Grocery Store and Restaurant Willingness to Pay for Local Foods in the Northwest

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Haley Hildebrandt

Major Professor: Aaron Johnson, Ph.D.

Committee Members: Philip Watson, Ph.D.; Jill McCluskey, Ph.D.

Department Administrator: Cathy Roheim, Ph.D.

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Authorization to Submit Thesis

This thesis of Haley Hildebrandt, submitted for the degree of Master of Science with a major in Applied Economics and tilted “Grocery Store and Restaurant Willingness to Pay for Local Foods in the Northwest,” has been reviewed in final form. Permission, as indicated by the signatures and dates below, is now granted to submit final copies to the College of Graduate Studies for approval.

Major Professor: _____Date:_____

Aaron Johnson, Ph.D.

Committee Members: _____Date:_____

Philip Watson, Ph.D.

_____Date:_____

Jill McCluskey, Ph.D.

Department

Administrator: _____Date:_____

Cathy Roheim, Ph.D.

Abstract

Using data from a choice based conjoint survey of grocery stores and restaurants in the Northwest we examine methods of advertising local foods, problems with procuring local foods, and estimate willingness to pay for local tomatoes. Common methods for advertising foods as local were state, county and company name for grocery stores and restaurants. Frequent problems grocery stores and restaurants had procuring local foods were high wholesale prices, insufficient supply and inconsistent quality of products. Using a base whole price of $0.99 per pound of tomatoes we find that grocery stores on average were willing to pay $0.77 more per pound for local tomatoes compared to conventional tomatoes. Restaurant on average were willing to pay $0.20 more per pound for local tomatoes compared to conventional tomatoes.

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Dedication

To my husband Malcolm Rupert

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Chapter 1 Introduction

The term local food has become increasingly well know over the past several years. Consumers often associate the term local food with positive benefits such as being better for the environment, being better for local economies and being healthier. The demand for local food items has drastically increased over the recent years (Lowe, 2011). This increase in demand is often measured by the increase in the number of farmers markets and other direct-to-consumer sellers (Lowe, 2011). Current research surrounding local foods has focused primarily on consumers and direct-to-consumer sellers of local foods. Since there has not been a consistent definition for local foods much of the previous research focuses on consumer's definitions and preferences for local foods.

The amount of food advertised as local has also increased at grocery stores and restaurants (Martinez, 2010). Consumers have shown an interest in local foods being more widely available in grocery stores and restaurants ((Brown, 2003) , (Schneider, 2005)). We hypothesize that the difference between consumer demand and the amount of local foods available at grocery stores and restaurants is due to the large demand that conventional grocery stores and restaurants face. Grocery stores work with large suppliers that are able to meet grocery store demands for large quantities of consistent products that are delivered frequently. Other sellers of local foods, direct-to-consumer markets, sell relatively small quantities of products and do not have the same expectation for product uniformity from their customers as conventional grocers or restaurants do (Lowe, 2011).

If local foods are to become more widely available to consumers then local foods must become more widely available at grocery stores and restaurants. Grocery stores and restaurants are where consumers purchase the majority of their food. Farmer's markets and

community supported agriculture are where most consumers currently buy the majority of their local food products. Direct-to-consumer markets have grown in recent years, however these venues are still limited in number and due inconvenient hours (usually once a week) and locations (located primarily in urban areas) still remain inaccessible to many people.

While numerous studies have examined consumer and producer preferences regarding local foods, knowledge surrounding conventional grocery stores and restaurants preferences for local foods is limited. The goal of our research is to expand the knowledge surrounding grocery store and restaurants definitions and preferences for local foods. A better understanding of intermediate sellers' preferences and definitions of local food will inform producers on how to supply grocery stores and restaurants with local foods, which in turn will make local food more accessible to consumers.

In order to conduct our research on grocery store and restaurant we distributed a survey to grocery stores and restaurants in Idaho, Oregon and Washington, here after referred to as the Northwest. The survey consisted of general questions focusing on demographics and general questions regarding local food buying habits as well a choice based conjoint section. The survey and region were chosen in order to address the following research objectives:

1. Identify most common methods of advertising food as local for grocery stores and restaurants.
2. Identify most common problems grocery stores and restaurants have with procuring local foods.
3. Determine if there is a difference between businesses (grocery stores and restaurants), states and rural and urban areas regarding responses to choice based conjoint questions.

4. Estimate willingness to pay for different attributes associated with local foods by group (groups are established in objective 3).
5. Determine the ranking of attribute importance by group.
6. Compare willingness to pay of grocery stores and restaurants to estimates of consumer willingness to pay for similar products.

This paper is divided into the following sections: literature review, methods, data, model selection, results and conclusions. After presenting the current research surrounding local foods in the literature review, the content and distribution of the survey is presented in the methods section. Then in the data section demographic information from survey respondents is compared to the demographics of the sample frame. The purpose of the comparisons is to determine how representative survey respondents are of the population. The data section also reviews summary statistics of the general questions that focused on local food buying practices. This section is followed by the model selection section where we discuss the hierarchical Bayes model that was used to estimate the willingness to pay. Then the results section presents the estimated parameters for the hierarchical Bayes model and estimates of willingness to pay and attribute importance. The paper ends with a conclusion section that focuses on the implications of our results for grocery store and restaurant suppliers.

Chapter 2 Literature Review

Local food is a broad area of research. Topics covered under the research of local foods range from qualitative interviews regarding people's feelings towards local foods to advanced statistical models focused on estimating the price premium people are willing to pay for local products. For the purpose of discussing the previous research done on local foods we divide the literature surrounding local foods into several categories: benefits of associated with local foods, price premiums for local foods, how local is defined and where local food is bought and sold. Finally our contribution to the local food literature is discussed.

2.1 Benefits Associated with Local Foods

Local foods are often associated with positive benefits. Consumers associate local foods with supporting local economies, environment benefits (Zepeda L. L.-R., 2004), as well as being fresher (Martinez, 2010) and healthier compared with non-local foods (Haas, 2014). Organic foods used to be seen to fulfill this niche market. Adams (2010) found that consumers feel the organic label has be taken over by corporate farms and now local food better fills the demand for food that is more environmentally friendly, supports community welfare and is more ethical. An example of the shift in consumer preference from organic to local foods can be seen in Costranigro et al's (2010) study which found customers interviewed in grocery stores preferred local apples to organic apples.

Consumers are not the only people that associate local foods with positive benefits. Chefs at restaurants perceive local foods to be fresher, better quality and support local businesses. Restaurants also use local foods to differentiate themselves from competition as well as to respond to consumer demand (Martinez, 2010). Grocery stores in Dunne's study

indicated supporting local economies, environmental concerns and responding to increasing demand as motivations for selling local foods.

2.2 Price Premium for Local Foods

The perceived benefits of purchasing local foods have led to research on the price premium placed on local foods. In order to conduct research on willingness to pay (WTP) for local foods researchers often must specify definitions of local for their studies, opposed to determining how local food is defined. Some definitions of local used by researchers were: country of origin ((i Furnols, 2011), (Mennecke, 2007)), grown within 300 miles (one day driving) (Onozaka, 2011), within a state (Wang, 2010) or food purchased from farmer's markets, directly from farmers or community supported agriculture groups (Zepeda L. a., 2006). Darby et al (2007) conducted a survey in Ohio using conjoint analysis to determine consumer definitions of "local". In this paper the levels for local in the conjoint section where: Grown "nearby", Grown in Ohio, Grown in USA, Information not available. The authors found that consumers did not distinguish between grown "nearby" and grown in Ohio.

Many different models and survey techniques can be used to estimate WTP. Estimates of WTP for local foods using choice based conjoint analysis found consumers have positive WTP for local foods. Darby (2008) interviewed consumers at farmer's markets and grocery stores in Ohio to estimate consumer WTP for local strawberries. In Darby's survey the prices used in the choice based conjoint ranged from $2.00 and $4.00 per pound of strawberries, with the price levels at $0.50 intervals. Estimated WTP of consumers interviewed at farmer's markets was $0.92 more per pound for strawberries grown locally compared to strawberries grown in the US. Shoppers interviewed at grocery stores in Ohio had an estimated WTP of $0.48 more per pound for strawberries grown locally compared to strawberries grown in the

US (Darby, 2008). A web based survey of consumers in the United States estimated WTP per pound of local apples and tomatoes (Onozaka, 2011). Consumers were willing to pay 9% more per pound for local apples and 15% more per pound for local tomatoes when compared to domestic apples and tomatoes.

A contingent valuation study using data from a telephone survey of consumers in South Carolina found consumer WTP of 27% more for produce grown in South Carolina and 23% more for meat products from South Carolina (Carpio, 2009). Shoppers surveyed at a farmers market in Orono, Maine had a WTP of 17% for food at the farmers market compared to food at grocery stores (Kezis, 1998).

While many studies have shown consumers are willing to pay more for local foods other studies have shown that not all consumers are willing to pay more for local foods. Only 46% of consumers surveyed in Washington County Nebraska said they would pay more for local foods compared with conventional foods (Schneider, 2005). In Brown's (2003) study only 28% of consumers surveyed in southeast Missouri would pay more for local foods. Respondents said that reduced transportation costs should make local foods less expensive compare to conventional foods.

The difference in consumer WTP in the studies mentioned above could be due to different survey techniques, as well as demographics of survey respondents and locations of surveys. Some studies interviewed customers at farmer's markets which often sells only local foods. Sampling from locations that specialize in local foods could induce selection bias. Darby et al (2007) found that estimates for WTP for local strawberries was higher for consumers surveyed at farmer's markets compared to those surveyed at grocery stores.

2.3 How Local Food is Defined

The term local has no set definition. Many people have varying definitions of what local food is. The lack of a precise definition has forced groups to define local for specific research and laws. In 2008 The United States Farm Act defined local as less than 400 miles from its origin, or within the State in which it was produced. Using state of origin as local is not new and has been used by several researches to define local in their studies. State branded items such as Washington apples or California peaches started in the 1930s. Advertising all commodities produced in a state under one "brand" started to gain popularity in the 1980s. In 2006 forty three states used state branding compared to 23 in 1995 (Patterson, 2006). While state boundaries are used as a definition of local food, research regarding how local food is defined shows it is not the only definition being used.

A study of shoppers at Farmer's Markets in Gainesville Florida found that in addition to using state origin as a definition of local foods consumers also used within 100 miles, within county and surrounding counties as definitions for local food (Haas, 2014). Research based on a mail survey sent to consumers in southeast Missouri found that consumers frequently define local as a geographical region not defined by political boundaries (Brown, 2003), such as the Palouse in northern Idaho and eastern Washington. Consumer's definition of local is influenced by population density; people in areas of high population density have a much smaller range that they consider to be local compared with people in areas with low population density (Martinez, 2010).

We hypothesize that grocery stores and restaurants in rural and urban areas will have different preferences for local foods, reflecting the difference in customer's preferences in these areas. We expect that when population density is controlled for that there will not be a

difference in preferences of local foods between the businesses in the different states we surveyed. For example we think that the similarity between eastern Oregon and eastern Washington is greater than the similarity between western Washington and eastern Washington.

Grocery Stores, similar to consumers, use a wide variety of definitions for local food. Political boundaries, such as state or county origin are popular methods used by grocery stores to advertising food as local ((Guptill, 2002) and (Dunne, 2011)). Alternative definitions of local foods used by grocery stores in upstate New York were with a 30 mile radius of stores as well as regional labels such as Chile, New Jersey and Washington State (Guptill, 2002). Grocery stores interviewed in four Oregon cities (Portland, Salem, Corvallis and Eugene) used mile distance from store and geographical areas (e.g., Northwest) to advertise food as local (Dunne, 2011). Most of the grocery stores interviewed in Oregon were green grocers, stores that specialize in health and organic foods.

2.4 Where Local Foods are Bought and Sold

In recent years local foods have become more widely available through direct-to-consumer sales and at grocery stores and restaurants. The number of direct-to-consumer sales outlets has increased drastically over the past 10 years. The Agricultural Marketing Services from the United States Department of Agriculture (USDA) reported that the number of farmer's markets in the United States increased to 5,274 in 2009 from 2,756 in 1998 (Martinez, 2010). Community-supported agriculture organizations also increased from 400 groups in 2001 to 1,144 groups in 2005. The number of farm to school programs increased from 400 in 2004 to 2,095 in 2009.

Direct-to-consumer sales, while increasing, made up only 0.4% of United States agriculture sales in 2007 (Martinez, 2010). Many farmer's markets are located in areas with high population densities such as urban areas (Lowe, 2011). Research regarding consumer preferences for local food found consumers would like to be able to buy more local food at grocery stores and restaurants ((Brown, 2003), (Schneider, 2005)). Inconvenient hours and locations of direct-to-consumer establishments are often cited as reasons for wanting local foods at grocery stores (Brown, 2003). In Schneider's (2005) survey 69.9% of consumers said they would be interested in buying local food at grocery stores and 51% said they would be interested in buying local food at restaurants.

Local foods have become available at some conventional stores. Several chain stores such as Walmart, Safeway and Kroger mention selling local foods on their webpages. Walmart's webpage indicates that locally sourced produce accounts for 20% of produce available; Safeway's webpage says that over 30% of their produce is sourced locally (Martinez, 2010). Grocery stores in Guptill and Wilkins's study said they would be willing to negotiate purchases if approached by a producer that had all of the required licenses and insurance.

Grocery stores and restaurants face problems when procuring local foods for their establishments. Grocery stores in Guptill and Wilkins's study said that barriers local producers face when supplying foods to grocery stores were inconsistent quality, insufficient supply, wholesale price of local foods, and not having retail "friendly" packaging such as barcodes. Farmers interviewed in Schneider's study showed less interest in supply to local grocery stores and restaurants than consumers showed in wanting to by local foods from these establishments. Only 8.6% of the farmers interviewed said they would be interested in supply

crops to local grocery stores. Farmer interest in selling to local restaurants was 8.1% of the total number of farmers interviewed.

The Studies on consumer preferences of local foods show that there is consumer interest in more local food being available at grocery stores than restaurants. Studies of farmers showed limited interest in supplying grocery stores and restaurants with their products. The disparity between farmer's willingness to supply local foods to grocery stores and restaurants with local foods and consumer's demand for local foods at grocery stores and restaurants and leads us to hypothesize that grocery stores and restaurants have requirements for local foods that are unconducive to stocking local foods.

2.5 Contribution to Literature

Studies focusing on local foods primarily use survey data. Most of the surveys conducted in the literature of local foods sample groups of people from single states or small geographical regions. It is possible that consumers/producers in different regions have different preferences and definitions for local foods. The more regions that are surveyed the better able researchers will be able to understand the local food movement. The majority of the research concerning local foods focuses on the consumer side. Less research has focused on grocery stores and restaurants. The research that has focused on grocery stores and restaurants is qualitative. We do not know of any studies that has estimated grocery stores and restaurants WTP for local foods.

Our research contributes to the literature by surveying grocery stores and restaurants in the Northwest. Our survey of businesses in this new region will bolster the knowledge surrounding businesses definitions of local foods and what problems they have with procuring local foods. We also designed our survey to enable us to estimate WTP for local tomatoes for

grocery stores and restaurants in our sample region. Knowing the price premiums businesses are willing to pay for local foods will help local food suppliers know if they can sell to grocery stores or restaurants or if they can afford to invest in technologies that will better enable them to work with grocery stores or restaurants.

Chapter 3 Methods

In order to fulfill our research objectives for this project a survey of grocery stores and restaurants had to be designed and distributed. The design process of this survey was very important to meeting our research objectives. The survey had to be designed to be consistent with economic theory, generate data that could be used to test for differences in preferences of respondents, could be used to estimate WTP and attribute importance. Based on the goal of the research we choose to use a CBC survey with a few general questions included in the beginning. We also choose to set up the mailing list to enable us to make comparisons between groups rather than having the mailing list mirror the sample frame.

3.1 Survey

The survey sent to grocery stores was four pages with 13 questions. The first four questions were general questions focusing on store characteristics. Questions 5-12 of the survey were choice based conjoint tasks. Question 13 asked if the respondent would like a summary of our findings. The final question was included to help incentivize response. The survey sent to restaurants had 16 questions; the first twelve questions of the survey sent to grocery stores and restaurants were the same. The additional questions on the surveys sent to restaurants focused on restaurant's local beef buying preferences. Restaurants were questioned if their store used local beef, and if so what requirements they had for the local beef they used and what problems they had with procuring local beef. To ensure the surveys would be filled out by the most knowledgeable person possible, surveys sent to grocery stores were addressed to the produce manager and surveys sent to restaurants were addressed to the stock manager. Since produce managers at grocery stores would be unable to answer questions regarding the stores purchasing practices regarding local beef products we chose not

to include questions about local beef on the surveys sent to grocery stores. To ensure the surveys were clear, concise, and garnered the correct information, cognitive interviews were conducted with the produce manager at a food cooperative and a local restaurant owner prior to sending out the survey. Full versions of the surveys are provided in Appendix 1.

