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A unique perspective on the demand for livestock product attributes

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A UNIQUE PERSPECTIVE ON THE DEMAND FOR LIVESTOCK PRODUCT

ATTRIBUTES

A Dissertation

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of

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Elizabeth S. Byrd

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Is approved by the final examining committee:

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Approved by Major Professor(s): Nicole J. Olynk Widmar

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        Head of the Departmental Graduate Program   Date

For my Dad.

ACKNOWLEDGEMENTS

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ABSTRACT

Byrd, Elizabeth S. Ph.D., Purdue University, December 2016. A Unique Perspective on the Demand for Livestock Product Attributes. Major Professor: Nicole J. Olynk Widmar.

Consumers are increasingly concerned about the social and environmental impacts of the foods they purchase. Both choice experiments and best-worst scaling (BWS) methodology have been used to elicit consumer willingness to pay (WTP) for food attributes and the relative importance of food attributes to consumers. The dissertation consists of four essays. Chapter 2 presents a formal law review article exploring the laws associated with wild game harvest, consumption, and inspections. The remaining three essays (Chapters 3-5) each address an extension or application of choice experiment and/or BWS methodology focused on credence attributes of meat products.

Two online surveys were used to collect choice experiment and best-worst data. Two different presentations of a BWS question were implemented. The two presentations yielded statistically different preference shares and rankings of attributes. Next, consumer WTP for local pork chops and chicken breasts was explored. Interestingly, consumers were willing to pay additional amounts for "local" chicken breasts but were unwilling to pay more "local" pork chops. Finally, the results of both BWS and choice experiments between a sample of outdoor enthusiasts and a nationally representative sample were compared.

CHAPTER 1. INTRODUCTION

1.1 <u>Introduction</u>

There is a substantial recent literature surrounding consumer preferences for meat attributes, including credence attributes such as animal welfare practices and the social and environmental impacts of food production (i.e., Tonsor et al., 2005; Lagerkvist, Carlsson and Viske, 2006; Carlsson, Frykblom, and Lagerkvist, 2007; Chang and Lusk 2009; Olynk, Wolf, and Tonsor, 2009; Olynk, Tonsor, and Wolf, 2010; Briggeman and Lusk, 2010; Lusk and Norwood, 2011; McKendree et al., 2013;). Past research has uncovered linkages in consumers' minds between the treatment and handling of livestock animals and the safety of the meat and dairy products they produce (Wolf, Tonsor and Olynk, 2011). Several studies have focused on consumer willingness to pay (WTP) for animal welfare attributes in food animal production such as egg-laying hens (Lusk and Norwood, 2011), pigs (Tonsor, Olynk, and Wolf, 2009), dairy cows (Olynk and Ortega, 2013), chickens raised for meat (Moran and McVittie, 2008), and beef cattle (Dickinson and Bailey, 2002). Reviewing the literature on the role gender plays in human-animal interactions, Herzog (2007) found women were more sensitive to animal welfare issues, were less likely to support research on animals, and were less likely to hunt than men. Likewise, females more frequently report a higher level of concern for animal welfare than males (McKendree, Croney and Widmar, 2014a). Other studies have focused on

religion and political affiliation (Deemer and Laboa, 2011). Taylor and Signal (2009) point out that attitudes towards different categories of animals could be useful in WTP studies for farm animal welfare. In that study, respondents classified animals as pet, pest, or profit/utility animals (Taylor and Signal, 2009). Recently pet ownership and concern for domestic food animal welfare have been linked in a national sample of US residents (McKendree, 2013).

On the other hand, wild animals have long been studied through the lens of natural resource economics. Studies have considered the public's acceptance of wildlife management techniques, including lethal control methods (Koval and Mertig, 2004; Martinez-Espineira, 2007). However, this public perception of wild animals has been largely absent from consumer analyses. There has been little focus on the linkages between perceptions of wild animals to consumers' demand for meat and meat attributes. This research seeks to investigate possible linkages between perceptions of wild animals and perceptions of hunting wild animals to consumer demand for credence attributes of meats.

Hunting has been the subject of several recent national and regional headlines. Most notably a Time Magazine cover story in December of 2013, called attention to the management of wild species via hunting (Von Drehle, 2013). A teenage hunter made national headlines when a public outcry resulted in her hunting photos being removed from Facebook (Perez, 2013). In Maine, a Humane Society of the United States (HSUS) backed ballot initiative proposes to stop the use of dogs, traps, and bait in black bear hunts (Baker, 2014). Beyond press coverage, popular television shows such as the Discovery Channel's Alaska: The Last Frontier and A&E's Duck Dynasty bring viewers

closer to hunting and fishing activities. In fact, there are 13.7 million hunters and 33.1 million anglers in the US. According to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, 14% of US residents 16 and older participated in fishing and 6% of US residents of the same age category participate in hunting (US Dept. of the Interior et al., 2011).[1]

Yet, according to the 2012 Census of Agriculture, there are only 3.2 million farmers operating farms (USDA, 2014). In the sense that sportsmen and women are potential consumers of the wild game and fish they harvest, they are more connected with that food than the average American. Therefore, sportsmen and women may also be viewed as producers. Significant differences can occur between producer's perceptions of animal welfare and handling and consumer's perceptions (Tonsor, Wolf, and McKendree, 2014). With more people fishing and hunting than farming, outdoor enthusiasts are an important link in understanding consumer sentiments towards animal welfare and meat demand. Furthermore, some traditionally "wild" species are being farmed and ranched like livestock, making their meat accessible to the general public, regardless of their participation in hunting. For example, farms that raise deer can produce breeding stock (much like purebred livestock), operate trophy hunting operations, produce animals to be slaughtered for venison, and/or produce deer co-products such as scent products, hides, velvet, or shed antlers (Anderson, Frosch, and Outlaw, 2007). The demand for bison meat has been increasing due to consumer demand for healthier meats; bison meat has fewer calories, less fat, and lower cholesterol than a comparable amount of turkey, chicken or

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[1] The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation is conducted by the U.S. Census Bureau to determine the numbers of people participating in hunting, fishing, and wildlife watching and how much they spend on those activities.

beef (Greaser, Marrow, Harper, 1995). A review of the regulatory schemes reveals wild

game meats follow a very different path to market than domestic livestock (Byrd,

Widmar, and Lee, 2015). This complicates matters for both the food safety inspection

system and individual producers.

There is a lack of applied research directed at the contemporary intersection of

wild species management and consumer demand for meat attributes. A multi-pronged

approach will be employed, which will integrate legal and regulatory expertise. Data

from two national samples of respondents will be employed to explore the relative

importance of meat purchasing attributes and willingness to pay for production process

attributes.

1.2 Studying Consumer Demand

Traditional microeconomics teaches one receives utility from consuming goods.

However, choice experiment literature relies on the notion that goods are a collection of

characteristics or attributes (Lancaster, 1966); a good is made up of more than one

attribute and the same attribute can be possessed by more than one good. Consumers

choose a utility maximizing bundle of these attributes (Lancaster, 1966). For example,

one of the choice experiments utilized in this research presents survey respondents with a

boneless, skinless chicken breast with attributes of price, location, pasture access,

antibiotic use, and certification entity.

Choice experiments are designed to replicate real world purchasing decisions

consumers may face when they buy products in a store (Olynk and Ortega, 2013).

Respondents are presented with products with different attributes and asked to select the

product they would purchase or opt not to purchase (Olynk and Ortega, 2013). For this research, respondents were randomly assigned to see choice experiments for either pork chops or chicken breasts. Consumer WTP was estimated for three attributes verified by three different entities (retailer, pork/poultry industry, USDA).

Best-worst choice experiments were also used to force respondents to make tradeoffs amongst attributes (Cummins et al., 2016). In best-worst questions, respondents are asked to choose the most (best) and least (worst) important attributes to them when purchasing a product. Researchers can calculate preference shares for the entire sample and for each individual to gauge how important various attributes are in making purchasing decisions. Best-worst scaling is based on the work of Rokeach (1973) who first defined values and value systems in the context of his work in social psychology. He identified eighteen terminal values that described desirable end states of existence and eighteen instrumental values that describe preferable modes of behavior through which the terminal values were achieved (Rokeach, 1973). The terminal values represent the goals a person may want to achieve and the instrumental values represent the behaviors or ways in which a person may achieve a terminal value.

Best-worst scaling (BWS) has been used extensively to explore the relative importance of public concerns (Finn and Louviere, 1992), health economics (Louviere and Flynn, 2010), and environmental research (Loureiro and Arcos, 2012; Rudd, 2011). In terms of the literature in agricultural economics, BWS has been used to explore the importance of organic food attributes (Lusk and Briggeman, 2009), the most important ground beef attributes (Lusk and Parker, 2009), policy preferences of dairy farmers (Wolf and Tonsor, 2013), and holiday turkey attributes (Widmar et al., 2016).

1.3 Dissertation Layout

Chapter 2 is a formal law review published in the Drake Journal of Agricultural Law[2] (Byrd, Widmar, and Lee, 2015). This article consists of an in-depth review of the laws associated with wild game hunting, consumption, and inspections. The first step is to compare and contrast existing US laws and regulations for food safety and inspection of traditional livestock species versus wild game species. The central goal of the law review is to highlight the disparities in inspection requirements, identify the problems with the current fragmented system, and suggest potential solutions. The regulatory environment surrounding game species and the management of meat harvested from wild species is expected to have wide-reaching impacts on the economics associated with hunting and economic impacts on rural communities and landowners.

Chapter 3 outlines an extension of best-worst methodology where different presentations of the same attributes (price, safety, convenience, taste, animal welfare, and nutrition) are compared statistically. In this chapter, half of respondents were shown pairs of attributes and asked to choose which attribute is most important to them. The other half of respondents saw three attributes and were asked to pick the most and least important to them. Thus, the current research contributes to the best-worst choice experiment literature by empirically testing best-worst designs.

Chapter 4 is an exploration of consumer WTP for local pork chops and chicken breasts. Local foods have been a hot topic among consumers for some time. Likewise, there has been research into the meaning consumers assign to local (Darby et al., 2008),

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[2] Please note that the law review follows the Bluebook format of legal citation and the location and format of citations in law review articles is different from those in the agricultural economics literature.

demand for local produce (Schneider and Francis, 2005; Loureiro and Hine, 2002), and demand for local milk (Park and Gomez, 2011; Wolf, Tonsor, and Olynk 2011). Researchers point out that it is relevant to consider the meaning of "local" to the product's consumers. Therefore, respondents were asked their definition of local foods and local was included as an attribute for both pork chop and chicken breast choice experiments. This essay will contribute to existing literature by exploring consumer WTP for locally produced meats in conjunction with a verification agency, such as USDA verified local pork, and will also provide more survey evidence for what consumers consider to be locally produced meat.

Chapter 5 compares the results of both BWS and choice experiments between a sample of outdoor enthusiast and a nationally representative sample. Outdoor enthusiasts are those who identify themselves as regularly participating in hunting, fishing, and/or other outdoor activities such as hiking or camping. This essay will evaluate differences and similarities between the samples, the results of which are expected to be of interest to natural resource managers, livestock agriculture groups, as well as consumer-oriented organizations interested in current animal treatment and management issues for both farmed and wild animals.

Chapter 6 contains concluding remarks that summarize the results of the preceding chapters.

CHAPTER 2. NON-AMENABLE MEAT CONSUMPTION, SALE, AND REGULATION: BISON, BEEF AND BAMBI, OH MY! ALL MEATS ARE NOT CREATED EQUAL[1]

2.1 Introduction

Deer, wild turkey, elk, rabbit, and squirrel are just a few of the species commonly hunted and consumed for food in the United States.[2] Furthermore, deer, bison, and elk are now farmed for food and fee hunting in addition to being recreationally hunted in the wild for personal consumption and sport.[3] The meat from these species can be inspected and is available in some stores and online retailers,[4] alongside traditional meats like beef, pork, and chicken. In fact, cervid farming is a rapidly growing industry in the United States with a total economic impact of $2.3 billion, employing 29,199 people.[5] Deer farming is a rapidly growing industry in many states. In Ohio, 59 percent of deer farm

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[1] Originally Published in the Drake Journal of Agricultural Law. Citation: Byrd, Elizabeth S., Nicole J. Olynk Widmar, and John G. Lee. "NON-AMENABLE MEAT CONSUMPTION, SALE, AND REGULATION: BISON, BEEF AND BAMBI, OH MY! ALL MEATS ARE NOT CREATED EQUAL." *Drake J. Agric. L.* 20 (2015): 337-453.

[2] *See* U.S. FISH & WILDLIFE SERVICE ET AL., 2011 NATIONAL SURVEY OF FISHING, HUNTING, AND WILDLIFE-ASSOCIATED RECREATION (rev. 2014), https://www.census.gov/prod/2012pubs/fhw11-nat.pdf [hereinafter 2011 NATIONAL SURVEY].

[3] Matthew J. Butler et al., *Commentary: Wildlife Ranching in North America — Arguments, Issues, and Perspectives*, 33(1) WILDLIFE SOC'Y BULL. 381 (2005).

[4] *Cabela's Wild Game Steaks Variety Pack*, CABELA'S, http://www.cabelas.com/product/Cabelas-Wild-Game-Steaks-Variety-Pack/746243.uts (last visited Feb. 7, 2016); *Golden Plains Bison*, OMAHA STEAKS, http://www.omahasteaks.com/products/Golden-Plains/Golden-Plains-Bison (last visited Feb. 7, 2016).

[5] DAVID P. ANDERSON ET AL., AGRIC. & FOOD POLICY CTR., TEX. A & M UNIV., ECONOMIC IMPACT OF THE UNITED STATES CERVID FARMING INDUSTRY 4, 14 (2007), https://www.afpc.tamu.edu/pubs/2/480/rr-2007-04.pdf.

s were started in the ten year period from 1999 through 2009.[8] Furthermore, deer

farming contributes total of $59.2 million dollars to the Ohio economy.[9] Deer and elk

farming is also rapidly growing in the state of Indiana with the number of licensed

breeders increasing 19 percent since 2006.[10] Deer and elk farming in Indiana have a total

economic impact of $49.3 million.[11] The number of Pennsylvania deer farms rapidly

expanded during the 1990's and 2000's, and accounted for $103 million of economic

impact to the state in 2007.[12]

     According to the 2007 Census of Agriculture, there were 198,234 bison, 269,537

deer, and 68,251 elk on game farms and/or ranches across the country.[13] Likewise, there

were 4,499 farms with bison, 5,654 farms with deer and 1,917 farms with elk.[14]

However, disclosure provisions require data that would identify a respondent in the

Agricultural Census to be suppressed;[15] thus, the reported numbers may be lower than

those actually reported by respondents. In 2013, there were 57,200 head of bison

slaughtered in the US; yet, only 46,600 were slaughtered in federally inspected

facilities.[16] In addition, feral pigs have been increasingly trapped and/or captured live for

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[8] WHITETAIL DEER FARMERS OF OHIO, INC., ECONOMIC IMPACT OF THE OHIO DEER FARMING INDUSTRY 1 (2010), http://www.shepstone.net/OhioDeer/OhioDeer.pdf.

[9] *Id.* at 2.

[10] JOHN LEE & ALICIA ENGLISH, IND. DEER & FARMING ASS'N, ECONOMIC IMPACT OF THE DEER & ELK FARMING INDUSTRY IN INDIANA 3 (2011), http://indianadeer.com/wp-content/uploads/2014/02/eis_-_short_version.pdf.

[11] *Id.*

[12] SHEPSTONE MGMT. CO., THE ECONOMIC IMPACT OF PENNSYLVANIA'S DEER FARMS 2 (2007), http://www.shepstone.net/padeer.pdf.

[13] TOM VILSACK & CYNTHIA Z.F. CLARK, USDA, 2007 CENSUS OF AGRICULTURE 25 (2009), http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf.

[14] *Id.*

[15] *Id.* at IX.

[16] NAT'L AGRIC. STATISTICAL SERV., USDA, LIVESTOCK SLAUGHTER 2013 SUMMARY 15 (2014).

transportation to commercial or federally inspected slaughterhouses.[17] With alternative species entering the commercial food chain, in addition to being hunted for recreation and personal consumption, it is important to understand the laws and regulations governing their harvest, slaughter, inspection, and consumption.

First, this Article examines the fragmented system of meat inspection as it relates to wild game meats and how the current situation could create difficulties for producers and consumers.   Then, attention turns to the unique situation of the feral pig related to the inspection of its meat, and efforts to stop the spread of this invasive species. Alternatives to the current regulatory system are presented and discussed with regard to processing, inspection, and sale of wild game meats.

2.2 A Brief History of Wildlife Law

In the United States, wildlife has been considered a public resource that belongs to the people.[18] Early in the colonization of North America, the British class system determined wildlife ownership.[19] Under that system, wildlife were owned by nobility. However, in North America, hunting was a critically important way of securing food and material for clothing.[20] Furthermore, wild game were scattered over the vast, wild

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[17] *Approved Feral Swine Holding Facilities*, TEX. ANIMAL HEALTH COMM'N, http://www.tahc.state.tx.us/animal_health/feral_swine.html (last visited Feb. 7, 2016).
[18] *See* Geer v. Connecticut, 161 U.S. 519, 529-30 (1896), *overruled by* Hughes v. Oklahoma, 411 U.S. 322 (1974).
[19] J.M. Kelley, Legislative Note, *Implications of a Montana Voter Initiative that Reduces Chronic Wasting Disease Risk, Bans Canned Shooting, and Protects a Public Trust*, 6 GREAT PLAINS NAT. RESOURCES J. 89, 91 (2001).
[20] Darren K. Cottriel, Comment, *The Right to Hunt in the Twenty-First Century: Can the Public Trust Doctrine Save an American Tradition?*, 27 PAC. L.J. 1235, 1244 (1996).

lands.[21] The alternative to the British class system was the Roman civil code which gave

title of the wild animal to the person who captured or killed it, even if that animal was on

someone else's land.[22] Under this free taking doctrine, hunters had substantial rights to

follow game, regardless of its location.[23] This custom recognized any member of the

community's right to hunt animals.[24] This doctrine of free taking of game by anyone was

recognized by most people of the time, and courts encouraged the doctrine by holding

that hunters could pursue game on another person's unenclosed and undeveloped land.[25]

Due to improvements in agriculture and industrialization of the country, by 1900

hunting was no longer necessary for survival.[26] Likewise, the amount of open land

diminished and private property rights gained more recognition.[27] Due in part to

dwindling game animal populations, lawmakers restricted and regulated hunting,

effectively ending the free taking doctrine.[28] As a result of these changes, the current

U.S. system emerged, establishing that the owner of private land is vested with certain

rights incident to ownership, which includes the exclusive right to hunt upon that land.[29]

This also means that landowners have the right to lease their land for recreational

purposes. In fact, 21 percent of all hunting related expenditures, for a total of $7.1

billion, were on land ownership and leasing.[30] Leasing land for recreational purposes

such as hunting can be a source of income for landowners.   According to the 2012

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[21]THOMAS A. LUND, AMERICAN WILDLIFE LAW 20 (1980).
[22]Kelley, *supra* note 16, at 92.
[23]Cottriel, *supra* note 17, at 1245.
[24]*Id.* at 1244.
[25]*Id.*; LUND, *supra* note 18.
[26]*Id.* at 1245.
[27]*Id.*
[28]*Id.*
[29]*Id.*
[30]2011 NATIONAL SURVEY, *supra* note 1, at 23.

Census of Agriculture, 33,161 farms offered tourism and/or recreational services and averaged $21,230 of income from these activities.[31] At times, increased demand for recreational activity has helped fuel increases in land values.[32]

On the legal and regulatory front, during the 1700's and 1800's, the federal government passed very few wildlife laws.[33] In the absence of federal legislation, the states acted by passing wildlife laws that withstood legal challenges.[34] According to the public trust doctrine, the public has ownership over certain natural resources[35] and a duty to protect them as well.[36] Historically, the doctrine has been primarily applied to navigable waterways.[37] However, it has expanded to include resources such as wildlife.[38] Thus, the public has an interest in the wildlife resource and the state has a duty to manage wildlife to meet the public's common needs.[39] This is in contrast to the laws associated with food source or companion animals such as livestock or pets (i.e. dogs) which are considered personal property.[40] Issues of public versus private ownership are

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[31]NAT'L ARGIC. STATISTICAL SERV., USDA, 2012 CENSUS OF AGRICULTURE - STATE DATA, 292 tbl. 6 (2014),
http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_US_State_Level/st99_2_006_006.pdf (noting income from farm-related sources in 2012 and 2007).

[32]Jason Henderson & Sean Moore, *The Capitalization of Wildlife Recreation Income into Farmland Values*, 38(3) J. OF AGRIC. & APPLIED ECON. 597, 597 (2006).

[33]Olen Paul Matthews, *Who Owns Wildlife?*, 14 WILDLIFE SOC'Y BULL. 459, 459 (1986).

[34]*Id.*

[35]Michael C. Blumm, *The Public Trust Doctrine—A Twenty-First Century Concept*, 16 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 105, 105 (2010).

[36]Cottriel, *supra* note 18, at 1268.

[37]*Id.* at 1262.

[38]*Id.* at 1264.

[39]*Id.* at 1269.

[40] David Favre, *Living Property: A New Status for Animals Within the Legal System* 93 MARQ. L. REV. 1021, 1026 (2010).

complicated by the increase in captive deer farming in many states.[41] Some states allow

for private individuals to own wildlife.[42]

In fact, in *Geer v. Connecticut*, the U.S. Supreme Court recognized the states'

sovereign trusteeship over the public wildlife resource, a case decided in 1896.[43] Despite

the fact wildlife laws were primarily passed by states, the federal government passed the

Lacey Act in 1900,[44] which made it illegal to transport across state lines any fish, wildlife

or plants taken in violation of any state, tribal, or U.S. law.[45] The trend continued and

numerous cases persisted to chip away at state sovereignty over wildlife.[46] The end came

with the 1979 Supreme Court decision in *Hughes v. Oklahoma*. [47] In that case the

Supreme Court declared wildlife to be an article of commerce subject to federal

regulation under the powers of the commerce clause.[48] Nevertheless, states continue to

regulate wildlife by establishing hunting seasons and bag limits, issuing licenses, and by

defining the legal means of taking wild game.[49] Thus, there remains a tension between

states and the federal government with the states being able to regulate wildlife via police

power, and the federal government regulating wildlife as an article of commerce.[50]

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[41]*See Captive Bred White-Tailed Deer License*, N.Y. STATE DEP'T OF ENVTL. CONSERVATION,
http://www.dec.ny.gov/permits/25011.html (last visited Feb. 7, 2016);
Captive Cervid Industry in California, CAL. DEP'T OF FISH & WILDLIFE,
http://www.dfg.ca.gov/wildlife/hunting/deer/captivecervind.html (last visited Feb. 7, 2016).
[42]*Captive Bred White-Tailed Deer License*, *supra* note 38; *Captive Cervid Industry in California*, *supra* note 38.
[43]Geer v. Connecticut, 161 U.S. 519, 529-35 (1896), *overruled by* Hughes v. Oklahoma, 411 U.S. 322 (1974); *see also* Kelley, *supra* note 16, at 93.
[44]Matthews, *supra* note 30, at 460.
[45] 16 U.S.C. § 3372 (2012).
[46]Matthews, *supra* note 30, at 460.
[47]*See generally* Hughes v. Oklahoma, 441 U.S. 322 (1979).
[48]*See id.* at 335.
[49]*See, e.g.*, COLO. CODE REGS. §§ W-2 (201), (203), (205) (2015).
[50]LUND, *supra* note 18, at 36, 49-50.

2.3 <u>A Brief History of the Food Safety System for Wild and Farmed Animals</u>

President Abraham Lincoln established the Department of Agriculture in 1862[51]

with the mission of promoting United States agriculture.[52] Although the legislation

creating the United States Department of Agriculture (USDA) did not mention food

safety, it was the logical place for the authority.[53] Originally, the USDA, had sole

responsibility for food safety.[54] However, the primary mission of the USDA, promoting

U.S. agriculture, was fundamentally at odds with a food safety mission.[55] Early on, food

safety functions were administratively separated because control over meat and non-meat

products were tasked to different units.[56] Congress enacted the Meat Inspection Act

(MIA)[57] administered by the Bureau of Animal Industry, and the Pure Food and Drugs

Act (PFDA) administered by the Bureau of Chemistry.[58] In fact, Congress passed, the

PFDA and the MIA on the same day in 1906.[59] The MIA established continuous

inspections by in-house federal inspections in meat processing facilities, a practice that

remains in place today.[60] The MIA was later amended through the Wholesome Meat Act

(WMA) of 1967.[61]

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[51]*FSIS History*, USDA (May 3, 2012),
http://www.fsis.usda.gov/wps/portal/informational/aboutfsis/history/history.
[52] 7 U.S.C. § 2201 (2012).
[53]Richard A. Merrill & Jeffrey K. Francer, *Organizing Federal Food Safety Regulation*, 31 SETON HALL L.
REV. 61, 78 (2000).
[54]*Id.*
[55]*Id.*
[56]*Id.*
[57]Meat Inspection Act of 1907, Pub. L. No. 59-242, 34 Stat. 1256, 1260-65.
[58]Merrill & Francer, *supra* note 50, at 79.
[59]*Id.*
[60]21 U.S.C. § 603 (2012).
[61]Wholesome Meat Act, Pub. L. No. 90-201, 81 Stat. 584 (1967).

