

**Between the Farm and the Farmer's Market: Slaughterhouses, Regulations, and
Alternative Food Networks**

by

Riva Caroline Hodges Denny

A thesis submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Master of Science

Auburn, Alabama
August 4, 2012

Keywords: red meat, slaughter, meat inspection regulations,
state meat inspection programs, alternative food networks, political economy.

Copyright 2012 by Riva Caroline Hodges Denny

Approved by

Michelle Worosz, Chair, Assistant Professor of Rural Sociology
Toni Alexander, Associate Professor of Geography
Walter Prevatt, Professor of Agricultural Economics
Norbert Wilson, Associate Professor of Agricultural Economics

Abstract

Proximity and access to slaughter establishments is a key factor for farmers who wish to produce red meat for local markets. However, the number of slaughter facilities in the US has fallen dramatically over the last four decades, from nearly 10,000 in 1967 to less than 3,000 in 2010. This thesis compares the slaughter industries of Michigan and Alabama, and assesses the importance of a state inspection program on the number of slaughterhouses in the state.

Qualitative interviews (20 from each state) are analyzed to identify the features and conditions of the Michigan and Alabama slaughter industries. Multilevel regression models were used with longitudinal data on slaughterhouse numbers in 40 US states from 1967-2010, to determine the importance of state inspection programs, HACCP requirements, time, agricultural structure and livestock industry on the number of slaughterhouses by inspection type. This thesis found that state meat inspection programs are more supportive of small slaughterhouses, and are related to significantly more non-federally inspected slaughterhouses, than federal inspection alone.

However, state inspection was not the only factor that influences the total number of slaughterhouses in a state.

Acknowledgments

It is a pleasure for me to thank my committee for their support and input throughout this project. I wish to especially thank my advisor Dr. Michelle Worosz for her support and confidence in me as a student and as a researcher, and for giving me such a good entree into the world of rural sociology. I also want to give special thanks to Dr. Iryna Johnson and Barney Wilborn for their assistance; as well as Claudine Jenda and the rest of the Auburn University library staff.

Of course, this thesis would not have been possible without the producers, processors, regulators and others in Michigan and Alabama who contributed their time and knowledge to this project. Thank you.

I also wish to express my gratitude to my parents for their encouragement and support of all my endeavors that have led me to this point, and to my brother for his understanding and keen wit. I also want to thank Melissa for teaching me to work hard and never quit, and the teachers and professors who have pushed me to be the student they knew I could; especially M. Leary, A. Simmonds, P. Shipton, and J. Jones. Also thanks to my RG Family for helping me learn what it is to be a good and critical student in any setting.

Last but not least, I want to thank my fellow students and friends in Auburn for their encouragement and humor in grad school work and life, and John David for his encouragement and faith in me. Emily, thank you for sending the email.

Table of Contents

Abstract.....	ii
Acknowledgments	iii
List of Tables	viii
List of Figures.....	ix
List of Abbreviations	xi
CHAPTER 1: INTRODUCTION.....	1
BACKGROUND AND LITERATURE REVIEW	6
History of US Livestock and Slaughter Industries	6
Location and technology, 1640s-1960s.	7
Concentration and consolidation, 1960s-2010s.	12
Regulations	22
History of federal meat inspection in the United States.	22
Application of federal acts as regulations.	24
History of state meat inspection.....	25
Types of Slaughter Establishments.....	28
Road Map.....	30

CHAPTER 2: THEORY AND CONCEPTUAL FRAMEWORK.....	32
Alternative Food Networks (AFNs).....	32
Processing in AFNs.....	38
AFNs and Grades and Standards (i.e., Regulations).....	39
Other Agrifood Literature	40
CHAPTER 3: METHODS.....	43
Research Questions.....	43
State vs. Federal Meat Inspection Programs.....	43
Sample.....	43
Data.....	44
Analysis.....	45
Limitations	45
Longitudinal Analysis of Inspection Programs and Slaughter Establishment Numbers ..	46
Sample.....	46
Data.....	46
Variables	46
Analysis.....	49
Limitations	51
Other Data.....	51
Legal Data.....	51

Talmadge-Adiken Program Data	52
CHAPTER 4: FINDINGS AND ANALYSIS	53
Context: Comparison of the Michigan and Alabama Meat Industries and Inspection Programs.	53
Slaughter and livestock and industries.....	53
Sample description.....	58
History of meat inspection	61
Description of Meat Inspection.....	62
Differences between Federal Meat Inspection in Michigan and State Meat Inspection in Alabama.	67
Application of inspection	67
Regulator attitudes	67
Advantages of state inspection program	69
Additional benefits of state inspection.....	71
Results of Longitudinal Analysis.....	73
CHAPTER 5: CONCLUSIONS	82
Summary	82
Analysis Findings.....	84
Limitations and Future Research	85
Contribution to AFN Literature	85
Standards.....	85

Actors	86
Conclusion	87
REFERENCES	88
APPENDIX A.....	101
APPENDIX B	103
APPENDIX C	104

List of Tables

Table 3.1. Composition of alternative beef value chain interview samples. Number of interviews (number of individuals interviewed), Michigan, Alabama and total	45
Table 3.2. Study variable names, definitions and sources.	47
Table 4.1. Regulator samples from Michigan and Alabama, position held at time of interview and average years of experience	59
Table 4.2. Description of processor sample, Michigan and Alabama.	60
Table 4.3. Descriptive statistics for study variables, 40 US states, 1967-2010.	75
Table 4.4. Four generalized linear mixed models of state inspection, HACCP, year, ag. structure and industry variables on federally inspected (FI) slaughter establishments, 40 US States, 1969-2010	78
Table 4.5. Four generalized linear mixed models of state inspection, HACCP, year, ag. structure and industry variables on non-federally inspected (Non-FI) slaughter establishments, 40 US States, 1969-2010.....	79
Table 4.6. Four generalized linear mixed models of state inspection, HACCP, year, ag. structure and industry variables on total slaughter establishments, 40 US States, 1969-2010.....	80
Table 4.7. Mann-Whitney U-tests of T-A program status and history on number of total, FI and Non-FI slaughter establishments, 42 US states, 2010.....	81

List of Figures

Figure 1.1. Number of slaughter establishments in US, 1967-2010.....	3
Figure 1.2. Michigan and Alabama slaughter establishment counts, 1967-2010... ..	5
Figure 1.3. Four firm concentration in cattle and hog slaughter as percentage of total commercial slaughter in US, 1920-2006... ..	13
Figure 1.4. Average annual red meat production per establishment, FI and Non-FI, in million pounds, US total, 1977-2010... ..	14
Figure 1.5. Number of FI establishments slaughtering more than 50,000 head of cattle and 100,000 head of hogs per year, United States, 1978-2010... ..	16
Figure 1.6. Number of FI slaughter establishments slaughtering 1 million or more head of cattle per year (1991-2010) and 4 million or more head of hogs per year (1995, 1998-2010) ...	16
Figure 1.7. Percentage of total FI head slaughtered by FI establishments slaughtering 50,000 or more head of cattle per year and 100,000 or more head of hogs per year, 1978-2010.....	17
Figure 1.8. Percentage of total head slaughtered by FI establishments slaughtering 1 million or more head of cattle per year (1991-2010) and 4 million or more head of hogs per year (1995, 1998-2010).....	17
Figure 1.9. US red meat production in million pounds per year and pounds produced annually per person in US, 1967-2010.	19
Figure 1.10. Farmer's share (net farm value) for 1 pound of retail beef and pork in dollars per pound (2009 dollars), 1970-2010.....	21
Figure 1.11. Farmer's share (net farm value) as percent of beef and pork retail price, 1970-2010	21
Figure 1.12. Creation of Federal Regulations	25
Figure 1.13. Map of meat inspection programs in the US, January 1, 2011.....	27
Figure 1.14. US slaughter establishments by inspection type, 1967-2010	29