3.1.1 General Survey Questions

The general survey questions for grocery stores and restaurants pertained to size of establishment and local food buying habits. We did not include questions about store revenue because survey respondents tend to find questions regarding dollar amounts off putting. For grocery stores size of establishments was measured in square footage of store and square footage of produce department. For restaurants size was measured by seating capacity. Respondents were asked what percentage of food sold at their store was advertised as local. To determine how local food was advertised grocery stores and restaurants were asked to indicate from a list all the methods that they used to advertise food as local, shown in Figure 3.1. Grocery stores and restaurants were also asked if they sold local tomatoes, and if so to indicate from a list the top three problems they had with procuring local tomatoes. Tomatoes were used to make the question simpler to answer and to be consistent with products used in the choice based conjoint questions. Restaurants were also asked if they used beef and, what requirements they had for local beef products. Finally, they were asked to identify from a provided list, top three problems they had with procuring local beef. The question regarding problems with procuring local tomatoes and beef are almost identical to each other, the list of potential problems with procuring local tomatoes and beef presented to survey respondents are as follows:

- Safety

- Freshness
- Not Enough consumer demand
- Have to change labels too often
- Sufficient Supply
- Working with local vendors
- Quality
- Wholesale price too high
- Have to work with too many vendors
- Animal Treatment (Beef Question only)
- Other (Write in)

	Yes	No
State of Origin	☐	☐
County of Origin	☐	☐
Mile Radius	☐	☐
Company Name	☐	☐
Other Geographic Region (please specify) _____	☐	☐

Figure 3.1 Methods of Advertising Local Foods

3.1.2 Conjoint Survey Questions

Choice based conjoint analysis has been used frequently in estimating WTP for local foods ((Darby, 2008), (Onozaka, 2011), (Wang, 2010)). Choice based conjoint (CBC) is a type of choice experiment. Unlike other choice experiments, CBC respondents are not asked to state their WTP for different characteristics or products. The products used in CBC questions are described in very precise terms. The precise descriptions of products in the CBC

section of the survey mimic purchasing decisions that people face in the real world; requiring respondents to face realistic tradeoffs between traits that may be important. These types of questions are easy for respondents to understand and answer. These questions while being simple allow for multiple attributes to vary simultaneously. This variation allows researchers to analyze which attributes are most important to purchasers and allows for the estimate of main and interaction effects of the attributes used in conjoint questions (Green, 2001).

The product that we choose to use in the CBC section of our survey was tomatoes. Tomatoes were chosen for our survey for several reasons. First, tomatoes are able to be produced throughout the survey region making it a product that could be purchased locally for all grocery stores and restaurants who received surveys. Second, previous research has shown that consumers frequently seek out local tomatoes (Kezis, 1998). Third, Onozaka's (2011) study of consumers used local tomatoes in a CBC survey, making comparisons between consumer and business WTP for local products possible. The attributes that we used to describe the tomato products in the CBC section were origin, price and seasonal availability.

Previous research shows that consumers and businesses use political boundaries, geographical region and mile distances to define local ((Haas, 2014), (Brown, 2003)). When choosing the levels of origin to use for the different levels of the CBC attribute we wanted the description of origin levels to be consistent for all respondents. Due to the varying size of states and counties in our survey region we chose to define origin in terms of miles from store instead of political borders. We used three different levels for the origin attribute rather than a local and non-local level. The origin attribute levels were "under 50 miles from store", "between 51-100 miles from store" and "101-200 miles from store". Using different origin levels allowed us to observe differences in respondents WTP for foods of different origins.

The range of mile distance for the different origin levels encompasses the mile distances considered to be local from the studies that focused on how consumers and grocery stores define local foods. Hass's (2014) study of consumers found food grown with 100 miles to be considered local. In a study of grocery stores Guptill (2002) found that some stores defined local to be food grown with 30 miles of their store.

Price was included as an attribute in order to be able to estimate WTP. The base whole sale price that we used was $0.99 per pound of tomatoes. The wholesale price was based on the average wholesale price for tomatoes in the Northwest for the previous year published by the USDA. We choose to have wholesale price levels of tomatoes range from 5% to 15% above a base wholesale price. By making the lowest price level 5% above the average price, we are assuming that there is a price premium for stocking local foods. Most of the literature on consumer WTP for local foods indicates that a price premium is placed on local foods. Previous studies of grocery stores and restaurants found that responding to consumer is one reason businesses stock local foods ((Dunne, 2011), (Martinez, 2010)) .We believe that grocery stores and restaurants are willing to pay a price premium for local foods because they can pass this price premium onto their customers. The upper level of our price attribute was also informed by literature based on consumer's WTP. Onozake et al (2010) used tomatoes as an instrument in their CBC survey and found that consumer's had a WTP of 15% for local tomatoes compared with non-local tomatoes. We did not think that grocery stores or restaurants would be willing to pay a higher price premium for local tomatoes than they could pass on to their customers.

The final attribute that we used to describe tomatoes was seasonal availability. In northern locations like Idaho, cold winter temperatures make year round production of local

produce economically impractical. It is only possible to stock local produce items when they can be grown in the region, either when they are in season or can be grown in greenhouses. We felt that not being able to stock products year round was an importance difference between local foods and conventional foods; potentially making seasonal availability an important factor when deciding what products to stock. We control for seasonal availability by adding it as an attribute with level corresponding to the regular growing season and an extended growing season for tomatoes. The attributes and levels used to describe tomatoes in the CBC section of the survey are shown in Table 3.1.

Table 3.1 Conjoint Attribute Levels

Attribute	**Levels**
Origin	Less than 50 miles 51-100 miles 101-200 miles
Price	5% above expected average 10% above expected average 15% above expected average
Availability	May-November Jul-Sep

We decided to hold quality constant for all tomatoes in the CBC section rather than include quality as an attribute. If quality was included as an attribute then respondents would possibly have to flip back and forth through their surveys to make accurate comparisons of products based on the quality descriptions provided. Having respondents comparing quality descriptions would increase the time the respondent spent on the survey, making completing the survey inconvenient. We provided a common grade description for tomatoes in the CBC

section. The description came from “United States Standards for Grades of Greenhouse Tomatoes” produced by the USDA in 2007.

In the CBC method the respondent is presented with several product options, called concepts. The respondent is asked to indicate which concept, if any, they would purchase. A concept is an item described in terms of different attribute levels. A task is groups of concepts a respondents is asked to pick from. We included an option to not purchase any of the concepts presented in a CBC task. Having a “none” option increases the accuracy of estimates by not forcing respondents to pick products that they would not purchase in the real world. Including a “none” option in tasks is common practice in CBC surveys.

If the “none” option is selected the survey respondent is indicating they would not stock/use local tomatoes, and would only source conventional tomatoes. In the survey the “none” option represents conventional tomatoes, tomatoes at the average market price of $0.99 per pound, available year round with an origin of over 200 miles from store location. An example CBC question is shown in Figure 3.2.

If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):

Origin (miles from store) Wholesale Price Per Pound Months Available	50 miles or less $1.04 (5%) Jul-Sep	101-200 miles $1.14 (15%) May-Nov	51-100 miles $1.09 (10%) May-Nov	Given these options I would not buy local tomatoes.
	○	○	○	○

Figure 3.2 Sample Choice Based Conjoint Question

The number of possible combinations of concepts is equal to the product of the number of levels in each attribute. In this case we have three attributes. Two attributes have

three levels and the other attribute has two levels. The total number of possible concepts is 18 (3*3*2).

The concepts are presented to the survey respondent in a task, with the number of concepts dependent on survey design. The maximum number of tasks in a CBC survey design is the number of possible unique concepts raised to the power of the number of concepts per task. When the number of concepts per task increases, the number of potential tasks a respondent can be asked also increases. The value of having more concepts per task is more information is gained from each completed task. Having many concepts per task makes it hard for respondents to make comparisons and can lead to frustration when filling out the survey. The number of concepts per task was limited to three so not to over whelm respondents. The number of potential task for our survey design is 5,832 (18^3).

It is impractical to ask respondents to consider all potential tasks. In order to keep the survey a reasonable size, we created several versions of the CBC section of the survey. Using multiple survey versions allowed us to limit the number of tasks per CBC survey to eight. The software that we used to create and analyze our survey was Sawtooth Software. Sawtooth Software is a company that specializes in creating software specifically for conjoint analysis. Sawtooth Software suggests that the number of survey versions multiplied by the number of tasks be greater than or equal to 80. We used 15 different survey versions, this is well above the minimum number of surveys versions based on Sawtooth Software's recommendation.

3.2 Theory

The theoretical framework for this paper is based on Lancaster's theory of demand. In this paper we are treating grocery store and restaurant survey respondents as consumers maximizing their utility (Lancaster, 1966). In Lancaster's theory of demand there are three

main assumptions. First, consumers derive utility from different characteristics of a good. Second, goods are made up of multiple characteristics. Finally, combinations of different characteristics may be valued differently than the sum of the value of individual characteristics. In Lancaster's theory of demand consumers choose goods that give them the highest utility. Utility of good k (U_k) is a function $\mathbf{Z}k$, where of $\mathbf{Z}_k$ is a vector describing the characteristics of good k.

$$U_{\mathbf{k}} = U(\mathbf{Z}_k) \quad 3.1$$

In the CBC framework a good is equivalent to a concept. A concept is described by different attribute levels. The utility of a concept is the sum of the estimated part-worth utilities for the attribute levels that make up a concept. Part-worth utilities can be estimated for interactions effects and main effects. For example if a concept is made up of the following attribute levels:

- Origin-50 miles are less
- Price- 5% above expected average price
- Seasonal availability- July through September

Than the utility for this would be equal to the sum of the following estimated part-worth utilities:

- Origin - 50 miles are less
- Price - 5% above expected average price
- Seasonal availability - July through September
- Origin - 50 miles are less **x** Price - 5% above expected average price
- Origin - 50 miles are less **x** Seasonal availability - July through September

- Price - 5% above expected average price **x** Seasonal availability - July through September

Using estimates of part-worth utilities of the different attribute levels in a concept is consistent with the main assumptions of Lancaster's theory of demand. In CBC concepts are made up of multiple attribute levels, consumers derive different amounts of utility from different attribute levels and interaction terms allows for combinations of different attribute levels to give a consumer more or less utility than the sum of the part-worth utilities of individual level estimates. When choosing between concepts in a task the respondent will choose the option that gives the highest utility. The part-worth utilities of attribute levels are modeled with a hierarchical Bayes model, which will be discussed later in chapter 5.

3.3 Survey List

The frame for our survey consisted of grocery stores and restaurants stores in Idaho, Oregon, and Washington. The list of potential survey respondents is categorized by the North American Industry Classification (NAICS) codes of 445110 (grocery stores & supermarkets), 445230 (permanent produce stands) and 722511 (full service restaurants). These NAICS codes were chosen as establishments that would best be able to respond to a survey regarding local food purchasing. The information for the grocery stores and restaurants came from infousa.com (InfoUSA, 2015) . For the restaurants in our survey frame we removed franchises and chains, as these establishments do not make food purchasing decisions at the store level.

From the survey responses we wanted to be able to make comparisons between respondents from different business types, states and rural and urban areas. However, if we sent out surveys to match the proportions in the survey frame, it is possible we would not get enough responses from each group to test for difference between groups. For example, we

may have too few rural responses to test between rural and urban areas. To protect against this situation, we used stratified simple random sampling to select from our list survey recipients. The stratums that we used were based on rural and urban areas in the three states for grocery stores and restaurants, making a total of 12 stratums.

The definitions of rural and urban used to define the stratums is based on the Rural Urban Continuum Codes (RUCC) published by the United States Department of Agriculture's Economic Research Services in 2013 by county locations (USDA 2013). Counties are classified into levels of urban and rural on a scale of 1-9, 9 being the most rural. Levels of rural and urban are based on county population and if counties contain or are adjacent to counties that are classified as metro areas. Metro areas are defined by the Office of Management and Budget. Table 3.2 shows descriptions of RUCC levels. For the purposes of stratifying the survey frame we divided grocery stores and restaurants into two classifications: rural or urban counties. Counties that had a RUCC less than or equal to four where classified as urban and counties that had a RUCC greater than 4 where classified as rural. Potential respondents from grocery stores and restaurants where divided into stratums for each business (rural Idaho, urban Idaho, rural Oregon, urban Oregon, rural Washington and urban Washington).

Table 3.2 Rural Urban Continuum Code Description

Code	Description
Metro Counties	
1	Counties in metro areas of 1 million population of more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
Non-metro Counties	
4	Urban populations of 20,000 or more, adjacent to a metro area
5	Urban populations of 20,000 or more, not adjacent to a metro area
6	Urban populations of 2,500 to 19,999 , adjacent to a metro area
7	Urban populations of 2,500 to 19,999 , not adjacent to a metro area
8	Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Completely rural or less than 2,500 urban population, not adjacent to a metro area

We expected our survey response rate to be roughly 10%; with that in mind we calculated the number of responses from both grocery stores and restaurants that would be required to conduct our analysis. Based on budget limitations and the number of responses needed we decided to mail a 3,600 survey. We divided the number between grocery stores and restaurants, sending 1,800 surveys to each group. The 1,800 surveys sent to each business type were divided as evenly as possible between stratums. The 15 CBC survey versions were distributed as evenly as possible across grocery store and restaurants stratums.

To increase accuracy of the mailing list, grocery stores were called to verify mailing address of store and to obtain the name of the produce manager so surveys could be addressed

directly to the produce manager by name. We felt that including the name of the grocery store produce manager would increases the likelihood of the survey being directed towards the person best able to complete the survey, which in turn would increase response rates. Grocery stores that were no longer in business were removed from the mailing and replaced with other stores from the survey frame. Calls were not made to restaurants. Restaurants do not always have a service desk to handle calls, making it hard get contact information for stock mangers and mailing address.

The number of restaurants in each stratum was large enough we were able to randomly selected 300 restaurants from each stratum. The number of grocery stores within each stratum varied, several of the stratums had less than 300 grocery stores in each making it impossible to send an equal number of surveys to each stratum and receive enough responses to conduct our research. All stratums except urban Oregon and urban Washington had fewer than 300 addresses for grocery stores. We had addresses for 99 grocery stores from rural Idaho, 147 addresses from urban Idaho, 134 addresses from rural Oregon and 94 addresses from rural Washington. We choose to survey all grocery stores in rural counties from all three states and all of urban Idaho. The remaining balance of surveys was divided evenly between urban Oregon and urban Washington. The distribution of surveys between stratums are in Table 3.3.

Table 3.3 Survey Mailing Distribution Between States and Counties

Stratums	Grocery Stores	Restaurants
Rural Idaho	99	300
Urban Idaho	147	300
Rural Oregon	134	300
Urban Oregon	663	300
Rural Washington	94	300
Urban Washington	663	300
Total Surveys Sent	**1800**	**1800**

Based on the availability of mailing addresses and lack of email addresses provided by www.infousa.com, mailing a paper survey was determined the best method for administering the survey. We used the Dillman method (Dillman, 2014) ,which consists of two separate mailings of the survey with cover letters, as well as a reminder postcard sent between the survey mailings. All survey cover letters where hand signed in blue ball point pen. Table 3.4 shows the mailing schedule for the surveys.

Table 3.4 Survey Mailing Dates

Mailing	Date
First mailing of cover letter & survey	February 12, 2015
Reminder Postcard	February 20, 2015
Second mailing of cover letter & survey	March 5, 2015

The data in this study was collected via mail survey distributed to grocery stores and restaurants in the Northwest. Surveys sent to both grocery stores and restaurants consisted of general questions and choice based conjoint questions. The general questions were designed to enable us to determine problems grocery stores and restaurants have with procuring local foods and popular methods of advertising food as local. The choice based conjoint section of the survey was used because of its ability to estimate part-worth utilities from survey responses that are consistent with Lancaster's theory of demand. The estimated part-worth utilities from the choice based conjoint section allow us to estimate WTP for local foods and estimate rankings of attribute importance. The survey list was compiled so that we would be able to make comparisons between local food preferences of grocery stores, restaurants, states and rural and urban areas.

Chapter 4 Data

The data used for this study came from survey responses from the mail survey distributed via mail, to grocery stores and restaurants in Idaho, Oregon and Washington. Using information from the mailing of the surveys we calculate the response rates our study. To determine how representative our survey respondents are of the sample region comparisons of demographic information from our sample frame and data from the 2013 census is shown along with a MANOVA test for non-response bias. Finally summary statistics for the non CBC questions are discussed.

4.1 Responses Rates

The number of surveys returned was 134 from grocery stores and 137 from restaurants. The number of returned surveys for each business type from each stratum is shown in Table 4.1 along with percent of the surveys returned from each stratum. Grocery stores located in rural areas had a higher percent of surveys returned compared to urban areas. For restaurants, which had same number of surveys sent to each stratum, Idaho had the highest percentage of surveys returned followed by Oregon and then by Washington. The number of responses received from grocery stores and restaurants were very similar, with the number of surveys received from restaurants exceeding the number of surveys received from grocery stores by three.

