WILLINGNESS TO PAY FOR ENVIRONMENTALLY FRIENDLY BEEF IN GEORGIA

by

JONATHAN WONG

(Under the Direction of John McKissick)

ABSTRACT

Recently niche beef markets, such as organic and grass-fed beef, have been emerging due to producers trying to capture a greater percent of the retail dollars. The purpose of this study is to analyze the willingness to pay for environmentally friendly beef. A statewide survey of 988 people was performed in order to obtain data on the demographics and buying habits of beef consumers. A censored probit model was used to analyze the survey data to determine the mean willingness to pay for environmentally friendly beef product. Interestingly people with higher education were concerned about the effect beef production had on the environment. And those that did realize the previous effect, and already purchased niche beef products were more likely to pay a premium for environmentally friendly beef.

INDEX WORDS: Environmentally Friendly Beef, Sustainable Beef, Willingness to Pay, Censored Probit,

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Dedication

I would like to dedicate this thesis to my brother, Stan Wong, and sister, Gwen Wong, who have always been there for me when I needed them, to my father, Stephen Wong, who supported my decision to return to graduate school in pursuit of a master degree, and to my late grandparents Ruby and K.F. Wong, uncle Phillip, Uncle Ralph, and mother, Jane Wong, who were all wonderful people whose brief encounter in my life was been more than impressionable, and left me appreciative and grateful for having known them, and always remembering and missing them.

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and hope you achieve all you desire. Thanks for making this experience complete and yes we are moving to Seattle.

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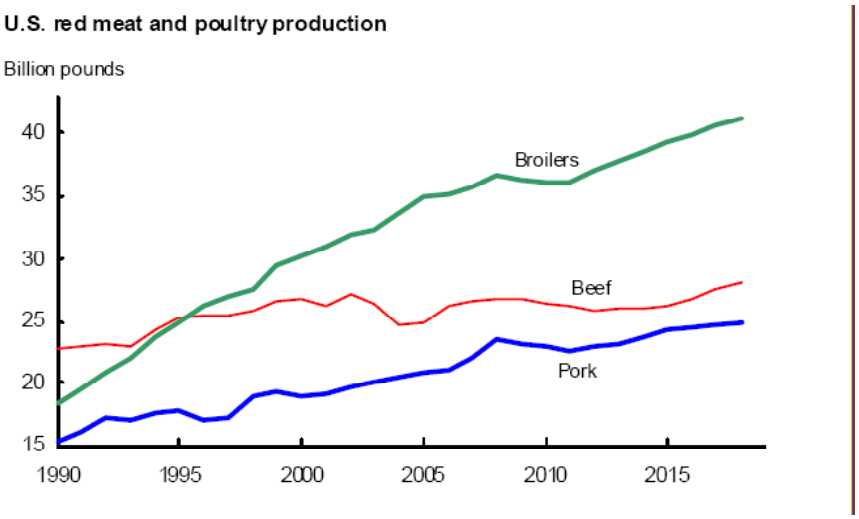
1. Introduction

Decreases in demand have severely impacted the beef industry and have been the result of changes in consumer preferences. One source of change in consumer preferences has been campaigns by the poultry and pork industries highlighting their respective health benefits that have shifted from beef to other meat types (see figure 1.1). Also the poultry and pork industries have increased production, pressuring beef prices down due to these changes, cattle producers have been forced to re-evaluate their production and marketing techniques. Economic pressures that cattle producers have been facing since the mid 1970's in conjunction with the decrease in demand have resulted in cattle and calf markets which have been differentiated into different segments based on labels and brands through a variety of certification programs. Each of these certifications address different consumer concerns based on value added goods, such as organic for less chemicals used in production, predator-friendly for production practices that do not harm natural predators such as wolves, and grass-fed for cattle raised on grass.



Note: Graph from http://www.beefretail.org

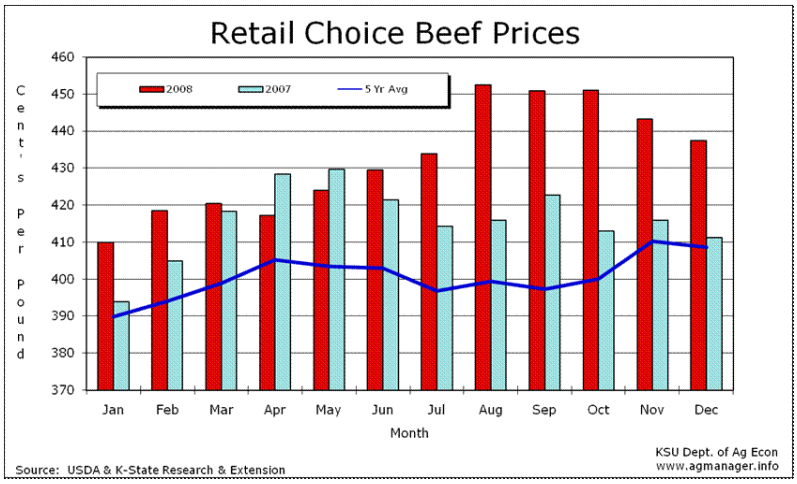
Figure 1.1: US Red Meat and Poultry Production

One niche market that is being pursued is the environmentally friendly beef market. The importance of environmentally friendly beef is three-fold: environmental stewardship, farm profitability, and prosperous farming communities. The goal of this thesis is to determine consumer response to various environmental attributes in relation to the cattle industry. A strong revealed preference for environmentally friendly beef would provide cattle producers another means for reaching an untapped market segment. The history of the current situation will be discussed in the background which is divided into 4 sections: 1) beef supply and demand trends, 2) organic, grass-fed, and environmentally friendly beef markets, 3) current culture of eco-friendly trends, and 4) the importance of labeling in market development.

1.1. Beef Supply and Demand

Cattle producers have been facing a declining market since the mid 1970's according to the USDA beef supplies inventory which shows national cattle inventory on the decline. Meanwhile the Kansas board shows that retail demand is also on the decline approaching lows

unseen since 1998 (Minert, 2008). Cattle producers are also facing declining inventories due to increased costs. In recent years, fuel costs have risen significantly as well as feed costs due to droughts (Westcott, 2009). This has forced many cattle producers to send their cattle to slaughter resulting in further decreased inventories. In addition to the economic pressures they are faced with, cattle producers have also been facing demand decreases from increased competition from other meat producers, namely chicken and pork. The process of being pressured on both sides economically, low market prices and increased costs have forced cattle producers to reconsider their production strategies, resulting in quality differentiation in the cattle industry.



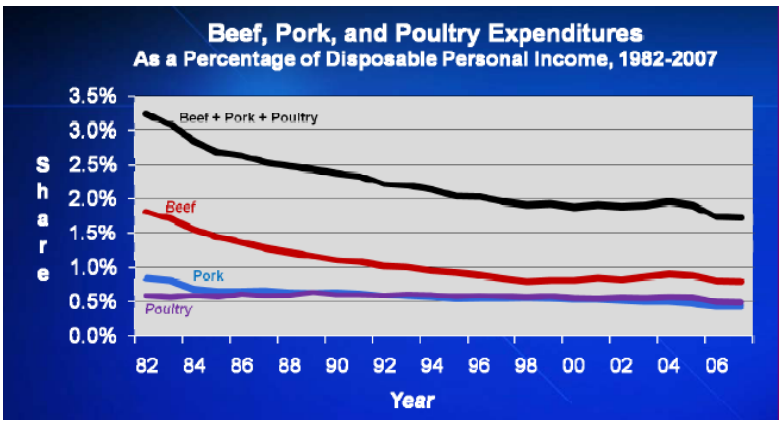
Note: Graph is from http://www.agmanager.info

Figure 1.2: Beef Prices, Retail

Meat comprises 21 percent of the overall U.S. retail food market (Rinehart, 2006) of which, cattle industry is the leading commodity in the US producing an estimated GDP of $49 billion dollars, with a market share of 17.9% of all commodities (Strickland, 2009). For example on January 1, 2009, the inventory of U.S. cattle and calves was 94.5 million head with only a 2% decrease from the previous year, even through these turbulent times (Clause and Huntrods,

2009). Costs are still rising and decreases in production are expected for 2009 and 2010 (see figure 1.1) (Westcott, 2009). But, as is also seen in figure 1, the production is expected to increase after 2010. This is especially relevant as the prices of beef are still on the rise.

Figure 1.2 (Minert, 2009) shows that the prices of beef drastically rose even though production also rose in 2008. The trend for the last half of 2008 is very promising when compared to both the five-year trend and the trend in 2007. Furthermore the amount of spending by American consumers on beef outstrips that of all other meats. This can be seen in figure 1.3. (Minert, 2009). And while increases in production and price are good signs for the beef industry, demand is decreasing.

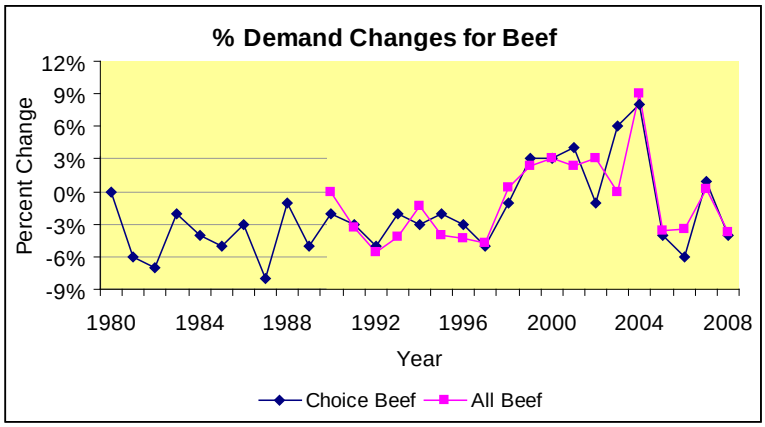


Note: Graph is from http://www.agmanager.info

Figure 1.3: Expenditures on Meat Products

Based on data from Kansas State University comparing beef demand changes to a 1980 base, the demand for both choice and overall fresh beef has declined. It can be seen from figure 1.4 that demand for both choice and overall fresh beef has declined (Minert, 2006). This indicates more need for diversification and niche markets for the beef industry to make beef

more appealing to consumer demands. One way the industry has already diversified is through the labeling of organic and grass-fed beef products. Eco-friendly beef is also a new niche market, but there are drastic differences between the three niches, which will be discussed in the next section.



Note: Data collected from http://www.ers.usda.gov/

Figure 1.4: Percent of Demand Changes for Beef with 1980 as the base year

1.2. Organic, Grass-fed, and Environmentally Friendly Beef Markets

There are three main niche markets that affect beef producers: organic, grass-fed, and environmentally friendly markets. All these markets share the common thread of being a niche market and therefore the established niche markets can lend potential information about current and future trends to newer markets. Each of these markets' respective traits will be discussed below.

1.2.1. Organic

The organic trade association defined organic in its 1995 meeting as, "…an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management

practices that restore, maintain and enhance ecological harmony" (OTA website, 2008). 'Organic' is a labeling term that denotes products produced under the authority of the Organic Foods Production Act. The principal guidelines for organic production are to use materials and practices that enhance the ecological balance of natural systems and that integrate the parts of the farming system into an ecological whole.

The idea of "organic" dates back to pre-World War II era when conscious organic agriculture began simultaneously in both India and Central Europe. While the organic idea started mainly with small personal gardens, it has since grown into a $46 billion industry (Organic-World.Net, 2007). The industry growth has had a similar growth multiplier on farmland with approximately 32.2 million hectares worldwide farmed organically, which represents 0.8% of total world farmland (Organic-World.Net, 2009).

Organic farms are distributed worldwide with Australia, New Zealand, Papua New Guinea, and neighboring islands in the Pacific Ocean having a dominant share of 39% of the total organic farmland (although most of it is rangeland), while Europe has 23 percent, followed by Latin America with 19 percent, Asia has 9.5 percent, and North America with 7.2 percent. Africa has a mere 3 percent. And while the farmland is well distributed, the demand markets tends to be concentrated in Europe (40%) and North America (30%) (Lotter, 2003).

While there are many organic markets, livestock is a major consideration with almost two-thirds of all organic land being grassland (Organic-World.Net, 2009). The organic meat market is estimated to expand along with the natural beef from $2.3 billion in 2004 to $5.5 billion in 2009, a 19% compounded annual growth rate (Perkins, 2006). Furthermore, sales of organic beef totaled nearly $10 million in 2003 with estimated cash register receipts at a 30%

annual increase through 2008 (Doering, 2004). While there is steady growth in the market place for organic products, organic agriculture practices cannot ensure that products are free of residues; however, methods are used to minimize pollution from air, soil and water. Organic food handlers, processors and retailers adhere to standards that maintain the integrity of organic agricultural products.

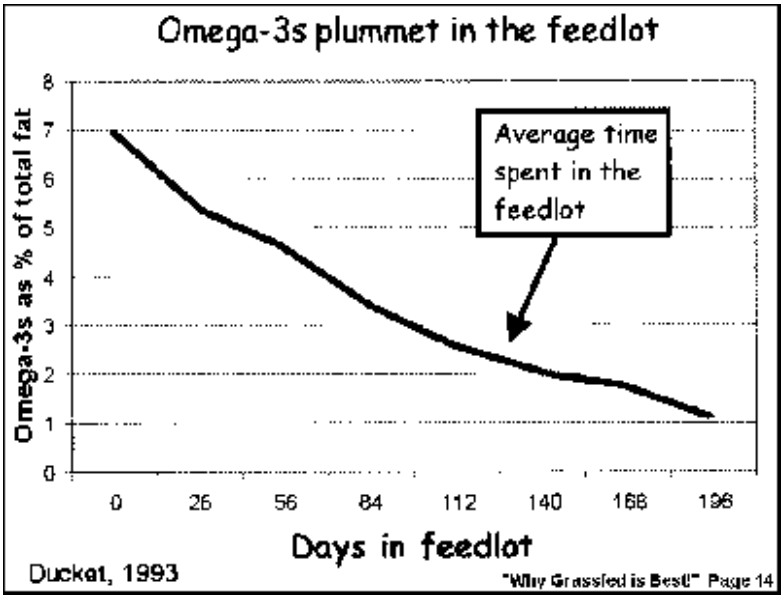
The primary goal of organic agriculture is to "optimize the health and productivity of interdependent communities of soil life, plants, animals and people" (OTA, 2008). From this description, organic agriculture defines itself on how the pollution in the air, water, soil affects the end product as opposed to how the growth and production of the product affect the environment. While the organic market has covered a previously ignored market of products free of residues and contaminants, not all customers are satisfied. For these customers the grass-fed livestock and sustainable agriculture niches have emerged.