Figure 1.15. US slaughter establishments by inspection type, 2006-2010	30
Figure 4.1. Number of livestock slaughter establishments by type in Michigan, 1967-2010	54
Figure 4.2. Number of livestock slaughter establishments by type in Alabama, 1967-2010	54
Figure 4.3. Cattle and calf inventory on January 1, and annual slaughter in thousand head, Michigan 1967-2010.....	56
Figure 4.4. Cattle and calf inventory on January 1, and annual slaughter in thousand head, Alabama 1967-2010.....	56
Figure 4.5. Hog and pig inventory on December 1 of previous year, and annual hog slaughter in thousand head, Michigan 1967-2010.....	57
Figure 4.6. Hog and pig inventory on December 1 of previous year, and annual hog slaughter in thousand head, Alabama 1967-2010.....	57

List of Abbreviations

ADAI	Alabama Department of Agriculture and Industries
AFN	Alternative Food Network
CAFO	Confined Animal Feeding Operation
CE	Custom Exempt
CFR	Code of Federal Regulations
CSA	Community Supported Agriculture
DOJ	U.S. Department of Justice
EIAO	Enforcement Investigation and Assessment Officer
ERS	USDA Economic Research Service
FDA	U.S. Food and Drug Administration
FI	Federal Inspection/Federally Inspected
FMIA	Federal Meat Inspection Act
FOIA	Freedom of Information Act
FSIS	Food Safety Inspection Service
FSMA	F.D.A. Food Safety Modernization Act
GIPSA	Grain Inspection, Packers and Stockyards Administration
HACCP	Hazard Analysis and Critical Control Point
IBP	Iowa Beef Packers
LFS	Local Food System

NASS	National Agricultural Statistics Service
Non-FI	Non-Federally Inspected (includes state inspected and custom exempt)
PBIS	Performance Based Inspection System
PHIS	Public Health Inspection System
PHV	Public Health Veterinarian
SSOPs	Sanitation Standard Operating Procedures
T-A	Talmadge-Aiken
USDA	United States Department of Agriculture
VBSC	Values-Based Supply Chain
WMA	Wholesome Meat Act

CHAPTER 1: INTRODUCTION

From the founding of the Slow Food movement in the 1980s, to Michel Pollan's 2006 book *The Omnivore's Dilemma*, to the U.S. Department of Agriculture (USDA)'s 2009 launch of their "Know Your Farmer, Know Your Food" initiative, and increasing interest and coverage in the media, there has been a rise in consumer demand for foods that come from outside of the conventional (i.e., industrialized) agrifood system (King, Hand, and DiGiacomo 2010). The qualities that alternative foods may carry, that distinguish them as an alternative to conventional food, are often linked to *who* produced it, and *how, where, when, and why* it was produced in that way (Worosz et al. 2008:173). The demand for alternative meat is especially strong. This demand is typically thought to be associated with, but not necessarily limited to: the number of high-profile outbreaks of foodborne diseases linked to the consumption of bacterially contaminated beef over the last two decades; an increased awareness of, and concern with, the healthiness of meat (e.g. "good" vs. "bad" types of fat); the environmental impact of conventional animal/meat production (e.g., confined animal feeding operations (CAFOs)); and ethical/moral concerns with the treatment of animals and workers in the industrialized livestock and meat production system (Severson 2010; cf., Lockie 2009)

Organic, all-natural, grass-fed and certified humane¹ meat is becoming increasingly easy to buy through conventional channels, especially mainstream health-food stores such as Whole Foods. However, consumers in many places do not have access to these stores, or they may want

¹ There are a number of organizations that certify animal welfare standards for production. Examples include Humane Farm Animal Care, Animal Welfare Approved, American Grassfed Association, and Global Animal Partnership.

to buy their meat directly from a specific farmer or butcher. Bower et al. (2010) categorizes these as food system tiers 2 and 1. Tier 2 represents values-based supply chains (VBSCs) which are characterized by the “close cooperation between strategic business partners within the chain” (Stevenson and Pirog 2008:122) and maintain and communicate the unique qualities of products to the consumer. Examples of VBSCs include cooperatives, local/regional distributors, and non-chain grocery and health food stores. Tier 1 represents direct sales (i.e. direct marketing) from producers to consumers, allowing consumers to gain the most in-depth product information; sales may take place at the producer’s farm, at a farmer’s market, through a community supported agriculture (CSA) program, or through the internet. Direct marketing and VBSCs allow producers to make more profit from their product than what may otherwise be possible by participating in the conventional, large-scale industrial system (Verhaegen and Van Huylenbroeck 2001). This is because VBSCs can give producers “a larger share of the food dollar” by eliminating the middlemen and can command higher prices as a specialty or niche product (Adam, Balasubrahmanyam, and Born 1999:3).

Meat production requires the slaughter and processing of livestock. Unlike fruit and vegetable harvesting, meat “harvesting” (i.e., slaughter) takes place off-farm and is not generally performed by the farmer.² Livestock producers who wish to sell their finished product directly to consumers or through a VBSC must locate a slaughter establishment³ that will provide this

² “Farm slaughter” (i.e., on-farm harvesting) does happen on a limited scale for the personal use of the farmer. Federal regulations prohibit the sale of the meat from amenable species (*See note 4* on page 4) that were not slaughtered under inspection.

³ For the purposes of this study a slaughter establishment is a business which conducts the slaughter and at least the minimal processing (e.g., evisceration, skinning, halving) of amenable livestock species (*See note 4* on page 4). This

service. An issue that is becoming increasingly visible with the increased demand and production of alternative meat is the limited access to inspected establishments that will provide custom slaughter and processing services for producers (Perry 2011; USDA 2010; Gwin 2009; Worosz et al. 2008; Conner, Campbell-Arvai, and Hamm 2008). These slaughter establishments are typically small, and independently owned/operated in contrast to the extremely large, corporately owned slaughter establishments that process meat for national distribution. The USDA defines large establishments as having 500 or more employees; small establishments as having between 10 and 499 employees; and very small establishments as those “with fewer than 10 employees or annual sales of less than \$2.5 million” (Federal Register 1996:38806).

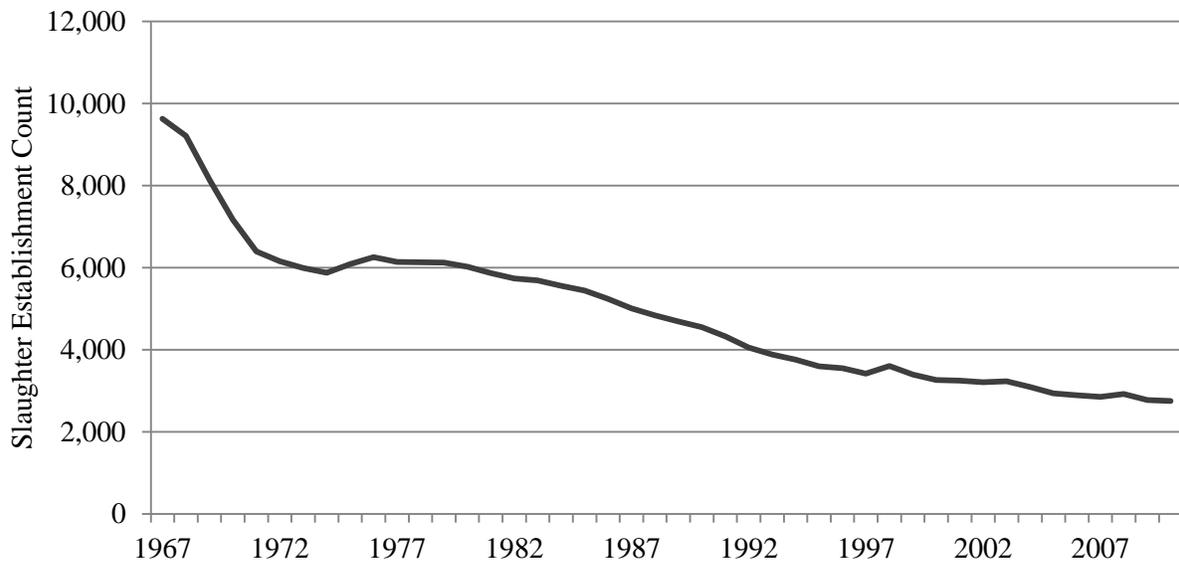


Figure 1.1 Number of slaughter establishments in US, 1967-2010.
Source: USDA Livestock Slaughter Summaries 1969-2011.

term is used in preference to “slaughterhouse” and “slaughter plant”, which carry small and large size implications respectively, “slaughter facility” which refers to the physical structure or “firm” which refers to the business organization and becomes complicated when one firm may operate multiple facilities.

