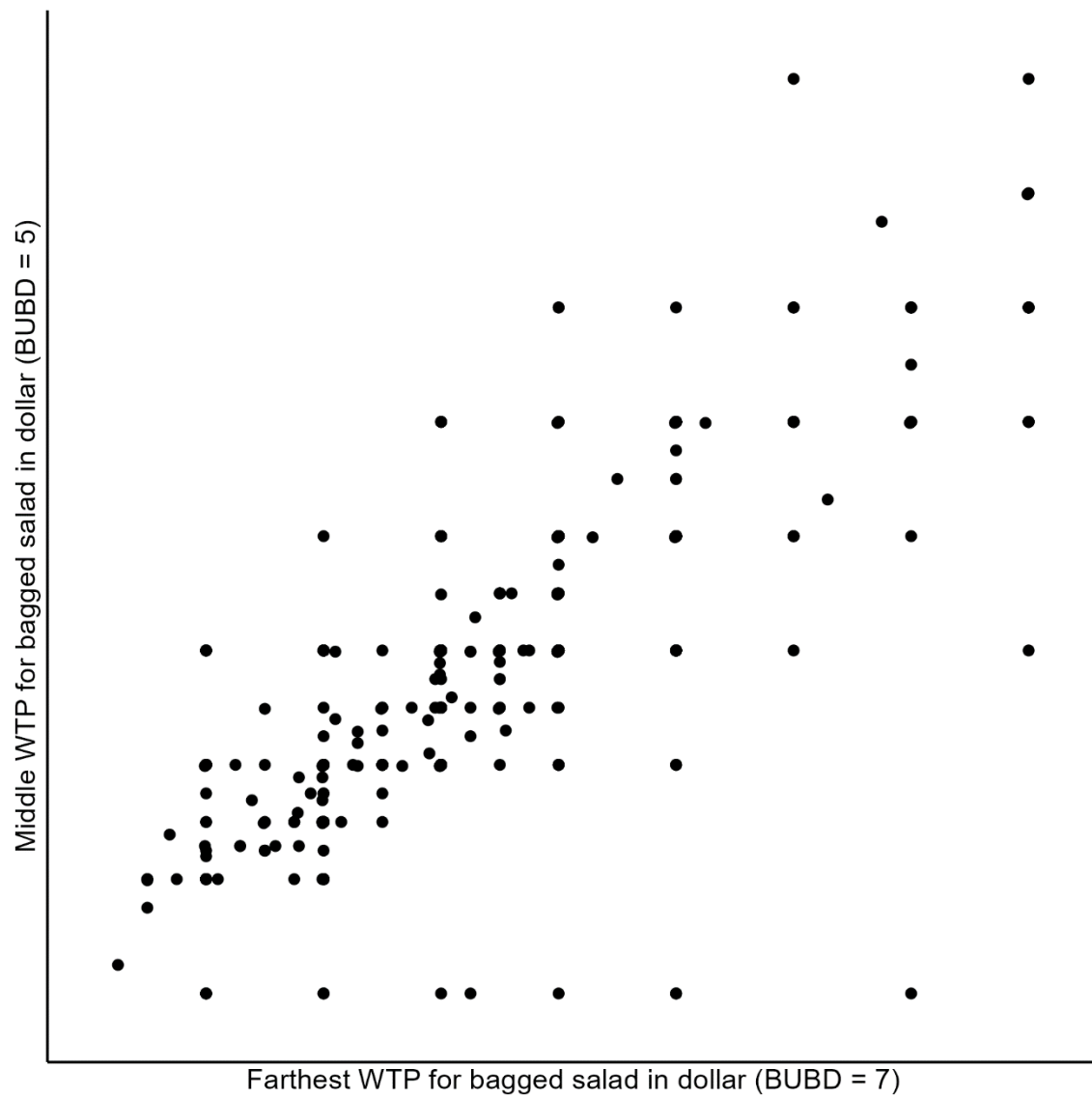


Figure 8 Farthest WTP vs. Middle WTP, bagged salad

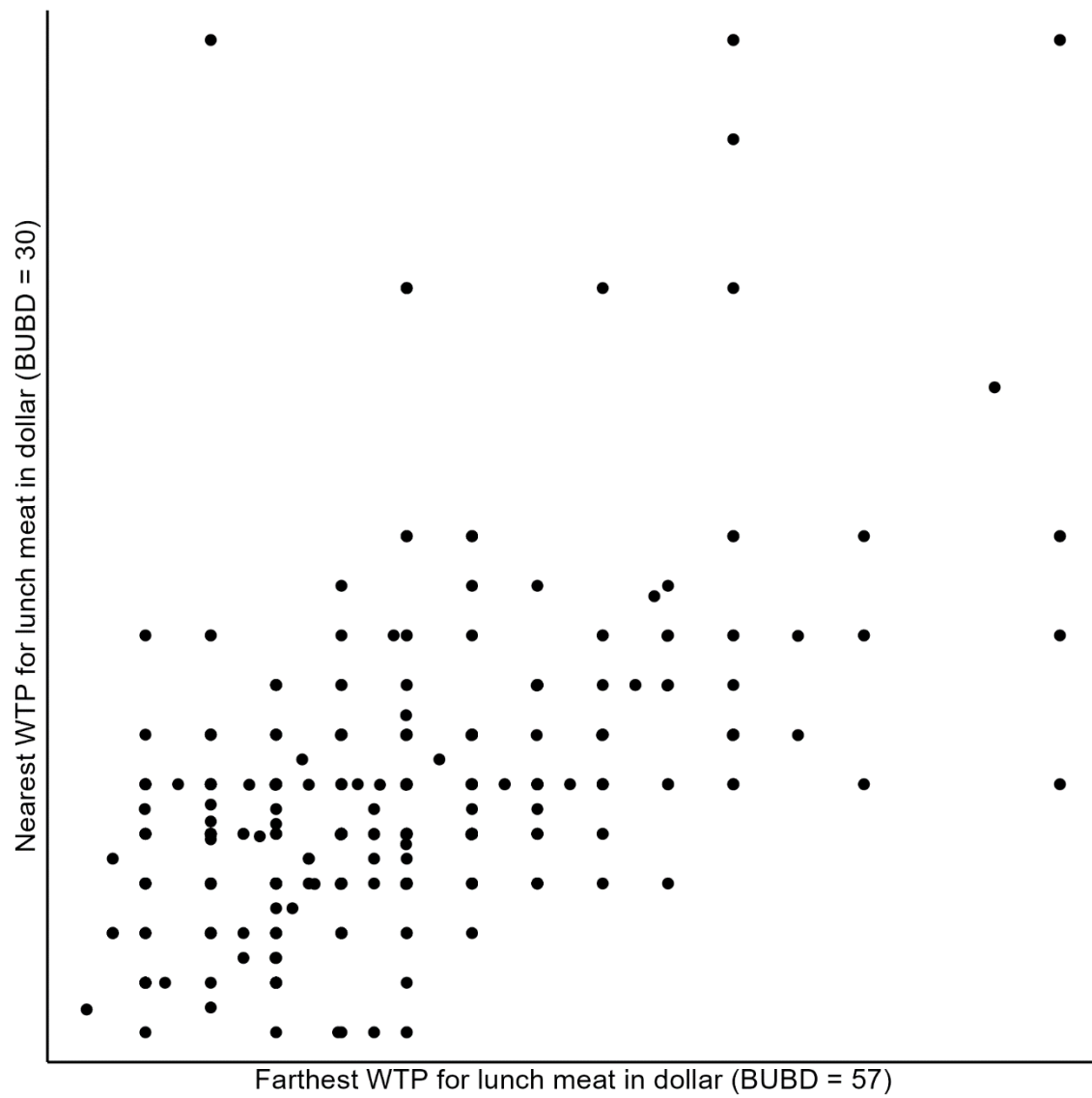


Figure 9 Farthest WTP vs. Nearest WTP, lunch meat

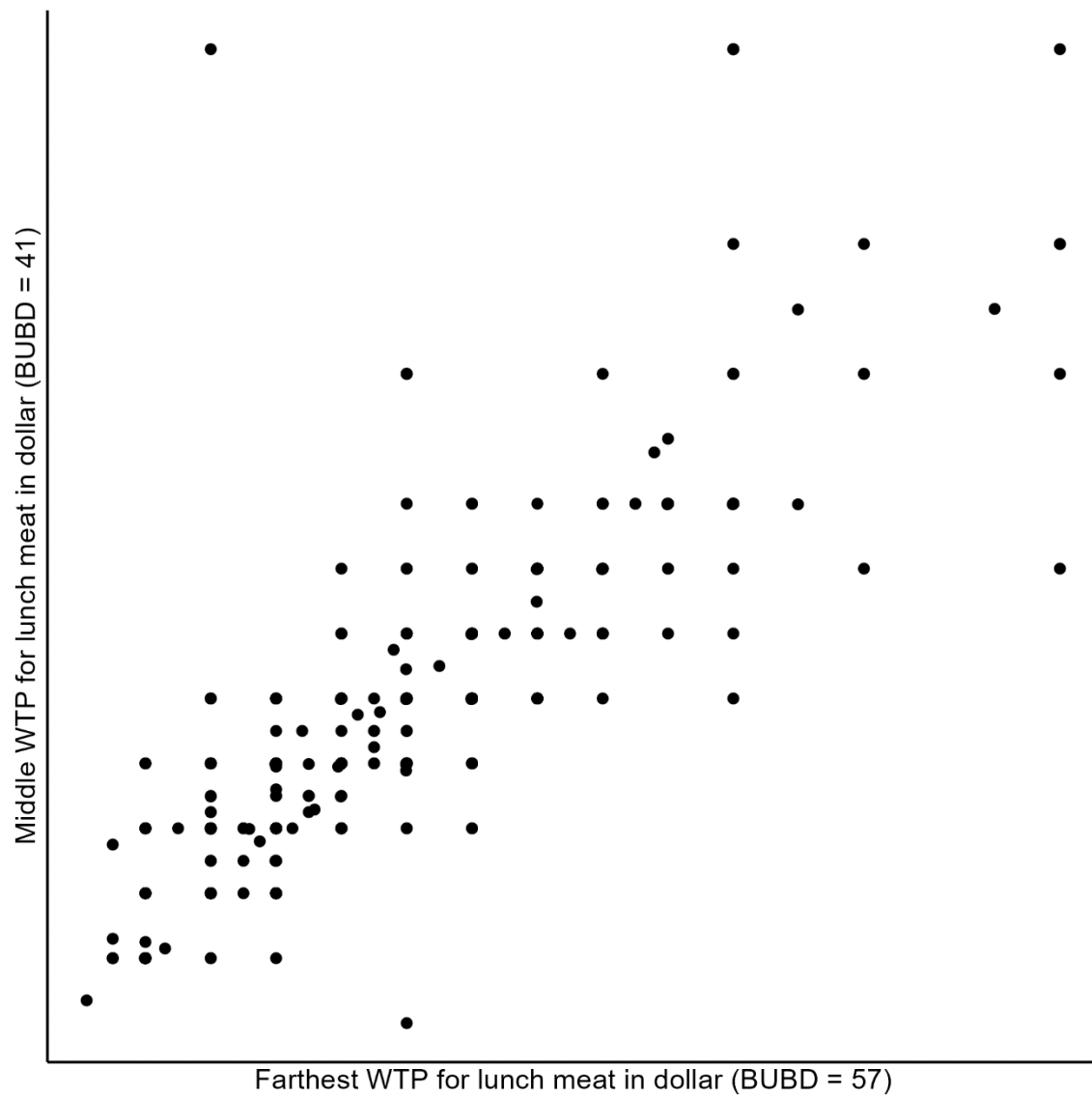


Figure 10 Farthest WTP vs. Middle WTP, lunch meat

Tables

Table 1 Variable description

Variable	Description
Dependent variable	
<i>WTP</i>	Willingness to pay for bagged salad/lunch meat with 3/30, 5/41, 7/57 days until BUBD
<i>Discount</i>	Set farthest BUBD as baseline, the discounts needed to buy bagged salad/lunch meat with fewer days until BUBD
Food Attributes	
<i>Nearest BUBD</i>	1 if salad/lunch is with 3/30 days until its best if used by date
<i>Middle BUBD</i>	1 if salad/lunch is with 5/41 days until its best if used by date
<i>Farthest BUBD</i>	1 if salad/lunch is with 7/57 days until its best if used by date