Table 4.1 Number of Surveys Returned per Stratum

	Grocery Stores Surveys			Restaurants Surveys		
	Returned		Sent	Returned		Sent
Stratum	Number	Percent	Number	Number	Percent	Number
Rural ID	28	28%	99	31	10%	300
Urban ID	18	12%	147	34	11%	300
Rural OR	25	19%	134	22	7%	300
Urban OR	20	3%	663	18	6%	300
Rural WA	12	13%	94	20	7%	300
Urban WA	31	5%	663	12	4%	300
Total	**134**	**7%**	**1800**	**137**	**8%**	**1800**

The American Association for Public Opinion Research standard definitions were used to calculate the overall response rate, refusal rate, cooperation rate and contact rate (AAPOR) . When calculating response rates non-deliverable surveys and surveys sent to ineligible respondents are removed from the total number of surveys sent; this is done so response rates are not lowered by large numbers of non-deliverables. The overall response rate is the percent of completed and partially completed returned surveys. The refusal rate is the proportion of known eligible survey recipients who indicated they did not want to participate in the survey. The cooperation rate is the proportion of surveys received from the number known eligible respondents. The number of known eligible respondents is the sum of received completely and partially completed surveys and respondents that choose not

participate but where eligible to participate. The contact rate is the proportion of known eligible respondents that received surveys from the mailing list.

In Table 4.2 the overall response rate, refusal rate, cooperation rate and contact rate are shown for grocery stores and restaurants. The number of non-deliverable surveys was higher for restaurants compared to grocery stores. Restaurants had a slightly higher overall response rate and contact rate not only because the number of surveys returned by restaurants was higher than grocery stores but also because the number of non-deliverable surveys sent to restaurants was higher.

Table 4.2 Grocery Store and Restaurant Survey Response Rates

Response Rates	**Grocery Store**	**Restaurant**
Overall Response Rate	9.7%	12.00%
Refusal Rate	1.2%	0.01%
Cooperation Rate	92.4%	94.20%
Contact Rate	10.8%	12.70%

4.2 Demographics of Survey Respondents

The sample frame from infousa.com included information on sales volume, business size (in square feet) and NAICS in addition to the mailing addresses of businesses. Using the additional information provided by infousa.com we made comparisons between the businesses that responded to our survey and business in the sample frame. The purpose of these comparisons was to determine how representative our sample was of the business in the sample region. The respondents used in making these comparisons where those that were used

to estimate WTP for local foods. Table 4.3 shows demographic information for grocery store survey respondents and all grocery stores in the sample frame. Grocery store respondents contain more stores with higher sale volume and are of larger size compared to the sample frame. Grocery store respondents were also more equally distributed the nine levels of the RUCC then the sample frame; this was done on purpose so that difference between these groups could be tested. The respondents from grocery stores were very representative of the proportion of grocery stores classified by NAICS codes. Slightly more than 7% of the grocery store respondents came from permanent produce stands and the rest of the respondents coming from grocery stores and supermarkets.

Table 4.3 Grocery Store Demographic Characteristics of Representative Sample

Grocery Store Sales Volume	**Sample frame**	**Respondents (Conjoint n=98)**
Less than $19,000	20%	9%
Between $ 190,000 - $22,999	20%	4%
Between $23,000 - $40,999	20%	17%
Between $41,000 -$220,000	20%	32%
Over $220,000	20%	38%
Grocery Store SQFT of Store		
Less than 2,263 sqft	20%	5%
Between 2,263 sqft -2,641 sqft	20%	7%
Between 2,642 sqft -3,182 sqft	20%	16%
Between 3,183 sqft -7,365 sqft	20%	33%
Over 7,365 sqft	20%	39%
RUCC		
1	47%	18%
2	18%	19%
3	15%	10%
4	6%	7%
5	4%	11%
6	5%	18%
7	2%	10%
8	0.06%	2%
9	0.09%	3%
NAICS		
445110 - grocery stores & supermarkets	92.5%	92.8%
445230 – permanent produce stands	7.5%	7.2%

The distribution of survey respondents from grocery stores are distributed fairly evenly across states. The distribution of grocery stores across states is much less evenly distributes in the sample frame and according to the 2013 business census. Table 4.4 shows the distribution of grocery stores between states from the 2013 census, the sample frame and survey respondents. The distribution of grocery stores in our sample frame is fairly consistent with the 2013 census. When creating the mailing list for the survey the goal was to receive a

somewhat even distribution of respondents between states in order to be able to make comparisons between them.

Table 4.4 Distribution of Grocery Stores by State

State	Grocery Stores		
	2013 Census	Sample Frame	Survey Respondents
Idaho	9%	10%	34%
Oregon	30%	35%	35%
Washington	61%	55%	31%

Demographic information for restaurant respondents and all restaurants in the sample frame are shown in Table 4.5. The information for sales volume and square footage of restaurants provided by infousa.com has a large proportion of entries equal to zero. We speculate that information was not available rather than actually being equal to zero, particularly since it does not make since for restaurant size to be zero square feet. Similar to grocery stores, respondents from restaurants represent businesses with higher sales volume and square footage compared to the distribution of the sample frame. The distribution of restaurant respondents are more equally distributed the nine levels of the RUCC then the sample frame.

Table 4.5 Restaurant Demographic Characteristics of Representative Sample

Restaurant Sales Volume	**Sample frame**	**Respondents (Conjoint n=127)**
Less Than $39,000	55%	40%
Between $39,000 – $149,999	15%	13%
Between $150,000 - $390,000	15%	21%
Over $390,000	15%	26%
Restaurant Square Footage of Restaurant		
Less than 1122.32 sqft	55%	40%
Between 1122.32 sqft - 2268 sqft	15%	9%
Between 2269 sqft - 3627 sqft	15%	23%
Over 3627 sqft	15%	28%
RUCC		
1	52.6%	11.8%
2	17.0%	21.3%
3	14.0%	11.8%
4	6.0%	2.4%
5	3.6%	19.7%
6	3.5%	19.7%
7	2.1%	8.7%
8	0.4%	1.6%
9	0.8%	3.1%

The distribution of restaurant surveys based on state of origin is reversed from what we see in the sample frame and 2013 census data, with 50% of respondents from Idaho, 30% of respondent from Oregon and 20% from Washington. In the sample frame the majority of restaurants are located in Washington (56%), 35% are located in Oregon and only 9% from Idaho. The sample frame for restaurants shows the distribution of restaurants by state that is very similar to the distribution of restaurants of the 2013 census.

Table 4.6 Distribution of Restaurants by State

State	Restaurants		
	2013 Census	Sample Frame	Survey Respondents
Idaho	11%	9%	50%
Oregon	37%	35%	30%
Washington	52%	56%	20%

To test for how representative our survey responses are of the population we tested for non-response bias. The purpose of this test is to determine if there is a difference between respondents that returned their surveys before the second mailing of the survey and those who returned their surveys after the second mailing. It is thought that if there is a difference between early respondents and later respondents there may also be a difference between those who responded to the survey those who did not.

To test for non-response bias a MANOVA test was conducted using selected questions from the survey to make comparisons between surveys that where received before and after the second mailing date. The variables that were used in the MANOVA test for grocery stores were percent local produced stocked in store and produce department, and the square footage of store and produce department. For restaurants percent local food on the menu and seating capacity where used in the MANOVA test. The traditional MANOVA test consists of four tests: Pillai, Wilks, Roy and Hotelling-Lawley. Each of the tests in MANOVA has the same null-hypothesis but the approach of the different tests is slightly different. The null-hypothesis for the MANOVA test is that the means of the variables received before and after the second mailings are not statistically different from each other. The results of the MANOVA tests are shown in Table 4.7. From the p-values in Table 4.7 we fail to reject the null hypothesis, the

mean of the variables tested for both grocery stores and restaurants were not statistically different between mailings. The MANOVA tests did not detect non-response bias.

Table 4.7 MANOVA Test for Non Response Bias

Business	**Manova Test**			
	Pillai	**Wilks**	**Roy**	**Hotelling -Lawley**
Grocery Stores	p-value = 0.44	p-value = 0.44	p-value = 0.44	p-value = 0.44
Restaurants	p-value = 0.26	p-value = 0.26	p-value = 0.26	p-value = 0.26

4.3 Summary Statistics

The first section of the survey consisted of questions focusing on general respondent information about size of establishment, current local food selling practices, methods of advertising local foods and what problems stores had with supplying local foods. Table 4.8 shows summary statistics for percent of local products (based on store definitions) sold at grocery stores and restaurants. Grocery stores and restaurants were similar in the volume of local food they sold. The range in percentage of local food sold by grocery store produce departments and on restaurant menus were the same, 0%-100%. The median percent of local foods sold by grocery store produce departments and on restaurant menu were also the same (10%). Restaurants did have a higher mean for percent of local on menus compared to grocery stores produce department sales, with restaurants mean percent local items on menu being 20% and mean percent local sales for grocery stores produce departments equaling 17.76%.

Table 4.8 Percent of Food Sales Local Summary Statistics Grocery Stores and Restaurants

Descriptive Stats.	Grocery Stores Percent Local Food Sold		Restaurants Percent Local Food Sold
	Produce Department	Store	Percent Local Menu
Min	0%	0%	0%
Max	100%	95%	100%
Median	10%	5%	10%
Mean	17.76%	15.5%	20%

The grocery store and restaurant respondents tended to be from larger than average businesses, when compared to the sample frame. The survey respondents from grocery stores and restaurants still covered a large range of business sizes. Summary statistics for establishment size are shown in Table 4.9. The range of grocery stores size in square feet is from 368 through 160,000 square feet. Restaurant respondents also showed a large range in establishment size, with the smallest restaurant having seating capacity for 6 and the largest restaurant having seating capacity for 500.

Table 4.9 Grocery Store and Restaurant Summary Statistics Establishment Size

Descriptive Stats.	Grocery Stores		Restaurants
	Produce Dept. Size Square Footage	Store Size Square Footage	Seating Capacity
Min	0	368	6
Max	25,000	160,000	500
Median	1000	8000	75
Mean	2122	19330	94

Since the term local has no consensus definition, we asked respondents to indicate all the methods their store used to advertise local foods. These results are shown in Table 4.10. Respondents were able to indicate more than one option, the percent's do not add up to 100, rather the percent indicates the respondents that answered the question this percent used this method to advertise local. The most popular methods of advertising food as local for both grocery stores and restaurants were based on political boundaries (state and county) and by company name. Mile distance was the least common method of advertising food as local for both establishments.

Respondents were given the option of writing in alternative methods used to advertise food as local. Twelve respondents wrote "Northwest" as a method of advertising food as local. The next most common method of advertising written in the "other" section, with five respondents, was city of origin. Four respondents wrote that they just use the term "local" as a method of advertisement. Three respondents said that they used country of origin as an advertisement method. Three respondents also wrote in different countries as a label for local such as France, Italy and Japan. Other studies have found that consumers have also defined food as local when the origin of the food product is known even if that origin is far away.

Table 4.10 Grocery Stores and Restaurant Method of Advertising Used

Method	**Grocery Stores N=112**		**Restaurants N= 83**	
	Percent Picked	**Rank**	**Percent Picked**	**Rank**
State	69%	1	60%	2
County	59%	3	30%	4
Mile	12.5%	5	22%	5
Company	61%	2	60%	1
Other	29.5%	4	34%	3

Respondents that said they used mile distance from store to advertise food as local were asked to write in the farthest distance considered local by their establishment. Grocery stores that advertise using miles had a larger mile range they consider as local compared to restaurants that use miles to advertise food as local. Table 4.11 shows summary statistics regarding distance from business in miles that was considered local. The maximum distance considered local by grocery stores was 500 miles. The maximum distance considered local by restaurants was 300 miles. Grocery stores also had higher mean and medians miles considered local compared to restaurants. Grocery store mean mile distance considered local was 140 miles while restaurant mean was 80 miles. Grocery store median mile distance considered local was 80 miles while restaurant mean was 50 miles.

Table 4.11 Maximum Mile Distance Considered Local for Grocery Stores and Restaurants

Descriptive Stats.	Grocery Stores Miles	Restaurants Miles
Min	1	1
Max	500	300
Median	80	50
Mean	140	80

Grocery store and restaurant respondents were asked if they stocked local tomatoes, and if so to indicate the top three problems they had with procuring local tomatoes (results in Table 4.12). Of the respondents that answered this question, 29% of grocery store and 40% of restaurant respondents said that they did not sell local tomatoes. The three most frequently indicated problems that grocery stores and restaurants had with procuring local tomatoes where: getting sufficient supply, wholesale price too high and inconsistent quality. For this question there was an option to write in other problems that establishments had with

procuring local tomatoes. The most common write in for problems with procuring local tomatoes was seasonal availability, with fourteen write in's. Two respondents said that they did not know the origins of their tomatoes, so did not know if they were local.

Restaurants also were asked if they used local beef and if so what to indicate from a list their top three problems they had with procuring local beef (list shown in Table 4.12). Of the restaurant respondents that answered this question 56% said they did not use local beef. The problems most frequently indicated for procuring local beef were the same problems most frequently indicated for procuring local tomatoes (getting sufficient supply, wholesale price was too high and inconsistent quality). The most written in answer for problems with local beef procurement were lack of nearby FDA or USDA facilities (three write in's) and suppliers did not indicate product origin (two write in's). Restaurant respondents who indicated they used local beef products were asked to write in any special requirements they had for the local beef products that they used. The most common write in response regarding requirements for local beef products were hormone free (15 write in's), antibiotic free (10 write in's), grass fed (9 write in's) and fresh/never frozen (3write in's).

Table 4.12 Problems Grocery Stores and Restaurants have with Supplying Local Foods

	Grocery Store:29% Do not Sell Local Tomatoes		**Restaurant: 40% Do not Use Local Tomatoes**		**Restaurant: 56% Do not Use Local Tomatoes**	
Potential Problem	**Grocery Store Local Tomatoes N=79**		**Restaurants Local Tomatoes N=51**		**Restaurants Local Beef N=72**	
	Percent	Rank	Percent	Rank	Percent	Rank
Safety	11%	9	4%	9	13%	9
Freshness	16.5%	6	22%	7	15%	7
Not Enough Consumer Demand	13%	8	5%	8	18%	6
Have to change labels too often	5%	10	0.00%	10	1%	10
Sufficient Supply	53%	1	65%	1	39%	2
Working with local vendors	30%	5	25.5%	5	32%	4
Quality	38%	3	41%	3	35%	3
Wholesale Price too high	45.5%	2	49%	2	67%	1
Have to work with too many vendors	15%	7	23.5%	6	15%	7
Animal Treatment	-	-	-	-	1%	10
Other	32%	4	31%	4	22%	5

Looking at the businesses that responded to our survey we find that non- response bias was not detected. We have no reason to believe that grocery stores and restaurants that

did not respond to our survey have differencing preferences for local foods than the businesses that did respond to our survey. The respondents of the survey tended to be larger businesses, in terms of revenue and in physical size of establishment (square footage) when compared to businesses in the sample frame. The number of responses received from the different states and between rural and urban areas surveyed did not match the distribution of businesses in the sample frame or the 2013 census. The difference in business distribution was done intentionally to allow for testing for difference in preferences between state and rural and urban areas.

Grocery stores and restaurants have many similarities in their demand for local foods. Both business types use similar methods of advertising food as local, similar amounts of local foods sold/used at their establishments and have the same problems with procuring local foods. However, while there are similarities between businesses, grocery stores have a larger mile range that they use to define food as local compared to restaurants.

Chapter 5 Model Selection

Responses from the CBC section of the survey were used to estimate the part-worth utility values for the attribute levels used in the CBC section of the survey. The part-worth utilities show the utility that each attribute level gives to the survey respondent. Estimating the part-worth utility levels for the different attribute levels enables us to estimate WTP and rank attribute importance for survey respondents. A hierarchical Bayes (HB) model was used to estimate the part-worth utilities.

Using a HB model to estimate the part-worth utilities allowed us to estimate part-worth utilities for the individual survey respondents. Having part-worth utility estimates at the individual level allows for respondents to have different preferences. If we did not us a HM model we would have instead estimate one set of part-worth utilities for all survey respondents. Estimating one set of part-worth utilities for all survey respondents assumes preferences are homogenous between all survey respondents. Individual level estimates also enable estimating aggregate market shares, which is the percent that each attribute level is picked be survey respondents (Lenk, 1996). Being able to predict market shares is useful for seeing how well a model represents market activity

The Bayesian approach differs from the Frequentist approach in the way that a statistical problem is approached. In the Bayesian approach, it is assumed that the data set is described by a model and that the parameters estimated in the model are consistent with the data. In the Bayes approach the data is fixed and the parameters are random. This is different from the Frequentist approach. In the Frequentist approach a model is assumed to be true and a data set is tested to see if it is consistent with the model. The data is treated as part of an unobserved data set. In the Frequentist approach parameters in a model are fixed but unknown

and the data is random. Just as the statistical approach to a problem is different, so is the way that statistical significance is interpreted. In the Frequentist approach a confidence interval is calculated. A confidence interval gives the probability of (1-p), where p is the chosen critical value; the real value will be in the confidence interval. For the Bayesian approach a credible interval gives the probability of (1-p), that given the data the true value will be in the credible interval.