Over the last 44 years, the total number of slaughter establishments in the US has decreased dramatically (Figure 1.1), from nearly 10,000 in 1967 to less than 3,000 in 2010, while the average size of slaughter establishments (measured by weight of output) doubled from 1972 to 1992 (Ollinger et al. 2005:8-9) and has continued to climb (see Figure 1.4), resulting in fewer slaughter establishments in fewer places. This pattern of consolidation, especially among large slaughter establishments that are part of the industrial food system, has been driven largely by market forces and economy of scale benefits (MacDonald and Ollinger 2000, 2005; MacDonald 2003; Ollinger et al. 2005). The numbers of small and very small plants have also decreased over the last several decades, even with the increased interest/demand for meats with “alternative” attributes. This begs the question of why access to slaughter remains a bottle neck in the production of such a “hot” niche product?

The Federal Meat Inspection Act (FMIA) requires that for meat to be sold, the animal⁴ must be inspected before and after slaughter for signs of disease, that the slaughter be done in a humane way, and that the processing of the meat be done in a sanitary environment. Thus, all slaughter establishments⁵ are subject to regulations intended to ensure the safety of the meat produced. The United States Department of Agriculture (USDA)’s Food Safety Inspection Service (FSIS) provides inspection to slaughter establishments in all states. In addition, twenty-seven states currently run state meat inspection programs that comply with federal requirements.

⁴ This applies only to species that are subject to the FMIA (i.e., cattle, swine, goats, sheep, equines); these species are called “amenable” species, because they are amenable (i.e., subject to) the meat inspection regulations.

⁵ Establishments that only process meat for the personal use of the animal’s owner are exempt from parts of the regulations, and are called “custom exempt” (CE). See subsection: “Types of slaughter establishments” on page 28 for a description of the ways the regulations apply to different types of establishments.

Prior research has found qualitative and quantitative differences between state and federal inspection programs, notably in their “economic, social, and food safety implications,” that make the option of state inspection attractive to small slaughter establishments (Slaughter et al. 2001:32; cf. Durham, Gardner, and Geise 2009). What is not known is how the benefits of state inspection may, or may not, be related to the number of slaughter establishments. For example, Michigan ended its state inspection program in 1981, but has maintained more slaughter establishments over the last twenty years than Alabama, which does have state inspection (Figure 1.2).

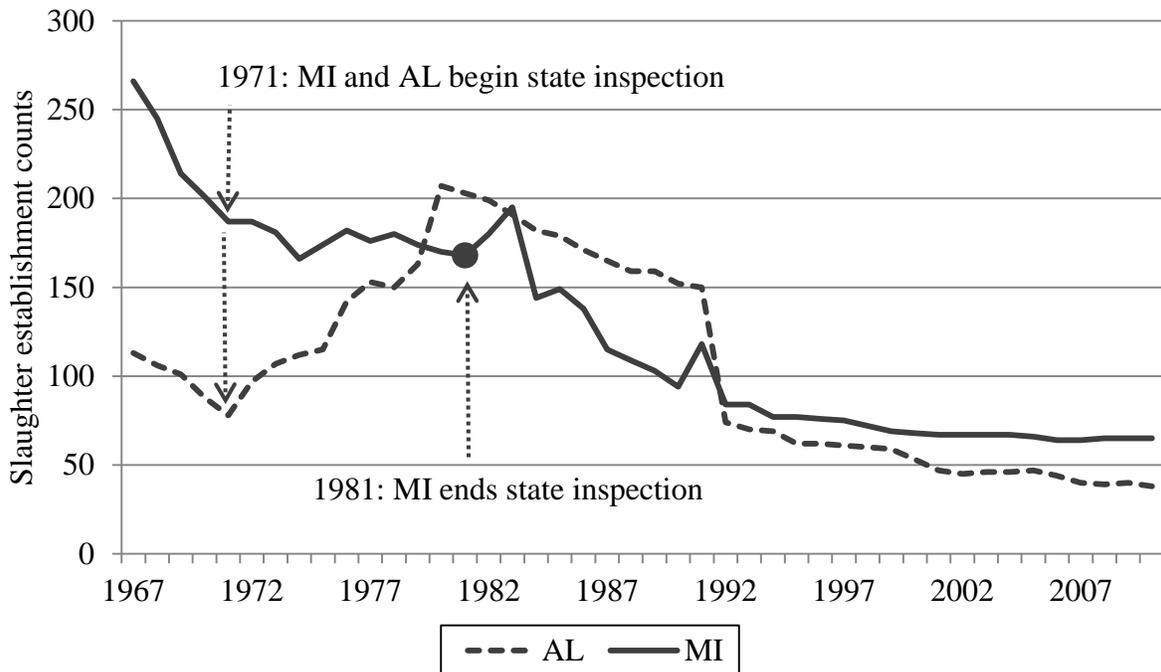


Figure 1.2. Michigan and Alabama slaughter establishment counts, 1967-2010.
Source: USDA Livestock Slaughter Summaries 1969-2011.

The purpose of this thesis is two-fold. First, using the cases of Michigan and Alabama, I will identify and explore the differences between state and federal meat inspection as they apply to small and very small slaughter establishments that may participate in alternative food

networks (AFNs). Second, because proximity to a slaughter establishment is a prerequisite for meat participation in AFNs, I will use statistical analysis to identify the effects of state inspection on the number of total slaughter establishments in a state.

The remainder of this chapter provides a brief history of the US livestock and slaughter industries and an overview of the development of meat inspection regulations. The purpose of this section is to provide necessary background and context for the slaughter industry as it exists today. The topics covered include the development of the livestock industry and the concurrent rise of the slaughter and meatpacking industries on a large scale. Meat inspection regulations were created in response to the industry and to facilitate its economic activities. This history is important for understanding the complexities that exist in the slaughter industry today, and how they shape the experiences of small scale processors.

BACKGROUND AND LITERATURE REVIEW

The livestock and slaughter industries are closely related and are best considered together—the livestock industry needs slaughterhouses to create a marketable product, and slaughter establishments need a supply of animals. Historically, slaughterhouses and small butchers bought live animals from auctions or from farmers, processed them, and then marketed the meat; direct marketing by farmers is a relatively new phenomenon.

History of US Livestock and Slaughter Industries

The history of livestock production and slaughterhouses in the United States provides the context for those industries today. This history reflects the challenges of storing and transporting

meat, technological innovations, geographical limitations, transportation challenges and economic principles of production and markets. As Skaggs (1986:3) puts it,

the red-meat industry is a microcosm of American economic development—a case study in imperfect markets...and [one that] encompasses the national experience, from the taming of a raw, unsettled frontier, which eventually gave rise to a complex agrarian supply base, to the evolution of industrial colossuses as competitive as any other American enterprises.

The past century, and last 50 years especially, have seen significant changes in the nature and location of the livestock and meatpacking industries.

Location and technology, 1640s-1960s. Historically, rural areas have provided the livestock for urban slaughterhouses and meatpackers. As early as the 1640s, meat, most often pork, was seasonally packed for export from cities such as New York, and later Cincinnati, Louisville, and Chicago (Skaggs 1986:11). “Meatpacking” originally referred to the “packing” of meat, most often in a barrel, for preservation and transportation, a process that began with an already dressed⁶ carcass (Hinman and Harris 1942:16). By the 1850s slaughter had been incorporated into “packing” establishments (Skaggs 1986:38) and today the term is used to refer primarily to large establishments that both slaughter and “process” carcasses into smaller units (i.e., primals,⁷ retail cuts) for transportation and resale.