The PFDA prohibited adulterated food in interstate commerce.[62] The Bureau of

Chemistry eventually became known as the Food and Drug Administration in 1930.[63]

The federal government began formally dispersing food safety duties in 1940 by

removing the FDA from the USDA.[64] The FDA was eventually moved to the

Department of Health and Human Services.[65]

2.3.1   The FDA

Under the Federal Food, Drug, and Cosmetics Act (FDCA), the FDA regulates all

food products *except* those specifically covered by the Federal Meat Inspection Act

(FMIA)[66] and the Poultry Products Inspection Act (PPIA).[67] The exemptions are detailed

in the FMIA and as such, the FDA provides inspection for all meat and animal food

products not covered under the FMIA and PPIA.[68] These products include seafood, dairy

products, and wild game.[69] Also, included with the FDA's responsibilities are non-

specified red meats such as bison, rabbits, game animals, members of deer family, elk,

and moose, and all non-specified birds such as wild turkey, wild ducks, and wild geese.[70]

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[62]Pure Food and Drug Act, Pub. L. No. 59-384, 34 Stat. 768 (1906); Merrill & Francer, *supra* note 50, at 79.
[63]Note, *Reforming the Food Safety System: What if Consolidation isn't Enough?*, 120 Harv. L. Rev. 1345, 1348 (2007) [hereinafter *Consolidation*].
[64]Merrill & Francer, *supra* note 50, at 82.
[65]*Consolidation*, *supra* note 60, at 1348.
[66]21 U.S.C. § 392 (2012).
[67]21 U.S.C. § 467(f).
[68]*See id.*; 21 U.S.C. § 467(f).
[69]*See FDA, USDA, NOAA Statements on Food Safety*, FDA, U.S. DEP'T OF HEALTH & HUMAN SERVS., http://www.fda.gov/NewsEvents/PublicHealthFocus/ucm248257.htm (last updated Mar. 23, 2011).
[70]FDA, U.S. DEP'T OF HEALTH & HUMAN SERVS., INVESTIGATIONS OPERATIONS MANUAL, 104 (2015) [hereinafter OPERATIONS MANUAL].

The Wholesome Meat Act "generally requires the inspection of certain animal species."[71] As regulated by the FDA, the fish industry does not do the same. Mandatory inspections are not feasible for the fish-processing industry, primarily because of the sheer number of species.[72] Unlike the USDA, FDA inspections are not continuous.[73] However, the new Food Safety Modernization Act (FSMA) increases "the FDA's authority to monitor, inspect, and enforce food safety standards."[74]

When it comes to wild game meats, the FDA provides general guidelines.[75] According to guidelines, game animals commercially sold for food must be farmed or ranched, not hunted, and either inspected under voluntary inspection by an agency with animal health jurisdiction or inspected by an agency other than one with the animal health jurisdiction.[76] If game animals are live-caught in the wild, they must undergo an inspection such as one conducted by an agency with animal health jurisdiction.[77] Live-caught wild animals must be slaughtered and processed following the same regulations for other meat or poultry that are determined by the agency possessing animal health jurisdiction and the agency actually conducting the inspection.[78] The agency actually conducting the inspection determines whether ante-mortem and/or postmortem

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[71]Brandt T. Bowman, Comment, *Roll Sushi, Roll: Defining "Sushi Grade" for the Consumer and the Sushi Bar*, 116 Penn St. L. Rev. 495, 512 (2011); *see* 21 U.S.C. § 603(a).

[72]Bowman, *supra* note 69, at 519.

[73]Richard Raymond, Opinion, *Farm Bill 2014: FSIS Inspection Must Satisfy FDA Requirements?*, FOOD SAFETY NEWS (Feb. 3, 2014), http://www.foodsafetynews.com/2014/02/farm-bill-2014-fsis-inspection-must-satisfy-the-requirements-of-the-fda/#.VFkaRfMo7cs.

[74]Pamela A. Vesilind, *Continental Drift: Agricultural Trade and the Widening Gap Between European Union and United States Animal Welfare Laws*, 12 VT. J. ENVTL. L. 223, 229 (2011).

[75]*See* PUB. HEALTH SERV., FDA, U.S. DEP'T OF HEALTH & HUMAN SERVS., FOOD CODE § 3-201.17 (2013), http://www.fda.gov/downloads/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/UCM374510.pdf [hereinafter FOOD CODE].

[76]*Id.*

[77]*Id.*

[78]*Id.*

examinations by an approved veterinarian are necessary.[79] For wild game that has been dressed in the field, a post-mortem inspection must be conducted by an approved veterinarian and the carcass must be transported following the regulations of the agency with animal health jurisdiction and the agency conducting the investigation.[80]

2.3.2   The USDA

The FMIA outlines standards for meats such as "cattle, sheep, swine, goats, horses, mules, other equines," and additional species of livestock deemed appropriate by the USDA.[81] The Poultry Products Inspection Act (PPIA) of 1957 covers poultry inspection.[82] Amenable poultry for the purposes of the PPIA include domestically raised chickens, turkeys, ducks, geese, and guineas, ratites, and squabs.[83] Further, meats and poultry shall be exempt from the FDA jurisdiction to the extent they are covered by the FMIA.[84]

Most wild game is a non-amenable species and are therefore not "meat" or "poultry" under the FMIA or PPIA.[85] Domestically raised game birds or waterfowl like pheasant, quail, partridge, or swans, are not amenable species.[86] Game birds can also include wild turkeys, geese, ducks, grouse, quail, and other non-domesticated fowl.[87]

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[79]*Id.* at § 3-201.17(A)(1)(c)(ii).
[80]*Id.* at § 3-201.17(A)(4).
[81]21 U.S.C. § 603 (a) (2012).
[82] 21 U.S.C. §§ 451-72.
[83]*See* 21 U.S.C. § 453(e).
[84]21 U.S.C. § 392(a).
[85]Operations Manual, *supra* note 68.
[86]Denise Amann, *Harvesting Wild Game*, FSIS, USDA, http://www.fsis.usda.gov/wps/wcm/connect/fsis-content/internet/main/newsroom/meetings/newsletters/small-plant-news/small-plant-news-archive/spn-vol5-no4 (last modified Mar. 24, 2015).
[87]*Id.*

Some U.S. game animal species include deer, elk, antelope, bison, bear, moose, and caribou.[88] Wild game also includes those being domestically raised.[89]

Traditional meat and poultry producers get cost-free USDA inspections funded by U.S. tax dollars.[90] The Agricultural Marketing Act of 1946 gives the Food Safety and Inspection Service (FSIS) authority to provide voluntary inspection for non-amenable species.[91] Producers of alternative livestock pay for the FSIS inspection necessary to sell and ship the product in interstate commerce.[92] Producers of non-amenable species must pay for this inspection because federal tax dollars cannot be used to provide voluntary FSIS inspection.[93] The 2010 rate for the voluntary inspection was $51.35 per hour with an additional requirement of a minimum visit of two hours.[94]

Before inspecting game or exotic animals, the federally inspected slaughterhouse must obtain approval to process these additional species.[95] Wild game carcasses must fit on a plant's existing equipment and the FSIS inspector must be knowledgeable about that particular species.[96] Each species of animal must be processed separately, which increases the cost to processors.[97]

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[88]*Id.*

[89]*See* FOOD CODE, *supra* note 73, at § 3-201.17.

[90]*See* Robert Luedeman & Darla Mondou, Article, *Meet the New Meat: Legal Aspects of Ratite Bird Production*, 8 SAN JOAQUIN AGRIC. L. REV. 1, 3 (1998).

[91]Amann, *supra* note 84.

[92]Luedeman & Mondou, *supra* note 88.

[93] *Inspection & Grading of Meat and Poultry: What are the differences?*, FSIS, USDA, http://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/production-and-inspection/inspection-and-grading-of-meat-and-poultry-what-are-the-differences_/inspection-and-grading-differences (last modified June 3, 2014) [hereinafter *Inspection & Grading*].

[94] *Slaughtering, Cutting, and Processing*, CORNELL SMALL FARMS PROGRAM, CORNELL UNIV., http://smallfarms.cornell.edu/2012/07/07/slaughtering-cutting-and-processing/ (last visited Feb. 7, 2016).

[95]*Id.*

[96]*Inspection & Grading*, *supra* note 91.

[97] *Non-Amenable Species*, AGRIC. OMBUDSMAN, UNIV. OF CAL. COOP. EXTENSION, http://ucanr.edu/sites/CESonomaAgOmbuds/Selling_Meat/Non-Amenable/ (last visited Feb. 7, 2016).

State-inspected meats that are non-amenable under the FMIA or PPIA may be transported in interstate commerce if the meats comply with FDA and applicable State laws.[98] Furthermore, individual states can require non-amenable meats obtain state inspection.[99] Thus, interstate movement of state-inspected or voluntary FSIS-inspected non-amenable product is dictated by FDA and state laws and requirements.[100]

Further differentiating mandatory and voluntary inspection is the fact the inspection mark for amenable livestock is circular; the mark is triangular for game animals.[101] Processed products that include more than three percent of raw or two percent of cooked wild game meat (and the remainder amenable meat or poultry) are subject to FSIS inspection.[102] These products, once they have passed inspection will be given the round USDA inspection mark.[103] Mislabeling of product attributes could potentially cause confusion and diminish consumer confidence in both products and verification agencies.[104] The same dangers exist when mixing meats. Even with proper labeling, mixing meats might cause consumer confusion and lower consumer confidence in wild game products. Additionally, the potential for mislabeling wild game products, particularly those that are mixed, exists and could have ramifications for consumers such as no longer wanting to purchase wild game products.[105]

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[98] *State Inspected Non-Amenable Species Crossing State Lines*, FSIS, USDA, http://askfsis.custhelp.com/app/answers/detail/a_id/1446/~/state-inspected-non-amenable-species-crossing-state-lines. (last updated July 1, 2015 11:54 AM) [hereinafter *Crossing State Lines*].
[99] *Id.*
[100] *Id.*
[101] *Id.*
[102] Amann, *supra* note 84.
[103] *Id.*
[104] *See* Nicole J. Olynk et al., *Labeling of Credence Attributes in Livestock Production: Verifying Attributes Which are More than "Meet the Eye"*, 5 J. FOOD L. & POL'Y 181, 184 (2009).
[105] *See generally id.*

Pundits have pointed out that selling wildlife, such as deer, could help reduce population numbers in many areas.[106] However, current regulations do not allow for this.[107] Assurance that the meat of an animal harvested by a hunter is transported to a processing facility that is clean, wholesome, and properly identified is generally not possible.[108] Thus, there is no assurance that the meat from a hunted animal is unadulterated.[109] In most states, hunted animals may be harvested for personal consumption, but not commercially sold.[110] But, wild game animals raised on farms, and following applicable regulations, may be sold if the jurisdiction allows.[111] The inspection requirements for alternative species like deer, elk, and bison are confusing and can be complicated.[112]

2.3.2.1   State Meat Inspection systems

States that have a "USDA equivalent" system of meat inspections can require inspection of non-amenable game and stamp those meats with a state mandatory inspection mark.[113] However, those non-amenable meats may be sold in intrastate commerce only.[114] Currently, just over half of the states have their own inspection program.[115] The Talmadge-Aiken Act of 1962 allows trained state inspectors with

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[106] Jim Sterba, *If Only Hunters Could Sell Venison*, WALL ST. J. (Oct. 18, 2013 8:49 PM ET), http://online.wsj.com/articles/SB10001424052702304410204579139424081224050.

[107] *See* Amann, *supra* note 84.

[108] *Id.*

[109] *Id.*

[110] *Id.*

[111] *Id.*

[112] *See* AGRIC. UTILIZATION RESEARCH INST., ALTERNATIVE LIVESTOCK SPECIES IN THE STATE OF MINNESOTA 48 (2002), http://www.auri.org/wp-content/assets/legacy/research/multi.pdf.

[113] *Slaughtering, Cutting, and Processing*, *supra* note 92.

[114] *Id.*

[115] ROB HOLLAND & MEGAN BRUCH, CTR. FOR PROFITABLE AGRIC., GENERAL OVERVIEW OF THE HISTORY, REGULATIONS AND INSPECTION INFORMATION FOR DIRECT MEAT MARKETING IN TENNESSEE 4 (2013), https://extension.tennessee.edu/publications/Documents/PB1819.pdf.

federal inspection privileges to complete inspections.[116] Likewise, Talmadge-Aiken

plants are considered federally inspected, and products from them have the federal

inspection mark.[117]

If meat is sold live, or "on the hoof," a custom-exempt slaughterhouse can

slaughter and process, wrap, and label the animal "not for sale," and the meat is delivered

in bulk to the owner/buyer.[118] The FMIA includes an exemption that allows animals to

be slaughtered for personal consumption without the carcass being inspected by officials

before slaughter or during processing.[119] Specifically, this exemption is often used by

farmers to sell meat "on the hoof" whole, in halves, or in quarters.[120] This exemption is

available because the live animal is being sold, rather than its meat.[121] The USDA

inspects custom slaughter plants, but only two to four times each year for sanitation and

facilities compliance purposes.[122] Because of this, these plants only process meat for the

owner of the animal—be it farmers, owners of livestock, or hunters.[123] The meat

processed by a custom-exempt slaughterhouse can be served to family, guests, and

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[116]*Id.* (noting nine states allow this including: Alabama, Georgia, Illinois, Mississippi, North Carolina, Oklahoma, Texas, Utah, and Virginia).
[117]*See id.* at 5.
[118] 9 C.F.R. § 303.1(a)(2) (2015); Lauren Gwin & Arion Thiboumery, *Conference on Agriculture and Food Systems: September 28, 2012: Local Meat Processing: Business Strategies and Policy Angles*, 37 VT. L. REV. 987, 988 (2013).
[119]21 U.S.C. § 623 (2012).
[120]RACHEL J. JOHNSON, DANIEL L. MARTI & LAUREN GWIN, ECON. RESEARCH SERV., USDA, SLAUGHTER AND PROCESSING OPTIONS AND ISSUES FOR LOCALLY SOURCED MEAT 7 (2012), http://www.ers.usda.gov/media/820188/ldpm216-01.pdf.

[121]LAUREN GWIN & JIM POSTLEWAIT, OR. STATE UNIV. EXTENSION SERV., FREQUENTLY ASKED QUESTIONS ABOUT USING CUSTOM-EXEMPT SLAUGHTER AND PROCESSING FACILITIES IN OREGON FOR BEEF, PORK, LAMB, AND GOAT, 3-4 (2009), http://smallfarms.oregonstate.edu/sites/default/files/small-farms-tech-report/techreport-custommeatfaqs.pdf.
[122]HOLLAND & BRUCH, *supra* note 113, at 6.
[123]*Id.* at 5.

employees of the animal's owner,[124] but the meat cannot enter commerce, be sold, traded, or gifted to a food bank or charity.[125]

2.4   Evidence of Variation and Inequality in the Current System

Producers must have access to a slaughterhouse that is approved to slaughter the animals they raise and provide the kind of inspection needed for the producers' intended market.[126] Producers could potentially be prohibited from shipping their game animals across state lines,[127] and must comply with additional health restrictions to gain access to a slaughterhouse with the approval to slaughter and inspect their alternative livestock or poultry.[128]

Access to processing facilities is a bottleneck in the meat supply chain, especially for local supply chains.[129] Producers need access to processing facilities that have the appropriate inspection status for their target market.[130] In addition, access to processors that provide value-added services such as patty-making, sausage, or jerky may be further limited.[131] Further exacerbating the lack of production facilities available for exotic meats, "processing deserts" have crept up for cattle, pigs, and chickens as the number of plants has declined.[132] Additionally, current slaughterhouses must take steps to become approved to slaughter non-amenable species and must slaughter all species separately

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[124]*Id.* at 5-6.
[125]GWIN & POSTLEWAIT, *supra* note 119, at 3.
[126]21 U.S.C. § 619 (2012).
[127]*Id.*
[128]*Slaughtering, Cutting, and Processing*, *supra* note 92.
[129]Gwin & Thiboumery, *supra* note 116, at 987.
[130]*Id.* at 988.
[131]*See id.*
[132]*Id.* at 990.

which adds to processing cost.[133] Another factor that could exacerbate the lack of

processing facilities for wild game is that some states have banned the importation of

animals such as captive deer.[134] For example Kentucky has banned deer imports from

Indiana, Pennsylvania, and Ohio.[135] In conclusion, the number of slaughterhouses

available to slaughter wild game animals is significantly fewer than for traditional

amenable species.

2.4.1 Mix Your Way to a Federally-Inspected Product

While it is possible for state-inspected non-amenable meats to be sold across state

lines if they comply with FDA and state laws,[136] these products cannot move as easily as

products that are federally inspected by the USDA.[137] Even if wild game meat is

federally inspected, it will still only carry the voluntary federal inspection mark as

opposed to the circular inspection mark amenable species receive upon inspection.[138]

The USDA has jurisdiction over products with more than three percent raw

meat.[139] Therefore, the inclusion of amenable meat, albeit a very small percentage,

makes it an amenable product subject to mandatory USDA inspection.[140] In other words,

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[133]21 U.S.C. § 619 (2012); *Slaughtering, Cutting, and Processing*, *supra* note 92.

[134]*See, e.g.*, Alan Clemons, *Deer Wars Intensify as State Agency Bans Captive Imports*, DEER & DEER HUNTING (Feb. 17, 2015), http://www.deeranddeerhunting.com/articles/deer-wars-intensify-state-agency-bans-captive-imports.

[135]*Id.*

[136]*Crossing State Lines*, *supra* note 97.

[137]*See generally* KNOW YOUR FARMER KNOW YOUR FOOD COMPASS. USDA 45, http://www.usda.gov/documents/KYFCompass.pdf (last visited Feb. 7, 2016).

[138]Amann, *supra* note 84.

[139]OPERATIONS MANUAL, *supra* note 68.

[140] *How Low Can the Level of Meat/Poultry be Before the Product is no Longer Amenable to U.S. Department of Agriculture (USDA) Jurisdiction (i.e., to the Federal Meat Inspection Act (FMIA) or Poultry Products Inspection Act (PPIA)?*, FSIS, USDA, http://askfsis.custhelp.com/app/answers/detail/a_id/412/kw/not%20subject%20to%20mandatory%20inspection/related/1 (last updated June 28, 2007).

non-amenable elk or deer meat can be used as an ingredient, along with beef or another

amenable meat, when mixed together in a meat product.[141] Wild game is considered a

non-meat ingredient and must originate from an approved source, meaning that is has

been inspected by a federal, state, or foreign service.[142] The final meat product, three

percent beef and 97 percent elk, is then subject to mandatory USDA inspection and will

carry the mandatory, round inspection mark.[143] Because it has been federally inspected,

it can be sold and shipped across the United States, even though it could contain 97

percent of state-inspected meat.[144] While this may seem like a far-fetched example,

products such as these are already available in stores and from online retailers.[145] For

example, one brand of venison jerky is advertised as containing three percent beef (to

adhere to USDA regulations for nationwide distribution).[146]

2.4.2   A "Wild" Amenable Species: The Feral Hog

The population of feral pigs in the United States is estimated at over 5 million and

they have been found in over 35 states.[147] Feral pigs are widespread in the Southern

United States.[148] However, populations exist as far north as upstate New York, Oregon,

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[141]Mike Mamminga, *Venison Inspection Requirements*, DEERFARMER.COM,
http://www.deerfarmer.org/index.php/component/content/article?id=188:venison-inspection-requirements
(last visited Feb. 7, 2016).
[142]*Id.*
[143]*Id.*; *Slaughtering, Cutting, and Processing*, *supra* note 92.
[144]Mamminga, *supra* note 139; *see* U.S.C. § 619 (2012).
[145]*See Venison Jerky*, BUFFALO BILLS, http://www.bbjerky.com/venison-jerky/ (last visited Feb. 7, 2016).
[146] *Id.*
[147] Gail Keirn, *We Can't Barbecue Our Way Out: Why Feral Swine Management Requires a National
Approach*, USDA (April 4, 2014, 10:00 AM), http://blogs.usda.gov/tag/feral-swine/.
[148]*See id.*

and Michigan.[149] Feral hogs are an invasive species that cause damage to agriculture

crops, lawns, and levee systems.[150] Furthermore, feral pigs damage the habitat of other

wildlife, including feeding on small wildlife and ground nesting birds.[151] Feral pigs also

present a disease risk; according to the 2012 Feral Swine Management Report from New

York State, they "are highly mobile disease reservoirs and can carry at least 30 viral and

bacterial diseases in addition to 37 parasites that affect people, pets, livestock, or

wildlife." [152] Feral swine cause $800 million in damage annually directly to agricultural

crops and $1.5 billion in total damages.[153] The capture, hunting, sale, and consumption

of feral pigs is regulated according to each individual state.[154] Although both feral and

domestic pigs are the same species and are treated the same according to the FMIA,[155]

they are regarded differently in other aspects by both legal and economic literature. In

fact, wild pigs are either trapped[156] or captured live[157] so that they may satisfy the pre

mortem inspection required by the FMIA so that the meat can be sold in interstate

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[149]*See id.*

[150] *Damage by Pigs*, MISS. STATE UNIV. EXTENSION, http://wildpiginfo.msstate.edu/damage-caused-by-pigs.html (last updated May 19, 2014).

[151] *Feral Swine: Damage and Disease Threats*, APHIS, USDA, http://www.aphis.usda.gov/publications/wildlife_damage/content/printable_version/feral_swine.pdf (last updated June 2013).

[152] *USDA Releases New York 2012 Feral Swine Management Report*, N.Y. INVASIVE SPECIES INFO. (Mar. 8, 2013), http://www.nyis.info/?action=news&type=news&prism_type=&startat=99.

[153]Gail Keirn, *Feral Swine: Ripping and Rooting Their Way Across America*, USDA (Apr. 30, 2013 1:00PM), http://blogs.usda.gov/2013/04/30/feral-swine-ripping-and-rooting-their-way-across-america/.

[154]*See* THE WILDLIFE SOC'Y, 2012 ANNUAL STATE SUMMARY REPORT WILD HOG WORKING GROUP (2012), http://www.dgif.virginia.gov/wildlife/feral-hogs/seaFwa-2012-annual-state-report.pdf.

[155] *Amenable Swine*, FSIS, USDA, http://askfsis.custhelp.com/app/answers/detail/a_id/1441/~/amenable-swine (last updated July 17, 2015).

[156] *Types of Traps*, MISS. ST. UNIV. EXTENSION, http://wildpiginfo.msstate.edu/types-traps-feral-pigs.html (last updated June 27, 2013).

[157] *Using Dogs*, MISS. ST. UNIV. EXTENSION, http://wildpiginfo.msstate.edu/hunting-wild-pigs-with-dogs.html (last updated June 27, 2013).

commerce.[158]   This presents an opportunity for animal welfare concerns associated with

the capture and eventual slaughter of feral pigs, in addition to the previously discussed

unequal treatment of other wild species with regard to meat inspection, sales, and

labeling.[159]

Consumers' animal welfare concerns for food animals have already had the effect

of changing production practices. For example, consumer groups used market pressure to

change milk producers' use of recombinant bovine somatotropin (rbST).[160] Additionally,

changes in production processes and the banning of gestation crates have been brought

about by ballot initiatives, state legislation, and market pressures.[161] Thus, it is important

to consider similar outcomes for the welfare of wild animals. The policy implications for

production and harvest of wild game animals in general could include changes in the way

game animals are hunted in wild settings, produced in farmed settings, and consumed for

food.   Annually, 13.7 million people over the age of 16 take part in recreational hunting

and spend $32.5 billion.[162] Specific to feral pig population control, policy changes could

result in changes to the ways feral pigs are hunted and captured and hamper the ability to

control the population growth of this invasive species.

According to the FSIS of the USDA, swine of the family Suidae, and species *Sus

scrofa* are amenable to the FMIA.[163] This includes domestic pigs and those that are now

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[158] *See* U.S.C. § 604 (2012).

[159] *See generally id.*

[160]Nicole Olynk et al., *Production Technology Option Value: The Case of rbST in Michigan*, AGRIC.
ECON., 2012, at 1.

[161] Melissa G.S. McKendree et al., *Consumer Preferences for Verified Pork-Rearing Practices in the
Production of Ham Products*, 38 J. AGRIC. & RESOURCE ECON. 397, 398 (2013).

[162] 2011 NATIONAL SURVEY, *supra* note 1, at 62.