<i>Overall Likeness</i>	1 if respondent likes the food overall. Respondents were asked to give how much they like salad/lunch overall, from scale 1 to 9. When the scale score is equal or greater than 7, we define that respondent likes the food.
Individual demographics	
<i>Age</i>	age of respondent
<i>Male</i>	1 if gender is male
<i>Race</i>	race of respondent: Black, White, Hispanics, Multiple, other
<i>Married</i>	1 if respondent is married
<i>Employed</i>	1 if respondent is employed
<i>College</i>	1 if respondent graduated from college
Household demographics	
<i>Having child</i>	1 if household has at least one child (age < 18)
<i>Low income</i>	1 if household's annual income < \$1,5000
<i>Medium income</i>	1 if household's annual income > \$1,5000 and < \$7,5000
<i>High income</i>	1 if household's annual income > \$ 7,5000
<i>Using Food Pantry</i>	1 if household has ever used food pantry at least once
<i>Using salad/lunch meat once week or more</i>	1 if household uses bagged salad/lunch meat once a week or more
Food Security	
<i>Food Secure</i>	1 if household is food secure. We define respondents as food secure when they obtain score 0-1 in ERS food security survey six-item module
<i>Food Insecure</i>	1 if household is food insecure. We define respondents as food insecure when they obtain score 2-4 in ERS food security survey six-item module
<i>Very Insecure</i>	1 if household is very food insecure. We define respondents as food secure when they obtain score 5-6 in ERS food security survey six-item module

Table 2 Skewness value^a of WTP distributions by BUBD

WTP by BUBD (\$)	Bagged salad		Lunch meat	
	Original	Trimmed by 90%	Original	Trimmed by 90%
Nearest	14.24	0.54	25.22	2.00
Middle	18.84	0.25	27.87	0.75
Farthest	25.10	0.30	27.37	0.82

a Skewness value is calculated by: $= \frac{\sum_{i=1}^N (x_i - \bar{x})^3}{(N-1)s^3}$

Table 3 T-Test for Randomization

Demographics	Salad		Lunch Meat		T-value	DoF
	Mean	SD	Mean	SD		
Age (years)	49.40	16.830	47.70	17.124	-3.114***	3898
Male (%)	37.94	0.485	36.04	0.480	-1.223	3898