The differences between the Bayes and the Frequentist approach can be easily be seen in how probability is approach when flipping a coin. A fair coin is flipped ten time and three flips are heads. In the Frequentist approach you look at the problems as: what is the probability of getting three heads in ten flips of a fair coin? The Bayes approach is a little different. In the Bayes approach you look at the problem as: given that I got three heads when I flipped a coin ten times what is the probability that this is a fair coin?

5.1 Hierarchical Modeling

In the context of the HB model the term hierarchical refers to the process of estimating coefficients in two levels. The lower level of the hierarchy consists of a multinomial logit model:

$$P_{ik} = \frac{e^{(X_k{}'\beta_i)}}{\sum_{(t=1-j)} e^{(X_t{}'\beta_i)}} \quad 5.1$$

Where

P_{ik} is the probability that individual i will choose the k^{th} concept given j concepts

X_t is a vector of values describing the t^{th} alternative (k is contained in t)

X_k is a vector describing the k^{th} alternative

$\boldsymbol{\beta_i}$ is the estimated part-worth utilities of the different attribute levels for the i^{th} individual

The upper level of the hierarchical model is the estimation of an individual's part-worth utilities ($\boldsymbol{\beta_i}$'s). The $\boldsymbol{\beta_i}$'s can be estimated in two ways, either from a multivariate normal distribution or with covariates.

When the $\boldsymbol{\beta_i}$'s are estimated using a multivariate normal distribution the upper level of the HB model is as follows.

$$\boldsymbol{\beta_i} \sim \text{Normal}(\boldsymbol{\mu}, D) \qquad 5.2$$

Where

$\boldsymbol{\mu}$ is a vector of means of the distribution of individuals' part-worth utilities

D is a variance/covariance matrix of individual's part-worth utilities

The part-worth utilities are estimated using effects coding. When using effects coding the part-worth utility for a particular attribute level is how much utility an individual gets from that level of an attribute compared to other levels of the same attribute. For each attribute one of the levels is excluded; part-worth utilities of the other levels of that attribute are estimated relative to the excluded level. The excluded level of an attribute is calculated as

the negative sum of all estimated part-worth utility for the other levels of the same attribute. When using effects coding the sum of the estimated part-worth utilities of an attribute always equals zero. In effects coding the number of part-worth utility coefficient estimated is equal to the total number of levels in all attributes minus the number of attributes. In our survey the total number of attribute levels equals eight and the number of attribute equal three. Therefore the number of part-worth utilities estimated is five (8-3=5).

An example of how effects coding is used for the estimation of the origin attribute levels is as follows. Origin has three levels, using effects coding only the part-worth utilities for two of the levels are estimated. The level “101-200 miles” is excluded and the part-worth utilities for the other levels for the origin attribute are estimated relative to “101-200 miles”. The part-worth utility estimation for “50 miles or less” is how much utility a respondent gets from that origin level compared to the amount of utility they get from the origin level“101-200 miles”. The same is true for the estimates of the part-worth utility of “51-100 miles”. The part-worth utility for “101-200 miles” is then equal to the negative sum of the part-worth utility estimates of “50 miles or less” and “51-100 miles”.

The part-worth utilities in the HB models are estimated using Gibb’s and Metropilous Hasting sampling, an iterative process. When part-worth utilities in the upper level of the HB model are estimated using a multivariate normal distribution the coefficients that are estimated are $\boldsymbol{\beta_i}$, $\boldsymbol{\mu}$ and D. The process begins with all parameters set at an initial level then:

a. Initial values of $\boldsymbol{\beta_i}$ and D are used to estimate a new $\boldsymbol{\mu}$
b. Using $\boldsymbol{\beta_i}$ and the new estimate for $\boldsymbol{\mu}$ a new D is estimated
c. Then a new $\boldsymbol{\beta_i}$ is estimated using the estimates of $\boldsymbol{\mu}$ and D

d. Repeat steps a-c

The iterations are repeated thousands of times for each individual survey respondent to ensure convergence. The final estimate for an individual's $\boldsymbol{\beta_i}$'s is the mean of the saved iterations for the $\boldsymbol{\beta_i}$'s. The saved iterations of the $\boldsymbol{\beta_i}$'s are used for the posterior distribution, from which the credible interval is calculated. The first 10,000 iterations (burn-in) are run and discarded, so the iterations saved for the posterior distribution reflect the data from the survey and not the initial level used to start the iterative process. After the burn-in an additional 50,000 iteration are performed. From the 50,000 iterations (after the burn-in) every fifth iteration is saved. This thinning process is used to remove any correlation between iterations.

The alternative method of estimating the upper level of the HB model is to use covariates. When using covariates the $\boldsymbol{\beta_i}$'s are estimated by a linear function. Covariates can be continuous or categorical variables. The variables used in the linear function are different characteristics of survey respondents. Covariates are variables that add new information about a survey respondent to the model. Potential covariates for our model is information collected in the general questions at the beginning of the mail survey such as percent of products sold that are advertised as local or size of establishment. Other potential covariates are business type, state where business is located and if business is located in rural or urban area. Location information was based on mailing address not from direct questions in the survey.

When using covariates the upper level $\boldsymbol{\beta i}$'s are estimated by a linear regression such as:

$$\boldsymbol{\beta_i} = \alpha + X\ V \qquad 5.3$$

Where

α is the intercept

X is a vector of an individual's characteristics

V is the estimated coefficients

The process of estimating the part-worth utilities when covariates are used in the upper level of the HB model is very similar to when a multivariate normal distribution is used in the upper level of the HB model. Instead of using a population mean (**μ**) to estimate part-worth utilities separate means are used for respondents that have different characteristics defined by the covariates used in the upper level of the HB model. A matrix normal distribution with mean zero and variance of 100 is used in place of the multivariate normal distribution to estimate the vector of means (Orme 2009).

Using a separate vector of means to estimate part-worth utilities based on covariates in the upper level of the HB model can increase the accuracy of the model. For example, if we used covariates that identified whether a respondent worked at a grocery store or a restaurant than instead of using an overall population mean **μ** to estimate respondent's part-worth utilities a separate vector of means would be used for grocery stores and restaurants ($\boldsymbol{\mu}_{\mathbf{G}}$ and $\boldsymbol{\mu}_{\mathbf{R}}$) to estimate respondent's part-worth utilities. If survey respondents from grocery stores and restaurants have different preferences for local tomatoes than using $\boldsymbol{\mu}_{\mathbf{G}}$ and $\boldsymbol{\mu}_{\mathbf{R}}$ instead of **μ** would produce more accurate estimates of the part-worth utilities. The use of covariates that are not applicable increases the number of parameters in the upper level of the model to be estimated, which can also decrease the accuracy of the model over all. To determine which of

our potential covariates are applicable to the model we use Counts to determine if adding covariates improve the upper level of the HB model.

5.2 Testing Potential Covariates

Counts analysis compares the frequency of selection of different attribute levels in the CBC section of the survey by group membership. The counts test only works for categorical variables. Other tests are used to determine the appropriateness of continuous covariates. An example of a counts test would be to compare the difference in frequency the origin level “50 miles or less” was selected between respondents from grocery stores and restaurants. A Chi squared distribution is used to tests for statistical difference in the way attribute levels are selected between groups. The null hypothesis of the counts test is that the frequency an attribute level is selected is the same between groups. If we reject the null hypothesis of the counts test, then we have reason to believe that adding group membership as a covariate to the upper level of the HB model is appropriate. The counts test also can be used to test the statistical significance of interaction effects between attribute levels, such as if the estimated part-worth utility of tomatoes that were grown within 50 miles and have longer seasonal availability are valued differently than the sum of the part-worth utilities for “Origin - 50 miles or less” and “Months Available - May-Nov”.

The results from counts tests comparing the frequency of attribute level selection between business types, state and rural and urban areas are shown Table 5.1. The purpose of this test is to determine if preferences for local tomatoes differs between respondents from grocery stores and restaurants, states, and rural and urban areas. If the between group chi square p-value is less than 0.05, then members of the different group are selecting attribute levels from the CBC surveys differently.

The results from counts tests of group membership are shown in Table 5.1. The null hypothesis is rejected for two of the three main affects, two out of three of the interaction effect and the none option for tests in differences in preferences by business type. Grocery stores and restaurants selected the attribute levels for origin and price at different rates as well as the how frequently the none option was selected. Respondents from grocery stores and restaurants showed different selection frequency of the interactions between attribute levels of Origin x Price and Origin x Availability. The null hypothesis for tests of differences in preferences for respondents from different states is rejected for one main effect, two interaction effects and the none option. The Respondents from the different states surveyed showed a difference in the frequency that the different levels of seasonal availability attributes were selected as well as how frequently the none option was selected. Respondents from the different states also selected the interaction of the different attribute levels of Origin x Availability and Price x Availability differently from each other. We fail to reject the null hypotheses for any of the tests for differences in preferences of respondents from rural and urban areas. Respondents from rural and urban areas did not show any differences in the frequency of the selections of any of the attribute levels in the CBC survey.

Table 5.1 Count Test for Differences in Attribute Level Selection between Groups

Attribute	**Between Group Chi Square p-values**		
	Business	**State**	**Rural and urban**
Origin	< 0.01*	0.78	0.09
Price	<0 .01*	0.78	0.09
Availability	0.54	<0.01*	0.13
Origin x Price	<0 .01*	0.46	0.33
Origin x Availability	0.03*	<0.01*	0.26
Price x Availability	0.15	<0.01*	0.73
None	< 0.01*	<0.01*	0.18
* indicates frequency of attribute level selection was statistically different between groups			

Grocery store and restaurant respondents differed in the frequency of their selection of two main effects and two interaction effects. Business type is a potential covariate to add to the upper level of the HB model. To reduce the number of superfluous variables estimated we tested the statistical significance of the main and interaction effects for grocery stores and restaurants separately.

Table 5.2 shows the results of a counts test for statistical significance of main and interaction effects of attribute levels for each business. The tests show if grocery stores or restaurants respondents are making distinctions between different levels of an attribute. This table shows that for both grocery stores and restaurants all main effects are statistically different from each other. This means that respondents from both grocery stores and restaurants react differently to different levels of the attributes. For grocery stores the interaction between origin levels and price levels and origin levels and availability levels are statistically different from each other. The interaction terms for restaurants are statistically different from each other.

Table 5.2 Counts Tests of Main and Interaction Effects for Grocery Stores and Restaurants

	Business	
Main Effects	**Grocery Store**	**Restaurant**
Origin	p <0 .01*	p <0 .01*
Price	p < 0.01*	p <0 .01*
Availability	p <0 .01*	p < 0.01*
Interaction Effects		
Origin x Price	p <0 .01*	0.18
Origin x Availability	p <0 .01*	0.09
Price x Availability	0.43	0.98
* Effect is statistically significant		

Additional counts test were done for state and rural and urban group membership to determine if there were differences in these groups when controlling for business type. The results of these tests for grocery store respondents are shown in Table 5.3. Rural and urban respondents are still not statistically different from each other. Grocery stores respondents from different states are statistically different from each other in the way that they selected the none option. Based on these test results, we do not use either state or rural and urban group membership as a covariate in the final HB model for grocery stores

Table 5.3 Count Tests of Statistical Significance between Groups for Grocery Store Respondents

Attribute	**Between Group Chi Square p-values**	
	State	**Rural and urban**
Origin	0.95	0.13
Price	0.87	0.52
Availability	0.09	0.39
Origin x Price	0.87	0.61
Origin x Availability	0.52	0.28
Price x Availability	0.78	0.51
None	<0.01*	0.78
* indicates statistical difference between groups		

In Table 5.4**,** the between group chi square p-values are shown for restaurant respondents. Rural and urban restaurant respondents do not respond to the CBC survey section differently. When we look at only restaurant respondents we see states respond differently when selecting seasonal availability levels and the none option. Thus, we continue to test state membership as a potential covariate in our HB model for restaurants.

Table 5.4 Count Tests of Statistical Significance between Groups for Restaurant Respondents

Attribute	Between Group Chi Square p-values	
	State	Urban/Rural
Origin	0.35	0.46
Price	0.20	0.39
Availability	<0 .01*	0.20
None	< 0.01*	0.11
* indicates statistical difference between groups		

There are two other potential covariates that could be used in our models establishment size and the current percent of local food stocked (based on establishment's definition of local). Size of establishment is measured in terms of seating capacity for restaurants and by square footage of produce department for grocery stores.

To test the appropriateness of these potential covariates in the upper level of our model we estimated the model adding one covariate at a time and used eight fold cross valuation. In cross valuation data from the survey responses are divided into two groups, the training data and the test data. The training data is used to create a model which then is used to predict the test data. To perform the eight fold cross valuation we use the eight tasks from the CBC section of the survey. The training data consists of 7 of the tasks; the eighth task is used as the test data. This process is repeated so that each task is used as the test data.

Using cross fold valuation we calculate three measures of goodness of fit: the misclassification rate (MR), the mean absolute error (MAE) and the average root likelihood (RLH). The MR is the percent of individual responses that where inaccurately predicted when using eight fold cross valuation. The MR shows how well the model is at predicting responses at the individual level. The MAE shows how well the model predicts market shares for each attribute level. The goodness of fit measure RLH compares the predictive power of the model

versus if the concepts within a task were picked randomly. The RLH test statistic is between zero and one, with higher numbers indicating better fit. The RLH is not a good standalone measure of goodness of fit because it often increases when the number of parameter estimated increases; even if the added parameters are not increasing the accuracy of the model.

Using the measures of goodness of fit MR, MAE, RLH the appropriateness of the potential covariates are determined. When testing for covariates we estimated grocery stores and restaurants in separate models, instead of using a dummy variable. The counts test we performed indicated the grocery stores and restaurants where statistically different from each other in the way that respondents answered the CBC questions. Estimating the models separately also allowed for the use of different covariates for grocery stores and restaurants and to test the significance of the interaction terms in the model for grocery stores. When the part-worth utilities for respondents from restaurants were estimated separately there were no statistically significant interaction effects, thus the models for restaurants only have main effects estimated. The covariate models along with their MR, MAE and RLH are shown in Table 5.5 (restaurants) and Table 5.6 (grocery stores).

Table 5.5 Eight Fold Cross Valuation Goodness of Fit Measures of Covariates for Restaurants

Models With Main Effects only	**Sample Size**	**MR**	**MAE**	**RLH**
No covariates	120	0.425	0.033	0.750
Percent local stock	115	0.437	0.035	0.749
Size (sqft produce dept.)	119	0.431	0.037	0.755
State	120	0.425	0.034	0.758

Table 5.6 Eight Fold Cross Valuations Goodness of Fit Measures of Covariates for Grocery Stores

Models With Interaction Effects	**Sample Size**	**MR**	**MAE**	**RLH**
No covariates	121	0.501	0.077	0.758
Percent local stock	107	0.498	0.062	0.770
Size (sqft produce dept.)	105	0.526	0.048	0.762
Size and Percent	95	0.504	0.049	0.768
Models With Main Effects only				
No covariates	121	0.500	0.078	0.700
Percent local stock	107	0.491	0.068	0.704
Size (sqft produce dept.)	105	0.495	0.048	0.693
Size and Percent	95	0.470	0.047	0.709

For restaurants all of the potential covariates decrease the models predations for individual responses and decreases the accuracy of predicting market shares. Therefore, when modeling restaurants we do not use any covariates. Looking at grocery stores in Table 5.6, excluding interaction effects of attribute levels increases the predictability of all of the estimated grocery store models, the MR and the MAE are lower. The RLH is lower for the models using only main effects, but this is expected since RLH naturally decreases when the number of parameters estimated decreases. Since including interaction effects decreases the accuracy of the model we do not include them in the final model. Percent of local stock in produce department decreases the MR and MAE, while having produce department size drastically decreases the MAE but increases the MR. Using both covariates results in the lowest MAE and the second lowest MR. The final model used to estimates grocery store's part-worth utilities used establishment size and percent local stock as covariates and only main effects.

5.3 Price Constraints

The estimated part-worth utilities for the price attributes are very important in estimating WTP. The law of demand states that as price increases demand decreases ceteris paribus. In our models this translates to the estimated part-worth utilities of price attribute levels associated with lower prices to be high than the estimated part-worth utility of price attribute levels associated with high prices. Based on the law of demand we expect the part-worth utility for price=5% to be greater than the part-worth utility for price=10% and that part-worth utility to be greater than the part-worth utility for price=15%. In other words holding all other attribute levels equal, respondents get higher utility from products that have lower prices. Individual's estimates that violate this ordering will produce inaccurate WTP estimates. Table 5.7 shows the percent of individual part-worth price estimates that violate the law of demand for both grocery store and restaurant models.