⁶ Dressing is the process of removing the “skin, ... gut, and ... other non-edible parts of the body” for the purpose of preventing or reducing contamination of the carcass with dirt from the hide, or material from the digestive tract (Warriss 2000:81).

⁷ Primal cuts are carcass divisions, based upon muscle structure and quality, from which individual retail cuts are made (Warriss 2000:86). An example is the rib primal, which may be cut into retail cuts such as rib-eye steaks or prime rib.

When the eastern US was still “frontier,” cattle, horses and pigs were allowed to run loose and herded up and sold by those who were able to get them to market. This practice slowly shifted westward and eventually turned into modern “ranching” as unclaimed land diminished and “improved” breeding became more common (Skaggs 1986:12-17). By the early 1800s animals were driven east from Ohio and increasingly farther west during the rest of that century. After the Civil War, when extended rail lines and a more densely settled east made shipping more attractive and feasible (Skaggs 1986:43-44, 54; Hinman and Harris 1942:34-35), animals were sent from Chicago and Kansas to eastern cities.

Cincinnati was the country’s early meatpacking center, with the first commercial pork packing plant opening in 1818. The industry made use of the plentiful free-ranging hogs in the Ohio River Valley and river access for transportation of the packed meat (Skaggs 1986:36). Additional impetus for early pork packing in the west lies in the fact that hogs do not drive as well as cattle and sheep, and do not fatten as well on the road (Hinman and Harris 1942:20).

Chicago was an early industrial center in the Midwest, but after the Civil War the city came to dominance as a trade and livestock point and replaced Cincinnati as the country’s meatpacking center (Skaggs 1986:44-45). The opening of the Chicago stockyards in 1865 served to meet the first two needs of the meat industry: transportation, and a cash market for livestock (Hinman and Harris 1942:30). At the stockyards, with the help of livestock commission merchants, farmers could sell their animals to packing firms who would typically ship live cattle by rail to their plants farther east (Hinman and Harris 1942:56-58). Hogs, in contrast, were packed at plants in Chicago (Warren 2007:13). Chicago was the first major consolidation and organization of livestock marketing. This arrangement facilitated coordination between shippers and railroads to avoid rate wars (Skaggs 1986:48). “Although Cincinnati’s packers had shipped

their pork products outside the immediate region, the larger packers of the 1860s and 1870s had an even more clearly national market orientation” (Warren 2007:9).

The refrigerated rail car was invented in 1879 by Gustavus Swift. It drastically changed the nature of the meatpacking industry by making it possible to ship dressed beef for about half the price of shipping live animals (Warren 2007:13). This technology allowed Swift to “conquer” the New York market in 1882 by being able to underprice the city’s butchers (Giedion 1975:221-222). Thus it was in the 1880s that Chicago emerged as a truly “terminal-market” (Warren 2007:13) and the competition among packers for eastern markets that ensued gave rise to allegations of a “Beef Trust” that were engaging in monopolistic behaviors (Yeager 1981:172-3). The strategies of market control included several pooling strategies between 1886 and the early 1900s and the formation of the National Packing Company in 1903 by Swift, Armour and Morris, by which they jointly owned and operated a number of smaller packing companies, while retaining their own corporate autonomy (Yeager 1981:145). The National Packing Company was voluntarily dissolved in 1912 following an unsuccessful trial of the company and its ten subsidiaries for anti-competitive practices under the Sherman Anti-Trust Act (Yeager 1981:220-7). While there was never a trust in the technical sense of *one* company having a monopoly, the “Big Five” (i.e., Swift, Armour, Morris, Cudahy, and Schwarzschild and Sulzberger [later Wilson]) together were recognized by the Federal Trade Commission in 1916 as having disproportionate market control (Skaggs 1986:103).

Railroad expansion made possible the creation of “ten principle livestock markets” by 1902. These stockyards “proved to be constriction points affording advantage to relatively few buyers” making sellers inevitably price takers. This is “a classic example of an oligopsonistic market ... in which a handful of buyers (in this instance fewer than a thousand packers

nationwide), in collusion or not, set prices” (Skaggs 1986:88). The locations of packing plants near these major stockyards also “tended to concentrate the meatpacking industry in the large cities, and to decrease meatpacking in small towns” (Hinman and Harris 1942:44). Thus, the refrigerated rail car was the first major step to moving meatpacking closer to where the animals were produced, and it is an example of a technological innovation allowing for new business practices, and industry decentralization.

Beginning in the late 1800s, independent pork packers in the Midwest began to buy animals directly, rather than at terminal markets, a practice which became common during the 1920s-1950s. This shift in buying practices also marked a shift in the locations of the packing plants, with new plants being built in mid-sized Midwestern towns, closer to the farms where the animals were being raised. Direct-buying gave farmers the benefit of knowing the price they would get before shipping their animals, let them avoid stockyard fees and commissions, and utilize now cheaper truck transport for the shorter distances (Warren 2007:17-22). While “hogs were best suited for direct buying because they tended to be more uniform in quality, with fewer variations in price in a given grade and weight compared to cattle and sheep,” the direct buying of cattle and sheep also increased significantly over that period (Warren 2007:17). The current meatpacking “Big Four” (i.e., Swift, Armour, Cudahy, Wilson) gradually began to buy directly to supplement their public market purchasing, and they eventually bought several of the independent packers in the Midwest. Nevertheless, at the end of World War I, the majority of the large, direct-buying, meatpacking firms were still independently owned and operated (Warren 2007:21). Most independent packers followed the overall business and production model of the big Chicago packers (Warren 2007:22-23); but this began to change in the 1960s.

From the end of WWII to the 1960s, feedlots gained increasing popularity and commercial use (Skaggs 1986:178).

From the early 1960s to the early 1970s, cattle raising moved from mostly smaller feedlots in the northwestern Corn Belt to larger feedlots (1,000 or more head), especially in the central and southern Great Plains. By 2000, feedlots with capacities greater than 32,000 head accounted for almost half the cattle marketed in the United States. (Warren 2007:26)

The move to feedlots was at least somewhat driven by increased consumer demand for prime grade cuts of meat after the war, which require “prime” animals, that are difficult to produce on grass (Skaggs 1986:179), as well as production efficiencies and the ability to control the end product through diet (Warren 2007:190). It was also during the 1950s and 1960s that the practice of buying calves to feed, rather than breeding them and then feeding them, as well as hiring the services of a feedlot began (Skaggs 1986:180). Concentrated animal production also facilitated the next major phase in the industry: the westward shift in the packing plant locations of the new “Big Three” (i.e., IBP, ConAgra, Excel [Cargill subsidiary]), to again be closer to the supply of animals, (Warren 2007:23, 26), which reduces procurement costs, animal “shrinkage” (i.e., weight loss) and injury from travel (Stull and Broadway 2004:35).

Iowa Beef Packers (IBP) opened its first plant in 1961, marking the start of a “new oligopoly in meatpacking” (Warren 2007:24). As Warren (2007:23) explains it, “this new Big Three revolutionized meatpacking in the 1960s in three main ways: refinement of the direct-buying strategies of earlier packers, applications of advanced technology, and consolidation of cutting and packaging operations.” Direct-buying became increasingly coordinated between packers and producers which “wedded both parties to agreements about types of animals to be raised through modern input-intensive practices” and “contributed significantly to the rapid

concentration of animal production among fewer farms and farmers since the 1970s.” New, specialized and more efficient, single-species plants were built in animal-producing regions, which combined slaughter and fresh meat packaging operations into the same facility (Warren 2007:23-25). However, it was IBPs introduction of “boxed beef” in 1967 (Broadway, Stull, and Podraza 1994:24) that was arguably the most revolutionary change in the industry (Warren 2007:24), akin to the invention of the refrigerated railcar. Boxing vacuum packed primal cuts allowed for more cost efficient shipping by eliminating waste (i.e., fat, bone), and it was more space efficient (Skaggs 1986:190-191). By 1989 boxed beef was more than 80% of beef sales in the US (Warren 2007:25).