[163] *Amenable Swine*, *supra* note 153.

feral, *Sus Scrofa domestica*, and the Common Wild Boar, *Sus scrofa fera*.[164] While other

species of wild game animals are non-amenable species and not subject to mandatory

USDA meat inspection for sale in interstate commerce, feral hog meat is subject to the

same regulations as farmed pork.[165] If feral pigs are captured live, they may be sold for

meat if state laws permit live capture and transportation to a slaughterhouse.[166] This

brings up an important point, namely that feral hogs must be inspected live before

slaughter, which means they must be captured live and transported to a slaughterhouse.[167]

Wild pigs are frequently trapped[168] or hunted with dogs[169] to achieve a live capture.

Hunting with the goal of capture typically uses trained hunting dogs to locate and keep

the hog in place, often by holding the pig by the ear, until hunters arrive to secure the hog

for live transport or euthanize it.[170] Some people consider hunting feral pigs by plane or

helicopter to be cruel,[171] including the People for the Ethical Treatment of Animals

(PETA).[172] Furthermore, the use of dogs for bear hunting is upsetting to some[173] and

recently a measure to ban bear hunting via hounding (use of dogs) failed in Maine.[174]

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[164] *Id.*

[165] *See id.*

[166] *See Slaughter Inspection 101*, FOOD SAFETY & INSPECTION SERV., USDA,
http://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-
sheets/production-and-inspection/slaughter-inspection-101/slaughter-inspection-101 (last modified Aug. 9,
2013).

[167] *Id.*

[168] *Types of Traps*, *supra* note 154.

[169] *Using Dogs*, *supra* note 155.

[170] *Id.*

[171] Mark Essig, *High Above the Hog*, N.Y. TIMES (Aug. 31, 2011),
http://www.nytimes.com/2011/08/31/opinion/high-above-the-hog.html?_r=0.

[172] *'Refuges' No Sanctuary for Feral Pigs*, PETA (July 12, 2011), http://www.peta.org/blog/refuges-
sanctuary-feral-pigs/.

[173] *Bear Trophy Hunting*, THE HUMANE SOC'Y OF THE U.S.,
http://www.humanesociety.org/issues/bear_hunting/ (last visited Feb. 7, 2016).

[174] Aislinn Sarnacki & Ben McCanna, *Maine Voters Reject Ban on Bear Hunting Practices for Second
Time*, BANGOR DAILY NEWS (Nov. 4, 2014, 11:34PM)

Likewise, other wildlife management techniques have caused concern; the USDA came under fire for allowing dogs to attack coyotes trapped in leg snares[175] and for the use of steel traps and cyanide cartridges.[176] Likewise, consumers are generally concerned that practices used in the production of domestic pigs, such as ear notching, tail docking, or teeth clipping, reduce the welfare of farmed pigs.[177] Thus, there is potential for consumer and public outcry regarding the treatment of feral pigs.

At the state level, feral hogs are either regulated by the state department of agriculture or the state fish and wildlife agency.[178] Where this control is situated determines how feral pigs are classified: livestock, wild game or wildlife, nuisance species, non-game animals, exotic species, or invasive species.[179] This classification determines whether feral pigs are regulated as wild game animals or as nuisances to agriculture.[180] States have the authority to determine the legal methods and seasons to capture or hunt feral pigs, whether live animals and/or meat can be sold, and restrictions on selling this meat.[181] There are a variety of state laws and policies in place across the country regarding the hunting and capture of feral hogs.[182] The Southeastern

http://bangordailynews.com/2014/11/04/politics/maine-voters-reject-ban-on-bear-hunting-practices-for-second-time/.

[175] *See* Cristina Corbin, *Animal Torture, Abuse Called a 'Regular Practice' Within Federal Wildlife Agency*, FOX NEWS (Mar. 12, 2013), http://www.foxnews.com/us/2013/03/12/animal-torture-abuse-called-regular-practice-within-federal-wildlife-agency/.

[176] Editorial, *Agriculture's Misnamed Agency*, N.Y. TIMES (July 17, 2013) http://www.nytimes.com/2013/07/18/opinion/agricultures-misnamed-agency.html?_r=1&.

[177]*Welfare Implications of Teeth Clipping, Tail Docking, and Permanent Identification of Piglets*, AM. VETERINARY MED. ASS'N (July 15, 2014), https://www.avma.org/KB/Resources/LiteratureReviews/Pages/Welfare-implications-of-practices-performed-on-piglets.aspx.

[178] THE WILDLIFE SOC'Y, *supra* note 152, at 6-8.

[179] *See id.* at 5-6.

[180] *See id.* at 5.

[181] *See id.* at 5-14.

[182] *See id.* at 15-22.

Association of Fish and Wildlife Agencies (SEAFWA) has formed a Wild Hog Working

Group from its member state fish and game agencies to address the problem of wild pigs

across fifteen states in the Southern U.S.[183] Even within their group, substantial

differences in the regulation of wild pigs exist.[184] For example, in Louisiana, feral pigs

are considered "outlaw quadrupeds" and may be hunted year round during daylight

hours, and at night with some restrictions.[185] In Mississippi, feral pigs are considered

nuisance animals and may be captured and transported to a slaughterhouse with a

transportation permit.[186]

Just as feral pigs are classified differently in each state, they are also regulated by

different state agencies.[187] For example, Oklahoma's Department of Agriculture

regulates all aspects of feral hogs except trapping and hunting, which are left to the

state's Department of Wildlife Conservation.[188] In Louisiana and Mississippi, each

state's department of wildlife has authority.[189] In Texas, the Animal Health Commission

regulates wild pig buyers, slaughter, and hunting preserves for wild pigs, but wild pig

hunting and permit authority is controlled by the state's wildlife department.[190]

States also have differing rules when it comes to selling and transporting wild

hogs.[191] In Mississippi and North Carolina, live wild pigs may not be transported or

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[183] *Id.* at 46.

[184] *See generally id.* at 5-47.

[185] *Outlaw Quadrupeds (Armadillo, Coyotes, Feral Hogs)*, LA. DEP'T OF WILDLIFE & FISHERIES, http://www.wlf.louisiana.gov/hunting/outlaw-quadrupeds (last visited Feb. 7, 2016).

[186] MISS. CODE ANN. § 49-7-1 (2015).

[187] THE WILDLIFE SOC'Y, *supra* note 152, at 6-8.

[188] *Feral Swine*, OKLA. AGRIC. FOOD & FORESTRY, http://www.ag.ok.gov/ais/feralswine.htm (last visited Feb. 7, 2016).

[189] THE WILDLIFE SOC'Y, *supra* note 152, at 6.

[190] *Id.* at 8-10.

[191] *Id.* at 8-10, 13-14.

relocated.[192] In Georgia, feral swine may be relocated if they have passed disease testing,[193] but in Florida wild pigs may only be transported by a licensed dealer.[194] In Arkansas and Louisiana, feral hogs can be sold at public animal auction barns;[195] but, other states impose stricter regulations on feral hogs sold in public sale barns.[196] In Alabama, Florida, Kentucky, North Carolina, Oklahoma, and Tennessee feral pigs may not be sold in a public sale barn.[197] Feral hogs may be sold for slaughter in Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, Oklahoma, and Texas, but not in Alabama, Kentucky, North Carolina, South Carolina, Tennessee or West Virginia.[198]

The disparities continue when the legal methods of hunting and capture are examined.[199] In Arkansas, any method of harvest on private land is allowed, including hunting with dogs, trapping or snaring, but restrictions apply on public land.[200] However, in Georgia, any snaring of feral hogs is not permitted.[201] On private land in Florida, archery, firearms, dogs, and trapping are legal methods to hunt feral pigs.[202] In Oklahoma, feral pigs may be hunted using firearms and archery during the day, but a permit must be obtained to hunt at night.[203] In Louisiana, feral pigs may be hunted or trapped after obtaining a hunting license and snared if the hunter possesses a trapping

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[192] *Id.* at 8-12.
[193] *Id.*
[194] *Id.* at 10.
[195] *See id.* at 13-14.
[196] *See id.*
[197] *Id.* at 13-14.
[198] *Id.* at 14.
[199] *See id.* at 15-22.
[200] *See id.*
[201] *Id.* at 16.
[202] *Id.*
[203] *Id.*

license.[204] In Virginia, baiting, night hunting, trapping, and hunting with dogs are permitted.[205]

This patchwork of state regulations on the hunting and sale of wild pigs presents a problem for effective interstate pig population control in part because there is no single federal law for managing invasive species.[206] Furthermore, these disparities also present an opportunity for state-by-state animal welfare legislation regarding the legal hunting and capture methods for wild pigs.[207] In addition, there is potential for consumer confusion or disapproval regarding the welfare of the pigs during the process.[208] For example, an animal rights group could lobby in a given state for a law making it illegal to sell feral pigs for slaughter thereby hampering the ability of state game agencies to effectively control the population of feral hogs by removing market incentives.

2.5 Producer Incentive to Inspect: Federal vs. State

In general, if the producer's state has a state inspection system the non-amenable species will likely be allowed to be processed through state meat inspection.[209] However, this option is dependent on whether the producer's state has maintained its own meat inspection system separate from the federal system.[210] In order for producers to ship

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[204] *Id.*

[205] *Id.*

[206] Cassandra Burdyshaw, *Detailed Discussion of the Laws Concerning Invasive Species*, ANIMAL LEGAL & HISTORICAL CTR., MICH. STATE UNIV. (2011), https://www.animallaw.info/article/detailed-discussion-laws-concerning-invasive-species.

[207] *See id.*

[208] *See* M.G.S. McKendree et al., *Bioethics Symposium II: Current Factors Influencing Perceptions of Animals and Their Welfare*, 92 J. ANIMAL SCI. 1821, 1829 (2014a).

[209] RON MCKAY, STATE MEAT INSPECTION PROGRAM, USDA RURAL DEV. & OR. STATE UNIV. 5 (2008), http://fic.oregonstate.edu/sites/default/files/mcKay_finalcdcleanA.pdf.

[210] *See* JOHNSON, MARTI & GWIN, *supra* not 118, at 5-6.

wild game products to another state, FDA meat inspection is another potential avenue.[211]

In New York, producers would need to locate a processing plant that is approved by the

USDA to slaughter that particular species and then pay an additional fee for the voluntary

inspection.[212] Non-amenable meat could obtain FDA inspection because its movement in

interstate commerce is governed by the FDA and applicable state laws where the meat is

shipped to and/or sold.[213] However, some states prohibit the sale of any uninspected

meat, thus FDA inspection alone may not be adequate.[214] To ship non-amenable meats

freely in interstate commerce, producers should either obtain state inspection where

available, or voluntary USDA federal inspection if the producer can locate a plant that

will slaughter non-amenable species.[215]

2.6 Possible Market or Legislative Solutions for Wild Game Meats

The current system of meat inspection in the United States is fragmented. That

divide is further highlighted when wild game meats are considered. There are a variety of

avenues that could be pursued to correct the problem.

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[211] *Crossing State Lines*, *supra* note 97.

[212] *See Slaughtering, Cutting, and Processing*, *supra* note 92.

[213] *Crossing State Lines*, *supra* note 97.

[214] *See id.*

[215] *Id.*

2.6.1 Make No Changes

2.6.1.1 Wild Game Producers

Under the current system, producers could pay for federal voluntary inspection to ship interstate to any state; they could also obtain state inspection and ship to states that recognize other state's inspections.[216] Likewise, obtaining a state inspection would allow producers to sell meat within their own states.[217] However, these options may not be available to all producers. For example, the producer's state may not have a separate state inspection system or the nearest slaughterhouse could be hundreds of miles away, making these types of inspections impossible or cost prohibitive.[218]

Producers could build their own processing facility. However, this requires a large volume of animals to slaughter and an established market for that type of meat product.[219] The on-farm slaughterhouse is subject to the same regulations as any other slaughterhouse.[220] A newly built slaughterhouse could opt to be federally or state inspected, or a custom-exempt processor approved by a local or state department of health.[221] However, meat processed at a custom exempt slaughterhouse could not be sold commercially.[222]

Another option for producers is to utilize mobile slaughterhouses or processing units.[223] This allows for the slaughter of animals on their own farm so that they do not

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[216] REBECCA THISTLETHWAITE & JIM DUNLOP, THE NEW LIVESTOCK FARMER: THE BUSINESS OF RAISING AND SELLING ETHICAL MEAT 155 (2015).

[217] *Id.* at 153.

[218] *Id.* at 11.

[219] *Id.* at 229.

[220] *Id.*

[221] *Id.*

[222] 9 C.F.R. § 303.1 (2015).

[223] *See* THISTLETHWAITE & DUNLOP, *supra* note 214, at 238.

need to be transported and is often a good option for producers of "wild" animals that may not be easy to load or transport.[224] For example, Texas allows wild game animals to be processed partly in a mobile unit and partially in an approved slaughterhouse to complete the processing, if it is observed in the field by a USDA inspector.[225] While this would increase production costs, it is a viable option already used by some wild game producers.[226]

Finally, rather than slaughtering animals and selling the meat, producers may opt to sell live animals which buyers can then have slaughtered for their personal consumption.[227] This is already commonly used for amenable species, but is rare for non-amenable species.[228]

2.6.1.2 Slaughterhouses

Slaughterhouses have different options to choose from depending on what state they operate in and what classification of slaughterhouse they currently fall under (e.g. USDA-inspected, state inspected, custom-exempt).[229] First of all, the options are dependent on whether the state has chosen to maintain a separate state inspection system alongside the federal system, or if the state has turned its inspection duties over to the USDA.[230] If the slaughterhouse is currently a USDA inspected slaughterhouse, it could make an application to the USDA to process additional species.[231] If the slaughterhouse

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[224] *Id.*

[225] *Id.*

[226] *Id.*

[227] *Id.* at 155.

[228] *See id.*

[229] *How Regulations are Classified*, CORNELL SMALL FARMS PROGRAM, CORNELL UNIV. (July 3, 2012, 12:55PM), http://smallfarms.cornell.edu/2012/07/03/how-regulations-are-classified/#.

[230] *Slaughtering, Cutting, and Processing*, *supra* note 92.

[231] *See id.*

is a state inspected slaughterhouse, it would need to explore the laws and regulations in the state where it operates to determine if a state inspected slaughterhouse can, or must, provide inspection services for wild game species.[232]

2.6.1.3   <u>States</u>

States could choose to alter their relationship with the USDA in terms of whether the state operates a completely separate system of state inspections, offers a federally equivalent system of state inspections, or has already turned its inspection duties over to the federal government. [233] If the state has already turned over its inspection system to the federal government or maintains a federally equivalent inspection service, it could consider restarting a state inspection service for small plants to facilitate local and alternative meats. This option would likely result in increased expense to the adopting state government.

If the state maintains a separate state system, it could consider mandating all slaughterhouses be federally equivalent to encourage all slaughterhouses to be able to provide federal meat inspection that would allow products to move in interstate commerce.[234] This would likely be an unpopular move in states with several small processors. For these small state-inspected slaughterhouses, such a mandate would likely force many plants to shut down because the cost of becoming compliant would be too high.

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[232] *See id.*

[233] *See How Regulations are Classified*, *supra* note 227.

[234] *Id.*

Furthermore, a state with an independent state inspection system could make wild game species amenable species for the purposes of state inspection, which is already the case in some states.[235] This would allow wild game producers to obtain cost-free state inspections.[236] However, it could increase the costs to the state as the number and type of inspections increased. States could also opt to do nothing. For states with a state inspection system, they could turn their system over to the federal government.

2.6.2 Legislative Action

2.6.2.1 Consolidate

Many have recommended that the U.S. consolidate all food safety functions under a single agency.[237] These recommendations began as soon as the FDA and USDA were split.[238] Experts point to the current system's arbitrary jurisdictional lines as evidence of the shortcomings of the current system.[239] As stated earlier in this Article, products containing over three percent amenable meat are under the jurisdiction of the USDA, despite the fact the remaining 97 percent could be non-amenable meats.[240] Another major difference in the two systems is that the USDA has continuous inspection, but the FDA does not.[241] Such an arbitrary distinctions could erode consumer confidence.

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[235] THISTLETHWAITE & DUNLOP, *supra* note 214, at 155.

[236] *See* Luedeman & Mondou, *supra* note 88.

[237] *Consolidation*, *supra* note 60, at 1346.

[238] *Id.*

[239] *Id.* at 1354.

[240] Amann, *supra* note 84.

[241] Raymond, *supra* note 71.

2.6.2.2   Make Wild Game Animals "Amenable Species" under the FMIA

To simplify the system of wild game meat inspection in the United States, one solution is to make wild game species amenable so that UDSA inspection is mandatory. This would reduce producers' costs because mandatory inspection is provided without charge for amenable species.[242]   However, it would increase government inspection costs, and could indirectly increase taxpayers' costs, because of the additional species and overall increase in animal numbers and the reimbursement under the current system. Presumably, slaughterhouses would still have to apply for approval to slaughter additional species and current regulations require a complete cleaning of equipment between slaughtering different species.[243] There will likely be an increased likelihood of cross-contamination for slaughterhouses that slaughter multiple species.

2.6.2.3   Allow State Inspected Meats to Ship Interstate

State inspected slaughterhouses are already required to be equivalent to federal plants.[244]   This transition is somewhat underway for small plants. For example, Indiana, Ohio, North Dakota, and Wisconsin have joined the USDA Cooperative Interstate Shipment Program which allows some small state-inspected plants to ship their products in interstate commerce with the USDA federal inspection mark.[245] However, this program is only available for small and very small plants.[246]

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[242] Luedeman & Mondou, *supra* note 88.
[243] *Slaughtering, Cutting, and Processing*, *supra* note 92.
[244] *How Regulations are Classified*, *supra* note 227.
[245] *Indiana Creating New Opportunity for Small Meat Processors*, FSIS, USDA (Apr. 8, 2014), http://www.fsis.usda.gov/wps/portal/fsis/newsroom/news-releases-statements-and-transcripts/news-release-archives-by-year/archive/2014/nr-040814-01.
[246] *Id.*

2.6.2.4   Alter USDA Pre-mortem Inspection Requirements for Wild Game Animals

The pre-mortem inspection requirement prevents hunted game from entering into the commercial food system. [247] When meat is wild-hunted and transported to the slaughterhouse, there could be fewer guarantees as to the safety or origin of the product. [248]

2.7 Conclusion

The system of laws dealing with wildlife food processing and sales in the United States is complicated and disjointed.   This begins with the notion that states may regulate wildlife through their police power and the federal government may regulate wildlife via the commerce clause.   Throughout legal history, this separation of power and oversight have often been at odds.   The divide widens when the current, fragmented food safety system in the United States is studied; this is especially evident when wild game meats are considered.

The status of most game meats as non-amenable species presents special legal challenges about the food safety system as a whole.   To summarize, the meat of feral and domestic hogs is subject to mandatory inspection by the USDA.   However, most wild game meat is under the regulation of the FDA, but may obtain voluntary inspection from the USDA for a fee.   Ranchers and farmers of wild species such as deer, elk, and bison face a complicated, disjointed system for getting their products to market.   They may face difficulties locating a suitable federally inspected slaughterhouse or be forced to deal

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[247] *See Slaughtering, Cutting, and Processing*, *supra* note 92.
[248] *See id.*

with a mishmash of state laws regarding their meat products.   Feral pigs, are classified as an amenable species for federal meat inspection purposes, but they are subject to various state laws as to their capture and hunting.   Thus, controlling the spread of this invasive species becomes difficult at the national scale.   The system of laws, both federal and state, in the United States is complex and varies tremendously for wild animal management, farming, ranching, and processing.

CHAPTER 3. PRESENTATION MATTERS: NUMBER OF ATTRIBUTES
PRESENTED IMPACTS RESULTING CONSUMER PREFERENCES

3.1 Introduction

Best-worst scaling (BWS) has recently found widespread use in a variety of fields

such as food and agriculture, environmental studies, health fields, and marketing

(Campbell and Erdem, 2015). The ultimate goal of BWS is to determine the relative

importance that respondents allocate to items in a set. Both the number of attributes

shown in each choice task and the number of choice tasks shown vary based on

experimental design. In BWS, respondents are presented a number of items (or attributes

or programs) and asked to choose which one is best (or most important) and which one is

worst (or least important). Finn and Louviere (1992) first used BWS to determine the

importance of food safety relative to other public concerns. BWS has been used

extensively in studies exploring health economics (Louviere and Flynn, 2010), and

marketing (Louviere, Flynn, and Marley, 2015) as well as environmental research

(Loureiro and Arcos, 2012; Rudd, 2011). Within food and agriculture, BWS has been

used to better understand values by food consumers for organic foods (Lusk and

Briggeman, 2009), the importance of ground beef attributes (Lusk and Parker, 2009), and

to parse out how consumers define "sustainable" agricultural production (Sackett, Shupp,

and Tonsor, 2013). Similarly, BWS has been used to gain insight into agricultural

producers. For example, Holland et al. (2014) utilized BWS to explore the factors

managers of large commercial farms considered the most important to success and Wolf

and Tonsor (2013) utilized BWS to gain insight into the preferences of dairy farmers for

different policy options. BWS was developed by Louviere in 1987 (Louviere, Flynn and

Marley, 2015) and was first published by Finn and Louviere (1992). It is a stated

preference method based in random utility theory (Louviere and Flynn, 2010) and is a

form of conjoint analysis (Erdem, Rigby and Wossink, 2012) developed as an extension

to Thurstone's (1927) method of paired comparison. The ultimate goal of BWS is to elicit

relative importance that respondents allocated to the different options in a set (Erdem,

Rigby and Wossink, 2012). However, BWS is more generalized than paired comparisons

in that respondents pick both a best and worst option which reveals the maximum

difference in respondent preferences (Erdem, Rigby, and Wossink, 2012). BWS is

superior to rankings such as Likert scale questions which may suffer from scale bias

(Erdem, Rigby, and Wossink, 2012) and do not force respondents to make explicit

tradeoffs between attributes or items (Sackett, Shupp, and Tonsor, 2013). Likewise,

ranking questions become more cognitively difficult as the number of items to be ranked

increases (Campbell and Erdem, 2015; Cohen, 2009). From a research perspective,

timing and respondent fatigue are important considerations, however, BWS can take up

to three times as long to complete as rating questions (Cohen and Orme, 2004). Thus, it is

important to consider the increased burden that BWS can impose on survey respondents.

It is also superior to ranking questions because as the number of items to rank increases

respondents may find the task more difficult and their responses may become more

anomalous (Erdem, Rigby, and Wossink, 2012).

BWS designs in the literature have included many different total numbers of attributes. For example, studies have included five (Holland et al., 2014), seven (Wolf and Tonsor, 2013; Brooks and Ellison, 2014), ten (Erdem, Rigby, and Wossink, 2012; Sackett, Shupp and Tonsor, 2013), eleven (Lusk and Briggeman, 2009; Lister et al., 2014), and fifteen (Louviere and Flynn, 2010) total attributes. Best-worst scenarios (or choice tasks) have also varied in the number of attributes respondents were presented to select amongst per question (Aizaki, Nakatani, and Sato, 2014). For example, best-worst choice experiments have shown two (Holland et al., 2014), three (Wolf and Tonsor, 2013), four (Auger, Devinney, and Louviere, 2007), five (Erdem, Rigby, and Wossink, 2012), six (Lusk and Parker, 2009), seven (Cummins et al., 2016), and eight (Lusk and Briggeman, 2009[1]) attributes or items to respondents in each choice question. However, it is recommended to have fewer attributes per best-worst task and more questions because the length of each best-worst task increases with the number of attributes presented per question (Chrzan and Patterson, 2006). Jaeger et al. (2008) presented respondents with three attributes per question based on the reasoning that increasing the size to four would make the best-worst task more difficult. On the other hand, one way to increase the total number of attributes or items included in a study is to include more than three items per question (Jaeger et al., 2008). However, researchers face a tradeoff between the number of items or attributes per question and the total number of questions shown to respondents (Cohen, 2009).

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[1] Lusk and Briggeman (2009) utilized an unbalanced design with each respondent answering twelve best worst questions. Six questions showed four items, three questions showed six items, and three questions showed eight items.

In choice experiments, researchers recognize that subject fatigue and cognitive difficulty can call into question the validity of choice experiments (Maynard et al., 2004). Increasing the number of attributes in a choice experiment (the number of characteristics respondents consider for each product) has been found to increase the variance of errors and change the resulting weights placed on attributes (Arentze et al., 2003). Likewise, respondents rely on decision simplifying strategies when a choice experiment contains more than four attributes that vary across choice sets (Mazzotta and Opaluch, 1995). It is probable these issues are also occurring within BWS questions.