1.2.2. Grass Fed

Grass-fed beef has no definitive industry-wide definition for grass-fed. A general definition, however, is provided by www.grass-fed-beef-101.com, as "… beef from cattle that have eaten only grass or forage throughout their lives, however some producers do call their beef grass fed but then actually finish the animals on grain for the last 90 to 160 days before slaughter."

Grass fed or pasture-fed cattle are a newer phenomena starting only in the late 1990s. One major benefit touted by analysts is the increase in omega 3:6 ratios (TexasGrassFedBeef.Com, 2009). Conventional feed is made up of small amounts of hay or

straw supplemented with grain, soy and other ingredients in order to increase the energy density of the diet, which can reduce the Omega 3 to total fat ratio (see figure 1.5).



Note: Graph is from http://www.texasgrassfedbeef.com

Figure 1.5: Omega 3 ratio for Conventional Beef

While many grass-fed farmers do not use any hormones or pesticides on the cattle or the feed, it does not preclude such use. Grass-fed (like organics) is primarily concerned with how the feed affects the product of the beef by providing a product more rich in Omega-3 and thought to be more humane by allowing the animal to fatten more gradually off of food from its natural diet. Grass-fed beef does not take into consideration the impact of the production process on the surrounding environment.

1.2.3. Environmentally Sustainable

Environmentally sustainable beef is a new trend, but sustainable agriculture is very expansive with three main areas of concern: environmental stewardship, farm profitability, and prosperous farming communities. Sustainable agriculture is the ability for a farm to produce food

indefinitely, without causing severe or irreversible damage to the surrounding environment. The primary issues are the long-term effects on the environment and the long-term ability for farmers to maintain and profit off the environment.

Since environmentally friendly beef is such a new trend, there is no definition that is generally agreed upon, so the definition provided is the same as was given to the survey participants. It is defined "as the protection from contamination of ground water and underground water tables by farm production runoff. Land management is also an important part of 'environmentally friendly' in its goal to reduce soil erosion. And finally the reduction of air pollutants to keep a higher level of clean air is the third part of environmentally friendly agriculture." This means that farmers who follow environmentally sustainable practices are not using chemicals, hormones, or feedlots as these factors negatively affect the environment. This insures that the cattle raised are organic, grass-fed, and are a sustainable resource.

1.3. Current Culture of Eco-Friendly Trends

Products are sold to fulfill needs, for example cars are sold to transport people, clothes are sold to keep people warm, and food is sold to feed and nourish people. While the demand for the base goods is there, the specifications of the goods are in a continuous state of change. Year after year, products change in a myriad of ways, still fulfilling their essential functions, but with added editions to "tweak" the features of how they perform to addresses taste discrepancies in the consuming market.

Food and agriculture, in general, have begun to address taste discrepancies in the market through labeling and branding. In particular, the beef and dairy industry has just begun to "badge" their products with labels, such as "Grass-fed" and "Organic".

In recent years, the environment has been a significant topic due to the recent events of natural disasters, diminishing resources, and pollution with politicians and grass roots organizations working together to reduce carbon footprints. With the first ever large scale climate change bill making it to the senate floor in 2007 introduced by Senator Lieberman and with a growing level of activism from groups such as 'Voted Green', eco-friendly products are on the rise. (For further information see: Sawick, 2009; Lewis, 2009)

Natural resources are under pressure from a world that is continuously growing smaller through the ever expanding population and production practices that deplete resources. The populations in Georgia and around the world are increasing. According to the United States Census Bureau, in 1990 Georgia had an estimated population 6.5 million; in 2000 Georgia had an estimated population of 8.2 million; and in 2007 Georgia had an estimated population of 9.5 million (Census Bureau, 2009). As the population continues to grow, more pressure is being placed on natural resources. This is evidenced by the control of natural water sources such as the Chattahoochee which is affecting neighboring states water supplies and ecosystems, namely Alabama and Florida (Terradaily.Com, 2007). The result of the boom in population out pacing natural water resource replenishment is a hike in water fees (Bennett, 2008).

As natural resource availability is consumed, these impacts are beginning to exhibit themselves to the public through: higher prices for resources, a reduction in resource availability, and degradation of quality. For example, in Georgia many have experienced harder times with the 2008 drought (Haire, 2007). The drought resulted in considering higher water prices, as well as limiting access in the form of water use restrictions (see Bennett, 2008; WSBTV, 2003).

Many industries are facing pressures from consumers and politicians to re-evaluate their production to minimize their harm on the environment.

Agriculture is one such industry that is re-evaluating their conventional production practices. Agriculture is one of the largest users of all natural resources, from oil and gas for cross country transportation to heavy water use for livestock and crops to land and soil erosion due to the intense nature of agriculture. For example, the water usage of agriculture has impaired 59% of the impaired river water surveyed as seen in Table 1 (NWQI, 1998).

Table 1.1: National Water Quality Inventory: 1998 Report to Congress

Table 1. Summary of U.S. Water Quality Impairment Survey			
Total Quantity in US	Amount of Waters Surveyed	Quantity Impaired by All Sources	Quantity Impaired by Agriculture
Rivers 3,662,255 miles	23% of total 840,402 miles	36% of surveyed 248,028 miles	59% of impaired 170,750 miles
Lakes, Ponds, and Reservoirs 41,600,000 acres	42% of total 17,400,000 acres	39% of surveyed 6,541,060 acres	31% of impaired 2,417,801 acres
Estuaries 90,500 square miles	32% of total 28,889 square miles	38% of surveyed 11,025 square miles	15% of impaired 1,827 square miles

Note: AFOs are a subset of the agriculture category. Summaries of impairment by other sources are not presented here (EPA, 2007).

The rearing of livestock is one of the most resource dependent industries in agriculture due to the resources dedicated to producing animal feed as well as in animal rearing. Many critics, of the breeding and slaughter of livestock, point out that livestock requires at least double

the amount of resources than pure crop production (Vesterby and Krupa, 2001). This is because not only are natural resources needed to rear the animals in terms of water and land, but these same resources are also need to grow the feed for the livestock, which consists of crops such as corn and grains. These organizations also point out that the waste produced in these livestock farms add further burden on natural resources.

Beef production is one industry that uses significant amount of natural resources. Organizations with environmental protection as their goal have applied pressures on the beef industry through advertisements stating that the American beef and dairy industry (see EPA, 2007; Reijnders and Soret, 2003; and Segelken, 1997):

- Can reduce their current larger carbon foot print;
- Is responsible for excess water consumption; and
- Degrades water, air and land quality in the local and global environment.

Recently, the beef and dairy industries have adapted to these pressures through adapting organic and grass-fed production practices. The use of organic and grass-fed branding has allowed some beef and dairy farmers to capture the new market of health-conscious or eco-friendly consumers.

1.4. The Importance of Labeling in Market Development

Branding and labeling has been a way that producers identify value attributes to goods to appeal to consumers whose concerns are significant enough to warrant paying a higher premium above stated market prices. Branding/labeling has been used in a diverse range of industries, such as in the production of finished goods such as “Recycled” paper, Energy Star

"Environmentally friendly" devices, and a variety of other proprietary "Green" labels such as Publix "Greenwise" foods.

To encourage the beef industry to adopt a label at one time would be a difficult task with imperfect information on the producers' side; consumers knew nothing about agricultural production. However in this modern day and age, with the arrival of the internet and mass marketing, many consumers have become more knowledgeable. This is already reflected in the many labels that currently exist in the market place, such as Grass-fed, free-range, predator friendly, and organic to name a few.

While the organic label has been in existence since before 1990s and has reached consumers worldwide, newer labels such as grass fed and environmentally friendly labels are less well known (Dryer, 2003). And while the market is still small, consumers are constantly paying more attention to eco-friendly products.

For some consumers, the health aspects of organic products—while significantly better than conventional production—may not go far enough to minimize perceived environmentally damaging practices. This may leave eco-friendly production the ability to capitalize on a segment of consumers that are currently being ignored. If producers pursued the branding of environmentally friendly beef and dairy products, then they may be in the position to capture the demand growth that the organic dairy industry had in the 1990s with sales growing over 500% from 1994 to 1999 (Dimitri and Greene, 2002).

1.5. Problem Statement

Due to potential demand changes in preferences and limited availability of natural resources, some consumers are is moving towards more conscionable consumption that embody responsibility towards how their production. There is a direct need to understand more about what the buying public knows and wants in their beef purchasing decisions, if the beef industry is to sustain itself and grow. The goal of this research project is to determine the demand and willingness to pay for beef products that are environmentally friendly.

In this analysis, it is hypothesized that individuals with a higher level of knowledge or concern about the environment will be willing to pay higher premiums, also people living in urban areas will be more willing to pay for environmentally friendly beef. It is also hypothesized that higher household incomes with fewer family members will be more willing to pay some premiums for environmentally friendly beef, however not the highest premium. It is also hypothesized that the number of children in a household will also contribute in a higher percentage of willingness to pay for environmentally friendly beef products.

2. Literature Review

This section of the thesis will review previous research on quality differentiated goods and the method of analysis used. While no available research directly examines environmental labels for cattle products, there exists research which will provide insight into how consumers behave with other products differentiated based on similar characteristics.

2.1. Environmental Agriculture

Environmental characteristics have in recent years proven to be a quality favored by consumers in the products they buy, for instance Straub and Thomassin (2006) have examined chicken, tomatoes and milk produced utilizing environmental management systems (EMS). In their research, choice modeling was utilized to examine 365 completed surveys from Montreal, Canada. By providing each respondent with 3 choice sets, the collection sample for analysis totals at 1095. To collect the data, a drop and pickup method was utilized which increases the probability of excluding single households and retired individuals.

In this study, an analysis was conducted comparing EMS products with those of organic, GMO, and other conventional products. Results from the study do indicate that consumers are willing to pay higher premiums for products with environmental properties. Results also indicate that consumers' willingness to pay premiums is highly correlated with education on the benefits of EMS products. In conclusion, Straub and Thomassin indicate that the gains made by

qualitative differentiated products, such as organics has been due to the elimination of asymmetric information between consumers and producers.

Premiums have also been shown to exist for the protection of water resources. In 1999 Hurley and Kliebenstein examine the willingness to pay for pork that exhibited a reduction in livestock odor and the reduced impact of swine manure storage and application on surface and ground water. The survey of participants included urban and rural residents from Iowa, Kansas, Vermont, Oregon, and North Carolina. From the survey, 329 completed surveys had been obtained for the analysis.

For the analysis, an experimental auction was performed where participants placed bids for 2 lbs packages of uniformly cut, boneless pork loin chops. Participants were allowed to bid on 10 packages that ranged in environmental attributes from conventional to 40-50% reduction levels on all three areas (air, ground water, surface water). The results indicate that the average premium paid for the most environmental of the packages was a 22% premium (which equates to a $0.94 premium). Throughout the five states surveyed, the level of willingness to pay on the higher premium did not differ significantly. Research has also shown that the nomenclature use to designate a product as an environmentally sustainable product is important if consumers are to distinguish between qualitatively differentiated products.

Loureiro, McCluskey, and Mittelhammer (2000) conducted a study comparing the willingness to pay premiums for conventional, organic, and environmentally sustainable apples utilizing a two-fold method: the first phase is a stated preferences approach; while the second phase is a revealed preferences approach. The data was collected through individual interviews coupled with actual grocery store purchases. The results of the survey collection netted 289

observations where the primary demographics were white (92%), female (89%), and the primary household shopper (87%). Less than half of the respondents had children under 18 with the average age of the respondent being 46.

The analysis of the stated preferences data confirmed the study's hypothesis contending that sustainable apple production was an intermediary choice between conventional and organic apple production. When comparing the attributes of the consumers, it was suggested that those consumers who would purchase sustainable would also purchase organic apples if offered the choice. It was also suggested that the 'organic' term was better defined in society with the 'sustainable' term being vaguer with the personal benefits harder to measure.

The only characteristic that positively affected a customer's willingness to pay for sustainable apples was the improved quality associated with sustainable agriculture apples. In this study, consumers more easily understood organic and conventional apples, while sustainable agriculture apples were understood by consumers at some level, but were not decisively indistinguishable from other apple types, organic and conventional. With the definition of 'sustainable' not clearly understood at the time of collection 8 years ago, the data of from this analysis should be updated since consumers perceptions may have changed.

2.2. Consumer Preferences for Beef

While research has shown that consumers exhibit a willingness to pay a higher premium for other quality differentiated products exhibiting agriculturally sustainable attributes, beef consumer have shown that education on what it means to be agriculturally sustainable is a key component to the success of agricultural sustainability beef products.

One study conducted by Mennecke, Townsend, Hayes, and Lonergan (2006) indicates that the production location and customer education on beef production influence consumers' beef choice. In the study, they utilized a conjoint analysis to find the key determinants of beef consumption. Their findings from the research identified food safety, traceability, region of origin, feed type, and consumers' previous knowledge as those determinants which influence consumer decisions.

For this study, data was collected from two sources: national sample of steak consumers, and students from Iowa State University. The first group was solicited using a third party marketing firm which screened participants to ensure that they were at least 18 years of age and consumed meat products. The second group of participants was a group of students from the College of Business at the University of Iowa who were given class credit for their participation in the research. After the completion of the survey process, results from the analysis indicate that local beef is the most significant decision characteristic among all groups of consumers and in the absence of local beef, beef is preferred from the following states Iowa, Texas, Nebraska, and Kansas. The study also indicated that knowledgeable consumers did prefer grass-fed beef, but overall the respondents were mostly unknowledgeable.

More recent studies have served to reinforce the significant role that the education of the consumer plays in influencing the willingness to pay premiums. A recent study conducted by Lusk and Parker (2009) indicate that consumers are now more knowledgeable and therefore prefer feeding cattle a grass-fed diet to reduce the amount and type of fat found in ground beef. For this study, 2000 households were sent mail surveys with 220 complete surveys received. A choice-based conjoint analysis method was utilized with 8 choice questions asked, resulting in

approximately 1,760 choices were available for the analysis. Overall the analysis indicated that people dislike any increases in total fat, saturated fat, Omega 6:3 ratio, and price.

The results also indicated that grass-fed beef was the most desirable with a preference share of 40.33%. The other significant preferences are 19.59% for sorting and labeling current cattle into improved fatty acid content; 13.09% for supplementing cattle diets with flaxseed oil; 13.08% for supplementing cattle diets with fish meal; 11.73% for genetic breeding of those cattle with improved fatty acid content; and 2.19% for cloning cattle with improved fatty acid content. The total amount of fat in ground beef was found to be more important than package price or size. This serves to illustrate that consumers are becoming more educated on the health implications of beef consumption in their diet.