Concentration and consolidation, 1960s-2010s. While the rise and heyday of the large independent packers during the 1920s-1960s reduced the market control of the large, terminal market packers, the meatpacking industry has again become increasingly concentrated and consolidated since the 1980s (Figure 1.3). Concentration refers to the number of firms in a market and how much of the market they control; it is usually measured by the percentage of the market that is controlled by the four largest firms in that industry. Consolidation refers to the number and size of plants, with higher consolidation referring to a higher number of larger plants. The invention of boxed beef and other technological production innovations in the 1960s increased the economy of scale benefits possible for meat packers, though there were concurrent changes in labor costs and other market forces (MacDonald and Ollinger 2005).

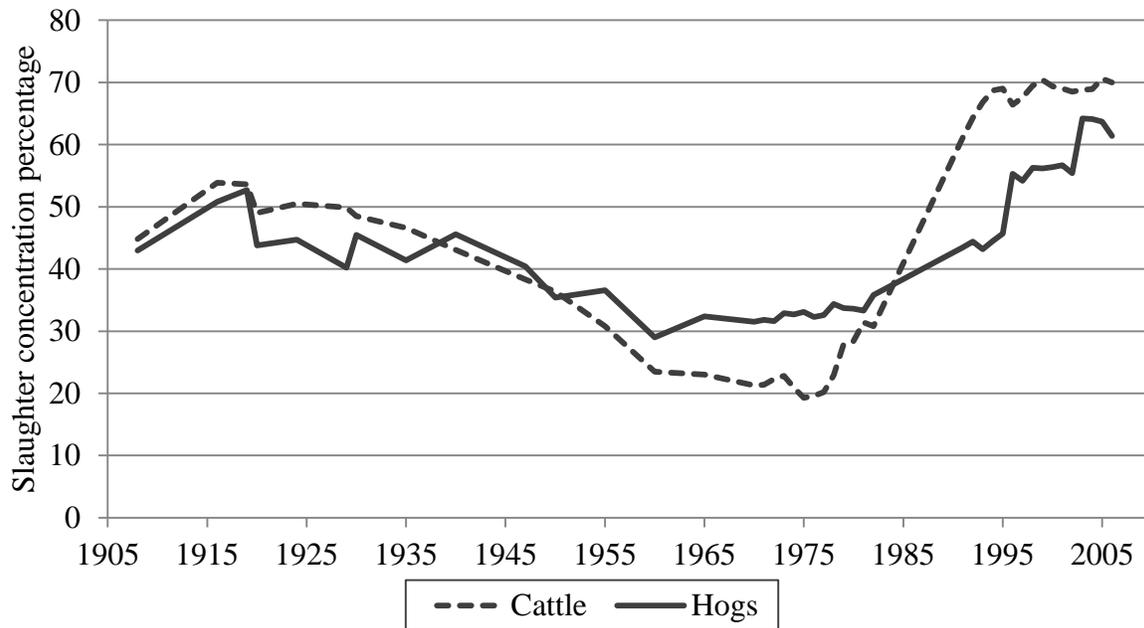


Figure 1.3. Four firm concentration in cattle and hog slaughter as a percentage of total commercial slaughter in US, 1908-2006.
Sources: 1908, 1916, 1919, 1924, 1929, 1935, 1947 from Williams and Stout (1964). 1920, 1930, 1940, 1950, 1955, 1960, 1965, 1970-1982 from Nelson (1985); 1991-2006 from GIPSA, Packers and Stockyards Program Statistical Reports (2000, 2008).

The “Big Three” that emerged in the 1960s have experienced further concentration through both horizontal integration (i.e., buying other firms in the industry) and vertical integration (e.g., meatpacking firms buying feedlots). In 2001, Tyson Foods bought IBP, and in 2002 ConAgra sold its meatpacking operations to the newly formed Swift and Company, which was bought by the Brazilian company JBS in 2007 (Warren 2007:23, 25; Johnson 2009). In 2008 JBS bought the Smithfield Beef Group—the fifth-largest U.S. beef processor at the time—but was blocked by the US Department of Justice (DOJ) from buying fourth-largest National Beef Packing Company (Johnson 2009). The purchase of the Smithfield Beef Group included the acquisition of Five Rivers Ranch Cattle Feeding, which made “JBS the largest cattle feeder in the United States” (Johnson 2009:2). As of 2009, the top four beef packing companies (and their

approximate market shares) were: Tyson (25%), Cargill (21%), JBS-Swift (18.5%) and National Beef (10.5%) (Lowe and Gereffi 2009:29), a total of 75% of the market. However, these four firms controlled 81% of steer and heifer slaughter that year (GIPSA 2011:45). Hog slaughter/processing is slightly less concentrated with the top four firms controlling approximately 70% in 2007:⁸ Smithfield (31%), Tyson (19%), JBS-Swift (11%) and Cargill (9%). Smithfield was also the largest hog producer in 2007 at 17% of US production, and number four in compound feed production with 3.6 million tons (Lowe and Gereffi 2008:30-2).

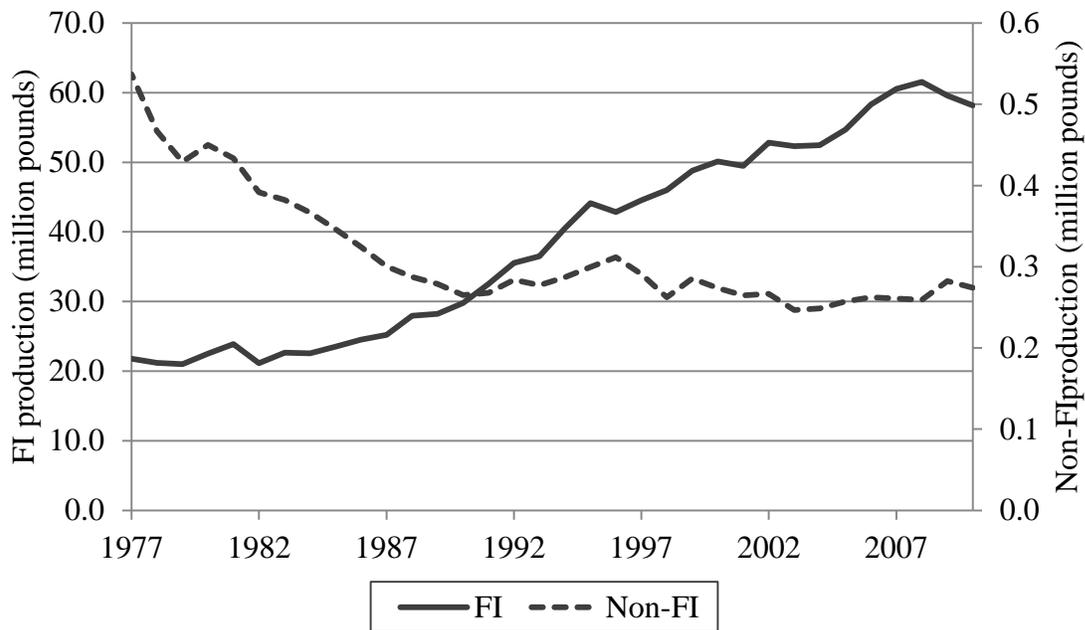


Figure 1.4. Average annual red meat production per establishment, FI and Non-FI, in million pounds, US total, 1977-2010.

Source: USDA Livestock Slaughter Summaries 1969-2011.

“Increased concentration coincided with shifts to much larger plants” (MacDonald 2003).

Figure 1.4 shows how the average size, measured by production output, of federally inspected

⁸ GIPSA (2011) reported the total concentration in hog processing at 63% in 2009.