Presence of child (%)	32.44	0.468	35.36	0.478	1.923*	3898
Household income (%)						
<\$1,5000	5.36	0.225	9.14	0.288	4.592***	3898
\$1,5000~\$75,000	49.22	0.500	49.75	0.500	0.325	3898
>\$75,000	45.42	0.498	41.12	0.492	-2.699***	3898
College (%)	52.47	0.500	46.19	0.499	-3.910***	3898
Employment (%)	54.87	0.498	52.79	0.499	-1.294	3898
Married (%)	49.22	0.500	50.76	0.500	0.956	3898
Food security status (%)						
Food secure	70.10	0.458	71.24	0.453	0.7757	3898
Food insecure	17.21	0.378	16.07	0.367	-0.9446	3898
Very food insecure	12.69	0.333	12.69	0.333	-0.0033	3898
Race (%)						
White	60.23	0.490	62.88	0.483	1.696*	3895
Black	8.60	0.280	11.02	0.313	2.536**	3895
Hispanic	19.61	0.397	17.12	0.377	-1.992**	3895
Multiple Group	2.26	0.149	1.69	0.129	-1.247	3895
Other	11.57	0.320	8.98	0.286	-2.632***	3895

a *** significant at 1% level, ** significant at 5% level, * significant at 10% level

Table 4 Descriptive Statistics (Bagged Salad Consumer)