And finally, research has shown the influence of consumers' perceptions on their purchase decisions. Campiche, Holcomb, and Ward (2004) researched consumer determinants for natural beef. In their study natural beef is defined as no use of growth hormones or antibiotics throughout the cattle production process. This differs from organic beef in that organic beef is based on the organic feed for the cattle. In this study, eight stores from the Oklahoma City metropolitan area, the Dallas/Fort-Worth metropolis, and the Kansas City metropolis were surveyed. The respondents were asked in-person with 100 responses collected from each store. It is important to note that the stores were already equipped with designated natural food areas and that most of their consumers would have some familiarity with natural food products.

In the study Campiche, Holcomb, and Ward (2004) used a dichotomous choice contingent valuation method (DC-CVM) to develop the survey, since this method lowers the

respondents' possibility of exaggerating their expressed willingness to pay. The authors also point out that this method is more appropriate for consumers that already have some familiarity with the product. In the study, there were four possible scenarios:

1. Respondents preferred natural beef to conventional beef
2. Respondents would buy natural beef at $5.60 per lb, but not at $6.50 per lb.
3. Respondents would not buy natural beef at $5.60 per lb, but would at $5.00 per lb.
4. Respondent preferred conventional beef to natural beef

To compute the willingness to pay, multinomial logit estimation was used. The results from the analysis show that respondents' previous meat purchasing behavior and natural beef perceptions significantly influence consumers' willingness to pay. Also, respondents who purchase other natural foods were more likely to purchase natural beef, as were consumers who checked labels.

Consumer demographics (gender, age, household size, education level) had no significant effect in determining their willingness to pay. Also brand did not affect a respondent's willingness to pay. The authors attribute this to the recent phenomena of branding fresh beef. It was speculated that as branding becomes more common, for an increasing number of consumers it becomes a stronger determinant in their willingness to pay.

2.3. Eco-Labeling Food and Cattle Products

Labeling is the means by which quality differentiated products identify themselves. Without labels, products would remain indistinguishable to consumers. It is through labeling,

that niche markets set themselves apart by establishing a unique identity for themselves by defining product markets such as organic, fair-trade, GM, American, natural, eco-friendly, etc. to name a few. But the effect a label has on the market place is uncertain since labels only serve to demarcate products from one another as opposed to defining the additional attributes they represent.

In a study by Moon, Florkowski, Bruckner, and Schonhof (2002) they examined which consumer characteristics from East and West Berlin influenced consumer willingness to buy eco-labeled foods. In the study, 525 returned questionnaires from 23 districts of Berlin in 1994 were analyzed. Utilizing an attitudinal willingness to pay (as opposed to a contingent valuation) methodology made it possible to address more qualitatively and identify socioeconomic and demographic characteristics affecting consumers' willingness to pay for eco-labeled food.

For the analysis, an ordered probit with and without sample selection was conducted. While demographics such as age and food safety concern were significant (and expected) something unexpected was the difference in perceptions of East and West Berliners. In fact, the authors suggest that the difference in education between the two regions of interest attributed to the results of West Berliners increased purchases of eco-labeled goods over those of East Berliners. They suggest that further education would benefit the eco-friendly food market in East Berlin.

While the results of Moon, Florkowski, Bruckner, and Schonhof (2002) present some good qualitative results, disagreement on the premium level and importance of eco-labels, quantitatively, exists (McCluskey and Loureiro, 2003). In a comprehensive discussion of

empirical studies on labeling McCluskey and Loureiro (2003) state that, “eco-labels are still considered market-oriented” as they do not require “direct government regulation”.

Also while eco-labels such as Blue Angel (a German instrument with 4000 certified products) have found success, there is large disagreement and a variety of findings on the price premiums attached to eco-labels. Some studies found price premiums of $0.40 with about a third of consumers willing to purchase (Blend and Ravenswaay, 1999) to eco-labels affecting preference ranking rather than choice of products (Roe et al., 2001). While the willingness to pay and the extent of the price premium seems to vary drastically from good to good with some goods (such as dyes) having no price premium to those goods that do (such as cotton, electricity, and apples)[1] With so much variety in eco-labeling, it is important to evaluate the potential of a niche market, such as environmentally sustainable beef thoroughly.

[1] For more information see Nimon and Beghin (1999); Ethier et. al (2000); and Blend and van Ravenswaay (1999)

3. Data

To estimate the potential consumer willingness to pay response to products with unique features, data must be collected for the analysis and estimation. This is done with the use of survey research. Without data on consumer behavior, it is not possible to anticipate how consumers will react to products introduced in the market place. Survey research is a key component in the estimation of non-market value goods. To estimate consumer demand for Environmentally Friendly beef, the process of a survey must be conducted to collect information. Surveys are conducted with the use of a survey instrument, which is used to collect information from a sample population. The sample population is a representative subset of the population at large, which consists of consumers of beef. The survey instrument is created to collect information on variables thought to influence the preferences of consumers which thereby affect their decision to purchase beef.

To measure consumers' willingness to pay, the survey instrument queries consumers on their consumption habits to determine if the respondent is a consumer of beef who is over the age of 18 years old. Once it has determined consumers are from the desired beef consumer population, the survey proceeds to inquire more from the consumer regarding their perceived knowledge of the cattle industry, the environment, their concern for the environment, their beliefs in how the cattle industry impacts the environment, premiums the consumer is willing to pay for cattle products branded with labels designating the beef as a product produced in a

manner conducive to limiting environmental impacts through production, and finally their background information.

The survey tool was designed to try and ensure respondents were consistent in their answers. Consumers were surveyed on their eating habits, attitudes towards the environment and the cattle industry, background and demographics, as well as price premiums they were willing to pay for environmental labels. Many of these variables are used to ensure that responses are consistent from those surveyed, for example a consumer who exhibits a positive willingness to pay for environmentally friendly beef would also show some concern for the environment and more specifically at least one aspect of the environment.

The lickert-item was used to measure individuals' degree of concern and how strongly consumers felt about various aspects of the cattle industry and the environment. Individuals surveyed are questioned on their knowledge of the beef industry and their belief if the industry negatively impacts the environment prior to questions regarding willingness to pay premiums or the cattle industry and its impacts on the environment to prevent any implied relationship from questions that address the cattle industry and the environment. Tests for consistency in response and potentially influential questions in the survey are a necessity to ensure that the response data is free of observations that are self conflicting and/or respondents are not unintentionally being influenced by questions.

Willingness to pay information was collected by presenting respondents with a series of price premiums at different levels and asks if they would be willing to pay the premiums. Using different levels of premiums not only allows for the capture of willingness to pay but also

determined to what degree respondents are willing to pay. At the end of the survey, demographic information was collected.

For the process of the data collection, the University of Georgia's Survey Research Center (UGA-SRC) was hired to conduct a telephone survey utilizing a random digital dial system. In conducting the survey, UGA-SRC made 7,918 attempts to contact individuals throughout Georgia. Of the 7,918 attempts, only 12.5% or 988 surveys were successfully completed. From the 988 complete surveys, 68 individuals did not consume beef and another 56 were thrown out because they did not purchase beef so the remaining 864 completed surveys remained in the sample. The survey was conducted in March 2008 and excluded any respondent who was under the age of 18.

The areas surveyed were a mixture of rural and metropolitan areas. The maps below illustrate the distribution of respondents throughout the state of Georgia. The first map, figure 4.1, shows the population distribution throughout Georgia utilizing census data from 2000. The second map, figure 4.2, shows the most heavily survey areas in the map are illustrated in a darker green while the lighter green areas represent fewer to no respondents. By comparing the distributions on the maps, it can be seen that the survey areas closely approximate actual population distributions.

The advantages of this survey method are that the cost is relatively inexpensive. However, this survey allows for respondents to provide inflated answers that may not be accurate, since they need not be actually purchasing any of the products in the survey.

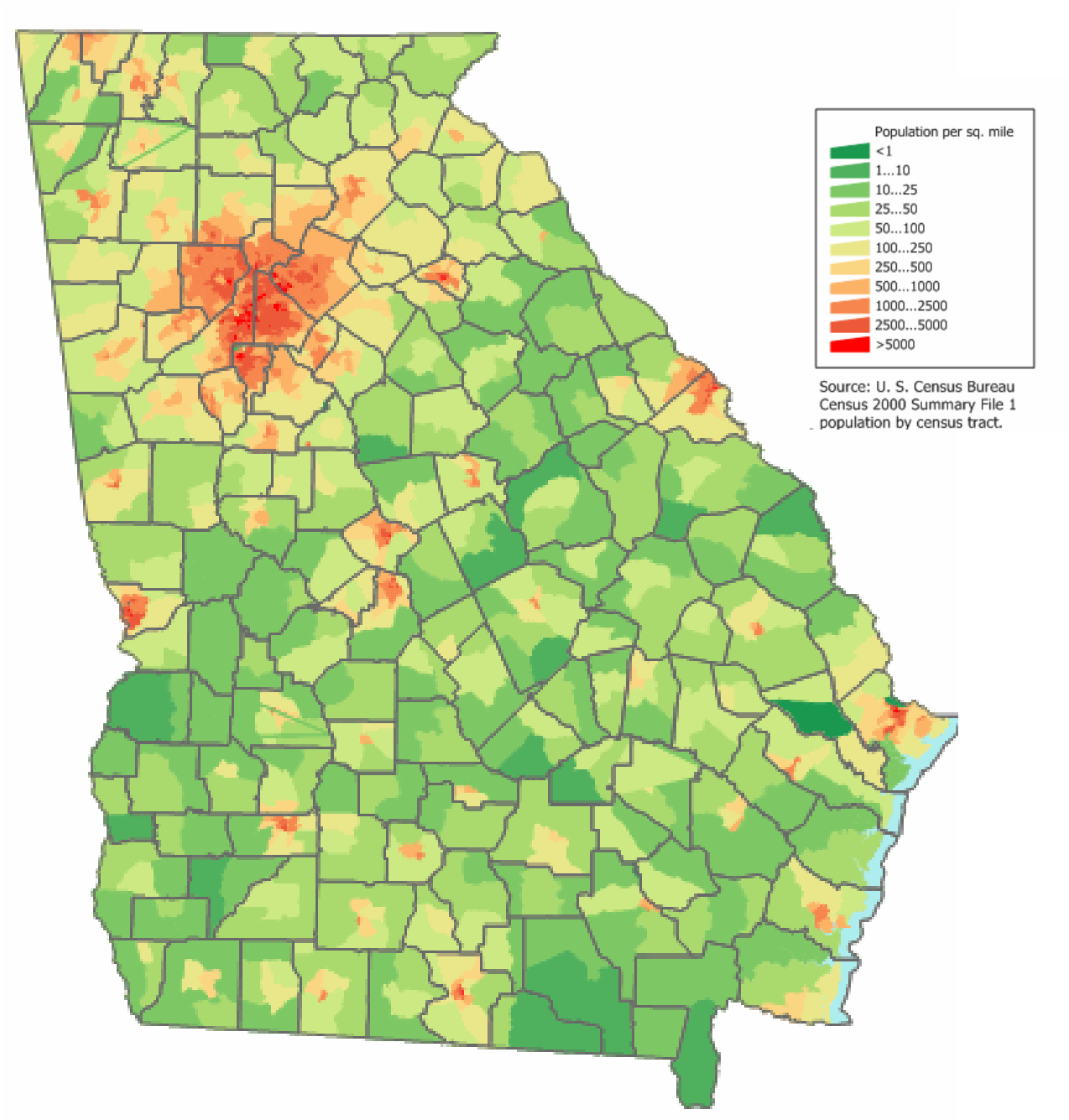


Figure 3.1: Census Map Data

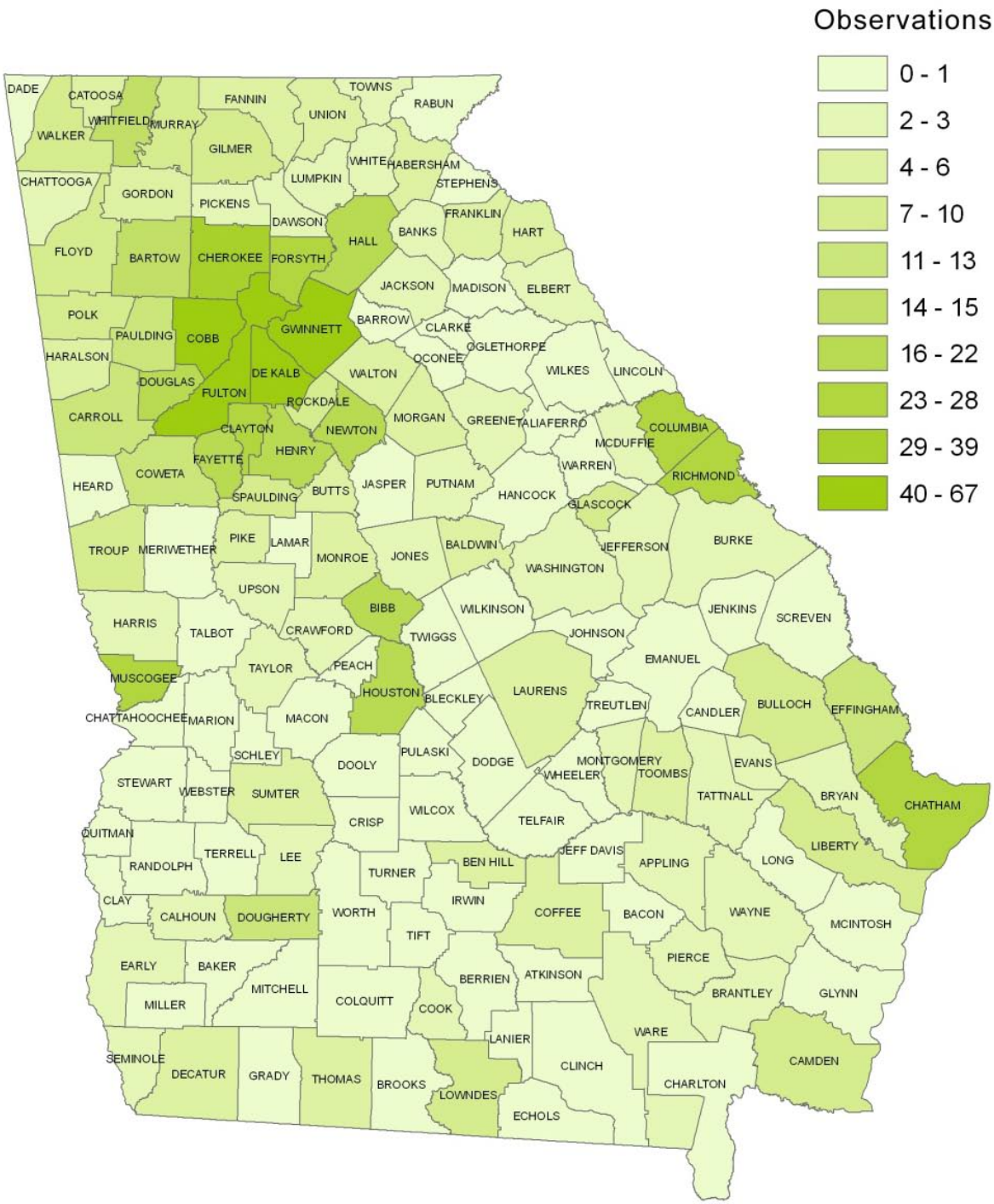


Figure 3.2: Distribution of Survey Respondents

3.1. Demographic Information

The remainder of the survey collected information on the background of the respondent. Background information thought to be influential in the purchasing decisions of consumers included gender, age, race, income, household size, education, marital status, and the metropolitan statistical area (M.S.A.).