Table 5.7 Percent of Part-Worth Utilities Violations Law of Demand by Business

Final Model	Percent Price Violations
Grocery	36%
Restaurant	18%

To deal with violations of the law of demand we imposed constraints in the model that force part-worth utilities to be higher for lower prices levels through simultaneous tying (Johnson 2000). Simultaneous tying puts a constraint on the lower level of the model only. The upper level is estimated the same way as when not using simultaneous tying, once the upper level is estimated then estimated part-worth utilities are checked to see if they follow the constraint. If the constraint holds then the lower level of the model is estimated. If the

constraint does not hold then that iteration of the upper level is re-estimated until part-worth utilities for the price attribute satisfies the constrain.

Implementing constraints can improve individual estimates but often harm aggregate estimates of market shares. Adding constraints is a tradeoff between variance and bias. Decreased variance with a little bias can improve individual predictions; aggregate models such as market share predictions are more sensitive to bias (Sawtooth Software, 2009).

Table 5.8 shows the MR, MAE and RLH for the unconstrained and constrained models for both grocery stores and restaurants. We see that adding the price constraint increases the accuracy of market share estimates and only slightly increase the MR for restaurants. For restaurants we use the constrained model to estimate part-worth utilities. For grocery stores we do see a tradeoff, MR decreases and MAE increases. Since our concern is with estimating WTP and attribute importance, which focuses on individual level estimates and not on predicting market shares, we included price constraints in the model used to estimate grocery store respondent's part worth utilities. From the estimated part-worth utilities for grocery store and restaurant respondent's WTP and attribute importance are calculated.

Table 5.8 Eight Fold Cross Valuation Measure of Goodness of Fit of Price Constrained Models

Final Model	**MR**	**MAE**	**RLH**
Grocery Unconstrained	0.500	0.049	0.709
Grocery Constrained	0.475	0.053	0.689
Restaurant Unconstrained	0.425	0.033	0.750
Restaurant Constrained	0.426	0.033	0.742

5.4 Calculations Using Part-Worth Utilities

To calculate WTP from estimated part-worth utilities, the price per unit of utility (PPU) must first be calculated. This is done by taking the change in price levels and dividing it by change in the part-worth of price of the corresponding price levels:

$$\text{PPU} = \frac{\Delta\, price}{\Delta\, utility} \tag{5.4}$$

Using PPU WTP is calculated by taking the difference in utility between concepts; utility of a concept is the sum of the part-worth utilities of the attribute levels that make up a concept, and multiplying it by the PPU.

$$\text{WTP} = \Delta \text{ utility} * \text{PPU} \tag{5.5}$$

Estimated part-worth utilities are also used to estimate the relative importance of each attribute used in the CBC survey questions. Attribute importance is a percent that indicates the relative importance of each attribute to a respondent's choice of concept in the CBC survey section. The measure of attribute importance compares the magnitude of change of a respondent's part-worth utilities for an attribute to the magnitude of change in a respondent's part-worth utilities of other attributes. The attribute that has largest range of part-worth utility values for its levels is the most important. An intuitive way of thinking of attribute importance is that the attribute that has the greatest effect on overall utility of a concept is the most important.

Attribute importance for attribute *i* of *w* attributes is calculated as follows:

$$A_i = \frac{HLi - LLi}{\sum_{t=1}^{w}(HLt - LLt)} \quad 5.6$$

Where

A_i – attribute importance of attribute *i*

HL_i – Highest part- worth utility of attribute *i*

LL_i – Lowest part- worth utility of attribute *i*

Estimates of respondent's part-worth utilities can be used to calculate WTP for the attributes used in the CBC section of the survey and attribute importance. We used two HB models to estimate survey respondent's part-worth utilities for the attribute levels in the CBC section of the survey. Based on results from counts test and eight fold cross-valuation it was determined that respondents from grocery stores and restaurants should be molded separately. The final models for grocery stores and restaurants estimated main effects only. The model used for grocery stores used two covariates in the upper level of the HB model, square footage of produce department and percent of local produce stocked. The model for restaurants did not use any covariates in the upper level of the HB model. To make estimated part-worth utilities consistent with the law of demand constraints were placed on the estimated part-worth utilities for the levels of the price attribute for both models. Results from the estimated final models and the calculations for WTP and attribute importance are shown in chapter 6.

Chapter 6 Results

The HB model estimates the part-worth utility coefficients for each survey respondent. When using the HB model the estimation process is done in two levels. In the upper level of the HB model the part-worth utilities for the attribute levels in the CBC survey are estimated. In the lower level of the HB model the estimated part-worth utilities are used in a multinomial logit model to estimates the probability a concept is chosen given the other concepts in a task. The part-worth utility estimates for the CBC attribute levels are used to estimate WTP for different attributes and to rank attribute importance. Using estimates of WTP and attribute importance rankings cross tables were created to make comparison between respondents WTP for local tomatoes, ranking of attribute importance, information collected from the survey and information in the sample frame from infousa.com.

6.1 Models

For grocery stores we used produce department square footage and percent of local produce stocked as covariates. These covariates were chosen based on counts and cross valuation tests. The results from the counts and cross valuation tests are shown in chapter 5. The upper level of the HB model estimated the grocery store's the part worth utilities for the different attribute levels. Each part-worth utility ($\boldsymbol{\beta}_i$) is estimated as a liner function of an intercept and covariates. The estimated coefficients for the covariates used in the upper level of the grocery store HB model are shown in Table 6.1.

Table 6.1 Hieratical Bayes Model Estimation of Grocery Stores' Part-Worth Utilities

Attribute Levels	Estimated Coefficients		
	Intercept	Square Footage Produce Department	Percent Local Produced Stocked
Under 50 Miles	1.4844644	-0.0000294	-0.0107930
Between 51-100 Miles	0.4434917	0.0000352	-0.0176146
Between 101-200 Miles	-1.9279561	-0.0000058	0.0284076
Price 5% above average	-0.6772155	0.0000432	-0.0101610
Price 10% above average	1.9749126	-0.0001557	-0.0682296
Price 15% above average	-1.2976970	0.0001125	0.0783906
Availability: Long	0.6204442	-0.0000694	0.0080975
Availability: Short	-0.6204442	0.0000694	-0.0080975
None Option	-6.6875333	0.0002723	-0.2749697

Looking at the relationship of produce department size and the $\boldsymbol{\beta_i}$'s we see that as produce department square footage increased the part-worth utilities for origin levels "Under 50 Miles", "Between 101-200 Miles" decreased. The price attributes level "Price 10% above average" decreases as produce department square footage increased along with the part-worth utility for "Availability: Long". The other part-worth utilities increase with an increase in square footage of a grocery store. Looking at the relationship between percent of local food stocked and part-worth utilities we see that as percent of local food stocked in the produce department increases the part-worth utilities for origin: "Between 101-200 miles" increases with the part-worth utilities for price level "15% above average" and the part-worth utility for longer seasonal availability. The other part-worth utilities decrease when percent of local produce stocked increases.

Aggregate estimates for grocery stores as a group are calculated by taking the mean of the estimated part-worth utilities for individual grocery store respondents for each iteration. Similar to individual estimates, aggregate estimates of part-worth utilities have a point

estimate and a posterior distribution. The point estimates of the part-worth utilities for the aggregate grocery store model are shown in Table 6.2; the 90% credible intervals for each attribute level are also shown.

The 90% credible interval can be used to determine if the estimated part-worth utility is statistically different from zero and if it is statistically different from part-worth utilities of other attribute levels. If zero is contained in the 90% credible interval then the estimated part-worth utility is not statistically different from zero. If the point estimate of a part-worth utility is contained in the 90% credible interval of another attribute level then the part-worth utilities for those levels are not statistically different from each other.

Table 6.2 Point Estimates of Aggregate Grocery Store Part-Worth Utilities with Credible Intervals

Attribute Level	Estimated Part-Worth Utility	90% credible interval	
		Lower Bound	Upper Bound
Under 50 Miles	1.209*	0.912	1.529
Between 51-100 Miles	0.182	-0.038	0.400
Between 101-200 Miles	-1.391*	-1.779	-1.041
Price 5% above average	1.368*	0.968	1.922
Price 10% above average	0.546*	0.107	1.117
Price 15% above average	-1.914*	-2.958	-1.247
Availability: Long	0.628*	0.416	0.840
Availability: Short	-0.628*	-0.840	-0.416
None Option	-11.852*	-17.320	-7.452
* Indicates Statistically Different From Zero using the 90% Credible Interval			

The only part-worth utility for the aggregate grocery stores model that is not statistically different from zero is the part-worth utility for the origin attribute level “Between 51-100 Miles”. However, this part-worth utility and all of the other attribute levels part-worth utilities are statistically different from each other. The aggregate point estimates for grocery stores are consistent with what we would expect to see:

- Higher levels of utility for products located closer to store
- Higher levels of utility associated with lower prices
- Higher utility for longer seasonal availability
- Lower utility from conventional tomatoes compared to local (based on none option)

The model used to estimate part-worth utilities for restaurants did not use covariates. In the upper level of the HB model the **βi**'s are distributed multivariate normal with a vector of means **μ** and variance/covariance matrix D. Due to the nature of the coefficient estimation with effects coding D only includes variance / covariance values for estimated coefficients. The estimated vector of means from which the part-worth utilities are distributes is shown in Table 6.3. The variance/covariance matrix D is shown in Table 6.4, because the D matrix is symmetric only the lower triangle is filled in.

Table 6.3 Vector of Means for Estimating Restaurant Part-Worth Utilities in the Hieratical Bayes Model

Attribute Levels	Vector of Means
Under 50 Miles	1.76
Between 51-100 Miles	-0.23
Between 101-200 Miles	-1.53
Price 5% above average	0.89
Price 10% above average	0.36
Price 15% above average	-1.25
Availability: Long	1.08
Availability: Short	-1.08
None Option	-4.46

Table 6.4 Covariance Matrix from Upper Level of Restaurant Hieratical Bayes Model

Estimated Attribute levels	Estimated Attribute levels					
	β_{U50}	$\beta_{51\text{-}100}$	$\beta_{P5\%}$	$\beta_{P10\%}$	β_{Long}	β_{None}
β_{U50}	2.40	-	-	-	-	-
$\beta_{51\text{-}100}$	-0.65	0.92	-	-	-	-
$\beta_{P5\%}$	-0.77	-0.29	12.90	-	-	-
$\beta_{P10\%}$	0.48	-0.01	-2.24	2.60	-	-
β_{Long}	-0.10	-0.17	-0.01	0.61	3.30	-
β_{None}	-5.03	0.93	8.03	-0.01	-2.06	83.44

The point estimates for the aggregated restaurant model are shown in Table 6.5 along with their corresponding 90% credible intervals.

Table 6.5 Point Estimates of Aggregate Restaurant Part-Worth Utilities with Credible Intervals

Attribute Level	Estimated Part-Worth Utility	90% credible interval	
		Lower Bound	Upper Bound
Origin: Under 50 Miles	1.76*	1.47	2.08
Origin: Between 51-100 Miles	-0.24	-0.50	0.02
Origin: Between 101-200 Miles	-1.52*	-1.83	-1.22
Price: 5% above average	2.00*	1.64	2.40
Price: 10% above average	0.09	-0.17	0.40
Price: 15% above average	-2.09*	-2.67	-1.63
Availability: Long	1.09*	0.82	1.39
Availability: Short	-1.09*	-1.39	-0.82
None Option	-4.51*	-6.71	-2.85
* Indicates Statistically Different From Zero using 90% Credible Interval			

Only two of the aggregate part-worth utility estimates for restaurants are not statistically different from zero, “Origin: Between 51-100 Miles” and “Price: 10% above average”. All part-worth utilities were statistically different from each other and like grocery stores; the estimated part-worth utilities for restaurants are consistent with our expectations:

- Higher levels of utility for products located closer to restaurant
- Higher levels of utility associated with lower prices
- Higher utility for longer seasonal availability
- Lower utility from conventional tomatoes compared to local (based on none option)

The estimated part-worth utilities from the grocery store and restaurant models were used to estimate individual and aggregate WTP and attribute importance for restaurants and grocery stores.

6.2 Willingness to Pay

To examine the price premium grocery stores and restaurants place on the origin of tomatoes we calculated the WTP for tomatoes of different origins compared to conventional tomatoes. We use the none option to represent conventional tomatoes. The utility of the none option is estimated as a whole not based on part-worth utilities of attribute levels. Therefore it is necessary to compare the conventional tomatoes to local tomatoes that are also described by levels of all the attributes in the CBC and not just one attribute level. Estimates of WTP were calculated using equation 5.5. To compare the WTP for local tomatoes versus conventional tomatoes we created three different concepts; with a concept corresponding to each level of product origin. Price and seasonal availability are held constant between concepts; this was done to enable comparisons between WTP for different origin levels. A description of conventional tomatoes and the local tomato concepts in terms of attribute levels are shown in Table 6.6.

Table 6.6 Description of Local and Conventional Tomato Products Used in Estimating Willingness to Pay

Attribute	Conventional	Local Product 1	Local Product 2	Local Product 3
Origin	Over 200 miles	101-200 miles	51-100 miles	50 miles or less
Price Per Pound	$0.99 (Average Price)	$1.14 (15% above average price)	$1.14 (15% above average price)	$1.14 (15% above average price)
Availability	Year Round	May-Nov	May-Nov	May-Nov

Estimates for WTP show how much more a respondent is willing to pay for one good compared to another. The calculated WTP indicates how much more a respondent is willing to pay for local tomatoes compared to conventional tomatoes beyond the $0.15 price difference between conventional and local tomatoes. For ease of interpretation the $0.15 difference in price of local tomatoes and conventional tomatoes has been added to the calculated WTP. The values in Table 6.7 represent the WTP for tomatoes with origin levels corresponding to these in table and seasonal availability of May-Nov when compared to conventional tomatoes.

Table 6.7 Willingness to Pay for Local Tomatoes Compared to Conventional Tomatoes

Tomato Products	Willingness to Pay Compared to Conventional Tomatoes	
	Grocery Stores	**Restaurant**
Local 1 **Origin: Between 101-200 miles**	$0.77 ($0.42 - $1.30)	$0.20 ($0.16 -$0.26)
Local 2 **Origin: Between 51-100 miles**	$0.87 ($0.50 - $1.46)	$0.24 ($0.19-$0.30)
Local 3 **Origin: Under 50 miles**	$0.95 ($0.54 - $1.57)	$0.29 ($0.24-$0.35)
(90% Credible Interval)		

Aggregate estimates of grocery stores WTP for different origin levels were not statistically different for each other. Aggregate restaurant WTP for local product 3 and local product 1 were statistically different from each other, meaning that restaurants are willing to pay more for tomatoes that have an origin of “50 miles or less” compared to tomatoes with origin “101-200 miles”. Grocery Stores have a higher WTP for local tomatoes compared to restaurants, over three times as high for all origin levels. The 90% credible intervals for grocery stores WTP had a larger range compared to the 90% credible interval for restaurants.

The 90% credible interval for grocery stores spanned a $0.88 range for the smallest credible interval. For restaurants the credible intervals were $0.10 and $0.11. The difference in 90% credible intervals for grocery stores and restaurants indicates that WTP varies more between grocery stores than the WTP of restaurants.

Potential reasons why these estimates of WTP could vary between grocery stores and restaurants could be because grocery stores have more control over the market up on their products. Also grocery stores can sell multiple types of tomatoes, conventional and local or even different levels of local allowing the consumer to decide if they want local or conventional tomatoes. Restaurants have fewer menu items and may find offering conventional and local products more difficult. Restaurants may also have smaller gross margins due to higher input costs per unit compared to grocery stores.

Grocery stores and restaurants WTP for longer seasonal availability is shown in Table 6.8. For grocery stores and restaurants WTP for longer seasonal availability are not statistically different from each other. The 90% credible intervals for grocery stores WTP for different level of origin and to longer seasonal availability are larger than those for restaurants, indicating that preferences for local foods varies more between individual grocery stores than individual restaurant preferences.

Table 6.8 Willingness to Pay for Seasonal Availability

	Grocery Store	Restaurants
WTP for Longer Availability In dollars	$0.08 ($0.04 -$ 0.16)	$0.06 ($0.04 - $0.08)
(90% Credible Interval)		

Onozaka's (2009) study of consumer WTP for local foods also used tomatoes in a CBC survey. Onzaka (2009) found that consumers had a WTP of $0.37 more per pound for local tomatoes compared to domestically produced tomatoes. Our study of intermediate sellers found a WTP of $0.77 more per pound for local tomatoes compared to conventional tomatoes for grocery stores and a WTP of $0.20 more per pound for local tomatoes compared to conventional tomatoes for restaurants. Onozaka's estimate of consumer WTP falls between our estimates for grocery stores and restaurants. In Onozaka's study the local attribute level was "locally grown" which is less precise than our CBC mileage references, more comparisons between consumer and intermediate sellers' WTP could be made if the definitions for local tomatoes were the same between studies.