(FI) slaughter establishments has increased 167 percent in the last thirty years, from 21.8 million pounds per establishment in 1977 to 58.2 million pounds in 2010. Concurrently, the average yearly production by non-federally inspected (Non-FI) slaughter establishments has decreased by nearly half, from 537,000 pounds per establishment in 1977 to 274,000 pounds in 2010.

The USDA definitions of establishment size are based on number of employees; however, the establishment size categories (i.e., “size groups”) reported in the USDA Livestock Summaries are based on the number of head slaughtered annually. The following discussion considers the changes in the largest size group reported. In 1978, when the USDA began reporting slaughter establishment size groups for FI slaughter establishments,⁹ the largest category (referred to hereafter as “large”) for cattle slaughtering establishments was 50,000 head or more slaughtered per year, while 100,000 was the largest for hogs. The largest size group currently reported (referred to hereafter as “very large”) is 1 million head or more for cattle plants and 4 million head or more for hog plants.

Since 1978, the number of large cattle slaughtering establishments has declined by 69 percent, while large hog slaughtering establishments have declined by 55 percent (Figure 1.5). Large cattle and hog slaughtering establishments currently slaughter over 97 percent of the cattle and hogs slaughtered under FI (Figure 1.7). There has only been a small increase in the percentage of hogs slaughtered by establishments in this group since 1978 (from 94 percent to 97 percent), but a much larger increase for cattle, from 83 percent in 1978 to 97 percent in 2010. In contrast, the number of very large cattle slaughter establishments has at least doubled since 1991, while the number of very large hog establishments has tripled since 1995 (Figure 1.6).

⁹ The USDA does not report size groups for Non-FI slaughter establishments.

Additionally, the percentage of FI slaughter that takes place at the very large slaughter establishments has increased from less than 30 percent to over 50 percent for both species (Figure 1.8). This means that in 2010, 14 establishments slaughtered 55 percent of the cattle slaughtered under FI, and 12 establishments slaughtered 57 percent of the federally inspected hogs.

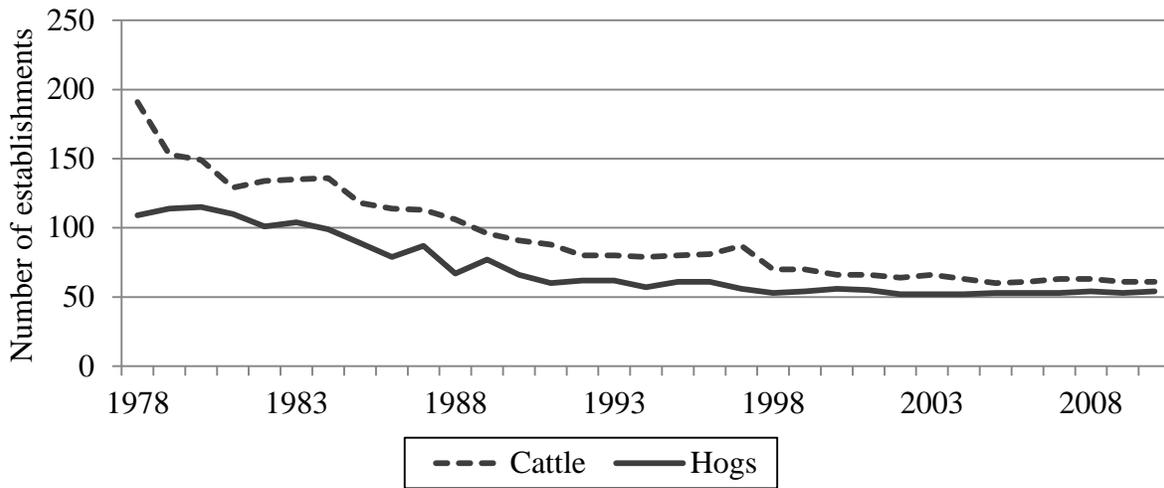


Figure 1.5. Number of FI establishments slaughtering more than 50,000 head of cattle and 100,000 head of hogs per year, United States, 1978-2010.
Source: USDA Livestock Slaughter Summaries 1979-2011.

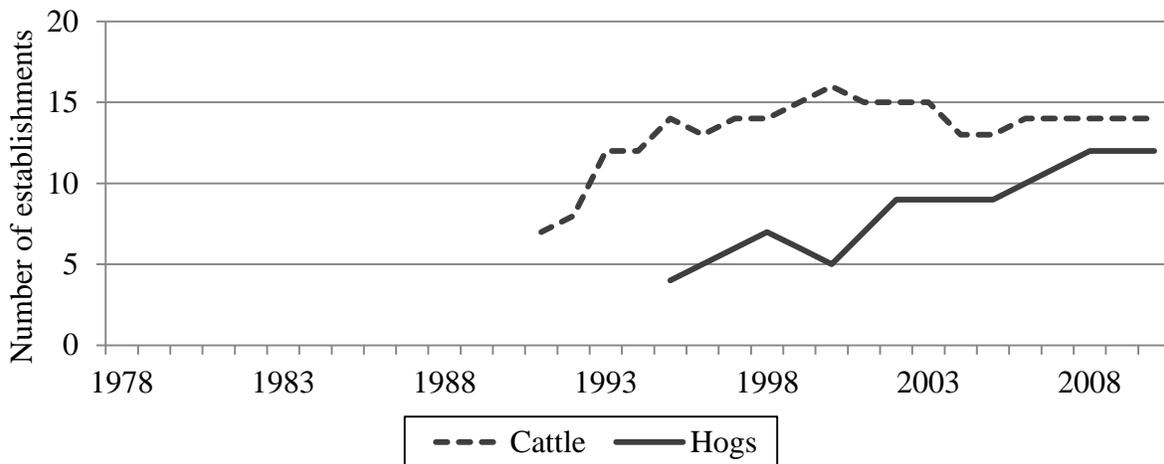


Figure 1.6. Number of FI slaughter establishments slaughtering 1 million or more head of cattle per year (1991-2010) and 4 million or more head of hogs per year (1995, 1998-2010).
Source: USDA Livestock Slaughter Summaries 1992-2011.

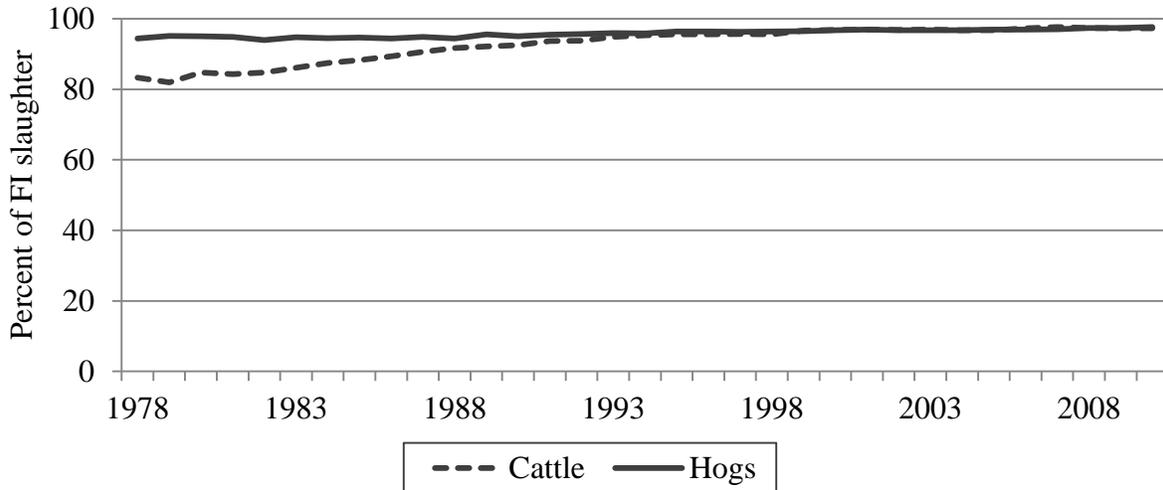


Figure 1.7. Percentage of total FI head slaughtered by FI establishments slaughtering 50,000 or more head of cattle per year and 100,000 or more head of hogs per year, 1978-2010.
Source: USDA Livestock Slaughter Summaries 1979-2011.