	Total	Food Pantry client	Non-Food Pantry Client
	N=709	18.62%	81.38%
Age (years)	49.40 (16.83)	44.04 (13.86)	50.62 (17.21)
Male	0.38 (0.49)	0.35 (0.48)	0.39 (0.49)
Willingness to Pay (\$)			
WTP	2.82 (1.47)	3.19 (1.61)	2.73 (1.42)
WTP (Nearest)	2.27 (1.40)	2.77 (1.47)	2.16 (1.40)
WTP (Middle)	2.86 (1.26)	3.19 (1.43)	2.79 (1.26)
WTP (Farthest)	3.32 (1.53)	3.61 (1.80)	3.25 (1.53)
WTP Corner Solutions (%)			
Total WTP	3.81	2.02	4.15
WTP 3 days	9.45	5.30	10.40
WTP 5 days	1.97	0.76	2.25
WTP 7 days	0.14	0.76	0.52
Discount/Premium (%)			
Discount/Premium (Nearest)	15.98 (0.76)	-0.10 (0.81)	19.66 (0.74)
Discount/Premium (Nearest)	6.40 (0.38)	1.01 (0.39)	7.63 (0.38)
Overall Likeness for Salad (%)			
Nearest BUBD	53.88 (0.50)	61.36 (0.49)	52.17 (0.50)
Middle BUBD	56.70 (0.50)	58.33 (0.49)	56.33 (0.50)
Farthest BUBD	68.55 (0.46)	64.39 (0.48)	69.50 (0.46)
Use Bagged Salad Once a week or More (%)	23.98 (0.43)	25.00 (0.43)	23.74 (0.43)
Presence of child (%)	32.44 (0.47)	46.21 (0.50)	29.29 (0.46)
Household Income (%)			
<\$1,5000	5.36 (0.23)	9.85 (0.30)	4.33 (0.20)
\$1,5000~\$75,000	49.22 (0.50)	69.70 (0.46)	44.54 (0.50)
>\$75,000	45.42 (0.50)	20.45 (0.40)	51.13 (0.50)
College (%)	52.47 (0.50)	37.12 (0.48)	55.98 (0.50)

Table 4 Continued

	Total	Food Pantry client	Non-Food Pantry Client
	N=709	18.62%	81.38%
Married (%)	49.22 (0.50)	46.97 (0.50)	49.74 (0.50)
Employment (%)	54.87 (0.50)	54.55 (0.50)	54.94 (0.50)
Food security status			
Food secure	70.10 (0.46)	31.82 (0.47)	78.86 (0.41)
Food insecure	17.21 (0.38)	37.88 (0.49)	12.48 (0.33)
Very food insecure	12.69 (0.33)	30.30 (0.46)	8.67 (0.28)
Race (%)			
White	60.23 (0.49)	53.03 (0.50)	61.87 (0.49)
Black	8.60 (0.28)	15.15 (0.36)	7.11 (0.26)
Hispanic	19.61 (0.40)	20.45 (0.40)	19.41 (0.40)
Multiple Group	2.26 (0.15)	3.03 (0.17)	2.08 (0.14)
Other	11.57 (0.32)	11.36 (0.32)	11.61 (0.32)

Table 5 Descriptive Statistics (Lunch Meat Consumer)

	Total	Food Pantry client	Non-Food Pantry Client
	N=591	19.63%	80.37%
Age (years)	47.70 (17.12)	41.53 (13.39)	49.20 (17.60)
Male	0.36 (0.48)	0.36 (0.48)	0.36 (0.48)
Willingness to Pay (\$)			
WTP	4.57 (2.43)	5.03 (3.08)	4.46 (2.23)
WTP (Nearest)	4.59 (2.57)	5.22 (3.51)	4.44 (2.26)
WTP (Middle)	4.55 (2.17)	4.91 (2.71)	4.46 (2.01)
WTP (Farthest)	4.58 (2.53)	4.95 (2.97)	4.49 (2.40)
WTP Corner Solutions (%)			
Total WTP	0.45	0.29	0.49
WTP 3 days	1.18	5.17	1.47
WTP 5 days	0.17	0.86	0.21
WTP 7 days	0.17	0.86	0.21
Discount/Premium (%)			
Discount/Premium (Nearest)	-28.63 (1.04)	-33.40 (1.16)	-27.46 (1.02)
Discount/Premium (Nearest)	-13.76 (0.58)	-14.29 (0.65)	-13.63 (0.57)
Overall Likeness for Salad (%)			
Nearest BUBD	69.54 (0.46)	71.55 (0.45)	69.05 (0.46)
Middle BUBD	51.78 (0.50)	51.72 (0.50)	51.79 (0.50)
Farthest BUBD	51.10 (0.50)	51.72 (0.50)	50.59 (0.50)
Use Bagged Salad Once a week or More (%)	32.49 (0.47)	37.07 (0.48)	31.37 (0.46)
Presence of child (%)	35.36 (0.48)	48.28 (0.50)	32.21 (0.47)
Household Income (%)			
<\$1,5000	9.14 (0.29)	21.55 (0.41)	6.11 (0.24)
\$1,5000~\$75,000	49.75 (0.50)	56.90 (0.50)	48.00 (0.50)
>\$75,000	41.12 (0.49)	21.55 (0.41)	45.89 (0.50)
College (%)	46.19 (0.50)	30.17 (0.46)	50.11 (0.50)