In terms of gender, a majority of those surveyed were females with 66.09% and 33.91% were males. The average respondent was 50 years old, married and lived in a city. The age distribution is presented in figure 4.2 and shows that the distribution is relatively normal, although it is slightly skewed to the left.

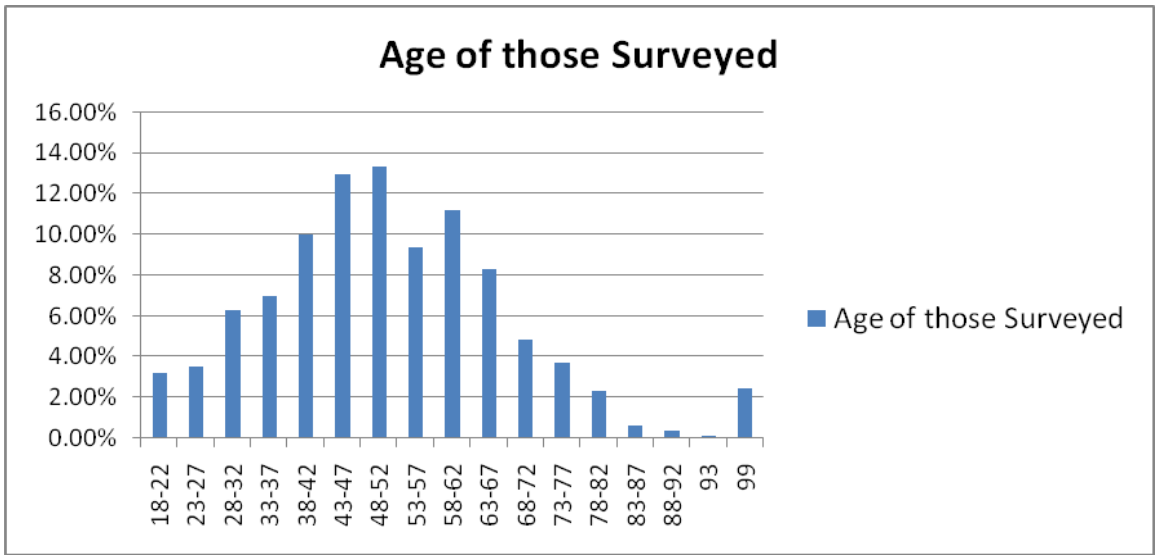


Figure 3.3: Age Distribution of the Respondents

It can be seen from figure 4.3, the mean and medium are both near the age of 50 with more than 50% between the ages of 38-62 years old. Figure 4.4 shows the income levels for the respondents. The annual average income was $78,000 calculated with the median values. With

respect to children, 378 of the respondents that consumed beef had at least one child under the age of 18 in their household.

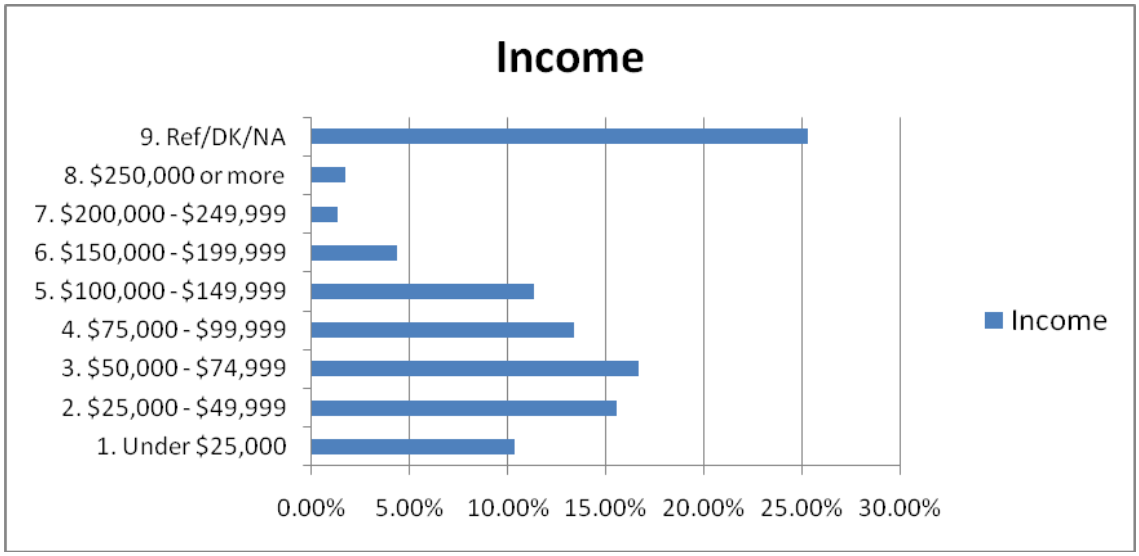


Figure 3.4: Income Distribution of the Respondents

3.2. Descriptive Statistics

In this section, some descriptive statistics about the respondents' preferences, purchasing behavior, and views on the environment. Some selected questions are displayed below and show the opinions of the respondents. These questions not only display the distribution of the answers, but it also provides a mindset for the empirical results to be interpreted.

Q. 3- Could you please rate, on a scale from 0 to10, where 0 is uninformed and 10 is very knowledgeable, how informed you are about agricultural production practices?

The graph below illustrates the distribution of how knowledgeable respondents felt they are about agricultural production practices. Althought most felt they knew something about agricultural production practices, 42.91% of those responded that they knew little or less than a

level 5 rating on the lickert-item in the graph below, while 37.75% felt they are somewhat knowledgable to very knowledgeable about agricultural production practices. Meanwhile 18.62% felt that they are familiar with agricultural production practices providing a 5 in their response.

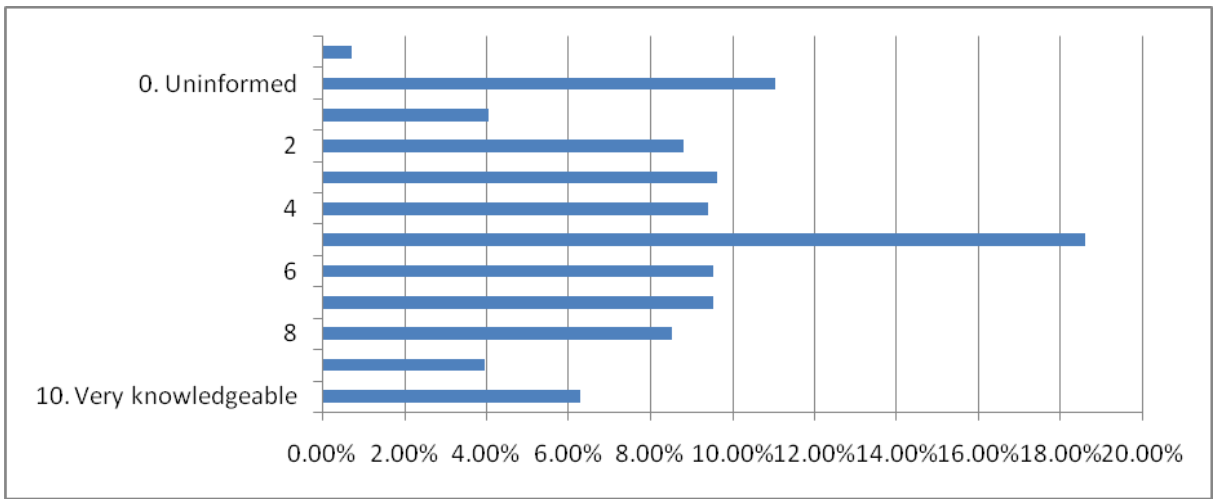


Figure 3.5: Agricultural Production Self-Reported Knowledge

Q. 5- On a scale of 0 to 10, 0 being no impact and 10 being the worst impact, please rate the impact of beef and dairy cattle farms on the environment?

A little over one-third of those surveyed felt that the cattle industry has made a significant impact on the environment with 34.31% stating values above 5, while 33.81% gave values below 5 indicating the industry makes less of an impact. 20.65% felt the industry makes a medium impact on the environment with a 5 rating.

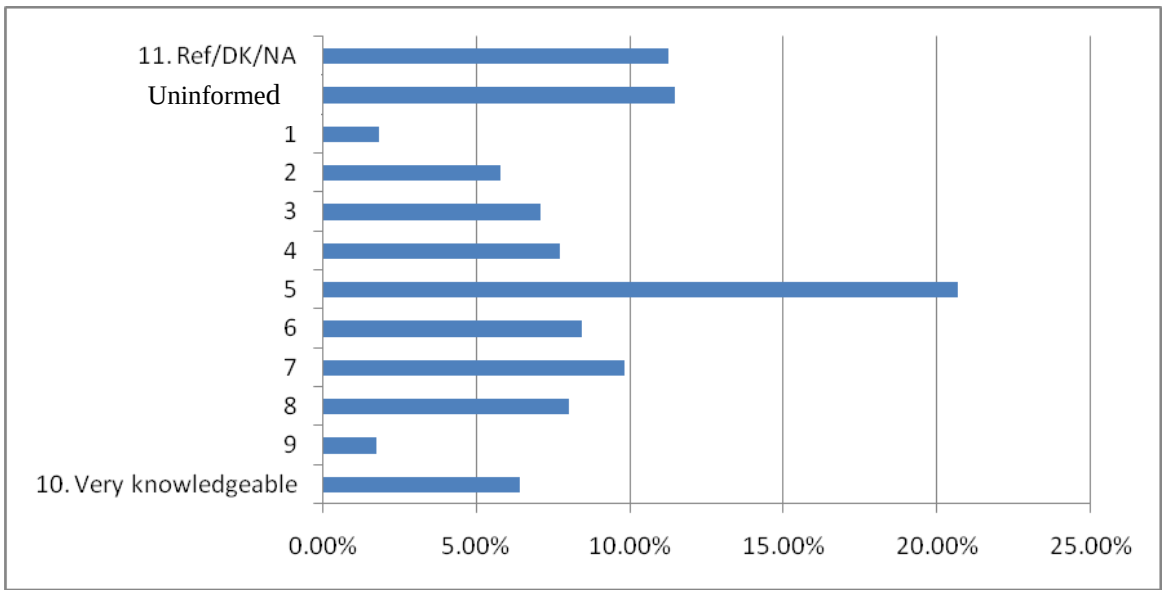


Figure 3.6: Impact of cattle production on the environment

Q. 6- Please rank the following on a scale of 0 to 10, 0 being no impact, and 10 being the worst impact on how much you think that beef and dairy cattle farms negatively impact the environment?

The impact of the cattle industry on the environment is believed to be anywhere from minimal to significant by 89% of those surveyed. The graph below indicates that of the three resources for the environment (water, land, and air), 63% voted 5 or higher for water, 49% voted 5 or higher for land, and 58% voted 5 or higher for air.

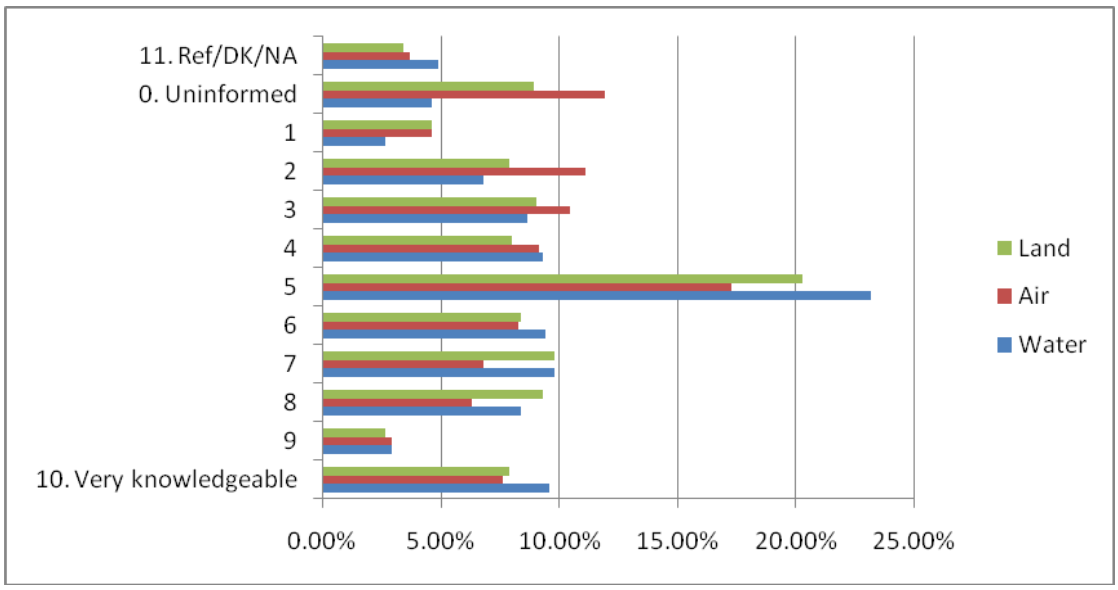


Figure 3.7: Survey of Cattle production impacts on Land, Air, and Water

Q. 7 - Do you purchase beef in the form of uncooked cuts such as steaks, roasts, ground beef, etc.?

A majority of those surveyed purchased beef in uncooked cuts such as ground and steaks at 88%, while the minority of those surveyed, just 12%, did not purchase uncooked cuts or refused to answer. This indicates that the sample of consumers used for the analysis would be those consumers the producers would be marketing towards.