The current research seeks to explore the differences in respondent's answers when two different presentations are utilized. Respondents were randomly assigned to see one of two best-worst presentations for the same six meat purchasing attributes: taste, convenience, safety, animal welfare, price, and nutrition. Half of respondents were shown two attributes, similar to a pairwise design, at a time ("show-2") and asked to choose the one that was most important to them and it was inferred the remaining attribute was the least important. In this case, the question was presented to respondents as a pairwise comparison. The other half of respondents were shown three attributes at a time ("show-3") and asked to choose the attribute that was most and least important to them. These two presentations were chosen due to their simplicity in design, and thus attractiveness as the smallest and simplest designs to test first. In addition, the time it took each respondent to complete the page and the number of clicks was recorded. Understanding the amount of time respondents took to complete the two BWS presentations will also help researchers evaluate potential tradeoffs.

The primary goal of this research was to determine whether there are statistically significant differences in the results arising from two experimental designs utilizing the same attributes in a BWS methodology. The secondary goal was to evaluate the differences in the time it took respondents to complete two different presentations of the same best-worst choice task. These results should be particularly interesting to those making marketing decisions based on BWS questions. For example, Cohen and Orme (2004) suggest the use of BWS for segmenting markets. However, if the results differ based on the statistical design, the best course of action may not be chosen.

3.2   Data and Methods

An online survey of U.S. residents was used to implement the best-worst presentation experiment. Online surveys are used to accomplish the dissertation research. Internet surveys are a popular means of gathering consumer data because they have lower costs and data is collected more quickly (Olynk, Tonsor, and Wolf, 2010). Internet survey results are not significantly different from conventional surveys, either via mail or in person (Fleming and Bowden, 2009; Marta-Pedrosa, Freitas and Domingos, 2007). A proprietary opt-in database managed by Lightspeed, GMI was used to identify and contact survey respondents. The online survey was developed, pre-tested, and hosted by Purdue University using the Qualtrics online survey platform. Quotas were utilized to ensure the sample received were representative of the U.S. Census for gender, age, income, education, and region of residence. In order to participate in the survey, respondents had to indicate they were 18 years of age or older.

3.2.1 Best-Worst Estimation

Respondents were presented with a choice experiment containing six meat attributes consumers might consider when purchasing meat products: taste, convenience, safety, animal welfare, price, and nutrition. Respondents were randomly assigned to see one of two different presentations of a best-worst choice task. For the show-2 presentation respondents were shown two meat attributes and asked to choose the one that was most important (best) to them; a sample task is shown in Figure 3.1.

From each of the following pairs of attributes, select the attribute that is most important when you purchase meat?	
○ Animal Welfare	○ Price

Figure 3.1 Sample "Show-2" Best-Worst Choice Task Shown to Respondents

The remaining attribute was inferred to be the least important (worst), following Holland et al (2014). These survey participants were shown a total of 15 best-worst choice experiment tasks with different attribute pairs (Table 3.1). For the show-3 presentation, respondents were shown three meat attributes and asked to select the attribute that was most important (best) and the attribute that was least important (worst). A sample choice task is shown in Figure 3.2. Respondents in this group saw 10 best-worst choice experiment tasks with different combinations of three attributes in each (Table 3.1).

Table 3.1 Design of Best-Worst Choice Tasks Shown to Respondents

	Show-2		Show-3		
1	Animal Welfare	Price	Price	Safety	Taste
2	Price	Taste	Safety	Nutrition	Taste
3	Animal Welfare	Convenience	Animal Welfare	Price	Nutrition
4	Taste	Animal Welfare	Taste	Nutrition	Animal Welfare
5	Nutrition	Price	Nutrition	Price	Convenience
6	Nutrition	Safety	Safety	Animal Welfare	Price
7	Taste	Convenience	Convenience	Safety	Animal Welfare
8	Convenience	Nutrition	Nutrition	Convenience	Safety
9	Safety	Price	Animal Welfare	Taste	Convenience
10	Price	Convenience	Taste	Convenience	Price
11	Safety	Nutrition			
12	Taste	Nutrition			
13	Convenience	Safety			
14	Safety	Animal Welfare			
15	Nutrition	Animal Welfare			

From each of the following sets of attributes, select the attribute that is most important and least important when you purchase meat?		
	Most Important	Least Important
Price	○	○
Safety	○	○
Taste	○	○

Figure 3.2 Sample "Show-3" Best-Worst Choice Tasks shown to Respondents

The six attributes were chosen to represent what consumers likely consider when purchasing meats and this was informed by previous research. The attributes safety, nutrition, taste and price were the four most important attributes in a study of food values for organic foods, in general (Lusk and Briggeman, 2009). While these attributes were previously considered with respect to organic food, they are also applicable to meat purchasing decisions. Safety has been ranked as one of the most important attributes for

various individual meats (Lister et al., 2014; Lusk and Parker, 2011). Thus, it was hypothesized that safety will be highly ranked amongst the attributes included in the current research. Convenience was also included as an attribute in the current study. Convenience was included as an attribute for organic foods (Lusk and Briggeman, 2009) and for three individual cuts of meat (Lister et al., 2014) in previous research. Finally, animal welfare (Lister et al., 2014) was also included as an attribute because of its potential relevance to meat purchasing decisions.

The show-2 and show-3 presentations both contained the same six attributes of meat. The only difference was the number of attributes shown in each task and the number of tasks shown. These two presentations were chosen due to their design simplicity, making them attractive as the least complex and most compact designs to test first. Presenting only two attributes at a time reduces complexity significantly, as respondents only need to choose the "best" or "most important" rather than choosing a best and a worst option, thus simplifying the choice task for the participant (Holland et al., 2014). Thus, this design collapses to a pairwise comparison from the standpoint of the respondent. Such simplifications may be particularly advantageous when conducting surveys via phone or in surveys with other questions of significant length or complexity. In the show-2 presentation, respondents only had to choose the "best" or most important attribute, while the "worst" attribute was inferred or assumed by researchers. The show-3 presentation was also tested because it is the simplest choice task for a respondent to choose both a "best" and "worst" option. In either design, a respondent could potentially select each individual attribute between zero and five times because each attribute appeared five times (Table 3.1). The respondents' choices of the best and worst, or

inference of worst in the case of only two attributes being shown, were used to determine each attribute's place along a continuum of importance (Lusk and Briggeman, 2009). The $J = 6$ attributes were taste, convenience, safety, animal welfare, price, and nutrition. Therefore, there are a total of $J * (J - 1) = 30$ possible combinations of best-worst rankings each respondent could have selected.[2,3] Let λ_j represent the location of an attribute, j, on the scale of importance. The unobservable importance of j for consumer i is:

$$I_{ij} = \lambda_i + \varepsilon_{ij} \tag{1}$$

where ε_{ij} is a random error term. The probability that consumer i chooses attribute j as the best and attribute k as the worst is the probability that the difference between I_{ij} and I_{ik} on the scale of importance is greater than all $J * (J - 1) - 1 = 29$ potential combinations available from the choices shown to each respondent. The error term is assumed to be independently and identically distributed type I extreme value and the probability of choosing a given best-worst combination takes the form (Lusk and Briggeman, 2009):

$$Prob(j = best \cap k = worst) = \frac{e^{\lambda_j - \lambda_k}}{\sum_{l=1}^{J} \sum_{m=1}^{J} e^{\lambda_l \lambda_m - J}} \tag{2}$$

The parameter λ_j is estimated using maximum likelihood estimation (MLE) and represents how important attribute j is relative to the least important attribute. The least

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[2] In the case of the pairwise or show-2 presentation respondents were presented with 15 questions. Each question contained 2 attributes which respondents were asked to choose the most important from. Thus, there were two ways to rank each question and a total of 30 combinations of best-worst rankings each respondent could have selected. Thus, each respondent represented 30 lines in the panel data set.
[3] In the case of the show-3 presentation respondents were shown 10 questions each containing 3 attributes. Thus, there were 6 possible combinations of best-worst rankings for each question and 60 possible ways to answer the question; thus, each respondent represented 60 lines in the panel data set. However, each attribute only appeared in five of the questions; in each case there were 6 possible ways to rank the attributes. This yields 30 potential ways a respondent could have ranked each attribute.

important attribute is determined through analysis of the respondent's answers and its

value must be normalized to zero to prevent issues with dummy variables (Lusk and

Briggeman, 2009). Previous research indicates that individuals are heterogeneous in their

beliefs; thus, a random parameters logit (RPL) model was utilized (Lusk and Briggeman,

2009; Holland et al., 2014). The RPL model was estimated using NLogit 5.0. The

resulting preference shares for either presentation necessarily sum to one across all six

attributes, and can be calculated as (Lusk and Briggeman, 2009):

$$share_j = \frac{e^{\lambda_j}}{\sum_{k=1}^{J} e^{\lambda_k}} \tag{3}$$

The resulting share for each attribute can be interpreted as the probability that an

attribute chosen is more important than another attribute (Wolf and Tonsor, 2013).

Further, if one attribute has a share two times that of second attribute, it can be concluded

that the first attribute is twice as important as the second (Wolf and Tonsor, 2013).

Confidence intervals are commonly used to consider statistical variability around

mean estimates for WTP values (Tonsor, Olynk, and Wolf, 2009; Olynk, Tonsor, and

Wolf, 2010; Widmar and Ortega, 2014; McKendree et al., 2013). ; The Krinsky-Robb

method (Krinsky and Robb, 1986) was used to construct 95% confidence intervals around

best-worst preference shares. Hole (2007) found the delta, Fieller, Krinsky-Robb and

bootstrapping methods of confidence interval calculations yielded similar results.

Application of the bootstrapping procedure proposed by Krinsky and Robb (1986)

generated a distribution of the preference share for each attribute. One way to utilize

confidence intervals to make comparisons is to examine whether or not the 95%

confidence intervals overlap (Schenker and Gentleman, 2001; Olynk, Tonsor, and Wolf,

2010). This intuitive method allows the researcher to make comparisons via visual inspection (Schenker and Gentleman, 2001; Olynk, Tonsor, and Wolf, 2010).[4]

A complete combinatorial test is utilized to test for statistical difference (one-sided significance test) between two independent empirical distributions (Poe, Giraud, and Loomis 2005). The complete combinatorial test was proposed by Poe, Giraud, and Loomis (2005) and implemented on estimated best-worst preference shares by Wolf and Tonsor (2013). Following Poe, Giraud, and Loomis (2005), 1,000 observations were drawn from a multivariate normal distribution parameterized using the coefficients and variance terms from the multinomial logit (MNL) model. These simulated coefficients from each model are subsequently used to test for differences in the distributions of the share preferences.

3.2.2   Measurement of Timing

The amount of time it took respondents to complete each question was recorded within Qualtrics to gain information about potential survey respondent fatigue. Timing of questions is hidden, meaning respondents do not know they are being timed (Qualtrics, 2015) such that this does not add to the complexity of the BWS questions. Timed questions in Qualtrics collect four measurements: first click, last click, page submit, and click count each rounded to the nearest millisecond. The first click metric counts how many seconds until the respondent interacts with the page (Qualtrics, 2015), and the last click metric counts the numbers of seconds until the respondent's last interaction with the page excluding pressing the "next" button. The page submit metric counts the number of

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[4] It should be noted that examining 95% confidence intervals for overlap is statistically more conservative than the standard method of significance testing. For further reading see Schenker and Gentleman, 2001.

seconds until the respondent clicks the "next" button. Finally, the click count metric counts the number of times the respondent clicks on the page. A value for click overage was also calculated by subtracting the number of clicks needed to complete the task, 15 for those respondents who saw 2 attributes at a time and 20 for those who saw 3 attributes, from the respondent's actual recorded click count. Click overage is assumed to be correlated with cognitive burden for the survey respondent.

3.3 Results and Discussion

A total of 818 respondents completed the best-worst portion of the survey. Respondents were randomly assigned to be presented with one of two best-worst presentations. A total of 405 respondents completed the show-3 presentation and 413 completed the show2.[5] Demographics of the 818 survey respondents, broken down by which presentation they saw, are presented in Table 3.2. Across both presentations, the respondents were 49% male and 51% female with a mean age of 47 years. After converting household income to be a continuous variable, the calculated average or mean household income was $50,169, which is slightly lower than the US median household income of $53,046 (US Census Bureau, 2014). A total of 97% of respondents graduated high school and 33% had completed at least 4 years of college. Thus, this sample is slightly more educated than the most recent U.S. Census indicates for the entire U.S. population with 85.7% of those over 25 years of age having graduated high school and 28.5% having a bachelor's degree or higher (US Census Bureau, 2014). There were no

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[5] Respondents in the Show 3 presentation were not forced to complete each question. As a result, some respondents did not complete any/all of the questions. Seven of the 825 respondents did not complete any questions; hence, those respondents were excluded from this analysis.

large differences in the basic demographics (percentage male, age, region of residence, household income, educational background and household size) between the respondents who saw the different presentations.

3.3.1   Best-Worst Preference Shares

The primary objective of this research was to determine whether the results of the best-worst analysis differ when the number of attributes shown at a time and number of choice tasks differ. The coefficients and standard deviations for both presentations can be found in Appendix A. The importance of each of the attributes was estimated relative to nutrition for both presentations. In the show-2 presentation all MNL coefficients with the exception of the coefficient on price and animal welfare were significant; all MNL coefficients except the coefficient on animal welfare were significant in the show-3 presentation. All standard deviation estimates were statistically significant, with the exception of the standard deviation for taste in the show-2 presentation, indicating statistically significant preference heterogeneity; thus, the RPL model is appropriate to model heterogeneity in respondent preferences.

Table 3.2 Sample Demographics

	Show-2	Show-3
Male	48.7	49.1
Age		
18-24 years	14.04%	12.35%
25-44 years	33.41%	34.81%
45-64 years	34.38%	34.57%
65 years and over	18.17%	18.27%
Region		
Northeast	17.19%	17.04%
South	33.67%	32.84%
Midwest	25.91%	26.91%
West	23.25%	23.21%
Annual Pretax Household Income		
Less than $20,000	17.93%	20.74%
$20,000 - $39,999	28.81%	29.88%
$40,000-$59,999	24.21%	20.49%
$60,000-$79,000	10.90%	14.32%
$80,000-$99,000	8.47%	6.17%
$100,000-$119,000	2.66%	3.71%
$120,000 or more	7.02%	4.69%
Educational Background		
Did not graduate from high school	3.15%	2.72%
Graduated from high school, Did not attend college	21.07%	23.21%
Attended College, No Degree earned	28.57%	23.70%
Attended College, Associates or Trade Degree earned	12.35%	17.28%
Attended College, Bachelor's (B.S. or B.A.) Degree earned	21.55%	25.19%
Graduate or Advanced Degree (M.S., Ph.D., Law School)	12.83%	7.65%
Other	0.48%	0.25%
Average Household Size	2.69	2.49

The two presentations yield similar, but not identical rankings of the meat attributes presented. Table 3.3 presents the mean preference share for the show-2 and show-3 presentations as well as the 95% confidence intervals for each mean preference share. The most important attribute is safety in both presentations. This is consistent with previous studies where safety has been found to be the most important attribute for ground beef (Lister et al., 2014; Lusk and Parker, 2009). In previous research on specific meats, safety was also ranked second to freshness for chicken breast and beef steak (Lister et al., 2014). Similarly, Lusk and Briggeman (2009) found safety was ranked the most important attribute for organic foods. Although both presentations in the current study rank safety first, safety accounts for 34.6% of the preference share in the show-3 presentation and only 22.6% of the preference share in the show-2 presentation. A complete combinatorial test was performed to determine if there were statistical differences between the preference share estimates from the two presentations. The results of this test indicated the distributions of preference shares for safety from the two presentations are statistically different. Also, the 95% confidence interval for the show-3 presentation exhibited greater variability around the mean estimate.

The second most important attribute in both presentations, according to the mean estimate of the preference share, was taste. This is similar to Lister et al., (2014) where taste was ranked the third most important attribute out of eleven for ground beef, beef steak and chicken breast.[6] Similarly, taste was the third most important value, behind safety and price, for organic foods (Lusk and Briggeman, 2009). The show-2 presentation yielded a mean preference share of 19.8% compared to 22.6% for the show-3

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[6] Lister et. al., (2014) also included freshness as an attribute which was ranked higher than taste for all three meats included in the study.

presentation. Based on the complete combinatorial test, the show-3 presentation yielded a statistically different distribution than the show-2 presentation for the taste attribute. Based on the mean preference shares, both presentations would rank price as the fourth most important meat attribute. According to the complete combinatorial test, there is a statistically significant difference between the distributions of the preference share for price in the two presentations. The show-2 and show-3 presentations yielded different rankings for the third and fifth places when only the rank of the mean shares was examined. The confidence intervals for nutrition (ranked third), price (ranked fourth) and animal welfare (ranked fifth) overlap in the show-2 presentation indicating they are not statistically different. In the show-3 presentation, the confidence intervals overlap for animal welfare (ranked third) and price (ranked fourth). However, the confidence interval for nutrition (ranked fifth) did not overlap. Thus, in this instance the show-2 presentation indicated that nutrition, price, and animal welfare were not statistically different in terms of the order of ranking. However, the show-3 presentation revealed that animal welfare and price were statistically "tied" but were statistically more important than nutrition. According to the complete combinatorial test, the distributions of preference shares were different between the show-2 and show-3 presentations for nutrition, but not for animal welfare.

Both presentations ranked the convenience attribute last. However, the show-2 presentation yielded a mean preference share of 9.5% which was statistically different than the mean preference share of 3.1% found in the show-3 presentation. Finding convenience to be a low ranking attribute is consistent with Lusk and Briggeman (2009)

Table 3.3 Statistically Significant Differences between Preference Shares Showing 2 and 3 Attributes at a Time

	Show-2			Show-3			Comparison	
	Mean Share	95 % Confidence Interval	Ranking	Mean Share	95% Confidence Interval	Ranking	P-Value	Statistically Significant Difference to the *10%, **5%, and ***1% levels
Price	16.0%	[15.2% , 16.8%]	3	13.8%	[11.8% , 15.8%]	3	0.0249	**
Safety	22.6%	[21.0% , 24.2%]	1	34.6%	[30.8% , 38.6%]	1	0.0000	***
Convenience	9.5%	[9.9% , 10.1%]	6	3.1%	[2.6% , 3.6%]	6	0.0000	***
Taste	19.8%	[18.9% , 20.8%]	2	22.6%	[20.4% , 24.8%]	2	0.0102	**
Animal Welfare	15.6%	[14.1% , 17.1%]	3	15.3%	[13.1% , 17.5%]	3	0.4083	
Nutrition	16.5%	[15.7% , 17.3%]	3	10.6%	[9.8% , 11.7%]	5	0.0000	***

who found that convenience ranked ninth out of eleven attributes for organic foods.

Similarly, Lister et al. (2014) found that convenience ranked last or next to last out of

eleven attributes for ground beef, beef steak, and chicken breast. One potential

explanation for this is that when purchasing raw meat cuts convenience is not important

or not substantially different between meats. However, convenience may be more

important when considering meat products with more processing such as breaded or pre-

cooked products.

Overall, the show-2 and show-3 presentations of BWS ranked the most (safety)

and least (convenience) important attributes the same. However, the preference share

devoted to each attribute was statistically different between the two presentations. For the

attributes in the middle of the ranking, there were discrepancies in both the ranking and

the preference shares across presentations. The 95% confidence intervals were also wider

for all attributes of the show-3 presentation than the show-2 presentation. For researchers,

this means that presentation of attributes in best-worst scaling (BWS) studies may alter

the results and conclusions drawn from BWS questions. This may be especially important

if researchers are attempting to sort out or rank a group of attributes beyond that which is

most or least important.

3.3.2   Timing

Researchers face a tradeoff when designing BWS questions between the number of

attributes per question and the total number of questions shown to respondents (Cohen,

2009). One important consideration in choice experiments is subject fatigue and cognitive

difficulty (Maynard et al., 2004). Thus several timing metrics were collected during the

survey. Table 3.4 displays the statistics for timed questions tracked using the timing feature within Qualtrics. Respondents who completed the show-2 presentation made their first and last clicks sooner and submitted the page sooner than those who saw the show-3 presentation. Similarly, those respondents who saw the show-2 presentation clicked the page less frequently. This is consistent with the experimental design in that show-2 respondents had to make 15 choices, one for each choice scenario shown, while show-3 respondents had to make 20 choices, two (a best and worst) for each of the 10 choice scenarios shown. The average seconds per question was calculated by dividing the seconds it took for the respondent to submit the page divided by the number of questions. Those respondents who completed the show-2 presentation averaged 3.41 seconds per question and those who completed the show-3 presentation averaged 14.51 seconds per question; thus those who completed the show-3 presentation took longer to complete each question. Similarly, the average clicks per question was calculated by dividing the click count by the number of questions answered. Respondents who saw the show-2 presentation averaged 1.07 clicks per question and those who saw the show-3 presentation average 2.29 clicks per question, which is statistically different than the show-2 presentation utilizing a t-test. Of course, it is expected that the show-3 presentation would take twice the number of clicks because respondents had to choose both a best and a worst. Figure 3.3 shows the distribution of the value for seconds until the page was submitted for each presentation.

Table 3.4 Timing Results for Different Presentations of Best-Worst Questions

	Show-2	Show-3	Statistically significant difference (p≤0.01)
First Click- Mean Seconds	17.63	42.93	
First Click- Median seconds	8.47	8.89	
First Click- STDEV	40.75	393.71	***
Last Click- Mean Seconds	53.69	141.69	***
Last Click-Median Seconds	42.63	89.19	
Last Click-STDEV	54.64	435.45	***
Page Submit- Mean Seconds	51.12	145.08	***
Page Submit- Median Seconds	41.89	91.26	
Page Submit- STDEV	52.58	436.14	***
Click Count- Mean	16.12	22.95	***
Click Count- Median	16.00	22.00	
Click Count-STDEV	2.60	4.49	***
Average Seconds per question (page submit divided by number of questions)	3.41	14.51	***
Average Clicks per question (click count divided by number of questions)	1.07	2.30	***

Similarly, Figure 3.4 shows the distributions of the click counts for the two presentations.

Consistent with Figure 3.3, there is greater probability mass closer to zero in the show-2

plot of click count compared show-3, indicating respondents complete show-2 question in

fewer clicks (Figure 2). Most respondents completed the show-2 presentation in 16 clicks

meaning that they answered each of the 15 questions in a single click plus one additional

click over all 15 choices. In the show-3 presentation there were a small number of

respondents who did not answer every choice scenario resulting in 5% of
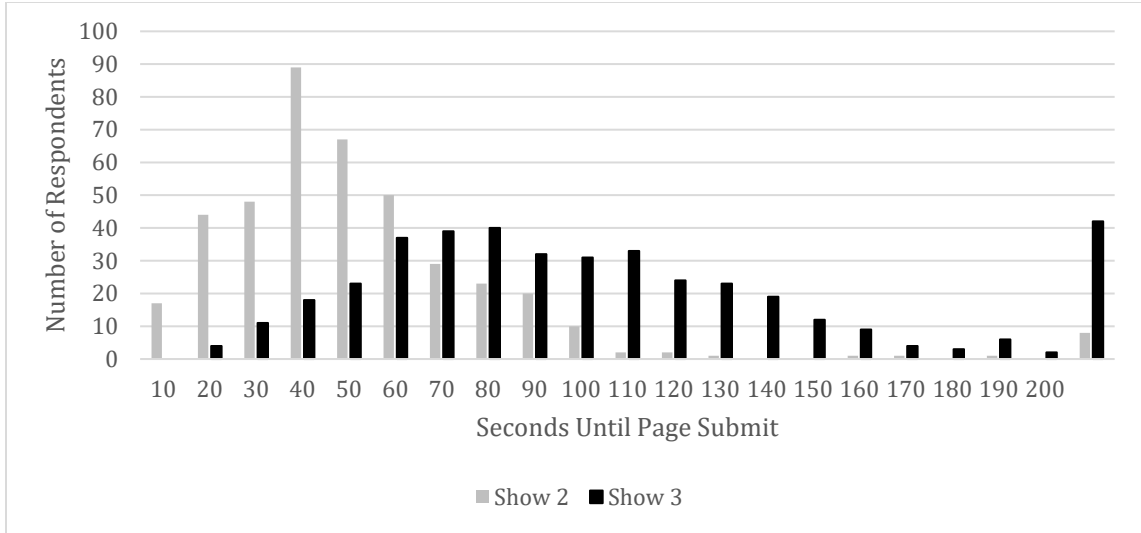
Figure 3.3 Seconds until Page Submit

observations with less than the 20 minimum clicks required to complete the entire set of

choice questions. However, it is notable that the distribution of the show-3 click count

was less concentrated around the 20 clicks necessary to complete the task and was more

even dispersed across the number of clicks than the show-2 presentation.