6.3 Attribute Importance

Estimates of individual and aggregate part-worth utilities attribute importance were calculated using equation 5.6. The resulting attribute importance is a percent indicating how important a particular attribute is to an individual when making a purchasing decision. In this study we have three attributes in the conjoint section. Average attribute importance and their standard deviations for aggregate estimates for grocery store and restaurants are shown in Table 6.9. For grocery stores the order of average attribute importance, from most important to least important, was: origin, availability and price. Restaurants' ordering of average attribute importance was: price, origin and availability. The average importance ranking of origin and price was very close for restaurants; the attribute importance for price was less than a percent higher than the attribute importance for origin. We suspect that the difference in attribute importance between grocery stores and restaurants could be because grocery stores are able to pass higher prices on to customers more easily than restaurants.

Table 6.9 Percent Each Attribute Contributes to Respondents' Decision by Business

	Grocery Stores		Restaurants	
Attribute	**Average Importance**	**Standard Deviation**	**Average Importance**	**Standard Deviation**
Origin	39.78%	22.21	35.70%	21.91
Price	28.37%	25.06	36.38%	25.58
Availability	31.85%	21.33	27.91%	19.39

For each respondent the importance of each attribute was calculated. Attribute importance for each respondent was ordered from one to three, one being most important. The histograms of attribute rankings show what percent of respondents ranked each attribute as most important (one), second most important(two) and least important (three). The histogram of grocery stores attribute rankings (Figure 6.1) shows that number of respondents that ranked availability as one, two or three was fairly even. Importance of the price attribute was fairly polarized, many respondents ranked price as either least important (three) or most important (one). Origin importance was ranked highly; most grocery store respondents ranked origin either one or two in importance. Restaurant respondent's ranking of different attribute importance levels were more consistent with the ranking of the average attribute importance levels, with price being ranked most important the most frequently, origin ranked as second most important by most respondents and availability ranked as least important by most respondents (Figure 6.2).

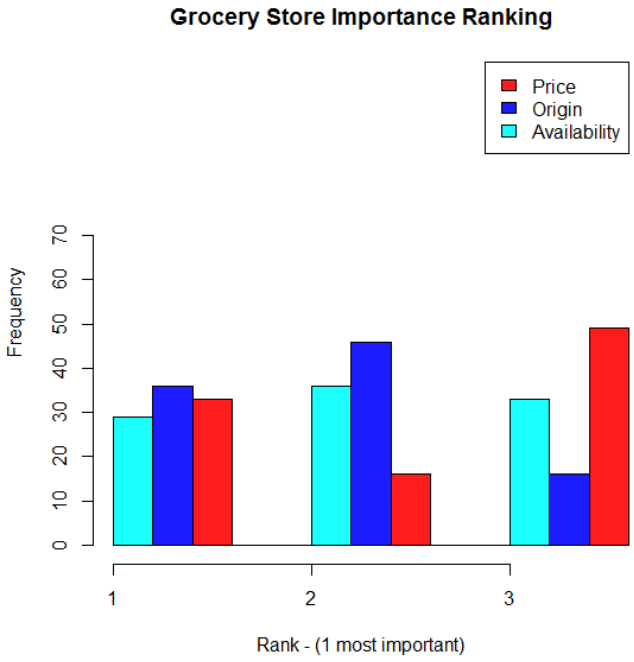

Figure 6.1 Grocery Store Ranking Attribute Importance

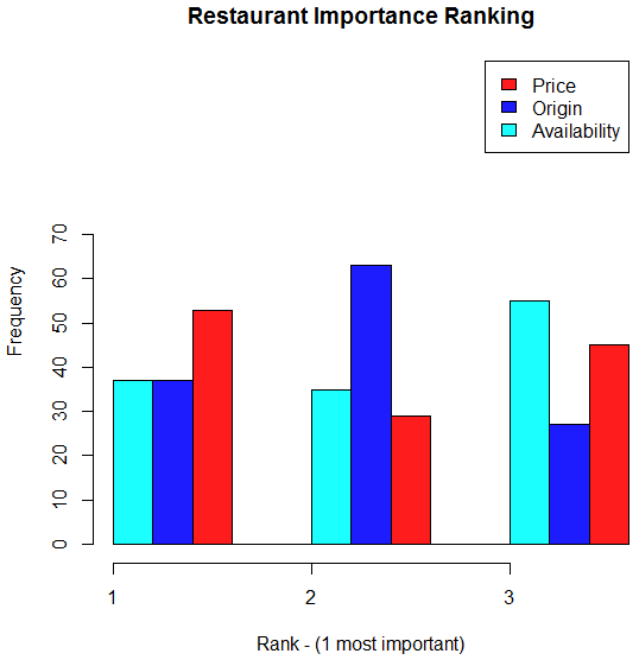

Figure 6.2 Restaurant Ranking Attribute Importance

6.4 Cross Tables

Cross tables were created in order to test for connections between grocery store and restaurants respondents WTP for local tomatoes, rankings in attribute importance, demographic information and responses to specific survey questions. The cross tables implement a Chi Squared distribution to test for statistical significance between variables. When using WTP in cross tables we divided WTP for local product 1into five groups based on the quintiles of individual's estimated WTP for grocery stores and restaurants. The quantiles of WTP for local product are shown in Table 6.10 for grocery stores and restaurants.

Table 6.10 Willingness to Pay for Local Tomatoes Quantiles

Business	Q1	Q2	Q3	Q4	Q5
Grocery Stores WTP	Under $0.18	Between $0.18-$1.33	Between $1.33-$5.34	Between $5.34 -$16.82	Over $16.82
Restaurants WTP	Under $0.18	Between $0.18-$0.28	Between $0.28-$0.71	Between $0.71-$1.53	Over $1.53

The number of all possible cross tables that could be created for grocery stores and restaurants very large. In order reduce the number of tables to be examined we only examined cross tables for cross table combinations with a correlation of |0.25| or higher. Correlations between variables are shown in Table 6.11 for grocery stores and Table 6.12 for restaurants, correlation higher than the cut off level are highlighted. The variables that rank attribute importance are all highly correlated with each other; given how these variables are linked we will not be examining these variables in relation to each other.

Table 6.11 Grocery Store Correlations of Variables

Variables	WTP Local Product 1	Rank Origin	Rank Price	Rank Availability
WTP Local Product 1	1			
Rank Origin	-0.24	1		
Rank Price	0.40	-0.53	1	
Rank Availability	-0.23	-0.27	-0.67	1
Advertising Method				
State	0.22	0.06	0.15	-0.22
County	0.31	0.05	0.05	-0.11
Mile	-0.08	-0.05	-0.12	0.18
Company	0.04	0.01	0.14	-0.17
Other	-0.01	0.08	-0.13	0.08
Problems with Procuring Local Tomatoes				
Safety	0.32	-0.12	0.10	0.00
Fresh	0.32	-0.15	-0.05	0.19
Insufficient Demand	-0.16	-0.14	0.00	0.13
Change Labels	-0.06	0.04	0.10	-0.14
Insufficient Supply	-0.09	0.05	0.13	-0.19
Working w/ Local suppliers	-0.20	0.00	0.06	-0.06
Quality	0.12	0.05	-0.17	0.14
Wholesale to high	-0.27	0.08	-0.25	0.20
Working with too Many Vendors	-0.01	-0.06	0.14	-0.10
Demographic Information				
Sales Volume	0.02	-0.06	0.04	0.01
Size (SQFT Department)	0.02	0.02	0.01	-0.02

Table 6.12 Restaurant Correlations of Variables

Variables	WTP Local Product 1	Rank Origin	Rank Price	Rank Availability
WTP Local Product 1	1.00	-0.30	0.48	-0.25
Rank Origin	-0.30	1.00	-0.45	-0.37
Rank Price	0.48	-0.45	1.00	-0.66
Rank Availability	-0.25	-0.37	-0.66	1.00
Advertising Method				
State	-0.11	-0.45	0.21	0.34
County	0.02	-0.09	-0.19	0.29
Mile	0.20	0.20	0.17	-0.39
Company	0.19	-0.38	0.29	0.18
Other	-0.34	-0.42	0.35	0.17
Problems with Procuring Local Tomatoes				
Safety	-0.11	0.16	0.09	-0.23
Fresh	0.20	0.20	0.03	-0.21
Insufficient Demand	-0.11	0.04	-0.25	0.20
Insufficient Supply	0.12	-0.16	-0.08	0.22
Working w/ Local suppliers	0.04	-0.08	0.18	-0.09
Quality	-0.12	0.07	-0.20	0.11
Wholesale too high	0.07	0.10	-0.02	-0.07
Working with too Many Vendors	-0.01	-0.03	0.02	0.01
Demographic Information				
Sales Volume	0.12	-0.08	-0.04	0.15
Seating Capacity	0.01	-0.03	-0.03	0.06

To determine statistical significance we are using a p-value of 0.05. The p-values for the Chi-Squared tests are shown below each cross table. If the p-value from the Chi Squared test is greater than 0.05 we fail to reject the null hypothesis that respondent's group membership of one variable is unrelated to group membership of the other variable. The cross tables that showed statistical significance relationships between variables are shown in Figure

6.3 and Figure 6.4. The cross tables of variables with correlations above |0.25| but did reveal statistically significant relationships between variables are shown in Appendix 2.

For grocery stores the comparison of WTP for local quantiles and how respondent's ranked the importance of the price attribute are shown in Figure 6.3. In this cross table the null hypothesis was rejected. Grocery store respondents who ranked price as the least important attribute where willing to pay more for local tomatoes. This is consistent with what we would expect; respondents that are less concerned with price are willing to pay more for local tomatoes compared with those who rank price as the most important attribute when making decisions.

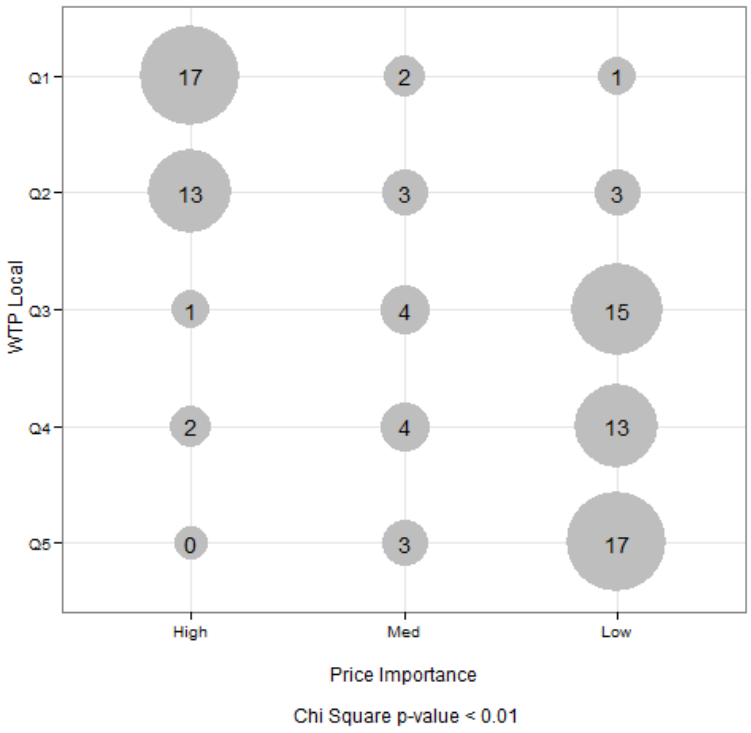

Figure 6.3 Grocery Store Cross Table Willingness to Pay for Local Tomatoes and Price Importance

The only other cross table for grocery store respondents that had a statistically significant p-value was the table comparing respondent's WTP for local tomatoes and if grocery stores used county as a method of advertising food as local, shown in Figure 6.4. This table shows that grocery stores that use county name to advertise food as local have a higher WTP for local Tomatoes compared to grocery stores that do not.

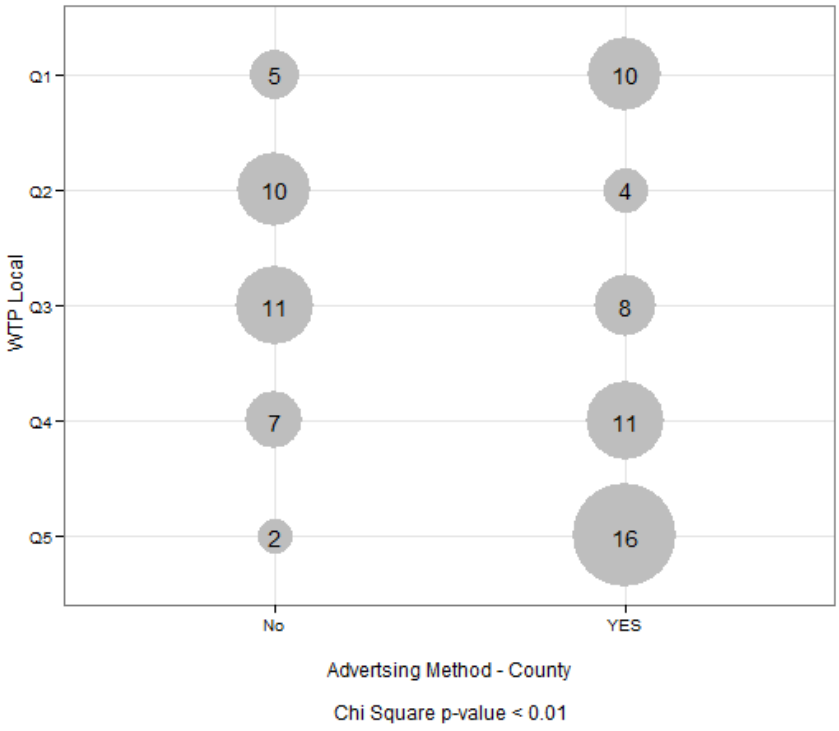

Figure 6.4 Grocery Store Cross Table Willingness to Pay for Local Tomatoes and Advertising Local by County

For restaurants the cross tables that had statistically significant p-values were those that compared WTP quantiles for local tomatoes to the attribute importance rankings. Figure 6.5 shows the relationship between restaurant respondent's WTP quantiles and how important price is to restaurant respondents. Similar to grocery stores, we find that respondents that rank price as least important are willing to pay more for local tomatoes.

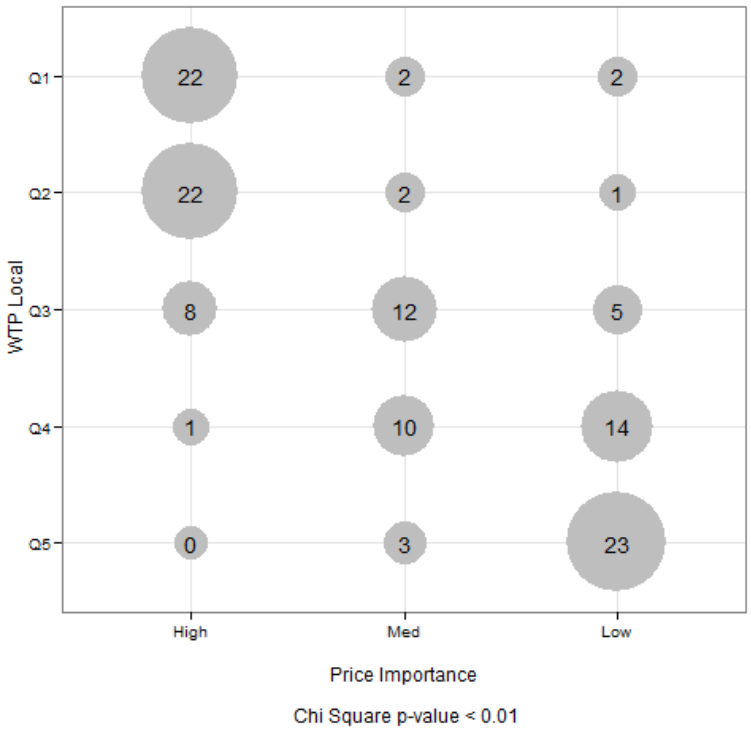

Figure 6.5 Restaurant Cross Table Willingness to Pay for Local Tomatoes and Price Importance

Figure 6.6 shows the relations ship between restaurant respondent's WTP quantiles and how important origin is to restaurant respondents. We find that respondents that rank origin as most important are willing to pay more for local tomatoes.