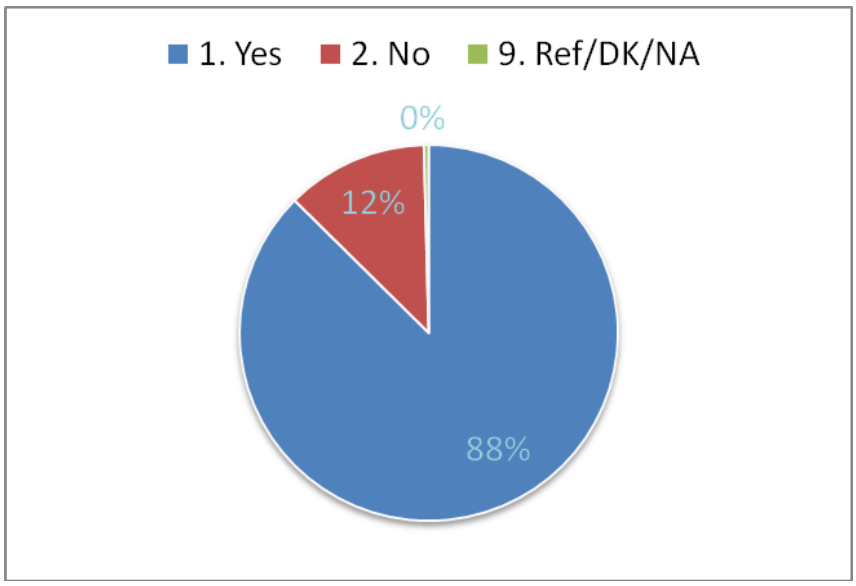


Figure 3.8: Beef Cut Purchases

Q. 8- On average, how many pounds of beef do you purchase in a month?

Approximately 80% of those surveyed purchased from 1 – 15 lbs of beef a month on average. However, over half of the 80% of the respondents only purchased 1-5 lbs. This indicates that these respondents do not spend a large portion of their income on beef.

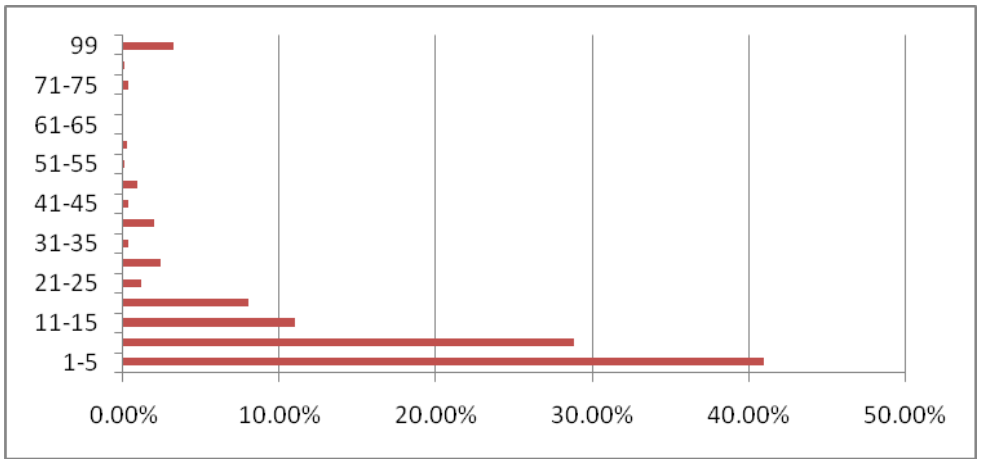


Figure 3.9: Average monthly beef purchase

Q. 10 - Would you be willing to purchase beef raised in a manner consistent with management practices that reduce air, water, or soil contamination if it cost more than what you currently pay for beef?

Of those surveyed who purchase cattle products, 66% or 568 individuals said they would purchase an environmentally friendly beef product if it cost more than what they currently pay. This question is important as it can be used to determine the accuracy of the results and the validity of the responses from those surveyed when compared to the empirical results.

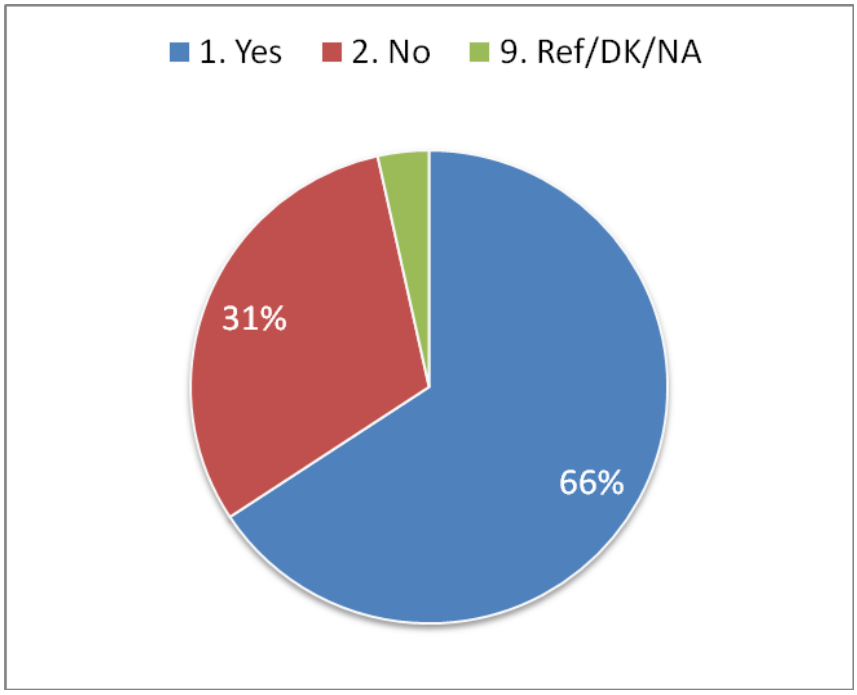


Figure 3.10: Willing to purchase environmentally friendly beef

Q. 11 - If you currently pay $6.00 per pound for beef, would you be willing to pay 30% more or $7.80 to purchase that beef if it was raised in a manner that promotes environmentally friendly agriculture?

The overall willingness to pay for beef was 53% of those who would purchase would pay premiums as high as 30% above current market prices as illustrated in the first of a series of three willingness to pay questions. Each subsequent question reduces the premium above retail by 10% down to the level of 10% above retail price. The analysis of the determinants of the premiums is found in chapter 5.

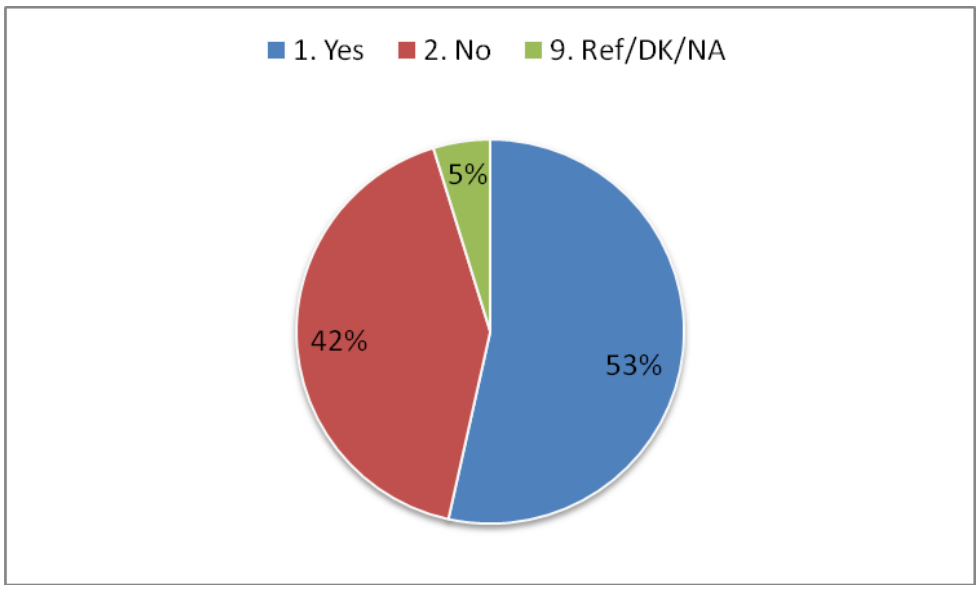


Figure 3.11: Willing to pay premiums for environmentally friendly beef

3.3. Model Variables

Summary statistics for the variables used in the empirical analysis can be found in table 3.2. The variables show us that on average of respondents were female, married and purchased about 13 pounds of beef monthly. The variables *Pay_Env*, *Pay_Green*, *Pay_Organ*, *Pay_Natural*, and *Pay_Farmfresh* represent the response to question 19 which states:

Q. 19: Which of the following phrases, best describes beef or milk products that you would pay more for:

1. *Environmentally Friendly*
2. *Green*
3. *Organic*
4. *Natural*
5. *Sustainable*
6. *Farm Fresh*
7. *Eco friendly*
8. *Will not pay more for milk or beef*
9. *Ref/DK/NA*

In this question, the respondent was allowed to choose one response. This question allows for the comparison of over-lapping of the potential market customers in the empirical analysis. However, this question will be analyzed (in chapter 5) only as to its relationship toward the willingness to pay for environmentally friendly beef because the data to directly compare niche markets is not available in this dataset. For this question, Environmentally Friendly (1), Sustainable (5) and Ecofriendly (7) were combined as *Pay_Env* as these options (though they may be perceived as different by the consumer) are directed toward the same product of environmentally sustainable beef.

It is also important to note that the Urban/Rural variable was written such that the response goes from a major city (1) to a rural area (4). Question 2's parts were indexed because there are several parts to the question and indexing would allow for all responses to be taken into account while still keeping the number of variables low. The question displayed below attempts to approximate the respondent's belief on their concern of the environment.

Q2: Protecting the environment has become an important topic. Please rate your concern for the following environmental categories on a scale of 0 to 10, 0 being unconcerned and 10 being very concerned:

Q2.1. Air pollution

Q2.2 Water pollution

Q2.3 Land quality

This question was indexed by taking the average of each answer (which is between 1 and 10) and then ranking the average answer as follows:

1. If average answer was 0, then *Env_Prot*=0
2. If average answer was between 0 and 3, then *Env_Prot*=1
3. If average answer was between 3 and 7, then *Env_Prot*=2
4. If average answer was greater than 7, then *Env_Prot*=3

The other variables are displayed below in table 3.2. Further information on the phrasing or ordering of the questions can be found in the Appendix.

Table 3.1: Summary Statistics for Model Variables

			Scale	
Variable	**Mean**	**Std Dev**	**Minimum**	**Maximum**
Agricultural Knowledge	4.78	2.87	0	10
Branded/Labeled Purchases	1.82	1.23	1	2
Major City(1) – Rural(4)	2.36	1.19	1	4
Age	50.99	16.32	18	97
Education: Less than high school(1) – Graduate or Professional Degree(4)	3.31	1.29	1	4
Income	4.75	2.81	1	8
Env_Prot	2.64	0.57	0	3
Pay_Env	0.22	0.42	0	1
Pay_Green	0.05	0.21	0	1
Pay_Organ	0.19	0.40	0	1
Pay_Natural	0.10	0.29	0	1
Pay_Farmfresh	0.15	0.36	0	1
% Female	0.66	0.48	0	1
% Non-White	0.26	0.44	0	1
% Married	0.65	0.48	0	1

4. Methodology and theoretical framework

Willingness-to-Pay econometric methods are used to determine what consumers are willing to pay, exchange, or sacrifice for a good or service. WTP methods are especially useful when trying to determine the benefit a producer will realize from catering to niche markets. This chapter begins with a discussion of the various WTP techniques which is followed by censored probit regression model used in this thesis.

4.1. Various WTP Estimation Techniques

There are a variety of methods utilized to measure willingness-to-pay. The method chosen for analysis is dependent on the type of survey instrument utilized and the availability of data. There are four primary methods that will be discussed below: Contingent Valuation, Selection Models, Choice Models and Conjoint analysis.

4.1.1. Contingent Valuation

Contingent Valuation is one of the most common methods used to elicit WTP and is especially useful in nonmarket valuation. Contingent valuation is conducted through surveys and uses stated preferences to determine a consumer's willingness to pay for products by defining what a product is and then allowing respondents to state how much they are willing to pay for that good. There are many benefits to this method such as the lower cost and the greater number of participants.

Loureiro and Hine (2002) utilize this method to determine the willingness for Coloradoans to purchase local, organic, and GMO-free potato products. In this article they surveyed 437 supermarket customers in Colorado through person-to-person interviews. Their results indicate that Colorado grown potatoes have a higher premium associated with it than both organic and GMO-free. They were also able to determine that the health-related concerns regarding the consumption of potatoes significantly affect the demand for niche potato markets.

This method had been used successfully and has been widely accepted; however opposition to this method exists. Concerns of lack of income constraints, response bias, and strategic behaviours plague the contingent valuation method (Diamond and Hausman, 1994). Epstein (2002) goes as far as to remark that contingent valuation is a regrettable necessity that, though plagued by failures such as not distinguishing between average and marginal values of willingness to pay, will be used for a long time.

4.1.2. Choice Models

Unlike contingent valuation, choice models allow the respondents to choose between different alternatives instead of comparing responses about different products. In choice models the respondents select one product from some set of differentiated products. This method can be administered in survey form or through an experiment. This method tends to more accurately determine consumer preferences than the other willingness-to-pay methods. And this method is also more labour intensive which results in generally smaller samples and makes the study more costly. This method also only takes into account the preferences with regard to the choices presented. Often a general idea about the willingness-to-pay for a good is not obtained.

Loureiro and Umberger (2007) utilize a choice model to analyze the importance US consumers' place on labelling in terms of food-safety, country-of-origin, and traceability. In this study they sent out 5000 surveys to consumers based on a mailing list purchased from Survey Sampling Inc. and received 632 sample participants. Their results indicate that food safety labelling (such as the USDA certification) provides the strongest premium. By utilizing a choice model a more realistic purchasing scenario is developed and analyzed.

When using choice modelling estimation, some sources of bias that are ignored in general market research surveys (like contingent valuation) need to be controlled for in choice models. Controlling for these biases leads to smaller sample sizes. And with the high costs and smaller sample sizes as a result of the bias adjustment, lower cost alternatives are often used.

4.1.3. Conjoint Analysis

Conjoint analysis is a method commonly used in marketing surveys that utilizes a trade-off method. In conjoint analysis the respondents are given a series of traits and are asked to trade-off traits to reach at their optimal preference. For example, a consumer may trade a lower price for an organic label. See figure 5.1 for an example of a conjoint analysis.

Table 4.1: Conjoint Analysis Example for Conventional and Grass-Fed Dairy

Attributes	Conventional	Respective Score	Grass-Fed	Respective Score
Omega 3:6 ratio	1:5	60	1:1	100
Hormones	Added	0	Not Added	20
Price per Gallon	$3.00	50	$4.25	0
Total Utility		**110**		**120**

This method is very useful at measuring preferences at the individual level and is very realistic as if on a shopping task. One method researchers are using is the choice based conjoint analysis. This method combines both choice modelling and conjoint analysis in that the participants still have to trade-off product attributes, but instead of a matrix format the participants have to choose from a set number of options.

Conjoint analysis surveys are complex to design and if designed poorly can provide over-valued emotional/preference variables and undervalue concrete variables. Others problems include: the inclusion of too many options which cause the respondents to resort to simplification strategies; it is difficult to determine the general value of a product because extrapolating about a set of underlying features is not possible; and overall cost of survey.