3.4 Conclusion

BWS is an increasingly important research method used by researchers in many

fields to ascertain the relative importance (or preference) for a set of factors, attributes, or

objects. The BWS questions in previous research have included a varied number of total

attributes and attributes per choice task. While there is some discussion around the ideal

number of attributes to show in each question, it is important to understand if different
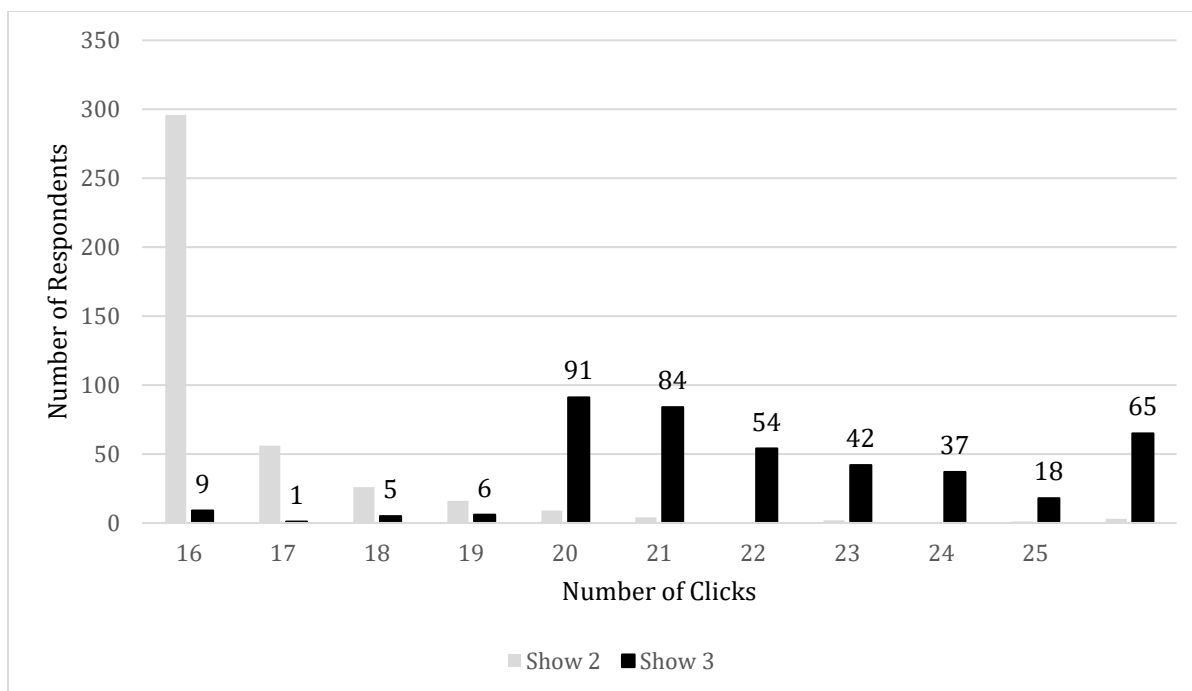
Figure 3.4 Click Count

experimental designs or presentations of BWS questions result in significantly

different findings. It is recognized that subject fatigue and cognitive difficulty affect the

reliability of choice experiment results (Maynard et al., 2004). It is hypothesized that a

similar issue may occur with BWS. In the current research, respondents were randomly

assigned to see one of two presentations of best-worst questions involving the same six

meat purchasing attributes. In addition, the time it took each respondent to complete each

page of questions and the number of clicks was recorded.

The current study demonstrates that significant differences can arise in the

resulting preference shares when respondents are shown a different number of attributes

per question. While both presentations ranked safety as the most important and taste as

the second most important attribute, a complete combinatorial test revealed that the

distributions of the preference share estimates were statistically different. Both

presentations also ranked convenience as the least important attribute with statistically

different distributions of preference shares when respondents were shown two versus

three attributes at a time. For other attributes, the two presentations yielded different

rankings based on the mean preference share estimate. The show-2 presentation yielded

three attributes with overlapping mean preference share confidence intervals that were

not statistically different. In effect, price, animal welfare, and nutrition were statistically

tied for the third most important attribute studied. The show-3 presentation yielded only

two attributes, price and animal welfare, with overlapping confidence intervals indicating

these mean preference shares were not statistically different. While both BWS

presentations yielded the same ranking of best and worst attributes overall, there were

differences between the two presentations with respect to the attributes in the middle.

Thus, we find that the results of BWS questions can in this case differ depending on the

number of attributes (and total number of questions) shown. Thus, researchers should

exercise caution in using BWS results, especially when intermediate preference ordering

or predicted preference share is important. Similarly, marketing managers should also

exercise caution making marketing decisions using BWS questions.

Future research should explore the effects of different presentations when

respondents are asked to consider more attributes at a time (e.g. showing 7 attributes at a

time). Similarly, it is important to understand if these results hold for other subject matter

applications (e.g. other foods, medicine, transportation, environmental valuation). Future

research should also consider the role heuristics play in respondent choices of best and

worst in various contexts. It is important that the preference shares resulting from BWS

questions reflect respondents' (and thus consumers') underlying preferences and not be attributable to the design of the experiment or the presentation of choice questions. A better understanding of the effects of best-worst presentation on estimated preference shares and cognitive burden will improve the reliability of best-worst results and make them more applicable in policy contexts and when making marketing decisions.

CHAPTER 4. ARE U.S. CONSUMERS WILLING TO PAY FOR LOCAL CHICKEN BREASTS AND PORK CHOPS

4.1 Introduction

Consumers are increasingly concerned about how their food is produced, thus considering impacts of production on animals, society, and the environment (Briggeman and Lusk, 2010). Similarly, consumers are concerned about issues of fairness and the distribution of benefits of the foods they purchase (Toler et al., 2009). Locally grown foods are an example of where consumer preferences may go beyond basic characteristics, such as freshness or food safety, of the food they buy (Toler et al., 2009). For example, locally grown products are perceived by at least some consumers to be of higher quality (Onozaka and Mcfadden, 2011). Onozaka and McFadden (2011) also hypothesized that preferences for local foods could be driven by safety concerns because consumers could perceive the global food system as less safe. Likewise, concern for climate change and attention to food miles and/or carbon footprint may lead consumers to think that globally sourced food is not environmentally friendly because it must be transported relatively greater distances (Onozaka and McFadden, 2011). Furthermore, Bond, Thilmany, and Keeling Bond (2008) found that economic development, quality,

and safety partly accounted for the premiums some consumers paid for locally grown food. Additionally, it has been shown that a portion of the premium consumers are willing to pay for locally grown foods is dedicated to the consumers' concern for local farmers (Toler et al., 2009).

Locally produced or "local" is a credence attribute (Dentoni et al., 2009). A credence attribute is one which cannot be assessed by consumers either before purchase or after consumption (Caswell and Mojduszka 1996). For example, a consumer cannot verify that a pork chop was produced locally during purchasing or consumption without additional information or assurances. One way in which a consumer might be satisfied that the pork chop was locally produced is to purchase it at a farmers' market and speak directly to the seller. Another way for the consumer to assure themselves they are purchasing a locally grown or produced product is to purchase a product that is certified or verified by a third party agency. Additionally, availability of local agricultural products is a barrier for consumers; in other words, locally produced agricultural products are sometimes not available when and where consumers typically shop (Stephenson and Lev, 2004). In fact, low availability of sustainable products, whether actual or perceived, could help explain the "attitude-behavior intention" gap where consumers have a positive attitude towards sustainable products but do not follow through with purchases (Vermeir and Verbeke, 2006).

According to Lev and Gwin (2010), livestock farms account for 58% of farms that had farm-direct sales in 2007. However, the average direct sales per livestock farm are less than one-third the average sales from farms that sell produce and other offerings. Lev and Gwin (2010) point out that it is important to understand consumer demand and

consumer willingness to purchase local products through the range of direct market channels including farmers' markets, farm stands, CSA's, buying clubs, and "on the hoof" live sales. Lev and Gwin (2010) estimated that in 2007, farm-direct sales represented 25% of local food sales. Thus, the majority of local foods are not sold through farm-direct channels and it is important to consider that local foods may also be found in specialty stores and regular grocery stores.

"Local" has recently received attention in the popular press as well as in the literature. Past research has focused on the definition of local foods (Darby et al., 2008). More recently, studies have considered WTP for locally grown produce (Loureiro and Hine, 2002) and locally produced milk (Wolf, Tonsor, and Olynk, 2011; Park and Gomez, 2012). However, a consensus has not been reached regarding the definition of local, nor the benefits or consumer WTP. Park and Gomez (2012) hypothesize that the premiums consumers were willing to pay for the "local" attribute was likely contingent on the definition of local used in the study. There is general agreement that local food refers to food produced in an area that is in close proximity to the consumer and in some geographic or political boundary (Hand and Martinez, 2010). However, Hand and Martinez (2010) recognize there is little agreement on exactly what those boundaries are. For example, there is little agreement on the mile radius (geographic) boundary or political boundaries such as county, metropolitan area, state, or region (Hand and Martinez, 2010). While consumers could be provided definitions of local based on the geographic boundaries specified by the metropolitan statistical areas defined by the US Census Bureau, definitions of "local" necessarily rely on consumer perceptions of what "local" means (Park and Gomez, 2012). Similarly, Onozaka, Nurse, and Thilmany

McFadden (2011) add that the marketing channel for produce affects respondents' definition of local and, in turn, affected the WTP for products that were labeled as "local". To further complicate the discussion, the ability to produce in a given locale may influence perceptions of and WTP for locally produced foods. Sackett, Tonsor and Schupp (2011) attributed the fact that the locality of production appeared more important in beef than apples to the fact that meat production is less specific to a place since apples cannot be grown in all places. In other words, if a product could not be grown locally, such as apples, the locality of production was not as important.

One area of local foods that has had relatively less attention is the topic of locally produced meats. Maynard, Burdine, and Meyer (2003) estimated the premiums respondents were willing to pay for locally produced ground beef, steak, chicken, and sausage. Van Loo et al. (2013) considered the interest in Georgia raised poultry finding that sustainably-raised and Georgia-grown to be the most important chicken attributes included in the study. Other research has focused on locally produced beef (Maynard et. al., 2004; Ridley, Shook and Devadoss, 2015). Maynard et al. (2004) hypothesized that locally produced beef provided attributes of verification of source which to consumers could include food safety, accountability, and environmental stewardship as well as supporting local, small-scale producers.

This chapter contributes to the understanding of consumer preferences and demand for local foods. First, this analysis explores how respondents' self-reported definitions of local foods are related to demographic characteristics and other factors hypothesized to be related to respondents' definition of local foods. For example, the hypothesis that respondents who reported participating in hunting and fishing (therefore

participating in catching or hunting their own food) would be more likely to define local as closer to home is tested. Second, this chapter seeks to determine whether or not consumers are willing to pay for verified local production of pork chops and chicken breasts through a nationwide survey. Further, this analysis explores whether WTP differs based on respondents' self-reported definition of local foods.

4.2 Materials and Methods

An online survey was used to collect data regarding respondents' socio-demographic characteristics and self-reported definitions of local foods. [255] The survey also contained designed choice experiments to determine the WTP for verified production attributes for pork chops and chicken breasts. In order to participate in the survey, respondents had to first indicate they were 18 years of age or older.

Respondents were asked to identify their definition of local foods. As previously discussed, local foods are defined by geographic or political boundaries (Hand and Martinez, 2010). Because this survey was administered nationwide, the definition needed to be applicable to respondents across the country. Specifically, the question employed in this analysis was adapted from Wolf, Tonsor and Olynk (2011) who considered the WTP for milk in a nationwide study. In that study, respondents were posed the following question: "Which of the following best describes the proximity from your home you consider 'local' food to originate from" (Wolf, Tonsor and Olynk, 2011). Respondents

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[255] A proprietary opt-in database, Lightspeed GMI, was used to identify and contact survey respondents. The online survey was developed, pre-tested, and hosted by Purdue University using the Qualtrics survey platform.

were given the choices of with 10 miles, 20 miles, 50 miles, 100 miles, within state or other (Wolf, Tonsor and Olynk, 2011). However, 1.7% of respondents in their nationwide survey chose other (Wolf, Tonsor and Olynk, 2011); therefore, "other" was omitted as an option in this study. Similarly, Onozaka, Nurse, and Thilmany McFadden (2010) found that 70% of respondents surveyed defined local to be within a 50-mile radius. It is worth noting that "local" is statutorily defined in the U.S. as a food having been transported less than 400 miles or within the state where they were produced (Johnson, 2016). Because previous research found consumers define "local" food to be produced much closer to their home than 400 miles, much lower mileages were utilized in this study. Thus, the options included in this study are consistent with the results of previous research.

Cross tabulations were used to understand how demographic factors may be related to a respondents' definition of local. In previous research, cross tabulations have been used to explore the relationships between demographics and stated concern for animal welfare (McKendree et al., 2014a; McKendree et al., 2014b) and demographics associated with organic food purchasers in Ireland (Davies and Cochrane, 1995).

Respondents were randomly assigned to a choice experiment for either pork chops or chicken breasts. Appendix A contains the information provided at the beginning of each choice experiment. Respondents taking part in the pork chop choice experiment received information about whether individual crates/stalls were permitted or not permitted, location was local or no claim was made, and whether antibiotic use was permitted or not permitted. Respondents in the chicken breast choice experiment were shown information about whether pasture access was required or not required, location

was local or no claim was made, and antibiotic use was permitted or not permitted. For both products, information about whether the certification entity was the USDA Process Verified Program (USDA-PVP), a retailer, or an industry (pork or poultry) was provided. Including a certification entity is consistent with the notion that "local" is a credence attribute and it is unlikely that such a claim would be made in a retail setting without some type of verification or certification (Olynk, Tonsor and Wolf, 2010; Olynk and Ortega, 2013). The set of attributes and their levels are shown in Table 4.1.

Table 4.1 Pork Chop and Chicken Breast Attributes and Attribute Levels Evaluated in Choice Experiments

Product Attribute	Pork Chop Attribute Levels	Chicken Breast Attribute Levels
Price	$2.49/lb $3.89 $5.29	$1.89/lb $3.15 $4.41
Individual Crates/Stalls	Not Permitted Permitted	▇▇▇▇▇
Pasture Access	▇▇▇▇▇	Not Required Required
Location	Local No Claim	Local No Claim
Antibiotic Use	Not Permitted Permitted	Not Permitted Permitted
Certification Entity	USDA-PVP Retailer Certification Pork Industry	USDA-PVP Retailer Certification Pork Industry

Respondents were shown three price levels for each product in dollars per pound that were comparable to retail prices for pork chops and chicken breasts at the time of survey administration. Pork chops were offered at $2.49/lb., $3.89/lb., and $5.29/lb. Chicken breasts were offered at $1.89/lb., $3.15/lb., and $4.41/lb.[256] The description of the attributes shown to respondents prior to the choice experiment is given in Appendix B. To determine the exact combinations of attributes and verification agencies shown to respondents, the SAS OPTEX program was used to create the main effects plus two- way interaction experimental design (Lusk and Norwood, 2005) which maximized the D-efficiency (86.84). This design yields a total of 24 choice sets for each product which were divided into three blocks so that respondents were shown eight choice sets (Tonsor et al., 2005; Olynk and Ortega, 2013; McKendree et al., 2013). A sample purchasing scenario for pork chops is shown in Table 4.2.

Table 4.2 Example Pork Chop Purchasing Scenario

Attribute	**Option A**	**Option B**	**Option C**
Price ($/lb.)	$5.29	$5.29	
Individual Crates/Stalls	Permitted	Permitted	I choose not to purchase either product
Location	No Claim	No Claim	
Antibiotic Use	Permitted	Not Permitted	
Certification Entity	Retailer Certification	USDA-PVP	
I Choose:	___	___	___

[256] Prices were selected to be consistent with the USDA Weekly Retail Chicken and Pork Feature Activity Publications at the time of survey administration. Ranges were selected to be within the range of prices reported for that week from different regions of the country to ensure the prices were representative of prices respondents may encounter in grocery stores where they resided.

A "cheap talk" statement was utilized to reduce hypothetical bias and was included in respondent instructions to inform respondents of potential bias before they take part in the choice experiment (Lusk, 2003). The specific language of the cheap talk statement (McKendree et al., 2013) can be found in Appendix C.

Choice experiments rely on random utility theory where utility is composed of a deterministic component V_{nit}, which depends on the attributes of an alternative, and a stochastic component, ε_{nit}, as:

$$U_{nit} = V_{nit} + \varepsilon_{nit} \tag{1}$$

Respondent n will choose alternative i if $U_{nit} > U_{njt}$ $\forall j \neq i$. The probability of respondent n choosing alternative i can be represented by:

$$P_{nit} = Prob\big(V_{nit} + \varepsilon_{nit} > V_{njt} + \varepsilon_{njt}; \forall j \in C, \forall j \neq i\big) \tag{2}$$

Given the assumed underlying distribution of the error term, the closed form of the logit choice probability can be expressed as:

$$P_{nit} = \frac{\exp(V_{nit})}{\sum_j \exp(V_{njt})} \tag{3}$$

Utilizing a model that allows for heterogeneous preferences is appropriate because previous research suggests that consumers preferences are heterogeneous (Lusk, Roosen, and Fox, 2003; Alfnes, 2004; Tonsor et al., 2005). Thus, a random parameters logit (RPL) model was employed.

If we employ the simplifying assumption that the deterministic portion, V_{nit}, is linear in its parameters, the general model can be specified as:

$$V_{it} = \beta_1 x_{it} + \cdots + \beta_k x_{it} \tag{4}$$

where x_{it} is the vector of attributes associated with the ith alternative, and the $\beta's$ are the parameters associated with those attributes.

The model was modified to enable researchers to determine whether those respondents' whose self-reported definition of local was "within 10 miles" or "within 20 miles" had a statistically different WTP for animal welfare attributes in pork chops and chicken breasts. For example, in the model for pork chops the deterministic part of utility, v, for individual i, can be expressed as:

$$v_i = \beta_1 Price_i + \beta_2 USDA\_Crate_i + \beta_3 Retailer\_Crate_i + \beta_4 Industry\_Crate_i \quad (5)$$

$$+\beta_5 USDA\_Loc_i + \beta_6 Retailer\_Loc_i + \beta_7 Industry\_Loc_i + \beta_8 USDA\_Anti_i$$

$$+\beta_9 Retailer\_Anti_i + \beta_{10} Industry\_Anti_i + \beta_{11} OptOut_i + \beta_{12}(OptOut_i * Local20)$$

$$+ \beta_{13}\left(USDA_{Crate_i} * Local20\right) + \beta_{14}(Retailer_{Crate_i} * Local20)$$

$$+\beta_{15}\left(Industry_{Crate_i} * Local20\right) + \beta_{16}(USDA_{Loc_i} * Local20)$$

$$+\beta_{17}(Retailer\_Loc_i * Local20) + \beta_{18}(Industry_{Loc_i} * Local20)$$

$$+\beta_{19}\left(USDA_{Anti_i} * Local20\right) + \beta_{20}\left(Retailer_{Anti_i} * Local20\right)$$

$$+ \beta_{21}(Industry\_Anti_i * Local20)$$

where $Price_i$ is the price of the boneless, center-cut pork chop and $OptOut_i$ is a constant representing the negative utility of not having the pork chop in the choice set. The terms, such as $\beta_2 USDA\_Crate_i$ are effects-coded interaction terms between the attributes, in this

case individual crates/stalls, and the verification agency [257,258,259]. The terms, such as

$\beta_2 USDA\_Crate_i * Local20$ are effects-coded interaction terms multiplied by a dummy

variable for whether the respondent reported local to mean "within 10 miles" or "within

20 miles". Appendix D contains sample NLOGIT code for the model modified to account

for respondent's definition of local.

Likewise, the WTP equation was modified to account for the addition of the

dummy variable *Local20* where *Local20* is equal to 1 if the respondent reported that local

food meant produced 10 or 20 miles from home and zero if the respondent indicated that

local food meant something else. For example, the WTP equation for USDA verified

crate free production was:

$$WTP_k = -2\left(\frac{\beta_2 + \beta_{13}*Local20}{\beta_1}\right) \tag{6}$$

The coefficients, the $\beta's$, on all variables except *Price* are assumed to vary

normally across consumers and are drawn from a normal distribution to allow for both

positive and negative WTP estimates (Lusk, Roosen, and Fox, 2003; Tonsor et al., 2005).

While the standard logit model exhibits independence from irrelevant alternatives;

random parameters logit models do not. Revelt and Train (1998) identified the possibility

for correlated taste parameters to form general patterns. To gain a better understanding

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[257] Following Olynk, Tonsor, and Wolf (2010) an example interpretation of the interaction terms between an attribute and a verification agency is the WTP for the USDA to verify to verify crate free production as opposed to not having the USDA verify crate free production.

[258] Effects coding is used to avoid confounding effects of absence of attributes with the "no purchase" option. Whereas regular dummy variables are coded 0 or 1, effects coding takes on the values 0, 1, or -1. The attribute is given a value of 1 when the attribute is present, -1 when the base category or the attribute is not present, and 0 otherwise (Tonsor, Olynk and Wolf, 2009).

[259] Attributes were not included without being interacted with a verification agency. By the design of the choice experiment respondents never considered attributes without a verification agency. This is consistent with the real world in that products with animal welfare claims are unlikely to be marketed without a verification or certification. (Olynk, Tonsor, and Wolf, 2010).

these potential correlations, Revelt and Train (1998) suggest constructing a Cholesky matrix Ω. Allow β to be a $k \; x \; 1$ vector of the coefficients on the attributes and η a $(k-2)$x1 vector of coefficients on random attributes in β. Then specify $\eta \sim N(\bar{\eta}, \Omega)$. The result can be expressed as $\eta = \bar{\eta} + LM$ where L is the lower triangular Cholesky factor such that $LL' = \Omega$. Following Revelt and Train, (1998), The M-vector contains independent normal deviates. Estimates of the Cholesky matrix exhibiting statistical significance supports interdependence in tastes and of potential correlations in preferences across attributes in the choice set (Scarpa and Del Guidice, 2004).

Confidence intervals are useful in considering the statistical variability around the mean estimate for WTP (Olynk, Tonsor, and Wolf, 2010). Thus, 95% confidence intervals for WTP estimates were found using the Krinsky-Robb method (Krinsky and Robb, 1986). Hole (2007) found the Krinsky-Robb method yielded similar results to the delta, Fieller, and bootstrapping methods to construct confidence intervals for WTP estimates.

4.3 <u>Results and Discussion</u>

A total of 825 respondents completed the survey; demographics of the survey respondents are presented in Table 4.3. The sample was comprised of 49% male and 51% female respondents with a mean age of 47 years for respondents. The mean household income was calculated at $50,170 after conversion to a continuous variable. This is slightly lower than the US median household income of $53,046 (US Census Bureau, 2014). In this sample, 97% of respondents graduated high school and 34% had completed at least 4 years of college (earned a Bachelor's Degree or Graduate or Advanced degree).

On average, 85.7% of American over 25 years of age have graduated high school, and

28.5% of respondents have a bachelor's degree or higher (US Census Bureau, 2014). The

mean household size in this sample is 2.64 people which is nearly identical to the US

average of 2.61 (US Census Bureau, 2014). Respondents reported spending on average

$138.43 per week on food with 76% being spent on food prepared at home and 24%

spent on food away from home. According to the Bureau of Labor Statistics (2015) the

Table 4.3 Respondent Demographics

Demographic Variable	Percentage of Respondents (%)		
	All n=825	Pork Chop CE n=413	Chicken Breast CE n=412
Male	49.2	50.4	48.1
Age			
18-24	13.3	14.8	11.9
25-44	34.2	33.9	34.5
45-64	34.2	31.7	36.6
65+	18.3	19.6	17.0
Education			
Did not graduate from high school	2.9	2.9	2.9
Graduated from high school, did not attend college	22.1	20.1	24.0
Attended College, No Degree Earned	26.3	28.6	24.0
Associates or Trade Degree	14.7	14.3	15.0
Bachelor's Degree Earned	23.3	24.2	22.4
Graduate or Advanced Degree (M.S., PhD., Law School)	10.3	9.7	10.9
Other	.5	.2	.8
Annual Household Pretax Income			
Less than $20,000	19.3	20.8	17.7
$20,000 - $39,999	29.3	30.5	28.2
$40,000 - $59,999	22.5	20.8	24.3
$60,000-$79,999	12.5	12.1	12.9
$80,000-$99,999	7.4	6.5	8.2
$100,000-$119,999	3.2	3.9	2.4
$120,000 or more	5.8	5.4	6.3
Region			
Northeast	17.1	17.7	16.5
South	33.2	35.1	31.3
Midwest	26.4	24.9	27.9
West	23.3	22.3	24.3

average weekly expenditure on food is $129.98. In a similar study, McKendree et al.

(2013) found that the average weekly expenditure on food was $132.77. Respondents

reported spending 24% of food expenditures on food away from home. McKendree,

Olynk and Ortega (2012) found that the majority of survey respondents spent 20% or less

on food away from home.