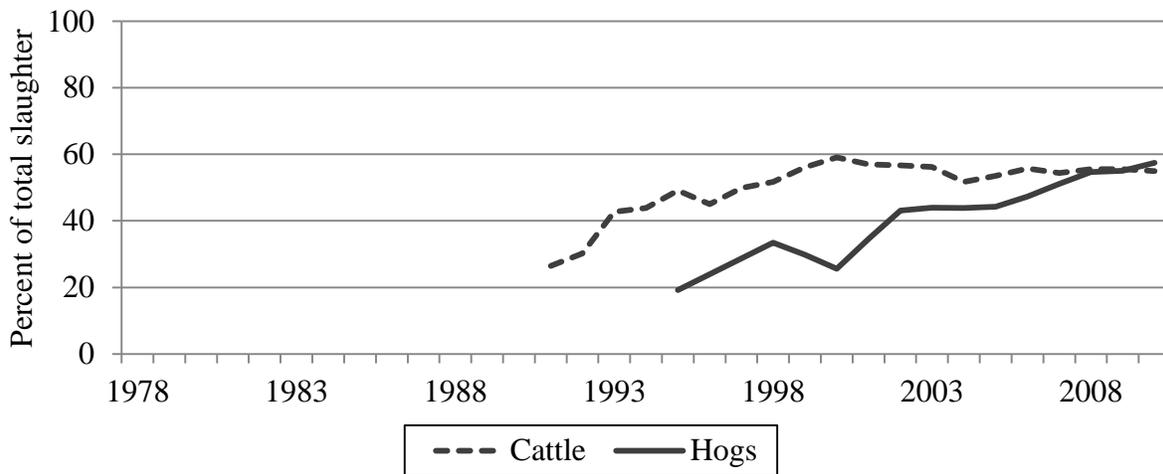


Figure 1.8. Percentage of total head slaughtered by FI establishments slaughtering 1 million or more head of cattle per year (1991-2010) and 4 million or more head of hogs per year (1995, 1998-2010).
Source: USDA Livestock Slaughter Summaries 1992-2011.

While anti-competitive behavior is not typically condoned in the US, Purcell (1990) explains how a shift in philosophy on the nature of competitive markets at the DOJ coincided with economic pressures in the industry, to explain why such high levels of concentration have

been allowed in the slaughter industry even with anti-trust legislation in place. From the 1950s to the early 1970s, the “Structure-Conduct Performance (SCP) paradigm” was widely accepted which held “that a high level of market concentration leads predictably to socially undesirable performance.” Thus during this period anti-trust laws were vigorously enforced. By the early 1980s there was a shift to the “Chicago School” which “argued that consolidation and concentration lead to increased efficiency.” The basis of the Chicago School was the theory of contestable markets in which “markets were seen as inherently competitive, and ease of entry and exit was the economic force that blocked any significant departure from competitiveness.” The “superior efficiency” argument, combined with the idea of contestable markets, the globalization of the American economy, and the increasing popularity of the “philosophy of deregulation” during the 1980s contributed to a decrease in merger challenges by the DOJ (Purcell 1990:1210-11).

The economic pressures faced by the slaughter industry are further explained by MacDonald (2003) and MacDonald and Ollinger (2005), who describe three important factors that explain consolidation in the slaughter industry. The first was technological and organizational changes including the invention of “boxed beef” that created economies of scale for large slaughter establishments. The second was changes in livestock production, such as increased feedlot size and feed technology improvements that could supply large slaughter establishments with animals year round. The third was changes in labor relations,¹⁰ and

¹⁰ The labor component is not specifically discussed in this thesis. For discussions on labor in meatpacking see: Broadway (2007); Broadway and Stull (2008); Crowley and Lichter (2009); Donato et al. (2007); Fitzgerald, Kalof,

especially the demise of unionized labor in meatpacking, which lowered wages at large plants and furthered their cost advantages. An additional factor was a decline in demand for red meat, especially beef, during the 1980s which increased competition in the meat sector (Figure 1.9). This decreased demand, and subsequent competition for market shares, increased the economic pressures on slaughter firms and thereby necessitated and rewarded efficiency (Ollinger et al. 2005). MacDonald and Ollinger (2005:1029) “estimate that the shift in the plant size distribution between 1977 and 1992 reduced processing costs by \$36.35 per head, or 27.5%.” This economic squeeze on the industry, which scale efficiencies helped manage, was seen by the DOJ as a confirmation of the correctness of allowing greater consolidation (Purcell 1990:1214).

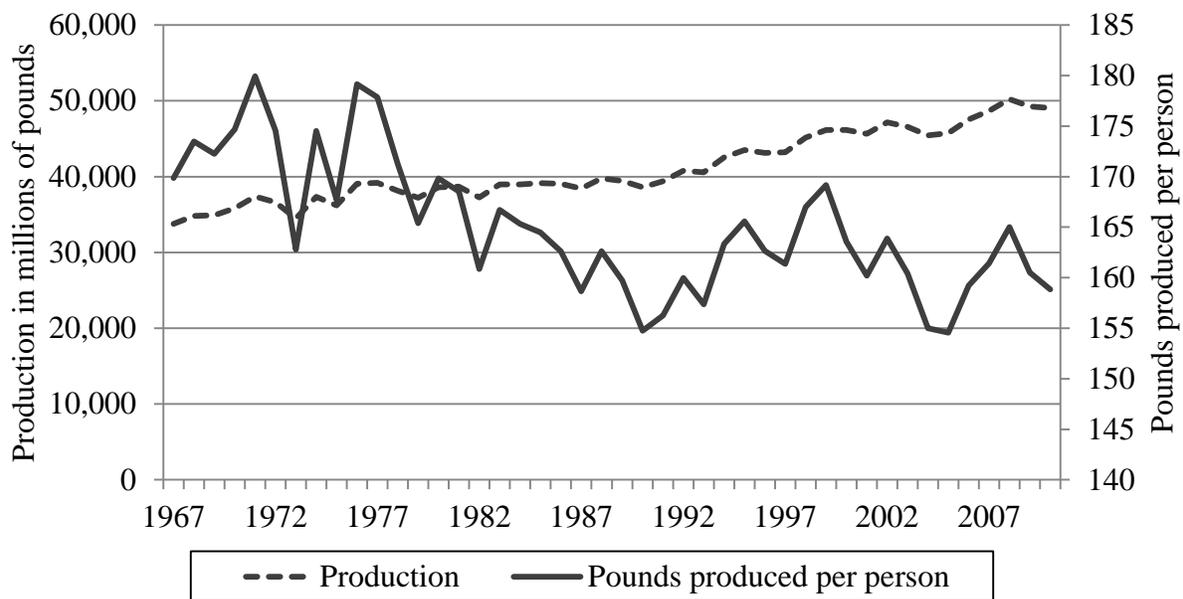


Figure 1.9. US red meat production in million pounds per year and pounds produced annually per person in US, 1967-2010.

Source: USDA Livestock Slaughter Summaries 1969-2011; US Census Bureau.

and Dietz (2009); Stull and Broadway (2004); Stull, Broadway, and Griffith (1995). Also see Skaggs (1986) and Warren (2007) for more historical information and information about unions in meatpacking.