Choice based conjoint analysis is a very popular method that helps to alleviate some of the issues with conjoint analysis. Lusk and Parker (2009) utilize choice-based conjoint analysis to determine consumer preferences for fat amounts and types in ground beef. In their experiment they sent out 2000 surveys to households throughout the US. In the survey they developed specific choices that had different package attributes. This allows for both the conjoint (choosing between different attributes) and choice modelling (choosing between options) techniques. The benefit of this method is to have a better understanding of the attributes that affect the willingness to pay while making the survey easy for the respondent.

4.1.4. Selection Models

Selection models are another common method of estimating willingness-to-pay. Selection models allow for self-selected samples. For instance, those who are not willing to pay a higher premium for organics are not randomly selected, instead they must first care about the

connection between health and food consumption. To better utilize this information in the sample, researchers use selection models. Selection models use a two equation model, where the first equation is the selection equation and determines whether the respondent places himself in the group that will pay the premium or not. The second equation is the outcome equation and runs the original model on the selected sample. See figure 5.2 for a graphical illustration of selection models.

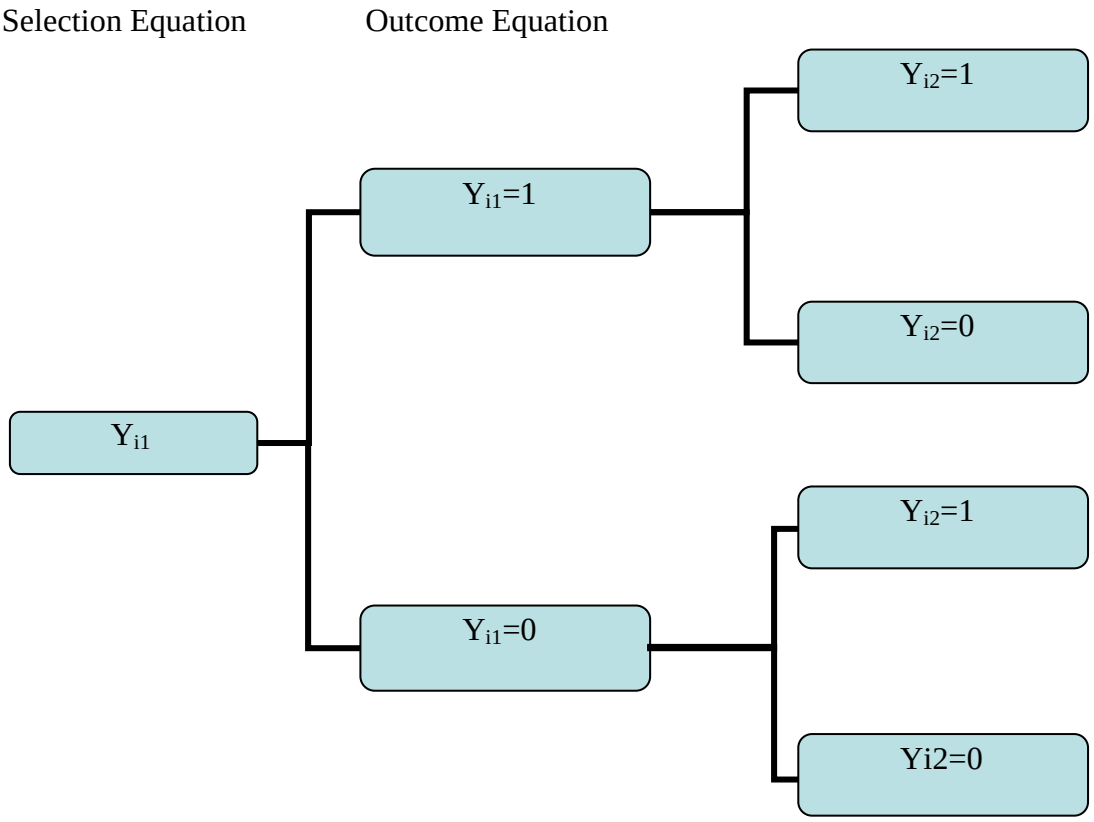


Figure 4.1: Conceptual Selection Model

There are various selection models available, but the most commonly used selection model is the Heckman selection model. Heckman Selection was developed by James Heckman and published 1979, for which he received the Nobel Prize. The Heckman sample selection model is based on two latent dependent variables Y_1 Y_2, such that

Eq 1: $Y_{i1} = \beta' X_i + U_{i1}$

Eq 2: $Y_{i2}^{*} = \gamma' Z_i + U_{i2}$

where equation 1 is the outcome equation and equation 2 is the selection equation. The model is such that Y_2 is a binary variable and Y_1 is continuous. The outcome equation is estimated from the selection equation such that Y_1 is only observable if Y_2 =1. However the z's are observable even in Y_2 =0.

One study by Park and Florkowski (1999) utilized a Heckman selection model to study the impact of advertising on pecan purchasing. 831 surveys were sent out with 430 of those used in the analysis. The results indicate that factors such as nutritional and quality characteristics reinforce purchasing behaviour and repetitive poor quality deters consumers. The Heckman selection model indicates that the expenditures on pecan products increases as total expenditures on nut products increase.

Heckman poses some problems as U_1 and U_2 need to be jointly normal for the model to work. If that assumption fails, the estimator is generally inconsistent and can provide misleading inference in small samples. The Heckman selection model can only be used if the outcome variable is continuous, but if there are two dichotomous dependent variables, and then a censored probit model can be used.

The censored-probit model has a very similar process as the Heckman selection bias model such that the dependent variables are bivariate and will still be analyzed through a selection equation and an outcome equation. A detailed discussion follows below.

4.2. Censored Probit Regression

A basic probit model ($y_i^* = x_i'\beta + \varepsilon_i$ where x_i is a vector of independent variables for observation i, beta is a vector of corresponding parameters, ε_i is the error term, and $\Phi(.)$ denotes the standard normal distribution function) determines the probability p_i that $y_i=1$ such that (Herron, 1999)

Eq. 3: $$pi = P(y_i^* \geq 0) = P(x_i'\beta + \varepsilon_i \geq 0) = P(\varepsilon_i \geq -x_i'\beta) = 1 - \Phi(-x_i'\beta)$$

which assumes that y_i^* denotes an unobserved latent variable with y_i being the observed dichotomous dependent variable. This means that $y_i=1$ if and only if $y_i^* \geq 0$, else $y_i=0$ (Herron, 1999).

The censored probit regression is like running two probit equations that are linked by correlated errors. Like the Heckman bias selection model, the system of equations is,

Eq 4: $$Y_{i3} = \beta' X_i + U_{i1}$$

Eq 5: $$Y_{i4}^* = \gamma' Z_i + U_{i2}$$

except that both Y_{i3} and Y_{i4} are latent dependent variables. It is assumed that $E[u_{i1}]=E[u_{i2}]=0$, $Var(u_{i1})=Var(u_{i2})=1$, and $Cov(u_{i1}, u_{i2})=\rho$ (Tao and Huang, 2006). What this specifically means is that we can completely observe the first probit, but for the second, we have a selected (or censored) sample. And in terms of the final four possible outcomes (see Fig. 5.2), we can observe two ($y_{i1}=1$, $y_{i2}=1$ and $y_{i1}=1$, $y_{i2}=0$) outcomes (Meng and Schmidt, 1985).

While it is possible to fully estimate the first probit separately, it would be inefficient to do so, unless $\rho=0$. If ρ is not equal to 0 then the second probit estimation will have selectivity

bias (Meng and Schmidt). Therefore only joint estimation is considered. The log-likelihood function is (Tao and Huang, 2006)

Eq 6: $$\ln L(\beta_1, \beta_2, \rho) = \sum_{i=1}^{n} \{ y_{i1} y_{i2} (X_{i1}\beta_1, X_{i2}\beta_2, \rho) + y_{i2}(1 - y_{i1}) \ln[\Phi_2(-X_{i1}\beta_1, X_{i2}\beta_2, -\rho)] + (1 - y_{i2}) \ln \Phi(-X_{i2}\beta_2) \}$$

where Φ and Φ_2 are the cumulative standard normal probability distribution and the jointly cumulative standard normal probability distribution, respectively.

For this thesis, the selection and outcome dependent variables were selected from the following questions:

- Selection: *Do you think that there are any negative characteristics associated with beef and dairy cattle production?*
- Outcome: *A positive response to paying a 10%, 20% or 30% premium above $6.00 per lb for beef*

4.3. Post-Estimation

After the initial censored probit model, a post-estimation of the parameters will be simulated to ensure that the precision of the estimates is not overstated. The post-estimation techniques begin right where the estimation finishes. Under standard regularity conditions, it follows that (Herron, 1999)

Eq 7: $(\beta - \hat{\beta}) \overset{a}{\sim} N(\theta, \hat{\Psi})$.

Equation 7 can be interpreted in two manners: (1) where β is fixed and $\tilde{\beta}$ is random with $\tilde{\Sigma}$ reflecting the uncertainty in $\tilde{\beta}$ and (2) where $\tilde{\beta}$ is fixed and β has a distribution which is normal with a mean $\tilde{\beta}$ and covariance matrix $\tilde{\Sigma}$. For this thesis, the later method will be utilized for the post-estimation analysis.

As in calculating fitted values in OLS, the $\tilde{\beta}$ will be substituted for β in equation 3. This substitution will yield the fitted probabilities, $\hat{p}_i$ (Equation 8).

Eq 8: $\hat{p}_i = 1 - \Phi(-\mathbf{x}'_i \hat{\beta})$

This allows us to estimate through simulation the confidence interval for $\hat{p}_i$ which involves drawing random vectors from the normal distribution in equation 7 and then repeatedly computing $\hat{p}_i$. There are three main steps used when computing the confidence interval for $\hat{p}_i$ (Herron, 1999)

1. Estimate $\tilde{\beta}$ and $\tilde{\Sigma}$ using the log likelihood function, seen in equation 6
2. The following steps are repeated N times, with each iteration indexed by I
   a) Draw a vector $\tilde{\beta}$ from a multivariate normal distribution with mean $\tilde{\beta}$ and covariance matrix $\tilde{\Sigma}$
   b) Calculate $\hat{p}_i^l = 1 - \Phi(-\mathbf{x}'_i \tilde{\beta})$
3. Find the confidence interval for $\hat{p}_i^l$ from the percentiles of $\hat{p}_i^l$, from l = 1,…,N

Once the confidence intervals are found, precision estimates for the censored probit estimation can be found.

To reiterate, we are using a censored probit (which is a selection model estimation) to estimate the willingness to pay for environmentally friendly beef. And we are using this model as a consumer must first be concerned about how the production of beef affects the environment before they can be willing to pay a premium for it.

5. Results

This section will describe the results as estimated from the empirical models. The initial discussion is on the censored probit model that was described in chapter 3. After determining those results, the marginal effects and discrete changes will be calculated. Based on these censored probit results, the post-estimation analysis (also described in chapter 3) will be run. All the analyses performed for this thesis were run using the STATA® System. Based on these results we can show that the willingness-to-pay for environmentally sustainable beef is influenced mostly by the consumers' current consumption patterns for niche beef markets like natural and organic markets.

5.1. Censored Probit

For the estimation, we used a censored probit technique. This technique was chosen over other willingness-to-pay methods primarily because of its ability to incorporate dependent latent variables in both the selection and outcome equations. It should be noted that for the dummy *Pay_* variables, the excluded category was *not willing to pay*. The results in table 5.1 show that for the selection equation (which measured if the respondent felt that beef production had negative qualities on the environment) and the outcome equation (which measured the respondent's willingness to pay a premium of 10%, 20%, or 30%) shared two common demographic characteristics (gender and marital status) that were significant. Detailed analysis of the results follows below.

Table 5.1: Results for the Censored Probit Outcome and Selection Equations

	Outcome Equation				**Selection Equation**			
Variable	*Robust Coef.*	*Std. Err.*	*95% Conf. Interval*		*Robust Coef.*	*Std. Err.*	*95% Conf. Interval*	
Constant[a,x]	0.489	0.198	0.101	0.878	-0.478	0.248	-0.964	0.008
Pay_Env[a]	1.104	0.129	0.850	1.357	-	-	-	-
Pay_Green[a]	1.658	0.336	0.998	2.317	-	-	-	-
Pay_Organ[a]	1.023	0.133	0.763	1.283	-	-	-	-
Pay_Natural[a]	1.146	0.179	0.794	1.497	-	-	-	-
Pay_Farmfresh[a]	0.655	0.130	0.401	0.909	-	-	-	-
Income	0.019	0.016	-0.012	0.049				
Urban/Rural[z]	0.017	0.042	-0.065	0.099	-0.060	0.039	-0.136	0.015
Age[d]	-0.005	0.003	-0.011	0.001	-0.001	0.003	-0.006	0.005
Female[c,x]	-0.174	0.096	-0.363	0.015	0.170	0.086	0.001	0.339
Non-White[x]	-0.017	0.112	-0.236	0.202	0.213	0.105	0.008	0.417
Married[a,w]	-0.316	0.092	-0.496	-0.136	0.318	0.086	0.149	0.486
Education[w]	-	-	-	-	0.106	0.037	0.034	0.178
Agricultural Knowledge	-	-	-	-	0.010	0.014	-0.018	0.038
Branded/Labeled Purchases[w]	-	-	-	-	0.100	0.032	0.163	0.037
Env_Prot[w]	-	-	-	-	0.244	0.076	0.094	0.394
Wald Chi Squared Test	198.35[a]							
Uncensored Obs	613							
Wald Independence Test	0.0257							

Note: [a, b, c, d] denotes 99%, 95%, 90%, 85% confidence levels for the outcome equation, respectively
[w, x, y] denotes 99%, 95%, 90% confidence levels for the selection equation, respectively

5.1.1. Selection Estimation

For the selection estimation, demographic variables were most important, with the desire for environmental protection (*Env and Beef Scale*) having a significant effect. These results indicate that those consumers who are concerned about the future of the environment and already purchase branded or labeled beef products are more inclined to feel that the production of beef and dairy negatively impacts the environment.

Another significant result is that the more education the respondent had the more likely they were to respond positively to the selection criteria. The three remaining significant results are all demographic characteristics, with two of them also being significant in the outcome estimation. The demographic characteristic not shared is the race of the respondent. For this analysis, the race categories were consolidated into white and non-white due to the poor distribution of the sample. As other studies have found, the results indicate that those respondents from non-white races were more likely to feel the environment was harmed by cattle production.

The remaining two demographic results are gender and marital status. These demographics indicate that respondents who are female and married were more likely to think that cattle production negatively impacts the environment. This is an interesting result as it can help pro-sustainability awareness groups understand who to target information to. Interestingly enough, these results have opposite results in the outcome estimation, which is discussed next.