Respondents were asked to identify their definition of local foods. The

relationship between respondents' definitions of local and other characteristics that were

hypothesized to be related to respondents' definition of local (Table 4.4). For example, it

was hypothesized that respondents who hunt or fish, in other words those who may be

involved in hunting or catching their own food, may define local food as having been

produced closer to home than those who do not hunt or fish. When asked, a total of

twenty-four percent of respondents reported regularly fishing and 10% reported regularly

hunting. In response to the question "Which of the following best describes the proximity

from your home you consider 'local' food to originate from" respondents were given the

choices of with 10 miles, 20 miles, 50 miles, 100 miles or within state. This question was

adapted from Wolf, Tonsor and Olynk (2011) who considered the WTP for milk. In their

study, potential responses to this question included "other" but only 1.7% of respondents

in a nationwide survey chose "other." Therefore, "other" was omitted as an option in the

current research. The most frequently selected categorization was "10 miles" with 37% of

respondents choosing this category. A total of 21% of respondents chose "20 miles". The

least popular category was "100 miles" with only 7% of respondents choosing this

option. Thus, over half of respondents thought that local food originated 20 or fewer

miles away from their home and just over three-quarters defined local food as being

within 50 miles from home. This result is consistent with Onozaka, Nurse, and Thilmany McFadden (2010) who found that 70% of respondents surveyed stated local was within a 50-mile radius. Similarly, Adams and Adams (2011) found that 73% of respondents in their study about produce defined local to be within 50 miles (aggregate of the categories for 10 miles, 30 miles, and 50 miles). Likewise, Zepeda and Li (2006) point out that consumers largely define local in a way that is smaller than their state of residence.

Cross tabulations were utilized to understand how demographic factors were related to a respondents' definition of local. Table 4.5 shows the results of cross tabulations between demographic and other characteristics with a respondents' definition of local food. For the purposes of this analysis, the categories "within 10 miles" and

Table 4.4 Additional Respondent Demographics and Variables of Interest

Variable of interest	Percentage of respondents (%)		
	All n=825	Pork Chop CE n=413	Chicken Breast n=412
Definition of Local			
10 miles	37.3%	38.2%	36.4%
20 miles	20.7%	21.1%	20.4%
50 miles	18.2%	17.2%	19.2%
100 miles	7.0%	7.0%	7.0%
Within State	16.7%	16.5%	17.0%
Participation in sporting activities			
Regularly fishes	23.9%	24.0%	23.8%
Regularly hunts	10.2%	10.4%	10.0%
Altered Total Meat Consumption in the Past 3 Years due to:			
Animal welfare concerns	19.8%	18.2%	21.4%
Food safety concerns	24.0%	21.8%	26.2%

"within 20 miles" were combined into one category which contained 58% of respondents.

The remaining categories (within 50 miles, within 100 miles, and within state) were

combined into a single category which represented 42% of respondents. The letters in the

table represent a statistically significant difference at the 5% level. For example, when

Table 4.5 Additional Respondent Demographics and Variables of Interest

	Local Defined As	
	Within 50 miles, 100 miles, or within state (A)	Within 10 miles or within 20miles (B)
Over 45	59.8%B	47.2%A
Under 45	40.2%B	52.8%A
All other regions	71.4%B	78.4%A
West	28.6%B	21.6%A
Not Low Income	58.4%B	46.3%A
Low Income (<$40K per year)	41.6%B	53.7%A
Not High Income	88.7%B	92.7%A
High Income (>$100K per year)	11.3%B	7.3%A
Not a College Grad	20.5%B	28.2%A
College Grad	79.5%B	71.8%A
Does not regularly fish	79.8%B	73.5%A
Regularly fishes	20.2%B	26.5%A
Does not regularly hunt	92.8%B	87.8%A
Regularly hunts	7.2%B	12.3%A
Altered Total Meat consumption due to animal welfare concerns in the past 3 years	16.5%B	22.1%A
Not altered total meat consumption due to animal welfare concerns in the past 3 years	83.5%B	77.9%A
Altered total meat consumption due to food safety concerns in the past 3 years	19.1%B	27.6%A
Not altered total meat consumption due to food safety concerns in the past 3 years	80.9%B	72.4%A

reading the "over 45" row, column A is significantly different than column B at the 5% level. Those respondents who were 45 years or older more frequently identified local as being within 50 miles, 100 miles, or within the state. On the other hand, respondents who were under the age of 45 more frequently reported local food to be within 10 or 20 miles.

Respondents from the West more frequently reported local to mean within 10 or 20 miles of home than did those from other regions. Respondents who were classified as low income (<$40,000 per year) more frequently reported local as meaning within 10 or 20 miles. Those classified as high income (>$100K per year) more frequently reported local to mean within 50 miles, 100 miles, or within the state. Similarly, college graduates more frequently reported local to mean within 50 miles, 100 miles, or within the state. In this study, respondents who fell into the high income category more frequently reported being college graduates. Likewise, those respondents who fell into the low income category more frequently reported not being college graduates. These results are interesting in light of previous research findings that residing in the West or being in the highest income category decreased the likelihood of buying local food (Zepeda and Li, 2006). In our study, those who resided in the West or fell into the highest income category more often defined local as being relatively further away. However, Wolf (1997) found that shoppers at farmers' markets were more often older and had higher incomes.

Individuals who identified themselves as regularly fishing more frequently categorized local as meaning within 10 or 20 miles. The same was true for those who identified themselves as regularly hunting. This is consistent with the hypothesis that those who hunt or catch their own food would have a different definition of local that

those who do not. Hunting and fishing are both sources of local meats (Tidball, Tidball, and Curtis 2014). In fact, Tidball, Tidball, and Curtis (2014) point to several popular books that tout hunting and promote hunting and fishing for meats (*Omnivore's Dilemma* by Michael Pollan published in 2006; *Girl hunter* by G. Pellegrini published in 2011; *Hunt, gathe*r*, cook* by H. Shaw published in 2011; *The mindful carnivore: A vegetarian's hunt for* sustenance by T. Cerulli published in 2012). However, as Martinez et al. (2010) point out, informal sources of local foods, such as hunting or fishing, are either difficult to measure or remain unmeasured. For example, many species of wild harvested meat and fish are absent from the USDA National Nutrient Database for Standard Reference (Tidball, Tidball, and Curtis 2014).

Altering meat consumption patterns due to concerns over animal welfare or food safety may be related to perceptions of local food production. Respondents were also asked if they had altered their meat consumption patterns in the past 3 years as a result of either animal welfare or food safety concerns. Those respondents who had altered their total meat consumption in the past 3 years as a result of animal welfare concerns more frequently reported that local meant within 10 or 20 miles. Respondents who reported they had altered their total meat consumption in the past three years as a result of food safety concerns also more frequently defined local as within 10 or 20 miles of their home. This finding is consistent with previous findings that consumers may perceive local foods as being safer (Onozaka and McFadden 2011). Maynard et al. (2004) previously hypothesized that locally produced beef provided consumer with source verification and food safety attributes. A similar argument can be made for those altering their meat consumption due to animal welfare concerns; consumers could feel as though locally

produced meats, which are likely to be produced on small farms, would have a higher level of animal welfare.

The marginal WTP for verified attributes for both pork chops (Table 4.6) and chicken breasts (Table 4.7) including the mean marginal WTP estimates for each verified attribute and the marginal WTP estimates for differing respondent definitions of local were estimated. A table of coefficients and standard errors can be found in Appendix E. First, we consider the mean marginal WTP estimates across the entire sample of respondents. For pork chops, respondents were WTP up to a mean marginal WTP of $1.98/lb. for the UDSA to verify crate free pork production and up to $2.34/lb. for the USDA to verify antibiotic free production. Likewise, for chicken breasts, respondents were willing to pay up to $1.78/lb. for USDA verification of pasture access and $1.87/lb. for USDA verification of antibiotic free production. However, respondents were unwilling to pay a premium (or willing to pay a negative amount) for the USDA to verify local production of pork chops. In contrast, respondents were willing to pay up to $2.06/lb. for the USDA to verify local production of chicken breasts. Likewise, respondents had a mean marginal WTP of up to $0.49/lb. for the retailer to verify local production of chicken breasts.

WTP for each product is then explored based on whether the respondent classified local as being within 10 or 20 miles. Considering pork chops, there are no statistical differences in the WTP for the verified attributes based on the respondents' definition of local. While there was no statistical difference in the WTP for USDA verified antibiotic-free pork chops, respondents who classified local as being within 10 or 20 miles had a 95% confidence interval that crossed zero for retailer or industry verified antibiotic free

production. On the other hand, respondents who classified local as 50 or more miles away from home were willing to pay up to $1.87/lb. for retailer verified and up to $2.11/lb. for industry verified antibiotic free production.

When chicken breasts are considered, a similar result arises. Respondents who defined local as being 10 or 20 miles away had a 95% confidence interval that crossed zero for industry verified antibiotic free production while respondents who defined local as further away had a WTP of up to $1.81/lb. for the same attribute. There were no statistically significant differences in WTP for USDA verified local production or retailer verified local production for chicken breasts based on respondents' definition of local. However, the 95% confidence interval for local production verified by the retailer

Table 4.6 WTP Results for Pork Chop and Percentage of Respondents WTP a Positive Amount for Each Verified Attribute

	Mean over Entire Sample		Defined Local as within 10 or 20 miles		Defined Local as 50 or more miles		Percentage of Respondents WTP a Positive Amount
	WTP	95% Confidence Interval	WTP	95% Confidence Interval	WTP	95% Confidence Interval	
Opting Out	$(5.53)	[-$6.69, -$4.37]	$ (5.72)	[-$7.38 , -$4.28]	$ (5.26)	[-$7.28 , -$3.43]	
Individual Crate_USDA	$1.98	[$1.35 , $2.64]	$ 1.82	[$1.09, $2.65]	$ 2.20	[$1.42 , $3.18]	84.0%
Individual Crate_Retailer	$0.27	[-$0.55 , $1.12]	$ 0.29	[-$0.67 , $1.25]	$ 0.24	[-$0.96 , $1.41]	45.5%
Individual Crate_Pork Industry	$2.34	[$1.39 , $3.33]	$ 2.51	[$1.34, $3.89]	$ 2.11	[$0.74 , $3.55]	72.6%
AntibioticUse_USDA	$4.55	[$3.52 , $5.80]	$ 4.12	[$2.98 , $5.57]	$ 5.16	[$3.83 , $6.83]	85.7%
AntibioticUse_Retailer	$1.32	[$0.30 , $2.34]	$ 0.94	[-$0.15 , $2.13]	$ 1.87	[$0.46 , $3.57]	61.7%
AntibioticUse_Industry	$1.17	[$0.14 , $2.40]	$ 0.53	[-$0.88 , $1.92]	$ 2.11	[$0.59 ,$ 3.84]	70.0%
Local_USDA	$(1.44)	[$-2.22 , $0.69]	$ (1.04)	[-$1.89 , -$0.17]	$ (2.02)	[-$3.16 , -$1.01]	9.4%
Local_Retailer	$(1.31)	[-$2.23 , -$0.44]	$ (0.81)	[-$1.93 , $0.22]	$ (2.04)	[-$3.54 , -$0.78]	9.9%
Local_Industry	$(3.37)	[-$4.80 , -$2.23]	$ (2.78)	[-$4.29 , -$1.58]	$ (4.24)	[-$6.10 , -$2.76]	3.9%

Table 4.7 WTP Results for Chicken Breasts and Percentage of Respondents WTP a Positive Amount for Each Verified Attribute

	Mean over Entire Sample		Defined Local as within 10 or 20 miles		Defined Local as 50 or more miles		Percentage of Respondents WTP a Positive Amount
	WTP	95% Confidence Interval	WTP	95% Confidence Interval	WTP	95% Confidence Interval	
OptingOut	$(7.52)	[-$8.54 , -$6.65]	$ (6.30)	[-$7.44 , -$5.34]	$ (9.11)	[-$10.44 , -$7.95]	
Pasture Access_USDA	$1.78	[$1.37 , $2.26]	$ 1.58	[$1.01 , $2.16]	$ 2.05	[$1.45 , $2.68]	91.7%
Pasture Access _Retailer	$1.47	[$1.04 , $1.93]	$ 1.34	[$0.74 , $1.93]	$ 1.65	[$0.99 , $2.27]	92.7%
Pasture Access _Industry	$1.43	[$0.87 , $2.02]	$ 1.18	[$0.47 , $1.97]	$ 1.76	[$1.01 , $2.56]	82.3%
AntibioticUse_USDA	$1.87	[$1.39 , $2.42]	$ 1.66	[$1.07 , $2.31]	$ 2.15	[$1.43 , $2.94]	75.0%
AntibioticUse_Retailer	$1.33	[$0.77 , $1.93]	$ 1.23	[$0.56 , $2.04]	$ 1.45	[$0.67 , $2.26]	74.3%
AntibioticUse_Industry	$1.11	[$0.43 , $1.82]	$ 0.58	[-$0.31 , $1.48]	$ 1.81	[$0.69 , $2.94]	61.7%
Local_ USDA	$2.06	[$1.55 , $2.62]	$ 1.74	[$1.12 , $2.36]	$ 2.49	[$1.85 , $3.19]	89.6%
Local_ Retailer	$0.49	[$0.02 , $0.96]	$ 0.01	[-$0.58 , $0.64]	$ 1.11	[$0.51 , $1.78]	68.9%
Local_ Industry	$0.49	[-$0.09 , $0.06]	$ 0.36	[-$0.42 , $1.08]	$ 0.66	[-$0.11 , $1.44]	59.7%

crossed zero for those respondents who defined local as being 10 or 20 miles away and was positive for those respondents who defined local as being 50 or more miles away. local production. Those who defined local as being 50 or more miles away had a WTP for retailer verified local production of up to $1.11.

In addition to the mean marginal WTP and confidence intervals, the percentage of respondents willing to pay a positive amount for each product and verified attribute Adams and Adams (2011) found that 86% of those surveyed were willing to pay a positive amount. It is not surprising given the fact that the mean marginal WTP for pork chops is negative that less than 10% of respondents are WTP a positive amount. On the other hand, 89.6% of respondents were WTP for USDA verified local production, 68.9% were WTP for retailer verified local production, and 59.7% were WTP for industry verification of local production. To further explore the relationship between definition of local and WTP for locally produced meats, respondents who were WTP a positive amount for each product were further broken down by their definition of local food (Figure 4.1). For chicken breasts, a higher percentage of those who defined local as further away (50 miles, 100 miles, or within the state) were WTP a positive amount for all three verification agencies than those who defined local as either within 10 or 20 miles. The opposite was true for pork chops, where a higher percentage of those who defined local as within 10 or 20 miles were WTP for verified local production. This interesting result seems to lend support to the hypothesis of Park and Gomez (2012) that the premiums consumers were willing to pay for the "local" attribute was contingent on the definition of local utilized. In the case of the current research, the consumers own

definition of local appeared to play a role in the premium (or lack of premium)

respondents were WTP for locally produced pork chops and chicken breasts.
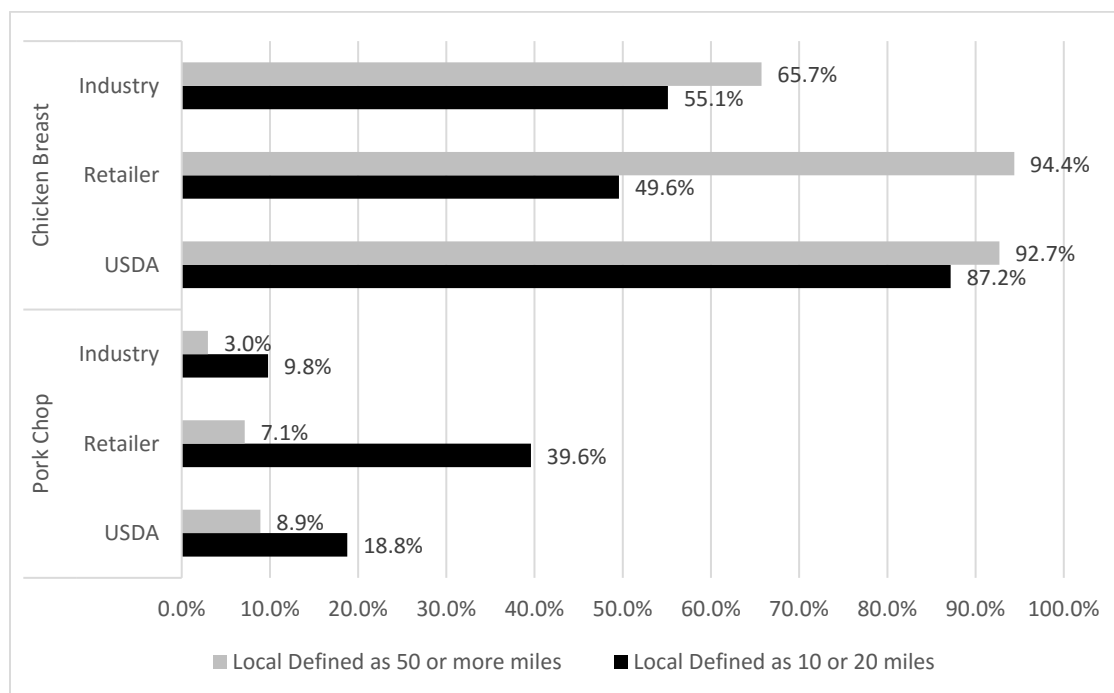
Figure 4.1 Percentage of Respondents WTP a Positive Amount for Local Production by
Respondents' Definition of Local

4.3.1   Special Considerations for Local Food Demand

While this analysis found that consumers were unwilling to pay a positive amount

for locally produced pork chops, it should not be concluded that there is no WTP for

locally produced pork. One explanation is that consumers simply feel differently about

these two species. Olynk and Ortega (2013) point out that the level of concern for animal

welfare may differ across species of livestock animal. It is possible that consumers also

feel differently about pigs and chickens in the context of local production. Another

potential explanation for this result is that the marketing channel, in this case a simulated

shopping experience, affects the WTP for locally produced meats from different species.

For example, Onozaka, Nurse, and Thilmany McFadden (2011) suggest respondents'

definition of local was affected by the marketing channel, and in turn, affected the WTP

for products that were labeled as "local". While their comments were directed at produce,

it is likely a similar process occurs with meats. The current research considered WTP for

locally produced pork chops in a simulated shopping experience that is admittedly more

similar to a grocery store than a farmers' market. Thus, it is likely that there is a

connection between marketing channel and WTP for locally produced meats.

Another explanation for finding no WTP for locally produced pork is the

perceived locality of production. Sackett, Tonsor and Schupp (2011) found that the

locality of production appeared more important in products that could be grown nearby

(beef) than it was for a product with limited geographic production (apples). So, if a

product could be grown locally, such as beef, the locality of production was far more

important. Consumers could perceive poultry as being able to be produced locally and

thus local production is more important. For example, backyard chicken production is

becoming more common place. In fact, the USDA proclaims urban chicken raising a

"growing phenomenon" (USDA, 2012). In fact, in a study of four metro areas (Denver,

Los Angeles, Miami, and New York City) it found that .8% of household owed chickens

and 40% were in favor of allowing chickens into their neighborhoods (USDA, 2012).

Thus, chickens could be seen as being able to be raised nearly anywhere (like your

backyard) and thus locality of poultry (or egg) production could be more important. Pigs

on the other hand, are not so common in a backyard setting, and could be seen by

consumers as being a farm animal which should be raised on a farm. Thus, pork could be

perceived to have a more limited production area, and thus location of production is less important and consumers may be less WTP for local pork production.

4.4 <u>Summary and Conclusions</u>

The definition of "local foods" can have varying definitions depending on the context, consumer segment, and potentially the specific product. In this study, over half of respondents classified local food as being produced within either 10 or 20 miles of their home as opposed to selecting within 50 or 100 miles or within their state. College graduates more frequently reported local to mean within 50 miles, 100 miles, or within the state. Those who identified themselves as regularly hunting or fishing and those who had altered their total meat consumption in the past three years due to animal welfare or food safety concerns more frequently categorized local as meaning within 10 or 20 miles.

There is evidence that the respondents' own definition of local affects not only the WTP for verified local production by different verification entities, but also affects the WTP for other verified attributes, specifically antibiotic free production of both pork chops and chicken breasts. Consumers are WTP for verified locally produced chicken breasts when verified by the USDA or the retailer. However, the current study found that consumers were unwilling to pay a positive amount for locally produced pork chops. Three potential explanations for this result were discussed. First, consumers could simply feel differently about these two livestock species. This explanation is consistent with previous research findings that concern for animal welfare attributes, another credence attribute, may differ across species. Second, that the marketing channel, in this case a

simulated shopping experience, could affect the WTP for pork chops and chicken breasts differently. More work should be done to explore how consumers WTP for locally produced meats, especially pork chops, may be affected by the marketing channel. Third, locality of production appears to matter more for products that can be (or are perceived to be) produced locally. Consumers could perceive chickens, which are becoming increasingly common as a backyard animal, could be produced locally. Thus, the locality of production for poultry may be more important and consumers may be WTP more for locally produced poultry. A better understanding of consumer WTP for locally produced meats will help livestock producers and retailers determine when and where selling products labeled as locally produced makes the most sense. Furthermore, a more extensive understanding of the effects that marketing channel have on the WTP for locally produced meats will assist farms involved in direct marketing and retailers determine the best marketing strategy for their products.

CHAPTER 5. OUTDOOR ENTHUSIAST'S PERSPECTIVES ON LIVESTOCK ANIMAL WELFARE

5.1 Introduction

Consumers, in general, are concerned about how their food is produced and processed. Specific to the production of livestock-derived food products, consumers are generally concerned with the social, animal welfare, environmental, and food safety attributes of the production of the products they consume (Olynk, Tonsor, and Wolf, 2010). It is expected consumers will be heterogeneous in their levels of concern for each of these areas and this may be especially true of their levels of concern for animal welfare. Studies have documented consumer willingness to pay (WTP) for animal welfare related production process attributes such as hog production without gestation crates (Tonsor, Olynk, and Wolf, 2009), egg production without battery cages (Lusk and Norwood, 2011), milk production without rBST (Olynk and Ortega, 2013), and beef production without the use of growth hormones (Dickinson and Bailey, 2002). However, most studies are limited to general samples of US residents (Lusk and Parker, 2009; Lister et al., 2014; Brooks and Ellison, 2014) or residents of specific states (Tonsor, Olynk, and Wolf, 2009).

Likewise, previous studies have used best-worst (maximum difference) scaling to better understand the consumer values and preferences for organic food (Lusk and Briggeman, 2009), preferences for fat in ground beef (Lusk and Parker, 2009) and preferences for sustainable farming practices in beef and apples (Sackett, Shupp, and Tonsor, 2013).

The meaning or interpretation of "good" animal welfare differs from person to person. For example, farmers and veterinarians may judge animal welfare by the body condition of the animal and its access to feed, water, and shelter (Hewson, 2003). For others, good animal welfare implies the animal is kept in a way that allows it to perform its natural behaviors; conventional laying hen battery cages have been largely abandoned in favor of housing systems which provides hens with a perch to roost and a private area to lay eggs (Hewson, 2003). Further, farmers often have differing views on animal welfare from consumers (Te Velde, Aarts, and Wan Woerkum, 2002; Tonsor, Wolf, and McKendree, 2014). In addition, past research has linked pet ownership to increased concern for livestock welfare (McKendree, Croney and Widmar, 2014a). Thus, relationships with animals, even those that are not consumed for food, can be related to consumers' level of concern for farm animal welfare. In addition to livestock and pets, other research has focused on concern for wild or feral animals. Studies have explored the public's acceptance of lethal management of wildlife in general (Koval and Mertig, 2004; Dubois and Harshaw, 2013), lethal control of coyotes (Martinez-Espineira, 2006) and lethal control of feral cats (Loyd and Miller, 2010).

This work builds on previous research and fills a gap in knowledge by investigating how sentiments towards and interactions with wild animals, both consumptive and non-consumptive, may be related to the level of concern for animal

welfare in livestock species. Specifically, this research explores how the underlying value system of a segment of the US population, namely outdoor enthusiasts', informs meat purchasing decisions and WTP for animal welfare attributes in pork chops and chicken breasts. For the purposes of this analysis, outdoor enthusiasts are individuals who regularly participate in outdoor activities such as fishing, hunting, hiking, camping, and watching wildlife. According to the most recent National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, 6% of U.S. residents 16 and older participated in hunting; 14% of U.S. residents of the same age category participated in fishing, and almost one third participated in wildlife watching (U.S. Dept. of the Interior et. al, 2011).[1] In terms of the connectedness of people to their food, hunters and anglers may be similar to or even closer to their food than farmers. There are 13.7 million hunters in the U.S. (U.S. Dept. of the Interior et al., 2011), but only 3.2 million farmers operating farms in the U.S. (USDA, 2014). Thus, the population of hunters and anglers is substantial, but the perceptions of hunters and anglers with regard to livestock animal welfare are largely unstudied. It has been found that livestock producers are less concerned about animal welfare (Te Velde, Aarts, and Wan Woerkum, 2002) and may also have significantly different perceptions of animal welfare and handling than consumers (Tonsor, Wolf, and McKendree, 2014). However, those who hunt, fish and take part in other outdoor activities are also consumers of livestock products. Thus, the perceptions of hunters with regard to livestock treatment and meat production are the main focus of this analysis.