Table 5 Continued

	Total	Food Pantry client	Non-Food Pantry Client
	N=591	19.63%	80.37%
Married (%)	50.76 (0.50)	33.62 (0.47)	54.95 (0.50)
Employment (%)	52.79 (0.50)	58.62 (0.49)	51.37 (0.50)
Food security status			
Food secure	71.24 (0.45)	31.03 (0.46)	81.05 (0.39)
Food insecure	16.07 (0.37)	30.17 (0.46)	12.63 (0.33)
Very food insecure	12.69 (0.33)	38.79 (0.49)	6.32 (0.24)
Race (%)			
White	62.88 (0.48)	55.65 (0.50)	64.63 (0.48)
Black	11.02 (0.31)	19.13 (0.39)	9.05 (0.29)
Hispanic	17.12 (0.38)	17.39 (0.38)	17.05 (0.38)
Multiple Group	1.69 (0.13)	0.87 (0.09)	1.89 (0.14)
Other	8.98 (0.29)	7.83 (0.27)	9.26 (0.29)

Table 6 Regression result Cragg' double hurdle model, WTP (Marginal Effects)

Variable	Bagged Salad		Lunch Meat	
	Cragg Stage 1	Cragg Stage 2	Cragg Stage 1	Cragg Stage 2
Nearest BUBD	-0.383*** (0.01)	-0.733*** (0.06)		-0.117 (0.10)
Middle BUBD	-0.311*** (0.00)	-0.322*** (0.03)		-0.028 (0.06)
Using Food Pantry	0.021** (0.01)	0.387*** (0.14)		0.434 (0.28)
Nearest BUBD*Using Food Pantry	0.036 (0.02)	0.170 (0.17)		0.292 (0.35)
Middle BUBD*Using Food Pantry	0.003 (0.01)	0.019 (0.10)		0.061 (0.20)
Food insecure	-0.025* (0.01)	0.165 (0.14)	-0.031 (0.03)	0.074 (0.30)
Very insecure	-0.000 (0.02)	0.002 (0.15)		-0.210 (0.31)
Overall likeness	0.028*** (0.01)	0.511*** (0.07)	0.021 (0.01)	0.956*** (0.15)
Using salad/lunch meat once week or more	0.006 (0.01)	-0.184* (0.10)		0.058 (0.19)
Age	-0.000 (0.00)	-0.013*** (0.00)	-0.001 (0.00)	-0.029*** (0.01)
Male	0.014 (0.01)	0.181** (0.09)	0.026 (0.02)	0.187 (0.20)
Married	0.005 (0.01)	-0.109 (0.09)	0.034** (0.02)	0.175 (0.19)
College	0.000 (0.01)	0.053 (0.10)	0.006 (0.01)	0.287 (0.19)
Employed	-0.005 (0.01)	-0.009 (0.10)	-0.009 (0.01)	-0.010 (0.18)
Having child	0.015 (0.01)	-0.036 (0.10)	0.004 (0.02)	0.386** (0.20)
High income	0.035* (0.02)	0.314 (0.26)	-0.011 (0.02)	0.642 (0.39)
Medium income	0.045** (0.02)	0.020 (0.25)	0.046* (0.03)	0.609* (0.33)
Observations	2,127	2,046	351	1,762

a *** significant at 1% level, ** significant at 5% level, * significant at 10% level

b standard errors are adjusted for clustering on person id (pid)

c probit regression is used in Cragg model's stage 1, and truncated normal regression is used in Cragg model's stage 2

d Medium income = 1 if household 's annual income > \$1,5000 and < \$7,5000

High income = 1 if household 's annual income > \$7,5000

Table 7 Regression result Cragg' double hurdle model, Discount (Marginal Effects)