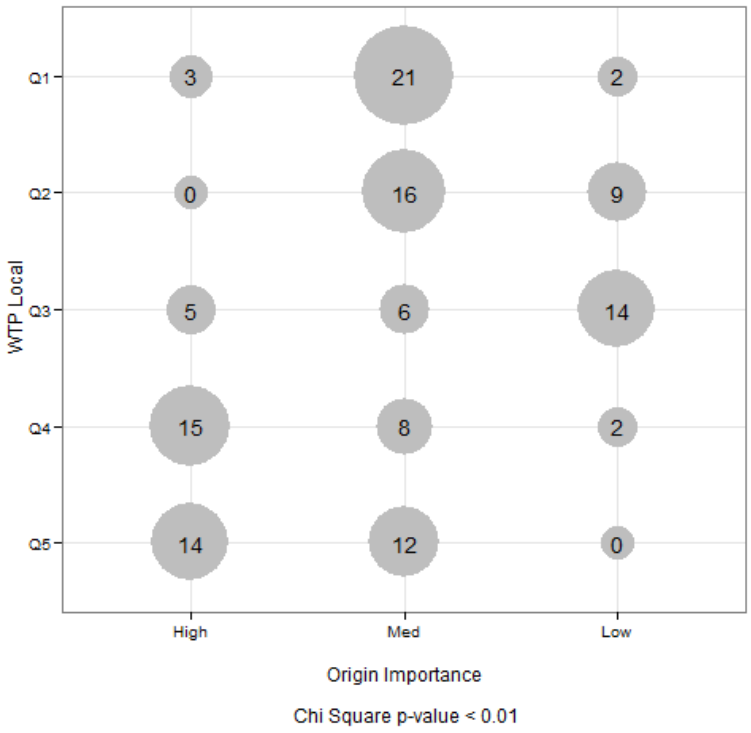

Figure 6.6 Restaurant Cross Table Willingness to Pay for Local Tomatoes and Origin Importance

Figure 6.7 shows the relationship between restaurant respondent's WTP quantiles and how important seasonal availability is to restaurant respondents. We find that respondents that rank availability as least important are willing to pay less for local tomatoes compared to restaurants that rank seasonal availability higher in relative importance.

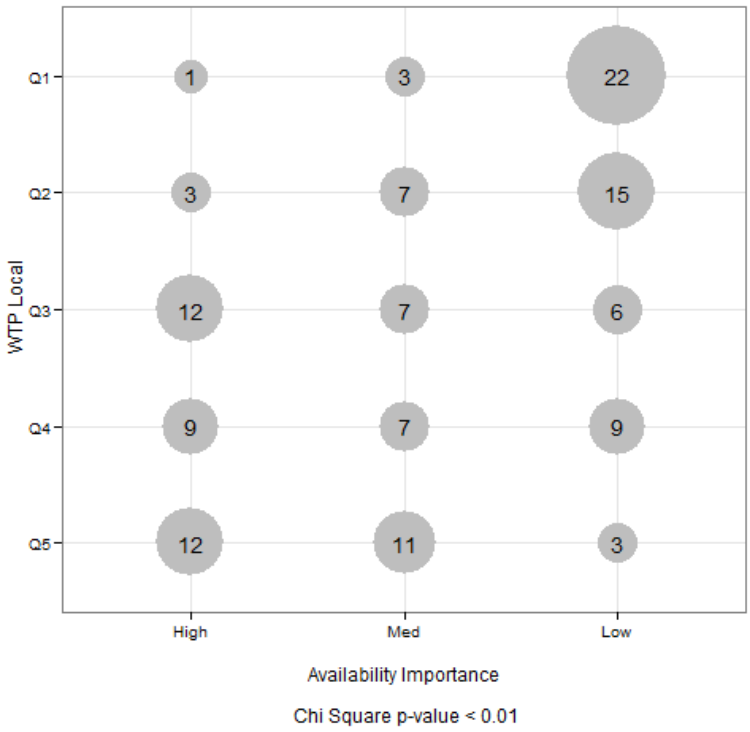

Figure 6.7 Restaurant Cross Table Willingness to Pay for Local Tomatoes and Availability Importance

Using part-worth utility estimates from a HB model we calculate WTP to for local tomatoes compared to conventional tomatoes to be $0.77 more per pound for grocery stores and $0.20 more per pound for restaurants. Restaurants had lower WTP for local foods compared to grocery stores and differentiated between origins of products more than grocery stores. Grocery stores also had large 90% credible intervals for estimates of WTP compared to restaurants, indicating that grocery store respondents were less homogenous in their preferences compared to restaurant respondents. We found that estimates of consumer WTP for local tomatoes form a previous study to fall in between our estimates of WTP for local tomatoes of grocery stores and restaurants at $0.37 more per pound for local tomatoes.

Attribute importance for grocery stores and restaurants was also calculated from the estimated part-worth utilites. We found that Grocery stores on average ranked origin as the

most important attribute followed by availability and price. Restaurants ranked price as most important followed by origin and availability. These rankings as well as the estimates of WTP indicate that grocery stores are less sensitive to the prices of local tomatoes compared to restaurants.

Significant relationships where found between respondent's WTP for local tomatoes and the ranking of the attributes used in the CBC survey. We found that grocery store and restaurant respondents that ranked price as least important of the attributes had higher WTP for local tomatoes compared to respondents who ranked price as most important. Restaurant respondents who ranked origin as their least important attribute had lower WTP for local tomatoes compared to respondents that ranked origin as most important. Restaurant respondents who ranked seasonal availability as their most important attribute had higher WTP for local tomatoes compared to respondents that ranked seasonal availability as least important.

Chapter 7 Conclusion

Research regarding local food has increased in recent years. Many researchers of local foods have focused on consumers; how consumers define local foods and what price premium they are willing to pay for local foods. Less research has been done on preferences of sellers of local foods; especially regarding quantitative studies on WTP. Grocery stores and restaurants have different requirements for local foods compared with consumers. In addition to having concerns with origin, sustainability and price (as consumers do) grocery stores and restaurants are also concerned with consistency of products, working with vendors and changing labels in stores. Our research focuses on grocery store and restaurant preferences and WTP for local foods. Our research adds to the literature by increasing the knowledge surrounding local food sellers.

Data for this study was collected from a survey of grocery store produce managers and restaurant stock managers in the Northwest (Idaho, Oregon and Washington). The survey consisted of a section regarding general information about local food buying practices, methods of advertising local foods and questions about local tomatoes. Restaurants were also asked questions about their local beef buying practices. The survey also included a choice based conjoint analysis section, the conjoint section focused on local tomatoes. The attributes in the conjoint section were: origin (defined as miles from store), price and seasonal availability.

Responses to general question regarding advertising methods show that for grocery stores and restaurants the most popular methods of advertising food as local are: by state, by county and by company name. When asked about problems with procuring local tomatoes grocery stores and restaurants indicated high wholesale price, insufficient quantity and

inconsistent quality most frequently. Restaurants where also asked what problems they had with procuring local beef. Similar to problems with procuring tomatoes, restaurants indicated wholesale price, insufficient quantity and inconsistent quality as their most common problems with procuring local beef. Grocery stores and restaurants also noted that they frequently do not know the origin of the products they sell; it is possible that these products would be considered local if their origin was known.

The results from our CBC survey indicate WTP for local tomatoes compared to conventional tomatoes is not influenced by the business location (state or rural and urban areas). Both grocery stores and restaurants have a positive WTP for local tomatoes. Using a base wholes price of $0.99 per pound of tomatoes for both grocery stores and restaurants we found on average grocery stores are willing to pay $0.77 more per pound for tomatoes grown within 200 miles of their store compared to conventional tomatoes. Grocery stores on average did not distinguish between the different levels of local ("under 50 miles", "Between 51-100 miles" and "Between 101-200 miles") used in the conjoint section of the survey. Restaurants did make distinctions between the different levels of local used in our CBC survey. On average restaurants were willing to pay $0.20 more per pound for local tomatoes grown 101 - 200 miles from their store compared to conventional tomatoes and $0.29 more for tomatoes grown within 50 miles of their store when compared to conventional tomatoes.

Using the responses from the survey we were able to rank the relative importance of the attributes used in the CBC section (origin, price and seasonal availability) for grocery store and restaurant respondents. The ranking shows which attribute are the most influential for a respondents purchasing decision. On average grocery stores ranked origin as most important followed by seasonal availability and price as least important. Restaurant

respondents on average ranked price as the most important followed by origin and seasonal availability. These results of attribute ranking are consistent with grocery stores having a higher WTP for local tomatoes compared to restaurants.

The results of our research have implications for food suppliers of grocery stores and restaurants for methods of labeling food as local as well as limitations for selling to grocery stores and restaurants. Some survey respondents indicated that they did not always know the origin of the food that they sell. Respondents also indicated the most popular methods of advertising food as local. Labeling the county or state origin of products is an easy way to market foods to grocery stores and restaurants as local.

Grocery stores and restaurants are willing to pay more for local tomatoes, however based on the problems listed with procuring local tomatoes it is doubtful that more local foods will be available at these locations. The problems that grocery stores and restaurants listed most frequently for procuring local tomatoes were wholesale price to high, insufficient supply and inconsistent quality. The combinations of these problems will make an increase in local food availability at grocery store and restaurants unlikely. Grocery stores and restaurants currently consider the whole sale price of local tomatoes to be too high, this not conducive to investments in technologies that would increase the growing period and consistency of tomatoes. Restaurants responses regarding problems with procuring local beef were the same as the problem with procuring local tomatoes. It is likely the increases in local beef availability will also not increase in the near future.

The specifications used in the CBC survey resulted in limitations of our results. The CBC section of the survey focused on tomatoes. Focusing on only one product allowed us to

make estimates of WTP for tomatoes. However, our results cannot be generalized to different local products. The literature of local foods shows that local foods are associated with higher quality products. In the CBC survey we choose to hold quality of tomatoes constant, this was done to make the survey easier to complete. By holding quality constant we are unable to investigate if grocery stores and restaurants associate local foods with higher quality products or their WTP for different quality levels of local foods. The origin levels that were used in the CBC survey where described in terms of miles. The results from the general section of the survey indicate that mile distance from store is not a common method of advertising food as local. It is possible that if the attribute levels of origin were more consistent with stores definitions of local that respondents would value local tomatoes more. Another limitation of our study in the survey area, our surveys were mailed only to grocery stores and restaurants in Idaho, Oregon and Washington. Grocery stores and restaurants in other areas may have different preferences for local foods.

Further research to address the limitations of our study should be conducted. Future research of grocery stores and restaurants should focus on different local products, differences in quality of local foods compared to conventional foods and using different definitions of local. Future research should also survey different areas to investigate if preferences for local foods differ between regions.

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Appendix 1: Grocery Store and Restaurant Surveys

April 8, 2015

Dear Participant:

My name is Haley Hildebrandt and I am a graduate student at the University of Idaho pursuing my Master's degree in applied economics. I am currently working on a USDA grant and am seeking your input and knowledge to help us understand what attributes of local food are most important to grocery stores and restaurants around the Northwest. Your feedback, aggregated with others, will be helpful to wholesale produce buyers, as well as current and potential suppliers by defining the limits of some of the decision parameters. Ultimately, this work could lead to better and more local suppliers of produce products.

The survey is intended to be filled out by the produce manager of your store or by the person who orders produce for your restaurant. If you are not that person, please pass this letter and other enclosed material to the appropriate person.

The survey should take no more than 10 to 15 minutes to complete. Your answers on the survey are considered **strictly confidential** and will not be reported with any identifiable information. Participation in this survey is voluntary. If there is a question you do not wish to answer, you may leave it blank. Please fill out the survey as accurately as possible. Once completed, mail the survey back in the postage paid, self-addressed envelope provided.

If your store would like a copy of this study once it has been completed please indicate so in the last question on the survey. If you do indicate you would like a copy of the results, an electronic report will be emailed to you. If your store would like more information regarding this study or have any questions feel free to contact me by phone at (206) 697-1918 or my major professor Dr. Aaron Johnson at (208)885-5489.

Thank you for considering participating in this study and assisting me in my educational pursuits.

Sincerely,

Haley Hildebrandt
hild7919@vandals.uidaho.edu

UNIVERSITY OF IDAHO

Local Food in the Northwest

Grocery Store Perspective

If your store does not participate in surveys please take a moment to email aaronj@uidaho.edu, enter "Local Produce Survey" in the subject line and enter the CODE (listed on the bottom right corner of the cover page of this survey) in the body of the email. This effort will help ensure we do not burden you with subsequent mailings soliciting participation in the survey.

Section 1:

1.What is the square footage of your

a. Produce Department _____sq. ft b. Total Store _____sq. ft

2. **In the last 12 months** approximately what percent of sales came from **products marketed as local** in the

a. Total Store _____% b. Produce Department _____%

(If 0% in Q.2b please continue to Section 2 on page 2)

3. a. Does your store use any of the following characteristics to advertise the local food you sell?

	Yes	No
State of Origin	☐	☐
County of Origin	☐	☐
Mile Radius	☐	☐
Company Name	☐	☐
Other Geographic Region (please specify) _____	☐	☐

b. If you answered yes to "mile radius" in Q.3 a , what is the farthest radius that you use to advertise as local to consumers? _____ **miles**

4. From the statements below please mark the **3** that present the most difficulty for your store in supplying local tomatoes. If your store does not sell local tomatoes please check the box below.

☐ **My restaurant does not sell local tomatoes**

___Product Safety ___Product Quality

___Product Freshness ___Wholesale price too high

___Consumer demand too low

___Have to work with too many vendors

___Changing labels to keep up with varying products

___Cannot get sufficient supply of goods at a given time

___Ease of working with local suppliers (punctual delivery, delivering agreed quantity)

___ Other: _____

Section 2:

In this section you will compare four Grade 1 Red tomato items. Grade 1 Red is defined as more than 90% of the surface is red. Free from sunscald. Tomatoes are no more than moderately kidney-shaped, lop-sided, elongated, angular, or otherwise deformed. Tomatoes are fairly smooth, not conspicuously ridged or rough. When comparing these tomato items you will indicate which item, if any, you would purchase.

We know that when choosing to sell a product at your store there are many considerations/requirements that you may have for that product such as certified organic or "non-spray". When answering the questions below we ask you to answer as if the products met all of your stores requirements and that the only difference between products are those described in the question (origin, price and availability).

Origin is given in terms of miles from your store; the availability is in terms of months that you will be able to get the product throughout the year; and the wholesale price per pound. The base wholesale price per pound in this survey is $0.99, which was the USDA reported average price for vine ripened tomatoes in the Northwest in the previous year. The price variations in the following question are relative to this price, for convenience the percent difference between the product prices compared to the base price is also given.

5. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (miles from store) Wholesale Price Per Pound Months Available	50 miles or less $1.04 (5%) Jul-Sep	101-200 miles $1.14 (15%) May-Nov	51-100 miles $1.09 (10%) May-Nov	Given these options I would not buy local tomatoes.
	○	○	○	○

6. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (Miles From store) Wholesale Price Per Pound Months Available	101-200 miles $1.14 (15%) Jul-Sep	51-100 miles $1.14 (15%) Jul-Sep	50 miles or less $1.09 (10%) May-Nov	Given these options I would not buy local tomatoes.
	○	○	○	○

7. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (Miles From store) Wholesale Price Per Pound Months Available	50 miles or less $1.04 (5%) Jul-Sep	101-200 miles $1.09 (10%) May-Nov	51-100 miles $1.04 (5%) Jul-Sep	Given these options I would not buy local tomatoes.
	○	○	○	○

8. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (Miles From store)	50 miles or less	51-100 miles	101-200 miles	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.14 (15%)	$1.04 (5%)	$1.09 (10%)	
Months Available	May-Nov	May-Nov	Jul-Sep	
	○	○	○	○

9. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (Miles From store)	50 miles or less	101-200 miles	51-100 miles	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.04 (5%)	$1.04 (5%)	$1.09 (10%)	
Months Available	May-Nov	May-Nov	Jul-Sep	
	○	○	○	○

10. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (Miles From store)	101-200 miles	50 miles or less	51-100 miles	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.04 (5%)	$1.09 (10%)	$1.14 (15%)	
Months Available	May-Nov	Jul-Sep	May-Nov	
	○	○	○	○

11. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (Miles From store)	101-200 miles	51-100 miles	51-100 miles	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.09 (10%)	$1.04 (5%)	$1.14 (15%)	
Months Available	Jul-Sep	Jul-Sep	May-Nov	
	○	○	○	○

12. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (Miles From store) Wholesale Price Per Pound Months Available	50 miles or less $1.14 (15%) May-Nov	50 miles or less $1.09 (10%) Jul-Sep	50 miles or less $1.14 (15%) Jul-Sep	Given these options I would not buy local tomatoes.
	○	○	○	○

13. Would your store like an electronic copy of the results emailed?

Yes ___ email:_____

No ___

Thank you for taking the time to complete this survey. Please return your completed survey in the stamped pre-addressed envelope. Your response is very important to us.

UNIVERSITY OF IDAHO

Local Food in the Northwest

Restaurant Perspective

If your restaurant does not participate in surveys please take a moment to email aaronj@uidaho.edu, enter "Local Produce Survey" in the subject line and enter the CODE (listed on the bottom right corner of the cover page of this survey) in the body of the email. This effort will help ensure we do not burden you with subsequent mailings soliciting participation in the survey.

Section 1

1. What is the seating capacity of your restaurant?

_____ seats

2. **In the last 12 months** approximately what percent of the items on your menu used **food products marketed as local**?

_____**%** **(If you answered Q.2 with 0% please continue Section 2 on page 2)**

3. a. Does your restaurant use any of the following characteristics to advertise the local food you sell?