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[1] The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation is conducted by the U.S. Census Bureau to determine the numbers of people participating in hunting, fishing, and wild-life watching and how much they spend on those activities.

Just how important of a population with regard to animal welfare and animal treatment are outdoor enthusiasts? In 2011, 13.7 million Americans hunted, spending 282 million days in the field and $33.7 billion (U.S. Dept. of the Interior et. al, 2011). Furthermore, from 2006 to 2011 the number of US residents over the age of 16 who hunted increased by 9%; most hunters, 84.7%, pursued big game such as deer or elk (U.S. Dept. of the Interior et al., 2011). A total of 33.1 million anglers spend 554 million days fishing and spent 41.8 billion dollars (U.S. Dept. of the Interior et al., 2011). While one may think that only rural residents hunted, in fact, hunters who resided in a metropolitan statistical area (MSA) made up the majority of hunters (U.S. Dept. of the Interior et. al, 2011). In fact, only 20% of hunters resided outside of an MSA (U.S. Dept. of the Interior et. al, 2011).

Hunting has recently been the subject of several national and regional headlines. A Time Magazine cover story in December of 2013, has directed increased attention to the management of wild species via hunting (Von Drehle, 2013). A teenage hunter made national headlines when a public outcry resulted in her hunting photos being removed from Facebook (Perez, 2014). In Maine, an activist backed ballot initiative aimed at ending the use of dogs, traps, and bait in black bear hunts failed (USA Today, 2014). In an age of social media and constant information, even local headlines become national news. Further, it is reasonable to suspect that hunting and wildlife news may affect different groups uniquely.

The goal of this analysis is to determine how consumers' outdoor activities, key demographic factors, as well as other factors such as gender, pet ownership, and opinions on hunting are related to the relative importance of preference shares obtained from best-

worst methodology and WTP for verified animal welfare production process attributes in the production of chicken breasts and pork chops. Capitalizing on the unique sample of respondents obtained, this analysis also examines potential differences in WTP for production attributes between respondents who did versus did not indicate that they regularly hunt.

5.2 Data and Methods

BWS was utilized to determine the relative importance of general meat product attributes and a choice experiment was employed to determine the WTP for specific verified attributes. An online survey was used to collect data regarding outdoor enthusiasts' activities, socio-demographic characteristics, household characteristics and opinions about hunting practices, as well as to elicit the data necessary for the WTP and best-worst methodologies.[2] A total of 872 respondents (outdoor enthusiasts) completed the survey. In order to participate in the survey, respondents had to first indicate they were 18 years of age or older. In addition, respondents were then asked if they regularly participated in fishing, hunting, or other outdoor activities like camping or hiking (they were permitted to select more than one activity). Only those who indicated they regularly participated in these activities were permitted to continue with the survey.

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[2] A proprietary opt-in database (Lightspeed GMI) was used to identify and contact survey respondents. The online survey was developed, pre-tested, and hosted by Purdue University. Additionally, respondents contacted by the panel provider were screened by the researchers for fit within the sample; fit was determined by being over 18 years of age and self-reported active participation in either hunting, fishing, and/or hiking, camping, or other outdoor activities. The survey was approved by the local institutional review board.

5.2.1 Econometric Analysis: Best-Worst Scaling

Respondents were presented with a choice experiment using a modified BWS to assess their relative preferences for six meat value attributes: taste, convenience, safety, animal welfare, price, and nutrition. For each best-worst task in this analysis, respondents were shown a pair of meat attributes and asked to choose the attribute that was most important (best) to them. A sample question is shown in Figure 2. From their choice of the most important attribute, the remaining attribute was inferred to be the least important (worst), following Holland et al. (2014). Survey participants were shown a total of 15 best-worst choice experiment tasks. These were blocked into three blocks of five best-worst tasks spaced approximately equally throughout the survey to help prevent fatigue with the best-worst task.

Each attribute could potentially be selected by each respondent between zero and five times in the experimental design. The respondents' choices of the best and worst attributes were used to determine each attribute place along a continuum of importance when purchasing meat (Lusk and Briggeman, 2009). A total of 6 attributes (J) were investigated through the use of best-worst methodology; therefore, $J = 6$ and there are a total of $J * (J - 1) = 30$ potential combinations of best-worst rankings that could have been chosen by each respondent. The location of the value attribute on the scale of importance for meat purchasing is represented by λ_j. Thus, the level of importance, which is unobservable to researchers, for consumer i is:

$$I_{ij} = \lambda_i + \varepsilon_{ij} \tag{1}$$

where ε_{ij} represents a random error term. The probability that the consumer i chooses attribute j as the best option and attribute k as the worst option is the probability that the

difference between I_{ij} and I_{ik} is greater than all $J * (J - 1) - 1 = 29$ potential differences available from the choices show to each respondent. The error term is assumed to be independently and identically distributed type I extreme value. Following Lusk and Briggeman (2009) the probability of choosing a given best-worst combination takes the form represented by:

$$Prob(j = best \cap k = worst) = \frac{e^{\lambda_j - \lambda_k}}{\sum_{l=1}^{J} \sum_{m=1}^{J} e^{\lambda_l \lambda_m - J}} \qquad (2)$$

Maximum likelihood estimation (MLE) is then used to estimate the parameter λ_j which represents how important attribute j is relative to the least important attribute. The least important attribute is not known ex ante, but is determined through analysis of the respondent's answers and its value must be normalized to zero to prevent issues with dummy variables (Lusk and Briggeman 2009).

Following Lusk and Briggeman (2009) and Cummins et al. (2016) a random parameters logit (RPL) model was used to allow for heterogeneity among individuals. The RPL models estimated in this analysis were completed using NLogit 5.0. The resulting preference shares, which must necessarily sum to one across all six attributes, can be calculated as (Lusk and Briggeman, 2009):

$$share_j = \frac{e^{\lambda_j}}{\sum_{k=1}^{J} e^{\lambda_l}} \qquad (3)$$

Individual preference shares are calculated using individual-specific estimates from the RPL model. Individual-specific preference shares can be used to analyze the correlations between one's preference shares and demographic or other factors of interest, such as the respondent's outdoor activities or opinions on hunting practices.

5.2.2   Econometric Analysis: Willingness to Pay

In addition to BWS tasks, respondents were randomly assigned to a choice experiment for one of two meat products, pork chop and chicken breast. For the pork chop choice experiment, respondents received information about whether individual crates/stalls were permitted or not permitted, location was local or no claim was made, and whether antibiotic use was permitted or not permitted. For the chicken breast choice experiment, respondents were shown information about whether pasture access was required or not required, location was local or no claim was made, and whether antibiotic use was permitted for not permitted. For each product, information about whether the certification entity was the USDA Process Verified Program (USDA-PVP), a retailer, or an industry (pork or poultry) group was provided. Respondents were shown three price levels for each product in dollars per pound. Pork chops were offered at $2.49/lb., $3.89/lb., and $5.29/lb. Chicken breasts were offered at $1.89/lb., $3.15/lb., and $4.41/lb. The prices shown were comparable to the range of retail prices for pork chops and chicken breasts at the time of survey administration.[3]

To determine the choice scenarios shown to respondents, the SAS OPTEX program was used to create the main effects plus two-way interaction experimental design (Lusk and Norwood, 2005) which maximized the D-efficiency at 86.84. This design yielded a total of 24 choice sets for each product which were divided into three blocks so that respondents were shown eight choice sets in total (Tonsor et al., 2005; Olynk and Ortega, 2013). As a part of the choice experiment, a "cheap talk" strategy was

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[3] Prices were selected to be consistent with the USDA Weekly Retail Chicken and Pork Feature Activity Publications which reports a national average price and price ranges for different regions of the country.

utilized to reduce hypothetical bias where researchers inform respondents of potential

bias before they take part in the choice experiment (Lusk, 2003).

Choice experiments rely on random utility theory. In the random utility model

employed to analyze the resulting data, utility is composed of a deterministic component

V_{nit}, which depends on the attributes of an alternative, and a stochastic component, ε_{nit},

as:

$$U_{nit} = V_{nit} + \varepsilon_{nit} \tag{4}$$

Respondent *n* will choose alternative *i* if $U_{nit} > U_{njt}\ \forall\ j \neq i$. The probability of

respondent *n* choosing alternative *i* can be represented by:

$$P_{nit} = Prob\left(V_{nit} + \varepsilon_{nit} > V_{njt} + \varepsilon_{njt};\ \forall\ j\ \in C,\ \forall\ j\ \neq\ i\right) \tag{5}$$

Given the assumed underlying distribution of the error term, the closed form of the logit

choice probability can be expressed as:

$$P_{nit} = \frac{\exp(V_{nit})}{\sum_j \exp(V_{njt})} \tag{6}$$

Utilizing a model that allows for heterogeneous preferences is appropriate because

previous research suggests that consumers preferences are heterogeneous (Lusk, Roosen,

and Fox, 2003; Alfnes, 2004; Tonsor et al., 2005). Thus, a random parameters logit

(RPL) model was employed.

If we employ the simplifying assumption that the deterministic portion, V_{nit}, is

linear in its parameters, the general model can be specified as:

$$V_{it} = \beta_1 x_{it} + \cdots + \beta_k x_{it} \tag{7}$$

where x_{it} is the vector of attributes associated with the ith alternative, and the $\beta's$ are the

parameters associated with those attributes. For pork chops the model for the

deterministic part of utility, v, for individual i, can be expressed as:

$$v_i = \beta_1 Price_i + \beta_2 USDA\_Crate_i + \beta_3 Retailer\_Crate_i + \beta_4 Industry\_Crate_i \quad (8)$$

$$+\beta_5 USDA\_Loc_i + \beta_6 Retailer\_Loc_i + \beta_7 Industry\_Loc_i + \beta_8 USDA\_Anti_i$$

$$+\beta_9 Retailer\_Anti_i + \beta_{10} Industry\_Anti_i + \beta_{11} OptOut_i$$

where $Price_i$ is the price of the boneless, center-cut pork chop and $OptOut_i$ is a constant

representing the negative utility of not having the pork chop in the choice set. The terms,

such as $\beta_2 USDA\_Crate_i$ are effects-coded interaction terms between the attributes, in this

case individual crates/stalls, and the verification agency. [4,5,6] To estimate mean WTP

estimates, the standard equation was used; for example, the WTP equation for USDA

verified crate free production was:

$$(9) \qquad\qquad\qquad WTP_k = -2 \left(\frac{\beta_2}{\beta_1} \right)$$

The coefficients, the $\beta's$, on all variables except *Price* are assumed to vary

normally across consumers and are drawn from a normal distribution to allow for both

positive and negative WTP estimates (Lusk, Roosen, and Fox, 2003; Tonsor et al., 2005).

A standard logit model exhibits independence from irrelevant alternatives; RPL models

do not. Revelt and Train (1998) identified the possibility for correlated taste parameters

to form general patterns. To gain a better understanding these potential correlations,

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[4] Following Olynk, Tonsor, and Wolf (2010) an example interpretation of the interaction terms between an attribute and a verification agency is the WTP for the USDA to verify crate free production as opposed to not having the USDA verify crate free production.

[5] Effects coding is used to avoid confounding effects of absence of attributes with the "no purchase" option. Whereas regular dummy variables are coded 0 or 1, effects coding takes on the values 0, 1, or -1. The attribute is given a value of 1 when the attribute is present, -1 when the base category or the attribute is not present, and 0 otherwise (Tonsor, Olynk and Wolf, 2009).

[6] Attributes were not included without being interacted with a verification agency. By the design of the choice experiment respondents never considered attributes without a verification agency. This is consistent with the real world in that products with animal welfare claims are unlikely to be marketed without a verification or certification. (Olynk, Tonsor, and Wolf, 2010).

Revelt and Train (1998) suggest constructing a Cholesky matrix Ω. Allow $\boldsymbol{\beta}$ to be a $k \; x \; 1$ vector of the coefficients on the attributes and $\boldsymbol{\eta}$ a $(k-2)x \; 1$ vector of coefficients on random attributes in $\boldsymbol{\beta}$. Then specify $\boldsymbol{\eta} \sim N(\bar{\eta}, \Omega)$. The result can be expressed as $\boldsymbol{\eta} = \bar{\eta} + \boldsymbol{LM}$ where L is the lower triangular Cholesky factor such that $LL' = \Omega$. Following Revelt and Train, 1998), The **M**-vector contains independent normal deviates. Estimates of the Cholesky matrix exhibiting statistical significance supports interdependence in tastes and of potential correlations in preferences across attributes in the choice set (Scarpa and Del Guidice, 2004).

Confidence intervals for WTP point estimates were found using the Krinsky-Robb method (Krinsky and Robb, 1986). Hole (2007) found the delta, Fieller, Krinsky-Robb and bootstrapping methods to construct confidence intervals for WTP estimates yield similar results (Hole 2007).

A complete combinatorial method will be used to statistically evaluate differences in the resulting distributions (Poe, Giraud and Loomis 2005). This test is completed by taking all possible combinations of the two independent vectors, sorting the vector of results, and identifying values of the cumulative distribution statistically different from zero (Poe, Giraud, and Loomis 2005 supplement). This method gives a one-sided significance level of the difference.

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5.3 <u>Results and Discussion</u>

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Demographics of the 872 survey respondents are presented in Table 5.1. The sample was comprised of 50% male and 50% female respondents; the mean age of

respondents was 47 years. After converting household income to be a continuous variable, the average or mean household income was calculated at $59,495. This is slightly higher than the U.S. median household income of $53,046 (U.S. Census Bureau, 2014). In addition to having a higher median household income, this sample is slightly more educated than the population. In this sample, 99% of respondents graduated high school and 42% had completed at least 4 years of college. According to the census, 85.7% of American over 25 years of age have graduated high school, and 28.5% of respondents have a bachelor's degree or higher (U.S. Census Bureau, 2014). The mean household size in this sample is 2.62 people which is nearly identical to the U.S. average of 2.61 (U.S. Census Bureau, 2014).

Previous research indicates pet ownership may be related to sentiments about animal welfare (McKendree, Croney, and Widmar, 2014b); 70% of respondents reported owning at least one cat or dog. In this sample of U.S. consumers, 63% regularly participated in fishing, 27% regularly participated in hunting, and 79% regularly participated in other outdoor activities. Because the sample was recruited to include outdoor enthusiasts, it contains more respondents that hunt and fish than the national average; in the U.S., 6% of residents hunt and 14% fish (Department of the Interior et. al, 2014). Opinions regarding hunting, not just participation in hunting are hypothesized to be related to concern for livestock animal welfare. Therefore, respondents were asked if they felt hunting for food and hunting for a trophy were acceptable reasons for others to hunt. Consistent with previous studies, 93% of respondents agreed with obtaining food as a reason for hunting (Heberlein and Willebrand 1998; Duda et al., 2010). Meanwhile, only 33% agreed with trophy hunting as a reason for hunting.

Table 5.1 Respondent Demographics

Demographic Variable	Percentage (%) of Respondents	
	Outdoor Enthusiast n=872	Nationally Representative n=825
Male	50	49
Age		
18-24	7	13
25-44	38	34
45-64	38	34
65+	18	19
Education		
Did not graduate from high school	1	3
Graduated from high school, Did not attend college	21	22
Attended College, No Degree Earned	21	26
Attended College, Associates or Trade Degree	14	15
Attended College, Bachelor's Degree Earned	29	23
Graduate or Advanced Degree (M.S., PhD., Law School)	13	10
Annual Household Pretax Income		
Less than $20,000	14	19
$20,000 - $39,999	22	29
$40,000 - $59,999	21	23
$60,000-$79,999	17	12
$80,000-$99,999	10	7
$100,000-$119,999	6	3
$120,000 or more	11	6
Region		
Northeast	17	17
South	33	33
Midwest	26	27
West	25	23
Outdoor Activities Regularly Participated in		
Fishing	63	24
Hunting	27	10
Other	79	36

The perceptions of outdoor enthusiasts, in particular those who regularly participate in hunting activities, are of interest in this analysis because it is hypothesized that hunters, being involved in the process of harvesting and processing wild animals, may have differing views with respect to meat and animal welfare. Analysis of the best-worst tasks revealed food safety was the attribute with the largest preference share at

23.0%, followed by taste at 20.2%, nutrition at 17.7%, animal welfare at 16.3%, price at 14.1%, and finally convenience with 8.7% of the preference share. Lusk and Briggeman (2009) also found that food safety was the most important attribute among a set of eleven food values for organic foods. Likewise, Lusk and Parker (2009) found that safety was the most important factor when ground beef was studied followed by expiration date which the authors argue is also related to food safety. Safety as a food attribute is clearly uniformly important.

Appendix F shows the coefficients and mean of individual preference shares. Individual-specific shares were calculated using individual-specific parameter estimates and were utilized for all calculations and correlations throughout this analysis. Reporting gender as female was correlated with having smaller preference shares for price (r=-.13, p<.01), convenience (r=-.19, p<.01), taste (r=-.18, p<.01), and nutrition (r=-.18, p<.01), but a larger preference share for animal welfare (r=.18, p<.01). Previous research has also found that women were more likely to report concern about animal welfare in general (McKendree, Croney, and Widmar, 2014a) and that women were less supportive of lethal means of wildlife management (Koval and Mertig, 2004). Likewise, Loyd and Miller (2010) found that women were less likely to prefer euthanasia of feral cats than men. Thus, the current results are consistent with previous research relating gender to sentiments towards animal welfare in the contexts discussed.

Pet ownership (households having at least one cat or dog) was correlated with smaller preference shares devoted to price (r=-.13, p<.01), convenience (r=-.07, p<.05), taste (r=-.14, p<.01), and nutrition (r=-.14, p<.01) and a larger share for animal welfare (r=.15, p<.01). This finding was consistent with McKendree, Croney, and Widmar (2014b) who

found that pet ownership is positively related to reporting concern about animal welfare. Similiarly, Martinez-Espineira (2006) found that cat ownership decreased the likelihood of approving of lethal methods of coyote control. Rothgerber and Mican (2014) found that childhood pet ownership was associated with higher levels of connection to and empathy for animals, but childhood ownership of pets was not associated with the decision not to eat animals (i.e. be strict vegetarians). The results of the current study yielded similar results in that pet ownership was correlated with larger preference shares for animal welfare despite the fact the majority of respondents did not report being vegan or vegetarian.

Other demographic factors were also explored for relationships with best-worst preference shares including respondents' participation in outdoor activities and approval for reasons people hunt. Identifying oneself as regularly fishing was positively correlated with the size of the mean shares of preference for convenience ($r=.13$, $p<.01$), taste ($r=.11$, $p<.05$), and nutrition ($r=.10$, $p<.01$) and negatively correlated with the share attributed to animal welfare ($r=-.09$, $p<.01$). Regularly hunting was positively correlated with the size of the preference shares allocated to convenience ($r=.11$, $p<.05$) and nutrition ($r=.08$, $p<.05$), but negatively correlated with the preference share devoted to safety ($r=-.08$, $p<.05$). Agreeing that hunting to obtain food was acceptable was positively correlated with a higher preference shares for taste ($r=-.10$, $p<.01$) and nutrition ($r=-.10$, $p<.01$), but a lower share devoted to animal welfare ($r=-.11$, $p<.01$). Likewise, agreeing that hunting for a trophy animal was acceptable was positively .

Table 5.2 Best-worst Preference Shares and comparison to the Nationally Representative Sample

	Outdoor Enthusiast			Nationally Representative			Comparison	
	Mean Share	95% Confidence Interval	Ranking	Mean Share	95% Confidence Interval	Ranking	P-Value	Statistically Significant Difference
Price	15.1%	[14.6% , 15.7%]	3	16.0%	[15.2% , 16.8%]	3	0.0000	***
Safety	22.9%	[21.8% , 24.0%]	1	22.6%	[21.0% , 24.2%]	1	0.1438	
Convenience	9.1%	[8.6% , 9.5%]	6	9.5%	[9.9% , 10.1%]	6	0.0000	***
Taste	22.1%	[21.4% , 22.7%]	2	19.8%	[18.9% , 20.8%]	2	0.0575	*
Animal Welfare	11.6%	[10.6% , 12.5%]	3	15.6%	[14.1% , 17.1%]	3	0.6249	
Nutrition	19.3%	[18.7% , 20.0%]	3	16.5%	[15.7% , 17.3%]	3	0.0000	***

correlated with higher preference shares for price (r=.11, p<.01), convenience (r=.22, p<.01), taste (r=.18, p<.01), and nutrition (r=.18, p<.01) and a lower share for animal welfare (r=-.17, p<.01). It is hypothesized that hunters, and those who agree with hunting as a means for obtaining food, may exhibit less concern for animal welfare and thus tend to have a (relatively) lower preference share devoted to animal welfare. Previous research found that animal producers are less concerned about animal welfare than consumers (Te Velde, Aarts, and Wan Woerkum, 2002) and producers and consumers do not see eye to eye on animal welfare issues (Tonsor, Wolf, and McKendree, 2014). Hunters, like animal producers are aware, and often hands-on, in the production and harvest of meat. More specific to wildlife is that public and wildlife agency employees have been found to have differing levels of support for lethal management of wildlife (Koval and Mertig, 2004). This is also consistent with the finding that hunters and respondents approving of hunting were more likely to support lethal methods of control for coyotes found by Martinez-Espineira (2006).

While the best-worst choice task forces respondents to make trade-offs between attributes, a hypothetical shopping scenario forces respondents to make tradeoffs among different products, or bundles of attributes. Table 5.3 reports the WTP estimates for pork chops and chicken breasts. A table of coefficients for pork chops (Appendix G) and chicken breasts (Appendix H) can be found in the appendices. The mean estimates for WTP for most verified attributes for both pork chops and chicken breasts were positive with the exception of locally produced pork chops. Thus, with respect to verified local production, consumers appear to view pork chops and chicken breasts differently.

Table 5.3 Mean Marginal WTP Results with 95% Confidence Intervals

	Outdoor Enthusiast		Nationwide		Comparison	
	Pork Chops				P-value	Statistical Significance
	WTP	95% Confidence Interval	WTP	95% Confidence Interval		
Opting Out	$(8.78)	[-$13.46, -$5.25]	$(5.53)	[-$7.51 , -$3.57]	0.9376	
Individual Crate USDA	$2.29	[$1.35 , $3.59]	$2.09	[$1.05 , $3.19]	0.4078	
Individual Crate Retailer	$0.87	[-$0.25 , $2.19]	$0.09	[-$0.79 , $1.02]	0.1447	
Individual Crate Pork Industry	$0.28	[-$1.12 , $2.04]	$2.57	[$0.45 , $4.82]	0.9618	
Antibiotic Use USDA	$3.65	[$2.74 , $4.84]	$4.51	[$3.37 , $5.92]	0.8662	
Antibiotic Use Retailer	$3.55	[$1.37 , $6.28]	$1.29	[$0.16 , $2.57]	0.0376	**
Antibiotic Use Industry	$3.81	[$1.83 , $5.64]	$0.92	[-$2.35 , $4.12]	0.0648	*
Local USDA	$(1.04)	[-$2.82 , $0.45]	$(1.43)	[-$2.40 , -$0.15]	0.3512	
Local Retailer	$(2.57)	[-$4.16 , -$1.25]	$(0.93)	[-$1.99 , $0.00]	0.9669	
Local Industry	$(1.54)	[-$3.28 , -$0.38]	$(3.46)	[-$5.24 , -$1.99]	0.0460	**
	Chicken Breast					
	WTP	95% Confidence Interval	WTP	95% Confidence Interval		
Opting Out	$(8.41)	[-$9.38 , -$7.59]	$ (7.42)	[-$8.25 , -$6.73]	0.9527	
Pasture Access USDA	$1.98	[$1.50 , $2.54]	$ 1.85	[$1.40 , $2.36]	0.3523	
Pasture Access Retailer	$1.52	[$1.07 , $2.01]	$ 1.47	[$0.95 , $1.98]	0.4421	
Pasture Access Industry	$1.37	[$0.63 , $2.12]	$ 1.40	[$0.85 , $1.99]	0.5278	
Antibiotic Use USDA	$1.69	[$1.28 , $2.14]	$ 1.58	[$1.09 , $2.17]	0.4073	
Antibiotic Use Retailer	$1.61	[$1.11 , $2.19]	$ 1.28	[$0.65 , $1.94]	0.2276	
Antibiotic Use Industry	$1.55	[$0.87 , $2.29]	$ 1.21	[$0.54 , $1.91]	0.2505	
Local USDA	$1.83	[$1.43 , $2.27]	$ 2.02	[$1.58 , $2.51]	0.7408	
Local Retailer	$0.70	[$0.29 , $1.08]	$ 0.33	[-$0.23 , $0.87]	0.1360	
Local Industry	$0.20	[-$0.28 , $0.66]	$ 0.37	[-$0.22 , $0.94]	0.6517	

This finding is consistent with Olynk and Ortega (2014) who discuss how

presence of concern for specific practices or the level of concern may not be the same

across all livestock species. Likewise, Olynk, Tonsor and Wolf (2010) found that WTP

for verified attributes differed across species and attribute when pork chops and milk

were considered. Thus, the current results are consistent with previous research where the

level and WTP for verified attributes has differed by species.