Variable	Bagged Salad		Lunch Meat	
	Cragg Stage 1	Cragg Stage 2	Cragg Stage 1	Cragg Stage 2
Farthest-to-Nearest	0.124***	0.235***	0.050***	0.160***
BUBD Discount	(0.01)	(0.01)	(0.01)	(0.01)
Using Food Pantry	-0.078	-0.024	-0.056	0.002
	(0.05)	(0.02)	(0.05)	(0.02)
Farthest-to-Nearest	-0.088***	0.021	-0.038	-0.038
BUBD Discount *Using	(0.03)	(0.03)	(0.03)	(0.04)
Food Pantry				
Food insecure	-0.013	0.034	-0.004	0.014
	(0.05)	(0.03)	(0.05)	(0.03)
Very insecure	-0.063	-0.008	0.090	-0.014
	(0.06)	(0.03)	(0.06)	(0.03)
Overall likeness	-0.166***	-0.071***	0.065**	-0.028*
	(0.03)	(0.02)	(0.03)	(0.02)
Using salad/lunch meat	0.016	0.012	-0.089**	-0.010
once week or more	(0.04)	(0.02)	(0.04)	(0.02)
Age	-0.001	0.001	-0.005***	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Male	-0.067**	-0.017	0.011	-0.004
	(0.03)	(0.02)	(0.04)	(0.02)
Married	0.033	-0.024	0.031	-0.008
	(0.04)	(0.02)	(0.04)	(0.02)
College	-0.006	-0.021	-0.069	-0.041*
	(0.04)	(0.02)	(0.04)	(0.02)
Employed	-0.041	0.037*	0.054	0.033*
	(0.04)	(0.02)	(0.04)	(0.02)
Having child	0.017	-0.012	0.037	0.004
	(0.04)	(0.02)	(0.04)	(0.02)
High income	-0.062	-0.093**	0.051	-0.032
	(0.09)	(0.05)	(0.08)	(0.04)
Medium income	-0.057	-0.084**	0.099	-0.067*
	(0.08)	(0.04)	(0.07)	(0.04)
Observations	1,418	875	1,770	438

a *** significant at 1% level, ** significant at 5% level, * significant at 10% level

b standard errors are adjusted for clustering on person id (pid)

c probit regression is used in Cragg model's stage 1, and truncated normal regression is used in Cragg model's stage 2

d Medium income = 1 if household's annual income > \$1,5000 and < \$7,5000

High income = 1 if household's annual income > \$7,5000

WTP questions

Now, please indicate the maximum you are willing to pay for Kroger brand Hearts of Romaine bagged salads with varying best-if-used by dates. As a reminder, each of these bagged salads vary by their **best-if-used by dates**. If you would not purchase a particular salad, you can bid 0.

Assume it is today's date. How much would you be willing to pay for bagged salads with the following best-if-used-by dates.

Best-if-used-by date	I bid
3 days from now	\$
5 days from now	\$
7 days from now	\$

Figure 11 Bagged salad WTP question

Now, please indicate the maximum you are willing to pay for Oscar Mayer Deli Fresh turkey lunch meat with varying best-if-used by dates. As a reminder, each of these lunch meat vary by their **best-if-used by dates**. If you would not purchase the lunch meat, you can bid 0.

Assume it is today's date. How much would you be willing to pay for turkey lunch meat with the following best-if-used-by dates.

Best-if-used-by date	I bid
30 days from now	\$
41 days from now	\$
57 days from now	\$

Figure 12 Turkey lunch meat WTP question

Food Security Survey Module: Six-Item Short Form

Transition into Module:

These next questions are about the food eaten in your household in the last 12 months, since (current month) of last year and whether you were able to afford the food you need.

NOTE: If the placement of these items in the survey makes the transition/introductory sentence unnecessary, add the word “Now” to the beginning of question HH3: “Now I’m going to read you....”

FILL INSTRUCTIONS: Select the appropriate fill from parenthetical choices depending on the number of persons and number of adults in the household.

HH3. I’m going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months—that is, since last (name of current month).

The first statement is, “The food that (I/we) bought just didn’t last, and (I/we) didn’t have money to get more.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- ☐ Often true
- ☐ Sometimes true
- ☐ Never true
- ☐ DK or Refused

HH4. “(I/we) couldn’t afford to eat balanced meals.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- ☐ Often true
- ☐ Sometimes true
- ☐ Never true
- ☐ DK or Refused

AD1. In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

- ☐ Yes
- ☐ No (Skip AD1a)
- ☐ DK (Skip AD1a)

AD1a. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

- ☐ Almost every month
- ☐ Some months but not every month
- ☐ Only 1 or 2 months
- ☐ DK

AD2. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

- ☐ Yes
- ☐ No
- ☐ DK

AD3. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

- ☐ Yes
- ☐ No
- ☐ DK

[End of Six-Item Food Security Module]

VITA

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