5.1.2. Outcome Estimation

Significant variables in the outcome estimation are the self-reported willingness of the respondents to pay a premium for a niche beef product. It did not matter which niche market the

respondent was willing to pay for as it indicated that they would also be willing to pay for environmentally friendly beef, which means that these niche markets are all drawing from the same consumer base. As more niche beef markets develop, the specialty beef markets become more stratified and there will be fewer consumers per niche market.

Other significant variables for the outcome estimation are age, gender, and marital status. As with other niche market analysis, the results indicated that younger consumers were more willing to pay a premium for environmentally friendly beef. These results indicate that males were more likely than females to pay a premium, which is contradictory to some current organic literature. As single respondents were also more likely to pay a premium which is understandable as single consumers generally tend to have more disposable income than married consumers, ceteris paribus.

While the information garnered from the censored probit model is interesting, further information can be gleaned from an analysis of the marginal effects and the discrete changes, which are discussed in the next two sections. Following the discussion on discrete changes, the results from post-estimation techniques discussed in chapter 4.3 will be analyzed.

5.2. Directional Effects

Directional effects can be measured via two methods: marginal effects and discrete changes. Directional effects are very useful because they can provide more explicit directional information to the parameter estimates. Marginal effects are popular due to their good approximation of the change in y by the unit change in x, but they work best for linear models. Another option is to use discrete change with binary models (Long and Freese, 2006). This is the best option for binary models as these models are naturally non-linear and marginal effects

are difficult to translate if the outcome is binary. Secondly as most of the independent variables are discrete, marginal effects are an inappropriate measure of change.

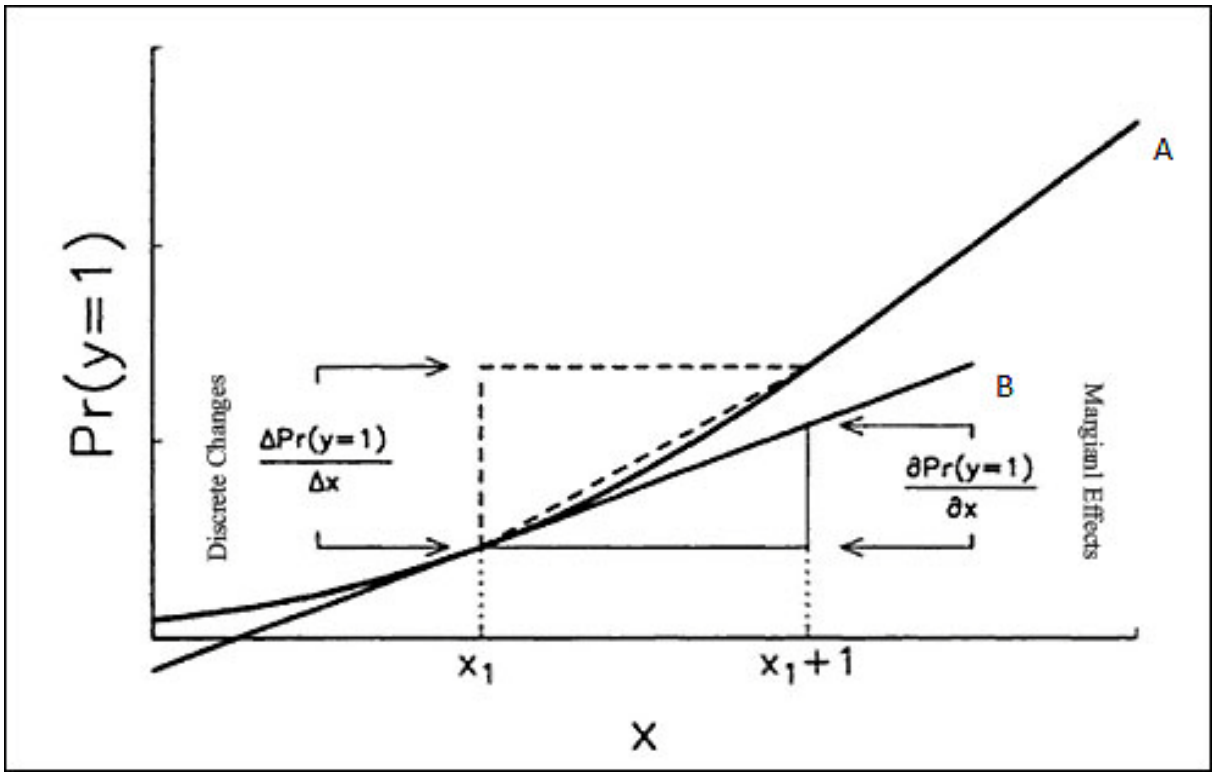


Figure 5.1: Marginal Change Compared with Discrete Change

Figure 5.1 shows the difference between a marginal effect and a discrete change. In the diagram it can be seen that if the change is linear, the marginal effect will approximate the change effectively. It can also be seen that if the change is linear the discrete change will also approximate the change similar to the marginal effect. If the change is not linear (as is seen in line A), the change is best approximated by the discrete change. Therefore, the marginal effect is not equal to the discrete change.

The STATA® System is very useful in estimating directional changes as it automatically determines the appropriate directional method. This means that if the independent variable is a

continuous variable, the marginal effect is calculated. On the other hand, if the variable is discrete, then the discrete change is calculated. A brief description is provided for both methods below, followed by the directional results.

5.2.1. Marginal Effects

Marginal effects generally apply towards continuous variables. While estimation for discrete variables can be done using marginal effects, the results are not accurate (see figure 5.1). A binary choice model predicted probability is given by (Anderson and Newell, 2003)

Eq 9: $$E[y \mid \boldsymbol{x}] = F(\boldsymbol{\beta}' \boldsymbol{x})$$

where y is a choice variable, **x** is a vector of explanatory variables, **β** is a vector of parameter estimates, and *F* is an assumed cumulative distribution function. When *F* is the standard normal distribution (Φ) it produces the probit model. For the probit model *f* is given by ◄, the standard normal density function, where (Anderson and Newell, 2003)

Eq 10: $$\phi(\boldsymbol{\beta}' \boldsymbol{x}) = \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{1}{2} (\boldsymbol{\beta}' \boldsymbol{x})^2 \right) .$$

The density function $f(\boldsymbol{\beta}' \boldsymbol{x})$ can be thought of as a scale factor that translates raw parameter estimates into marginal effects. For this thesis the marginal effects were calculated using the probit regression routine in STATA®. The marginal effects, using the probability defined in equation 3, are defined below (Anderson and Newell, 2003):

Eq 11: $$\frac{\partial \Pr(y_{it}^* = 1 \mid \mathbf{x})}{\partial x} = \phi(\beta' x)\beta$$

Since the dependent variable in the outcome equation is binary, the marginal effects are not able to be interpreted as they would be in linear regressions.

5.2.2. Discrete Changes

The discrete change is preferred for binary variables and since this thesis uses a probit model. To define discrete change, two qualities must exist (Long and Freese, 2006):

1. $\Pr(y = 1 \mid \mathbf{x}, x_k)$ - this is the probability that an event, *y*, will occur given **x**; noting in particular the value of x_k
2. $\Pr(y = 1 \mid \mathbf{x}, x_k + \delta)$ -this is the probability that the event, y, will occur when x_k increases by some amount δ.

Once these qualities are met then a change of δ in x_k can be calculated as equation 12 and which

Eq 12: $$\frac{\Delta \Pr(y = 1 \mid \mathbf{x})}{\Delta x_k} = \Pr(y = 1 \mid \mathbf{x}, x_k + \delta) - \Pr(y = 1 \mid \mathbf{x}, x_k)$$

can be interpreted as a change in variable x_k from x_k to x_k+ δ leading to the predicated probability of an event change, such that the predicted probability of an event changes, *ceteris paribus*, by,

Eq 13: $$\frac{\{\Pr(y = 1 \mid \mathbf{x})}{\Delta x_k}.$$

5.2.3. Directional Effects Results

The directional effects results for the environmentally sustainable beef are shown in table 5.2. It can be seen from these results that the same outcome variables that were significant in the censored probit estimation, are still significant. These results also show the correct directional effects for the model, which are once again the same as the censored probit estimation. These

results also indicate the magnitude of the significance as compared to the other variables in the estimation.

Table 5.2: Directional Effects Results for the Outcome Equation

Variable	*Marginal Estimate*	*Std. Err.*	*95% Conf. Interval*	
Pay_Env[a*]	0.2475	0.0209	11.8700	0.0000
Pay_Green[a*]	0.2337	0.0166	14.0600	0.0000
Pay_Organ[a*]	0.2281	0.0214	10.6700	0.0000
Pay_Natural[a*]	0.2188	0.0198	11.0700	0.0000
Pay_Farmfresh[a*]	0.1583	0.0242	6.5400	0.0000
Urban/Rural	0.0050	0.0124	0.4100	0.6840
Age[d]	-0.0014	0.0009	-1.5800	0.1150
Income	0.0055	0.0046	1.2100	0.2270
Female[c*]	-0.0504	0.0275	-1.8300	0.0670
Non-White[*]	-0.0050	0.0334	-0.1500	0.8810
Married[a*]	-0.0898	0.0256	-3.5100	0.0000
Pr(Outcome=1)	0.7799			

Note: [a, b, c, d] denotes 99%, 95%, 90%, 85% confidence levels for the outcome equation, respectively
[*] denotes dy/dx is for discrete change of dummy variable from 0 to 1

We once again can see that the *pay_* variables have the greatest impact on the respondents' willingness to pay for environmentally friendly beef. While all of the *pay_* categories are significant, those who would choose to buy *pay_farmfresh* over the other *pay_* variables would be the less likely to purchase sustainable beef. This is probably true because

consumers who wanted to buy farm fresh items would be more concerned with the location of the farm/ranch than with the characteristics of the product.

Surprisingly, the other significant variables are not as influential as the *pay_* variables. One would expect for the demographic variables (age, gender, and marital status) to have a stronger influence on the willingness to pay based on the previous research done on organic and niche market. And while these variables are significant, they are not as strong of a predictor as the *pay_* variables. This indicates that purchase behaviors are more telling than demographics. But this also means that those who are willing to buy niche market products are also more likely to be interested in environmentally friendly beef than consumers who never purchase niche market goods. And unless the later consumers can be convinced to purchase niche market goods, environmentally friendly beef will be competing with organic beef, grass-fed beef, and other niche beef markets.

The following results reveal how well the post-estimation performed through the results. While the modeling results provide central results and test the validity of the model, through the Wald Chi Square test, it is important to also to test the model performance when it is simulated through the post-estimation technique developed in section 4.3.

5.3. Post-Estimation

In section 4.3 the post-estimation techniques are discussed including the motivation and the theory. Also included in section 4.3 are the following the 3 steps,

1. Estimate $\hat{\beta}$ and $\hat{\Sigma}$ using the log likelihood function, seen in equation 6

2. The following steps are repeated N times, with each iteration indexed by I

   a) Draw a vector $\tilde{\beta}$ from a multivariate normal distribution with mean $\hat{\beta}$ and covariance matrix $\hat{\Sigma}$

   b) Calculate $\hat{p}_i^l = 1 - \Phi(-\mathbf{x}'_i \tilde{\beta})$

3. Find the confidence interval for $\hat{p}_i^l$ from the percentiles of $\hat{p}_i^l$, from l = 1,…,N

when N is set at 10,000 iterations we get the post-estimation results, as shown in table 5.3. To calculate these results, the 864 observations (censored and uncensored) from the censored probit model, its resulting parameter estimates, and resulting covariance matrix are set as the base for the simulations. The 10,000 observations are then drawn from a normal distribution and fit to the regression model found from the censored probit estimation.

Table 5.3: Post-Estimation Results for the probability of the outcome

Variable	*Obs*	*Percentile*	*Centile*	*Binom. Interp. [95% Interval]*	
p_outcome	864	2.5	0.98035	0.97314	0.98336
		50	0.99852	0.99833	0.99869
		97.5	0.99977	0.99973	0.99979

The results in table 5.3 are read as: on average (50 percentile) the regression model predicts about 99.85% of the outcomes correctly with a confidence interval of 99.83% to 99.87%. This model predicts at even the 25th percentile at 97%. And by the 97.5th percentile, the regression model has predicted about 99.98% of the outcomes correctly. These results are relatively good

considering the use of survey data. With these post-estimation results, model estimation, and marginal effects results we can feel confident in the suitability of the model and the predictability of the regression equation.

6. Summary & Conclusions

6.1. Conclusions

Cattle producers in Georgia have been experiencing difficult economic times. Beef Demand has been on the decline since the mid 1970's due to a variety of factors, ranging from increased competition to changing consumer preferences; meanwhile production costs have been on the rise. In order to mitigate these economic issues, cattle producers have been searching for alternative ways to improve profits. One alternative cattle producers have been exploring is the use of branding and labeling. With the use of brands and labels, cattle producers can address consumer preferences to make their products more attractive to consumers, thereby increasing the premium they can charge the consumer.

In this study, a 2008 telephone survey was conducted on potential consumers about their purchasing behavior, preferences, and attitudes towards the environment and the cattle industry. These results were then analyzed through the use of a statistical method called a censored probit analysis. This survey was conducted on the state level, throughout the state of Georgia in a diverse range of metropolitan statistical areas (M.S.A.). The objective of this research was to determine the demand and willingness to pay for beef products that are environmentally friendly.

Survey results showed that 93% of those surveyed were beef consumers. Of those beef consumers, 53% have a stated willingness to pay for environmentally friendly beef. While over half of those beef consumers surveyed are willing to purchase environmentally friendly beef, 42% of those surveyed felt they knew little about cattle production practices, while 36% felt they are well informed of cattle production practices, and 18.62% were somewhere in between.

To test the validity of the survey results, a censored probit model was estimated. Since there was a need for a selection technique and the two dependant variables were both binary, the censored probit technique was utilized. Since only those consumers who felt concern about the impact beef has on the environment would be potentially interested in paying a premium on environmentally friendly beef, environmental concern about beef production (question 4) was set as the selection variable and the outcome variable was the willingness to pay, broken into 3 premium categories (questions 11, 12, and 13). Once the censored probit estimation was run, directional effects for the outcome equation were calculated to get more information about the magnitude of the variable on the willingness to pay.

Some of the interesting results for the selection equation are that education, previous history of purchasing branded/labeled goods, and how concerned they were about the environment were significant. The education variable is important since it indicates that those who progress into higher levels of education may feel they are more aware about the impact of beef production. Perhaps, this is because higher levels of education provide people with more exposure to information regarding the environment. This also ties into the environmental concern variable as those who care about the environment are those who think themselves more aware of beefs' production impact on the environment.