Previous research has considered the size of market (percentage of respondents

WTP above a certain amount) as an important outcome of consumer demand work. For

example, Olynk, Tonsor, and Wolf (2010) calculated the percentage of consumers WTP

above a threshold level to assist producers in determining the potential market share for

their products and identified critical points at which point producers should switch

verification agencies. In similar fashion, the percentage of hunters and non-hunters that

are WTP a positive amount for locally produced chicken breasts and pork chops was

calculated and the results are shown in Figure 5.1. Interestingly, a higher percentage of

hunters are willing to pay for locally produced pork chops verified by all sources. It is

important that livestock producers recognize that the proportion of the market (or portion

of consumers) with positive WTP for locally produced meat varies depending on the

species, and perhaps product, in question.
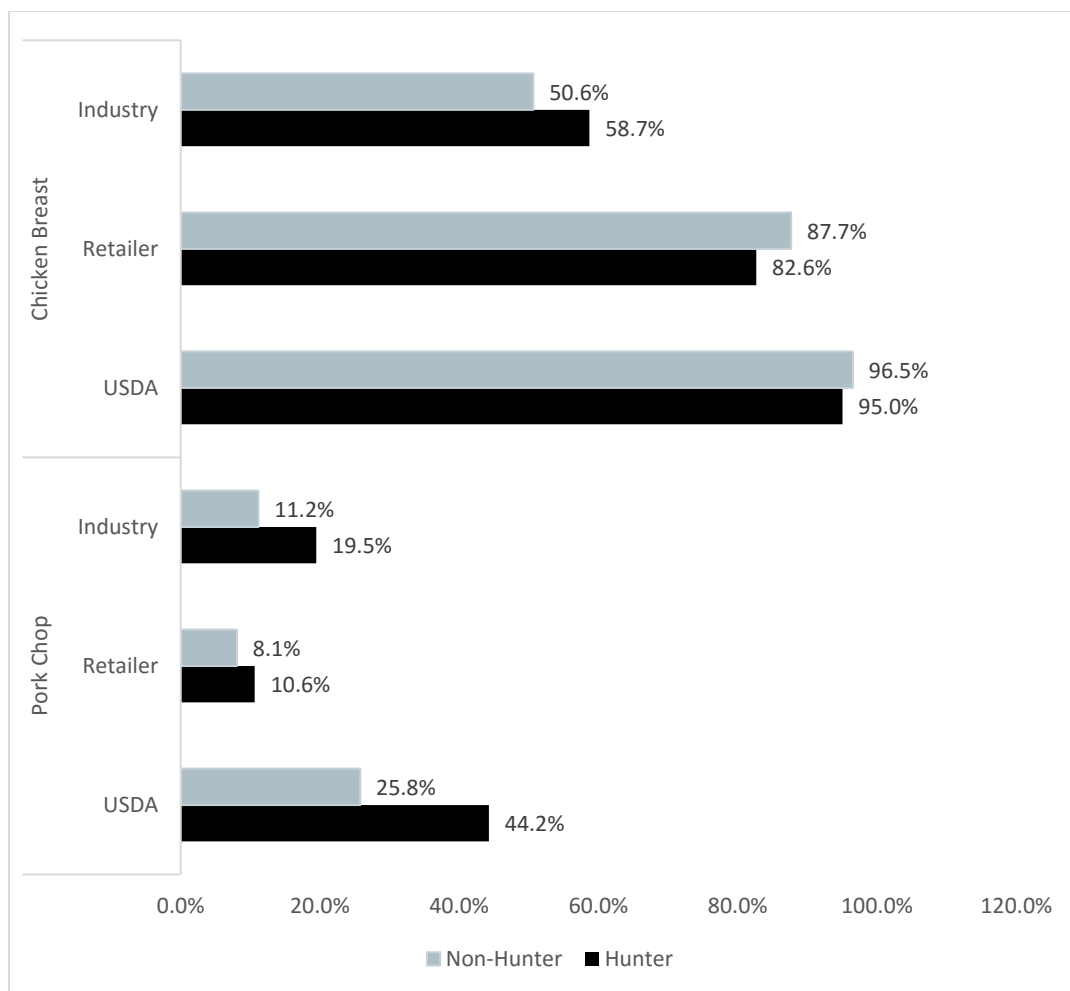
Figure 5.1 Percentage of Respondents WTP a Positive Amount for Verified Local Production for Pork Chops and Chicken Breasts

5.4 Comparison with a Nationally Representative Sample

To contribute to the analysis, the outdoor enthusiast sample was compared to the nationally representative sample discussed in further detail in Chapters 3 and 4. The nationally representative sample was similar demographically to the outdoor enthusiast sample (Table 5.1). However, substantially fewer respondents participated in outdoor activities because respondents were not recruited specifically for their participation in these activities. In the nationally representative sample, 24% participated in fishing, 10%

reported participating in hunting, and 36 % reported participating in other outdoor activities compared to 63%, 27%, and 79% from the outdoor enthusiast sample respectively.

A statistical comparison between the preference shares for each best-worst experimental design and WTP results from the choice experiment was conducted following the complete combinatorial method proposed by Poe, Giraud, and Loomis (2005). For the comparison of best-worst preference shares, only those respondents from the nationally representative sample who participated in the "show-2" design were compared. The results of the best-worst analysis from the nationally representative sample and comparison between the two samples is shown in Table 5.2. The two samples have similar rankings when the confidence intervals are examined via the method of overlapping confidence intervals. However, outdoor enthusiasts have statistically higher preference shares for taste and nutrition and statistically lower preference shares for price and convenience.

A similar analysis was conducted for the WTP estimates for the choice experiment. Appendices F (pork chop) and G (chicken breast) shows the coefficients and standard deviations for both samples. For the comparison of WTP estimates all 825 respondents from the nationally representative sample were compared to the 872 respondents from the outdoor enthusiast sample. Similar to the outdoor enthusiast sample, the standard deviations are statistically significant for all attributes except taste. However, the coefficient on price is not significant for the nationally representative sample. The WTP results were also compared for both samples (Table 5.3). There were no statistical differences between the outdoor enthusiast and nationally representative

sample WTP estimates for chicken breasts. For pork chops statistically significant differences in the distributions of the WTP estimates were noted for retailer verified antibiotic use, industry verified antibiotic use, and industry verified local production.

5.5 Conclusion

It has been previously suggested that livestock producers are less concerned about animal welfare than consumers (Te Velde, Aarts, and Wan Woerkum, 2002) and recent research points to the fact that producers and consumers do not see eye to eye on animal welfare issues (Tonsor, Wolf, and McKendree, 2014). Hunters are often hands-on in the production and harvest of meat or management of wildlife. It is hypothesized that hunters, and those who agree with hunting as a means for obtaining food, may exhibit less concern for animal welfare in the form of lower preference shares devoted to animal welfare from best-worst analyses and lower WTP estimates resulting from choice experiment methods.

Preference shares for six meat attributes were calculated and correlations between those and demographic and lifestyle factors were explored. Food safety and taste were the most important attributes to outdoor enthusiasts; meanwhile, price and convenience were the least important. Reporting be female or a pet owner was correlated with a higher preference share devoted to animal welfare. On the other hand, reporting approval of hunting for food, regardless of their participation in hunting, was correlated with having a lower preference share for animal welfare. These results were compared to a nationally

representative sample. Outdoor enthusiasts place relatively more importance on taste and nutrition and relatively less importance on price and convenience.

This study also adds to the current body of knowledge regarding the factors that affect sentiments towards animal welfare in meat animals. A simulated shopping scenario elicited the WTP for verified attributes for both pork chops and chicken breasts. The WTP for each attribute was positive with the exception of locally produced pork chops. A higher percentage of hunters were willing to pay for locally produced pork chops. Thus, proportion of the market WTP a positive amount for locally produced meat may vary depending on the species or product in question. The outdoor enthusiast sample was also compared to a nationally representative sample for the same choice experiments. There were no statistical differences between the two samples for the WTP for chicken breast attributes. For pork chops statistically significant differences in the distributions of the WTP estimates were noted for retailer verified antibiotic use, industry verified antibiotic use, and industry verified local production. Thus, significant differences were found in both the best-worst preference shares and the resulting WTP estimates for some meat products.

CHAPTER 6. CONCLUSIONS

6.1 Conclusions and Implications

There is no literature linking consumer perceptions of wild animals (or participating in activities like hunting or fishing) and preferences for meat attributes. With hunting the subject of national news and state referendums, it is timely to explore how the relationships between perceptions of wild animals and the demand for meat attributes. In fact, hunting and fishing are sources of local meats (Tidball, Tidball, and Curtis, 2014). Thus, understanding consumer preferences and demand for locally produced meats (pork chop and chicken breast) were also explored.

Each chapter has provided a different perspective and employed differing methodologies to contribute to understanding of consumer preferences for livestock product attributes. Significant differences can arise in the resulting preference shares when respondents are shown a different number of attributes in a BWS question. Both presentations ranked safety as the most important, taste as the second most important attribute, and convenience as the least important. However, a complete combinatorial test revealed that the distributions of the preference share estimates were statistically different. In addition, these two different presentations yielded different rankings based on the mean preference share estimate. Thus, resulting preference shares differed depending on the number of attributes (and total number of questions)

shown. Thus, researchers should exercise caution in using BWS results, especially when intermediate preference ordering or predicted preference share is important.

The definitions and WTP for local foods was explored. Overall, over half of respondents in a nationally representative survey classified local as being produced within 10 or 20 miles of their home. Likewise, consumers are WTP for verified locally produced chicken breasts when verified by the USDA or the retailer. However, there was no WTP for locally produced pork chops. We find evidence that the respondents' own definition of local affects not only the WTP for verified local production by different verification entities, but also affects the WTP for other verified attributes, specifically antibiotic free production of both pork chops and chicken breasts.

A sample of outdoor enthusiasts was compared to a nationally representative sample. Outdoor enthusiasts have statistically different (higher) distributions of preference shares for taste and nutrition and statistically different (lower) preference shares for price and convenience. There were no statistical differences between the outdoor enthusiast and nationally representative WTP estimates for chicken breasts. For pork chops statistically significant differences in the distributions of the WTP estimates were noted for retailer verified antibiotic use, industry verified antibiotic use, and industry verified local production.

Over the course of this dissertation, extensions and applications of both choice experiment and best worst-methodology have been employed to contribute to the existing body of literature utilizing these techniques. Specifically, this research has contributed to the understanding of consumer preferences for livestock product

attributes. The results are expected to be of interest to a variety of groups including

livestock producers, consumer groups, and marketing managers. These results

contribute to a broad understanding of how consumers' perceptions of animals, both

wild and domestic, may come to affect livestock production agriculture and wildlife

management in the future.

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APPENDICES

Appendix A. Multinomial and Random Parameters Logit Results

Value	MNL	RPL Econometric Estimations		MNL	RPL Econometric Estimations	
		Show-2			Show-3	
	Coefficient	Coefficient	Standard Deviation	Coefficient	Coefficient	Standard Deviation
Price	-0.0192	-0.0329	0.3432***	0.2164***	0.2466***	1.9248***
	0.0289	0.0354	0.0526	0.0370	-0.0868	0.981
Safety	0.1855***	0.3125***	0.8401***	0.5869***	1.1712***	1.6579***
	.0293	-0.04902	0.0558	0.0381	0.0841	0.0947
Convenience	-0.3941***	-0.5515***	0.4213***	-0.6314***	-1.2440***	1.3971***
	0.0303	-0.0414	0.0492	0.0402	0.0776	0.0892
Taste	0.1493***	0.1827***	0.0208	0.4049***	0.7445***	1.0182***
	0.0292	0.0324	0.0554	0.0374	0.0641	0.0799
Animal Welfare	-0.0903***	-0.0568	1.403***	0.1774***	0.3547	2.2076***
	0.0290	0.0659	0.0847	0.03695	0.0884	0.1056
Nutrition	0	0		0	0	

Note: Statistical significance to the 1%***, 5%**, and 10%* levels.

Appendix B. Description of Attributes included in Pork Chop and Chicken Breast Choice
Experiments

Description of Attributes included in Pork Chop Choice Experiment
Price refers to the cost per 1 lb. of center cup pork chop:
- $2.49/lb.
- $3.89/lb.
- $5.29/lb.

Individual Crates/Stalls refers to the use of practices individually confining animals
where:
- Not Permitted means the animal was raised on an operation certified to *not*
  confine animals in individual crates, stalls, or cages
- Permitted indicates that no claims regarding confinement of animals in individual
  crates, stalls, or cages are being made

Location refers to the proximity of the source farm to your home:
- Local means the pork was produced on a farm that is near your home's location.
- No Claim means that no claim is made about the location of the farm.

Antibiotic Use refers to the use of antibiotics on animals where:
- Not Permitted means the animal was raised on an operation certified to *not*
  administer antibiotics to animals
- Permitted indicates that no claims regarding use of antibiotics are being made

Certification Entity refers to the process used in verifying animal welfare and handling
claims made on the product label where:
- USDA-PVP means the label is backed by a producer's participation in a
  certification and process verification program (PVP) managed by the United
  States Department of Agriculture (USDA)
- Retailer Certification means the label is backed by a producer's participation in a
  certification and verification program managed by a private, third party retailer
  that is neither associated with livestock industry nor any consumer groups
- Pork Industry Certification means the label is backed by a producer's
  participation in a certification and verification program managed by the poultry
  industry itself

Description of Attributes included in Chicken Breast Choice Experiment
Price refers to the cost per 1 lb. of boneless, skinless, chicken breast:
- $1.89/lb.
- $3.15/lb.
- $4.41/lb.

Location refers to the proximity of the source farm to your home:
- Local means the chicken was produced on a farm that is near your home's location.
- No Claim means that no claim is made about the location of the farm.

Pasture Access refers to the ability of animals to access grass pasture (when weather permits) and not be confined solely to indoor production facilities:
- Required means the animal was raised on an operation certified to provide animals with access to grass pasture (when weather permits)
- Not Required indicates that no claims regarding access to grass pasture are being made

Antibiotic Use refers to the use of antibiotics on animals where:
- Not Permitted means the animal was raised on an operation certified to *not* administer antibiotics to animals
- Permitted indicates that no claims regarding use of antibiotics are being made

Certification Entity refers to the process used in verifying animal welfare and handling claims made on the product label where:
- USDA-PVP means the label is backed by a producer's participation in a certification and process verification program (PVP) managed by the United States Department of Agriculture (USDA)
- Retailer Certification means the label is backed by a producer's participation in a certification and verification program managed by a private, third party retailer that is neither associated with livestock industry nor any consumer groups
- Poultry Industry Certification means the label is backed by a producer's participation in a certification and verification program managed by the poultry industry itself.

Appendix C. "Cheap Talk" Statement Included in Choice Experiments

The experience from previous similar surveys is that people often state a higher willingness to pay than what one actually is willing to pay for the good. It is important that you make your selections like you would if you were actually facing these choices in your retail purchase decisions, noting that allocation of funds to these products means you will have less money available for other purchases.

Appendix D. Sample NLOGIT Code for Model Modified to Account for Respondent's Definition of Local

```
CREATE; LCDUM=LOC20UND*CDUM$

CREATE; LPAUS=LOC20UND*ECPASTD_$
CREATE; LPARE=LOC20UND*ECPASTD0$
CREATE; LPAPI=LOC20UND*ECPASTD1$

CREATE; LAU=LOC20UND*ECANTIUD$
CREATE; LAR=LOC20UND*ECANTIU0$
CREATE; LAI=LOC20UND*ECANTIU1$

CREATE; LLocU=LOC20UND*ECLOCD_U$
CREATE; LLocR=LOC20UND*ECLOCD_R$
CREATE; LLocI=LOC20UND*ECLOCD_P$



NLOGIT;Lhs=DECISIO0;Choices=1,2,3;
Rhs=Cdum,PriceC,ECPASTD_,ECPASTD0,ECPASTD1,ECANTIUD,ECANTIU0,ECA
NTIU1,ECLOCD_U, ECLOCD_R,ECLOCD_P, LCDUM, LPAUS, LPARE, LPAPI,
LAU, LAR, LAI, LLocU, LLocR, LLocI;
Pts=50;Cor; RPL;Parameters;
Fcn=Cdum(N),ECPASTD_(N),ECPASTD0(N),ECPASTD1(N),ECANTIUD(N),ECANT
IU0(N),ECANTIU1(N),ECLOCD_U(N), ECLOCD_R(N),ECLOCD_P(N);
Maxit=50;Pds=8;PrintVC;Effects:;halton;Means:;Matrix;Crosstab;Prob=prMLa$Definiti
on of Local
```

Appendix E. RPL Coefficients for Pork Chops and Chicken Breasts

Variable	Pork Chop		Chicken Breast	
	Coefficient Estimates	Standard Deviation Estimates	Coefficient Estimates	Standard Deviation Estimates
Price	-0.4642***		-0.6922***	
	0.0435		0.0476	
Individual Crate_USDA	0.5115***	0.6245*		
	0.1005	0.0798		
Individual Crate_Retailer	0.0565	0.2157*		
	0.1322	0.0912		
Individual Crate_Pork Industry	0.4888	0.7921*		
	0.1516	0.1413		
Pasture Access_USDA			0.7096***	0.0737
			0.0909	0.1006
Pasture Access_Retailer			0.5696***	0.4538***
			0.1073	0.1110
Pasture Access_Pork Industry			0.6108***	0.0879
			0.1277	0.2024
AntibioticUse_USDA	1.1980***	0.1547	0.7436***	0.4736***
	0.1534	0.1289	-0.1270	0.1123
AntibioticUse_Retailer	0.4334**	0.7084***	0.5018***	0.0549
	0.1736	0.1453	0.1308	0.1021
AntibioticUse_Industry	0.4904**	0.9314***	0.6276***	0.2387
	0.1923	0.1535	-0.1939	0.1701
Local_USDA	-0.4692***	0.03653	0.8601***	0.5150***
	0.1236	0.07485	0.1113	0.1015
Local_Retailer	-0.4739***	0.2645**	0.8600***	0.0029
	0.1429	0.1141	0.1113	0.0942
Local_Industry	-0.9837***	0.2956***	0.3834***	0.0921
	0.1718	0.1140	0.1105	0.1333
Opting Out	-2.440***	5.8585***	-6.3094***	3.2459***
	0.5026	0.4077	0.4078	0.2704

Appendix E continued.

Individual Crate_USDA*Local20	-0.3429***	
	-0.1714	
Individual Crate_Retailer*Local20	-0.0423***	
	-0.2927	
Individual Crate_Industry*Local20	-0.0062***	
	-0.1357	
Pasture Access_USDA*Local20		-0.1617
		0.1316
Pasture Access_Retailer*Local20		-0.1071
		0.1372
Pasture Access_Industry*Local20		-0.2033
		0.1948
AntibioticUse_USDA*Local20	-0.5882	-0.1682
	-0.602	0.16
AntibioticUse_Retailer*Local20	-0.5629***	-0.0757
	-0.3188	0.1646
AntibioticUse_Industry*Local20	-0.8502***	-0.4284
	-0.4287	0.2693
Local_USDA*Local20	0.5222	-0.2578
	-0.7381	0.1399
Local_Retailer*Local20	0.1092**	-0.3787*
	-0.208	0.1417
Local_Industry*Local20	0.2974***	-0.1043***
	-0.1625	0.1819
Opting Out*Local20	5.8584***	1.9471***
	0.4077	0.4529

Statistical significance to the 1%***, 5%**, and 10%* levels.

Appendix F. Random Parameters Logit Results

Value	Outdoor Enthusiasts RPL Econometric Estimations		Nationwide RPL Econometric Estimations	
	Coefficient	Standard Deviation	Coefficient	Standard Deviation
Price	-0.2453***	.3728***	-0.0329	0.3432***
	(.0254)	(0.0353)	0.0354	0.0526
Safety	0.1670***	.8168***	0.3125***	0.8401***
	(.0333)	(0.0443)	-0.04902	0.0558
Convenience	-0.7597***	0.4158***	-0.5515***	0.4213***
	(.0307)	(0.0443)	-0.0414	0.0492
Taste	0.1325***	0.0125	0.1827***	0.0208
	(.0226)	(0.0367)	0.0324	0.0554
Animal	-0.5175***	1.5351***	-0.0903***	1.403***
Welfare	(.0522)	(0.646)	0.0290	0.0847
Nutrition	0.00			

Statistical significance to the 1%***, 5%**, and 10%* levels.

Appendix G. RPL Coefficients for Pork Chops from the Outdoor Enthusiast and Nationally Representative Samples

Variable	Outdoor Enthusiast		Nationally Representative	
	Coefficient Estimates	Standard Deviation Estimates	Coefficient Estimates	Standard Deviation Estimates
Opting Out	-4.0135***	3.4925***	-2.3794***	5.3328***
	0.7453	0.3908	0.4580	0.7500
Individual Crate_USDA	0.5239***	0.5257***	0.4484***	0.6764***
	0.0966	0.1076	0.1087	0.1386
Individual Crate_Retailer	0.1984	0.3954	0.0196**	0.1754
	0.1285	0.5575	0.0967	0.2104
Individual Crate_Pork Industry	0.0635	0.0215	0.5523	0.6629**
	0.1808	0.1871	0.2324	0.2690
AntibioticUse_USDA	0.8339***	1.0465***	0.9700***	0.1669
	0.1057	0.3602	0.1115	0.1109
AntibioticUse_Retailer	0.8120***	0.1845	0.2775*	0.0650
	0.2327	1.2549	0.1210	0.7187
AntibioticUse_Industry	0.8715***	0.0269	0.1979	0.0842
	0.2457	0.5617	0.3628	0.4566
Local_USDA	-0.2381	0.2845	-0.3069**	0.0114
	0.1851	0.2010	0.1402	0.1059
Local_Retailer	-0.5879***	0.2581	-0.1993**	0.1047
	0.1419	0.6381	0.0993	0.0910
Local_Industry	-0.3521	0.1671	-0.7443***	0.3211
	0.2155	0.3682	0.1562	0.1340**
Price	-0.4572***		-0.4300***	
	0.0449		0.0421	

Appendix H. RPL Coefficients for Chicken Breasts from the Outdoor Enthusiast
and Nationally Representative Samples

Variable	Outdoor Enthusiast		Nationally Representative	
	Coefficient Estimates	Standard Deviation Estimates	Coefficient Estimates	Standard Deviation Estimates
Opting Out	-5.8796***	3.4252***	-5.0583***	3.4756***
	0.3306	0.3414	0.30333	0.3067
Pasture Access_USDA	0.6927***	0.5145***	0.6318***	0.3337***
	0.0773	0.1103	0.0679	0.0957
Pasture Access_Retailer	0.5307***	0.0394	0.5015***	0.4349***
	0.0837	0.1466	0.0938	0.1027
Pasture Access_Pork Industry	0.4794***	0.0407	0.4780***	0.0897***
	0.1224	0.238	0.0935	0.1527
AntibioticUse_USDA	0.5836***	0.6114***	0.5400***	0.5475***
	0.0731	0.1867	0.0921	0.1123
AntibioticUse_Retailer	0.5619***	0.0052	0.4351***	0.1248
	0.0845	0.1297	0.1095	0.1195
AntibioticUse_Industry	0.5417***	0.4059***	0.4129***	0.0196
	0.1235	0.1788	0.1258	0.1902
Local_USDA	0.6406***	0.3485***	0.6898***	0.2857***
	0.0655	0.0792	0.0771	0.1168
Local_Retailer	0.2436***	0.1511	0.1119	0.0163
	0.0675	0.1129	0.0919	0.1108***
Local_Industry	0.0699	0.15043	0.1277	0.3659
	0.0879	0.1896	0.1002	0.1181
Price	-0.6993***		-0.6819***	
	0.04861		0.04343	

VITA

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Elizabeth Sheryl Byrd earned a Bachelor's of Science in Quantitative Agricultural Economics with Honors and Highest Distinction from Purdue University in 2004. She earned a Juris Doctor degree from the West Virginia University College of Law in 2009. Elizabeth completed her M.S. degree in Applied Agricultural Economics at Cornell University under the supervision of Dr. David Just.

In 2012, she began the PhD program in Agricultural Economics at Purdue University and will receive her doctoral degree in December 2016. In November 2016, Elizabeth will begin her post graduate career as a Teaching Assistant Professor, Division of Resource Management, Davis College of Agriculture, Natural Resources and Design at West Virginia University. In her spare time, Elizabeth enjoys horseback riding, hunting, preparing cattle and hogs for show, and helping out on the family farm.