	Yes	No
State of Origin	☐	☐
County of Origin	☐	☐
Mile Radius	☐	☐
Company Name	☐	☐
Other Geographic Region (please specify) _____	☐	☐

b. If you answered yes to "mile radius" in Q.3 a , what is the farthest radius that you use to advertise as local to consumers? _____ **miles**

4. From the statements below please mark the **3** that present the most difficulty for your restaurant in supplying local tomatoes. If your restaurant does not use local tomatoes please check the box below.

☐ **My restaurant does not sell local tomatoes**

___Product Safety ___Product Quality

___Product Freshness ___Wholesale price too high

___Consumer demand too low

___Have to work with too many vendors

___Changing labels to keep up with varying products

___Cannot get sufficient supply of goods at a given time

___Ease of working with local suppliers (punctual delivery, delivering agreed quantity)

___ Other: _____

Section 2:

In this section you will compare four Grade 1 Red tomato items. Grade 1 Red is defined as more than 90% of the surface is red. Free from sunscald. Tomatoes are no more than moderately kidney-shaped, lop-sided, elongated, angular, or otherwise deformed. Tomatoes are fairly smooth, not conspicuously ridged or rough. When comparing these tomato items you will indicate which item, if any, you would purchase.

We know that when choosing to sell a product at your store there are many considerations/requirements that you may have for that product such as certified organic or "non-spray". When answering the questions below we ask you to answer as if the products met all of your stores requirements and that the only difference between products are those described in the question (origin, price and availability).

Origin is given in terms of miles from your store; the availability is in terms of months that you will be able to get the product throughout the year; and the wholesale price per pound. The base wholesale price per pound in this survey is $0.99, which was the USDA reported average price for vine ripened tomatoes in the Northwest in the previous year. The price variations in the following question are relative to this price, for convenience the percent difference between the product prices compared to the base price is also given.

5. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (miles from store)	101-200 miles	101-200 miles	51-100 miles	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.14 (15%)	$1.04 (5%)	$1.09 (10%)	
Months Available	Jul-Sep	May-Nov	May-Nov	
	○	○	○	○

6. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (miles from store)	101-200 miles	101-200 miles	51-100 miles	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.14 (15%)	$1.04 (5%)	$1.14 (15%)	
Months Available	Jul-Sep	Jul-Sep	Jul-Sep	
	○	○	○	○

7. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (miles from store)	51-100 miles	50 miles or less	51-100 miles	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.09 (10%)	$1.14 (15%)	$1.04 (5%)	
Months Available	May-Nov	May-Nov	Jul-Sep	
	○	○	○	○

8. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (miles from store)	101-200 miles	51-100 miles	50 miles or less	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.04 (5%)	$1.09 (10%)	$1.04 (5%)	
Months Available	Jul-Sep	May-Nov	Jul-Sep	
	○	○	○	○

9. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (miles from store)	101-200 miles	50 miles or less	50 miles or less	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.04 (5%)	$1.04 (5%)	$1.09 (10%)	
Months Available	Jul-Sep	May-Nov	May-Nov	
	○	○	○	○

10. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (miles from store)	51-100 miles	50 miles or less	101-200 miles	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.09 (10%)	$1.14 (15%)	$1.09 (10%)	
Months Available	Jul-Sep	Jul-Sep	May-Nov	
	○	○	○	○

11. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (miles from store)	101-200 miles	51-100 miles	50 miles or less	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.04 (5%)	$1.14 (15%)	$1.04 (5%)	
Months Available	May-Nov	May-Nov	May-Nov	
	○	○	○	○

12. **If these were your only options for local tomatoes, which would you choose? Fill in the circle below the option that you would purchase (Choose only one):**

Origin (miles from store)	50 miles or less	51-100 miles	101-200 miles	Given these options I would not buy local tomatoes.
Wholesale Price Per Pound	$1.09 (10%)	$1.09 (10%)	$1.14 (15%)	
Months Available	Jul-Sep	Jul-Sep	May-Nov	
	○	○	○	○

Section 3: The following questions pertain to beef products you might use in your restaurant.

13. Does your restaurant use beef?

Yes ___

No ___ - (if no, please skip to Q.16 on page 5)

14. Does your restaurant have any special requirements for local beef products you use?
(Such as hormone or antibiotic free)

15. From the statements below please mark the **3** that present the most difficulty for your restaurant in supplying local **beef**. If your restaurant does not use local beef please check the box below.

☐ **My restaurant does not sell local beef**

___Product Safety ___Product Quality

___Product Freshness ___ Animal Treatment

___Consumer demand too low ___Wholesale price too high

___Have to work with too many vendors

___Changing labels to keep up with varying products

___Cannot get sufficient supply of goods at a given time

___Ease of working with local suppliers (punctual delivery, delivering agreed quantity)

___ Other: _____

___ Other: _____

___ Other: _____

16. Would your restaurant like a copy of the results emailed?

Yes ___ email:_____

No ___

Thank you for taking the time to complete this survey. Please return your completed survey in the stamped pre-addressed envelope. Your response is very important to us.

Appendix 2: Additional Cross Tables

Grocery store cross tables of variables with correlations higher than |0.25| but with non-statistically significant relationships between variables.

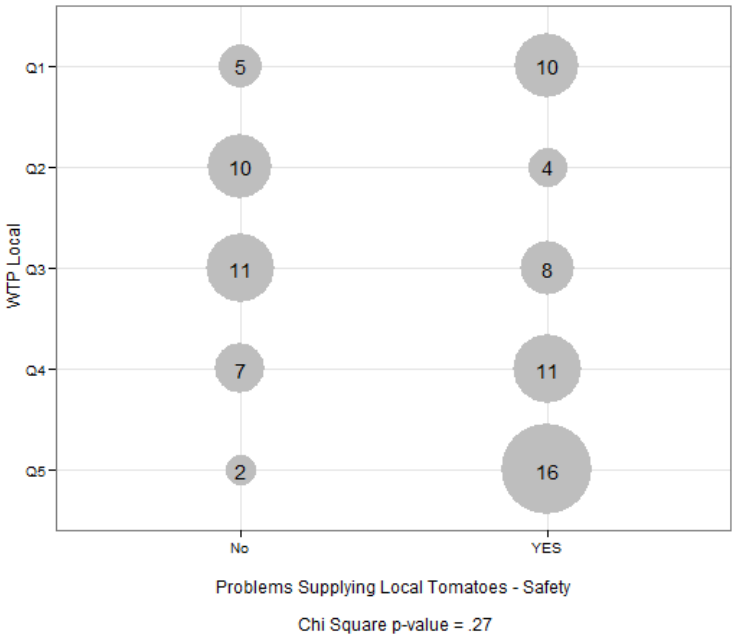

Figure A2. 1 Grocery Store Cross Table Willingness to Pay for Local Tomatoes and Safety Concerns

Figure A2. 2 Grocery Store Cross Table Willingness to Pay for Local Tomatoes and Problems with Wholesale Price

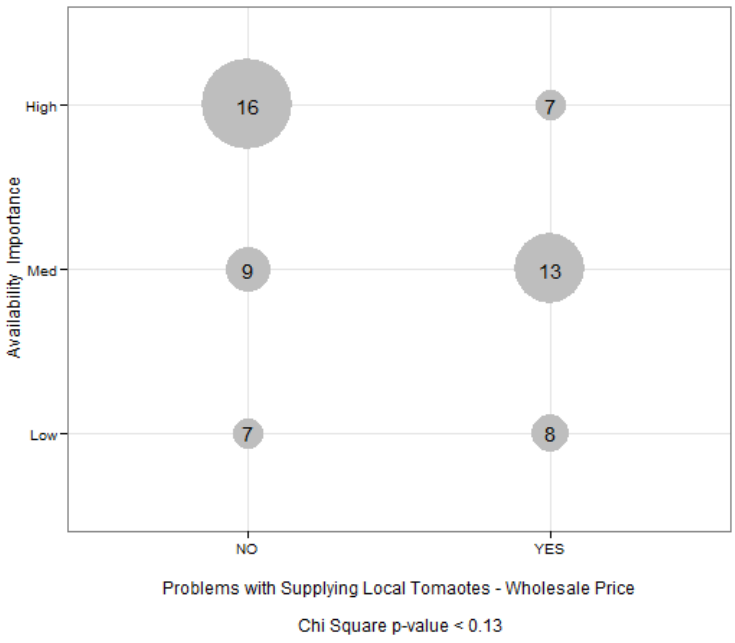

Figure A2. 3 Grocery Store Cross Table Attribute Importance and Problems with Wholesale Price

Restaurant cross tables of variables with correlations higher than |0.25| but with non-statistically significant relationships between variables.

Figure A2. 4 Restaurant Cross Table Origin Importance and Advertising Local by State Origin

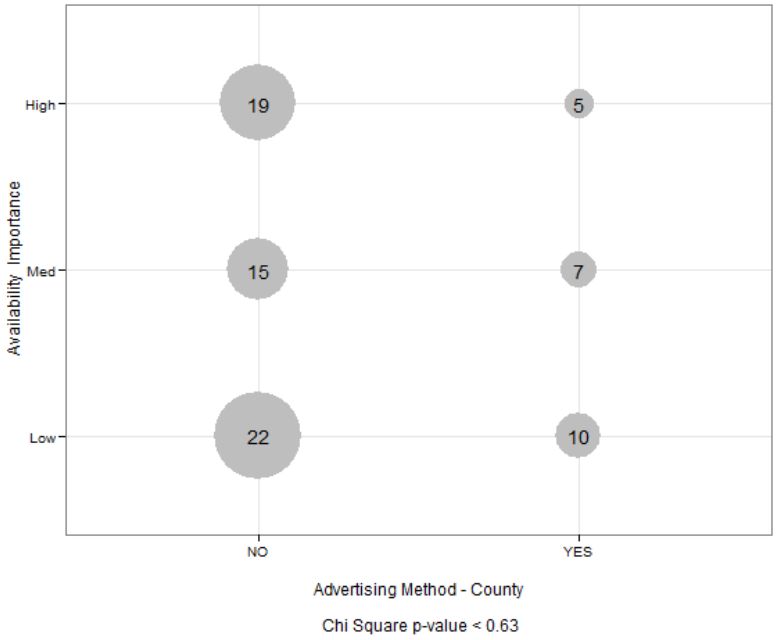

Figure A2. 5 Restaurant Cross Table Origin Importance and Advertising Local by County Origin

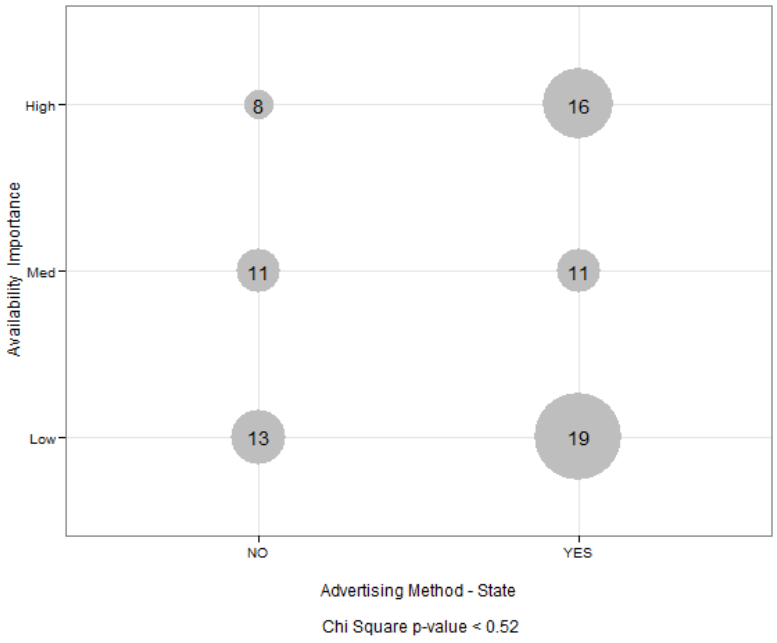

Figure A2. 6 Restaurant Cross Table Availability Importance and Advertising Local by State Origin

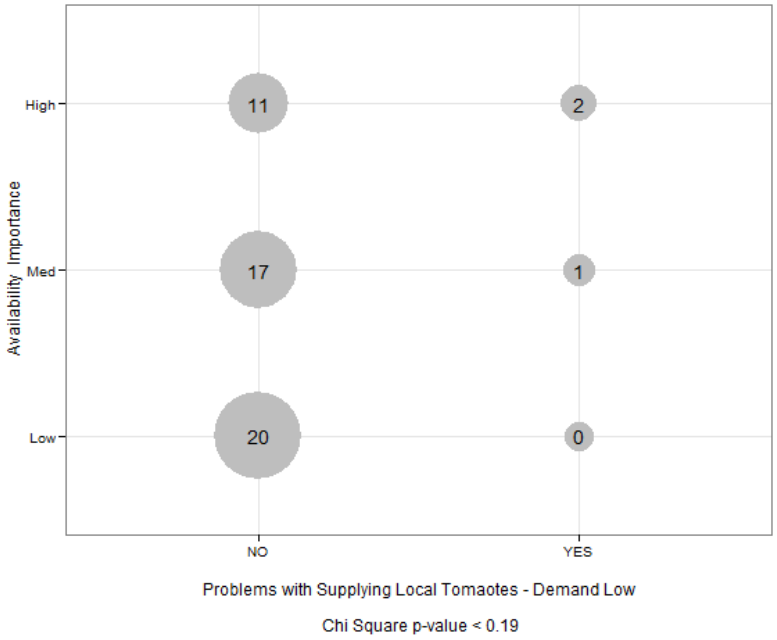

Figure A2. 7 Restaurant Cross Table Availability Importance and Problems with Low Demand

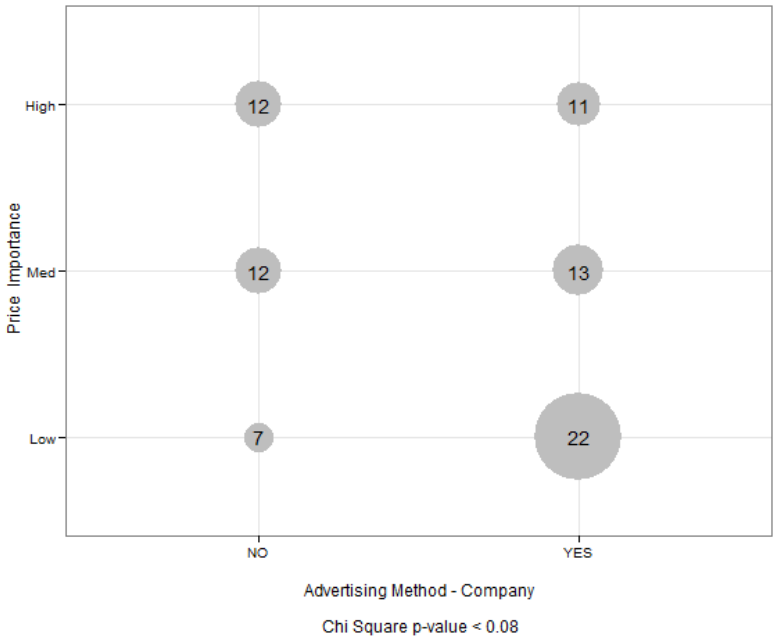

Figure A2. 8 Restaurant Cross Table Price Importance and Advertising Local by Company Name

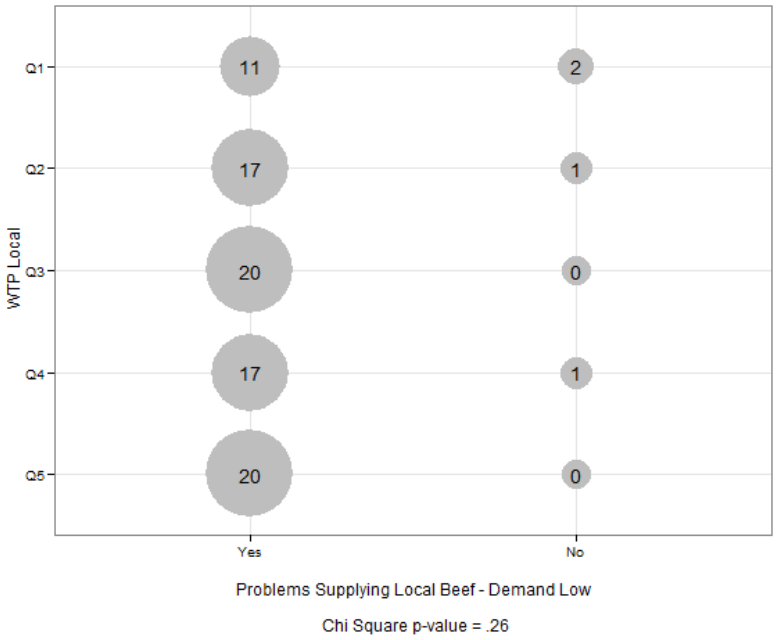

Figure A2. 9 Restaurant Cross Table Willingness to Pay for Local Tomatoes and Problems with Low Demand