The outcome equation also had a few interesting results. The most interesting result was that the *pay_* variables had the greatest impact on the willingness to pay, more than the demographic characteristics of the respondents. This means that those who already purchase from niche beef markets are more likely to buy environmentally friendly beef than those who currently do not purchase from niche beef markets. From these results it is inferred that the best

way to increase the market potential of environmentally friendly beef is to educate those in the censored population about the effects of beef production on the environment.

To ensure accuracy of these results post-estimation techniques were utilized. The post estimation results indicate that at the 97.5 percentile of 10,000 simulations, the estimated model was able to predict the results 99.98% of the time. This indicates that results are relatively robust and we can feel confident about the model predictability.

6.2. Limitations and Future Research

Telephone surveys only provide insight into the potential profile of consumers who exhibit willingness-to-pay for niche markets. Only through test marketing is it possible to obtain an actual consumer profile for an individual who is willing to pay for environmentally friendly beef products. Test marketing environmentally friendly beef will provide actual consumer profiles, as well as a better understanding of actual consumer premium payment patterns. Since the quality of the product is a significant factor in beef purchasing decisions, a taste test would serve to reinforce in the mind of consumers that environmentally friendly beef is a quality product with environmentally friendly attributes. Since consumers were not presented with a physical product in this survey, consumer responses tend to be over or under inflated in comparison to actual exhibited behavior. Also this survey cannot be expanded to the US since it was only conducted in Georgia. A more in-depth survey could analyze the whole US and then determine the national willingness to pay.

Since the WTP amounts were skewed, we were unable to run a well-fitting ordered probit estimation. With more in depth survey, an ordered probit could be run and better information

about the levels consumers were willing to pay would be clear. Also by producing the product and performing a test market, the willingness to pay can be better observed through actual purchases. However, this does require a beef producer to create the environmentally friendly beef product, which may have costs involved. Having the option to purchase the actual product in a market setting may give more realistic prices than from the survey. The surveyors could also set up a taste panel and test how the flavors or cuts of environmentally friendly beef compare to other niche beef products as well as conventional beef. The industry may want to start their test marketing of an environmentally friendly beef product, focusing on those groups who have the highest mean WTP such as the group of participants who already purchase niche beef products. They may also want to study how improving the education of consumers on the effects of beef production affects the consumers' willingness to pay. In addition, the survey data could be expanded to include what is the best way to label or capture the attribute consumer desire.

However, if a follow-up survey were conducted instead or addition to the test marketing, it should include a price-quantity question. The particular question could ask the respondent how much of the environmentally friendly beef product they would be willing to purchase at their stated price. This would allow for a hypothetical demand curve to be formatted. Such a survey could also be phrased to determine how many times a week/month would one purchase environmentally friendly beef products to better help producers understand their consumers' potential purchasing behavior.

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Appendix: Survey Instrument

Environmentally Friendly (Sustainable Agriculture) Beef/Milk Survey

January 2008

Hi, my name is _____, I am calling from the University of Georgia Research Center for the Center for Agribusiness and Economic Development at the University. We are conducting a short survey to learn more about Georgian's concerns towards food, water and air quality. Your participation is vital to the success of this research and will help in the efforts to produce better quality milk and beef products. Your household was randomly selected to participate in the study, and I'd like to interview a member of your household. Would you be willing to help us out by answering some questions?

[INTERVIEWER: THE SURVEY SHOULD LAST ABOUT 10-12 MINUTES]

In order for the results of the survey to be representative of the population, I need to speak to the adult aged 18 or older in the household who last celebrated a birthday. Would that be you?

1. Yes
2. No [WHEN WOULD BE A GOOD TIME TO REACH THAT PERSON?]

   [REINTRODUCE YOURSELF AND THE STUDY OR ARRANGE TIME FOR CALL-BACK AND GET THE RESPONDENT'S FIRST NAME]

Great! Before I start, I need to let you know that any information you provide for me will be kept strictly confidential and your participation is completely voluntary. You can skip any questions you don't want to answer, and you may discontinue participation at any time. Although there is no direct benefit to you for participating in this study, no risk or discomfort is anticipated from your participation. Also, my supervisor may listen to part of the interview for quality control purposes.

Q1 - Do you eat beef or drink milk?

1. Both [SKIP TO Q2X1]
2. Neither
3. Drink milk but do not eat beef
4. Eat Beef but do not drink milk

9. Ref/DK/NA [SKIP TO Q2X1]

Q1a -From the following list, could you please state which is the reason for not consuming beef or milk?

[INTERVIEWER NOTE: READ RESPONSES, CHOOSE ONLY ONE]

1. Allergies
2. Culture or religion
3. Health concerns
4. Other [Specify] _____

Q2- Protecting the environment has become an important topic. Please rate your concern for the following environmental categories on a scale of 0 to 10, 0 being unconcerned and 10 being very concerned:

Q2.1. Air pollution

0. Not at all concerned
1. . . .
2. . . .
3. . . .
4. . . .
5. . . .
6. . . .
7. . . .
8. . . .
9. . . .
10. Very concerned

11. Ref/DK/NA

Q2.2 Water pollution

0. Not at all concerned
1. . . .
2. . . .
3. . . .
4. . . .
5. . . .
6. . . .
7. . . .
8. . . .
9. . . .

10. Very concerned

11. Ref/DK/NA

Q2.3 Land quality

0. Not at all concerned
1. . . .
2. . . .
3. . . .
4. . . .
5. . . .
6. . . .
7. . . .
8. . . .
9. . . .
10. Very concerned

11. Ref/DK/NA

Q3- Could you please rate, on a scale from 0 to10, where 0 is uninformed and 10 is very knowledgeable, how informed you are about agricultural production practices?

0. Uninformed
1. . . .
2. . . .
3. . . .
4. . . .
5. . . .
6. . . .
7. . . .
8. . . .
9. . . .
10. Very knowledgeable
11. Ref/DK/NA

Q4 - Do you think that there are any negative characteristics associated with beef and dairy cattle production?

1. Yes
2. No [SKIP TO Q5]

9. Ref/DK/NA [SKIP TO Q5]

Q4a - Could you please state some of the negative characteristics you feel are associated with beef and dairy cattle production?

[INTERVIEWER NOTE: Please do not read any of the selections below to the respondent. Please match their response as closely as possible to one of the categories below. CHOOSE ONLY ONE RESPONSE]

1. Environmental (ex. negatively affects air and water quality, over grazing, and harms the land by erosion)
2. Resource consumption (ex. competition for resources, such as high water consumption by dairy farms, animal feed in the form of corn, etc)
3. Aesthetics (ex. cattle farms are ugly and degrade the surrounding scenic views)
4. Cloned Meats (ex. use of cloned animal stock)
5. Use of hormones and antibiotics (enhance animal growth)
6. Local economy (jobs, local sales, local taxes, subsidies)
7. Animal Feed (bone-meal)
8. Humane animal treatment
9. Disease and sickness (BSE/Mad Cow, Foot and Mouth disease)
10.Unsure
11.Other _____
12.Ref/DK/NA

Q5 - On a scale of 0 to 10, 0 being no impact and 10 being the worst impact, please rate the impact of beef and dairy cattle farms on the environment?

0. No impact [SKIP TO DEFINITION]
1. . . .
2. . .
3. . .
4. . .
5. . .
6 . .
7. . .
8. . .
9. .
10. Worst impact
11. Ref/DK/NA [SKIP TO DEFINITION]

Q6 - Please rank the following on a scale of 0 to 10, 0 being no impact, and 10 being the worst impact on how much you think that beef and dairy cattle farms negatively impact the environment?

Q6.1. Water quality

0. No impact
1. . . .
2. . . .
3. . . .
4. . . .
5. . . .
6. . . .
7. . . .
8. . . .
9. . . .
10. Worst impact
11. Ref/DK/NA

Q6.2. Air quality

0. No impact
1. . . .
2. . . .
3. . . .
4. . . .
5. . . .
6. . . .
7. . . .
8. . . .
9. . . .
10. Worst impact
11. Ref/DK/NA

Q6.3. Land quality

0. No impact
1. . . .
2. . . .
3. . . .
4. . . .
5. . . .
6. . . .
7. . . .
8. . . .
9. . . .
10. Worst impact

11. Ref/DK/NA

DEFINITION
Some of the following questions deal with the idea of being 'environmentally friendly agriculture'. Environmentally friendly agriculture in this survey is defined as the protection from contamination of ground water and underground water tables by farm production runoff. Land management is also an important part of 'environmentally friendly' in its goal to reduce soil erosion. And finally the reduction of air pollutants to keep a higher level of clean air is the third part of environmentally friendly agriculture.

Q7 - Do you purchase beef in the form of uncooked cuts such as steaks, roasts, ground beef, etc.?

1. Yes
2. No [SKIP TO Q14]

9. Ref/DK/NA [SKIP TO Q14]

Q8 - On average, how many pounds of beef do you purchase in a month?

_____ Pounds

99 - Ref/DK/NA

[RANGE: 1 - 99]

Q9 - Do you purchase branded cattle products that advertise qualities beyond taste and tenderness, for example environmental protection, organic, grass fed beef, humane animal treatment, etc or other such similar labels?

1. Yes
2. No [SKIP TO Q10]

9. Ref/DK/NA [SKIP TO Q10]

Q9a - What type of products do you purchase? Would it be . . .?

[INTERVIEWER NOTE: READ RESPONSES. CHOOSE ALL THAT ARE APPROPRIATE]

1. Grass-fed Beef
2. Organic Beef
3. Natural Beef

4. Predator Friendly Beef
5. Animal Compassionate
6. Not listed or other _____
7. Ref/DK/NA
8. Exit

Q10 - Would you be willing to purchase beef raised in a manner consistent with management practices that reduce air, water, or soil contamination if it cost more than what you currently pay for beef?

1. Yes
2. No [SKIP TO Q14]

9. Ref/DK/NA [SKIP TO Q14]

Q10a - Please select which of the following qualities of the environment you would consider most important in your purchase decisions?

1. Water quality
2. Air quality
3. Land quality

9. Ref/DK/NA

Q11 - If you currently pay $6.00 per pound for beef, would you be willing to pay 30% more or $7.80 to purchase that beef if it was raised in a manner that promotes environmentally friendly agriculture?

1. Yes [SKIP TO Q14]
2. No

9. Ref/DK/NA [SKIP TO Q14]

Q12 - If you currently pay $6.00 per pound for beef, would you be willing to pay 20% more or $7.20 to purchase that beef if it was raised in a manner that promotes environmentally friendly agriculture?

1. Yes [SKIP TO Q14]
2. No

9. Ref/DK/NA [SKIP TO Q14]

Q13 - If you currently pay $6.00 per pound for beef, would you be willing to pay 10% more or $6.60 to purchase that beef if it was raised in a manner that promotes environmentally friendly agriculture?

1. Yes
2. No

9. Ref/DK/NA

Q14 - On average, how many gallons of milk do you purchase in a month?

_____ Gallons

99 - Ref/DK/NA

[RANGE: 0 - 99]

Q15 - Would you be willing to purchase milk raised in a manner consistent with management practices that reduce air, water, or soil contamination if it cost more than what you currently pay for milk?

1. Yes
2. No [SKIP TO Q19]

9. Ref/DK/NA [SKIP TO Q19]

Q15a - Please select which of the following qualities of the environment you would consider most important in your purchase decisions?

1. Water quality
2. Air quality
3. Land quality

9. Ref/DK/NA

Q16 - If you currently pay $4.00 per gallon for milk, would you be willing to pay 50% more or $6.00 to purchase a gallon if it was raised in a manner that promotes environmentally friendly agriculture?

1. Yes [SKIP TO Q19]
2. No

9. Ref/DK/NA[SKIP TO Q19]

Q17 - If you currently pay $4.00 per gallon for milk, would you be willing to

pay 25% more or $5.00 to purchase a gallon if it was raised in a manner that promotes environmentally friendly agriculture?

1. Yes [SKIP TO Q19]
2. No

9. Ref/DK/NA [SKIP TO Q19]

Q18 - If you currently pay $4.00 per gallon for milk, would you be willing to pay 10% more or $4.40 to purchase a gallon if it was raised in a manner that promotes environmentally friendly agriculture?

1. Yes
2. No

9. Ref/DK/NA

Q19 - Which of the following phrases, best describes beef or milk products that you would pay more for:

1. Environmentally Friendly
2. Green
3. Organic
4. Natural
5. Sustainable
6. Farm Fresh
7. Eco friendly
8. Will not pay more for milk or beef
9. Ref/DK/NA

Q20 - Which of the following best describes where you live?

1. Major city (population of 50,000 people or more)
2. Small city (population 5,000 to 49,000)
3. Small town (population less than 5,000)
4. Rural area or farm

9. Ref/DK/NA

Q21 - Gender (Ask only if unsure)

1. Male
2. Female

9. Ref/DK/NA

Q22 - What race do you consider yourself to be?

1. African American
2. American Indian
3. Asian
4. Caucasian
5. Hispanic
6. Multi-racial or other (Specify_____)

9. Ref/DK/NA

Q23 - What is your age?

_____ years

99 - Ref/DK/NA

[RANGE: 18 - 99]

Q24 - What is the highest education level you have completed?

1. Less than high school
2. High school graduate
3. Some college/technical school
4. College graduate
5. Graduate or professional degree

9. Ref/DK/NA

Q25 - What is your marital status?

1. Single (never married)
2. Married
3. Divorced
4. Widowed

9. Ref/DK/NA

Q26 - How many children under the age of 18 years old live in your household?

_____ Children

99 - Ref/DK/NA

[RANGE: 0 - 99]

Q27 - How many adults of 18 years old or older live in your household, please including yourself?

_____ Adults

99 - Ref/DK/NA

[RANGE: 1 - 99]

Q28 - Which of the following ranges describes your total household income before taxes?

1. Under $25,000
2. $25,000 - $49,999
3. $50,000 - $74,999
4. $75,000 - $99,999
5. $100,000 - $149,999
6. $150,000 - $199,999
7. $200,000 - $249,999
8. $250,000 or more
9. Ref/DK/NA

Q29 - Are you a member of, or do you contribute to the following organizations?

[INTERVIEWER NOTE: READ RESPONSES, CHOOSE ALL THAT APPLY]

[PROGRAMMER NOTE: YES, NO TOGGLE]

1. Sierra Club
2. Green Peace
3. National Audubon Society
4. World Wildlife Fund
5. Ref/DK/NA
6. Exit

Q:END

Thank you for your time. That completes the survey. You have been very helpful. You can call Dr. James Bason at the University of Georgia at 706-542-9082 with any questions about this research study. All research at the University of Georgia is governed by an Institutional Review Board to protect your rights as a participant. If you have any questions about your rights as a research participant you may contact the Institutional Review Board at 706-542-3199 or email at IRB@uga.edu.

c:IMPORT FIPS
c:IMPORT MSA