There has long been concern over the issue of captive supply¹¹ and the potential for oligopolistic practices stemming from concentration and consolidation in the livestock and meatpacking industries. The core of the concern is that due to a lack of competition, packers are able to lower prices for producers and simultaneously raise meat prices for consumers. GIPSA (1996, 2002, 2011) and others (e.g., Brester and Marsh 2001; Azzam 1998; MacDonald 2003) have found that the possible livestock price decreases are minimal and more than outweighed by the increased efficiency experienced by large scale meat slaughter and processing. However, these studies admit that some of their models are inconclusive and that other researchers interpret the evidence as indicating various levels and forms of price discrimination. As shown in Figures 1.10 and 1.11, farmers are receiving less of the retail value per pound (in constant 2009 dollars), as well as a smaller percentage of the retail price than they were in the 1970s. This decrease

¹¹“GIPSA defines captive supply as livestock that is owned or fed by a packer more than 14 days prior to slaughter, livestock that is procured by a packer through a contract or marketing agreement that has been in place for more than 14 days, or livestock that is otherwise committed to a packer more than 14 days prior to slaughter” (GIPSA 2002:2). For cattle, captive supply is typically of fed cattle—cattle that have been fed on concentrated feed to achieve the desired body composition, and are ready for slaughter—and typically takes place through forward contracts, marketing agreements or packer feeding. Forward contracts (also called “basis contracts”) are an agreement for the sale of a specific number of fed animals in a specified future month, with the price is usually based on a formula using the futures price. Marketing agreements are typically ongoing agreements that specify the general number of fed animals to be sold per unit of time, with the price usually determined by a formula “based on average prices for other cattle slaughtered at the plant or publicly reported prices, with premiums and discounts applied for differences in cattle quality” (GIPSA 2001:13). Captive supply for hogs mostly takes place through production and marketing contracts, that include the specification of genetics and production practices, and packer ownership/production of hogs (GIPSA 2001).

suggests that farmers today have less market power and are getting less for their animals than they used to. Furthermore, this decrease has no doubt encouraged some producers to pursue alternative marketing strategies.

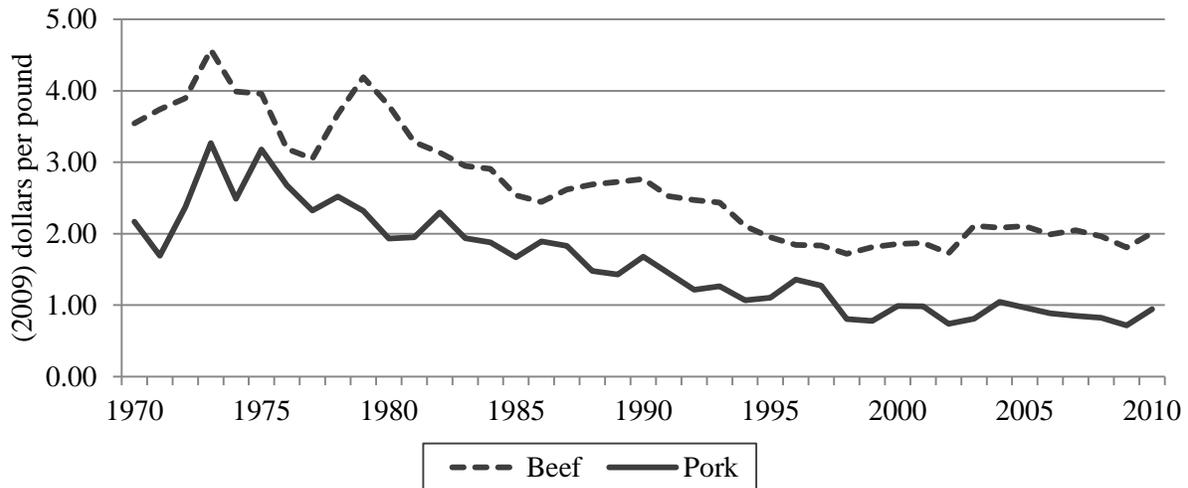


Figure 1.10. Farmer's share (net farm value) for 1 pound of retail beef and pork in dollars per pound (2009 dollars), 1970-2010.
 Source: USDA ERS meat price spreads data sets (<http://www.ers.usda.gov/Data/MeatPriceSpreads/>).

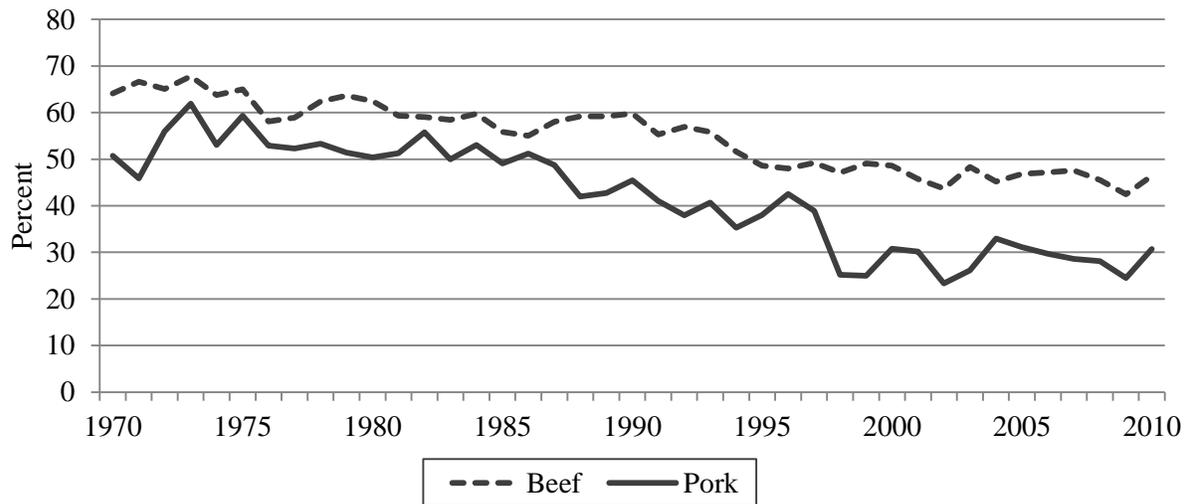


Figure 1.11. Farmer's share (net farm value) as percent of beef and pork retail price, 1970-2010.
 Source: USDA ERS meat price spreads data sets (<http://www.ers.usda.gov/Data/MeatPriceSpreads/>).

Regulations

While the consolidation and other livestock and slaughter industry changes discussed above are some reasons for the decrease in the number of slaughter establishments, meat inspection regulations and regulatory changes offer some additional explanation.

History of federal meat inspection in the United States. The statutory basis of contemporary meat inspection in the US began in 1890 with “an act providing for an inspection of meats for exportation, prohibiting the importation of adulterated articles of food or drink, and authorizing the President to make proclamation in certain cases, and for other purposes” (Statutes at Large 1890:414). The 1890 act specified the inspection for wholesomeness of pork packed for export, *if inspection was requested by the importer*; the act also called for the inspection of, and potential quarantine of, imported livestock. This act was followed the next year by “an act to provide for the inspection of live cattle, hogs, and the, carcasses and products thereof which are the subjects of interstate commerce, and for other purposes” (Statutes at Large 1891:1089). The 1891 act required the inspection of live cattle for diseases before export, the ante-mortem inspection of cattle if the meat is intended for export, and the ante-mortem inspection of cattle, sheep and hogs if the meat is intended for interstate commerce.

In 1906 the congressional budget appropriations for the Bureau of Animal Industry¹² amended the initial inspection acts of 1890 and 1891 to *require* the ante and post inspection of cattle, sheep, hogs and goats for export or interstate commerce and also stipulated the

¹² The Bureau of Animal Industry was the USDA agency originally charged with ensuring the health of animals used for food. After several reorganizations of meat inspection responsibilities, FSIS was created in 1981. (see: http://www.fsis.usda.gov/About_FSIS/Agency_History/index.asp)

maintenance of sanitary conditions in slaughter establishments, as well as labeling and container marking requirements, and specifications of marks of inspection (Statutes at Large 1906:674). This statute is much more detailed than the previous ones, closely resembling the current regulations, and it is the first time that sanitation is included in the law rather than only animal health. In 1907 (Statutes at Large 1907:1260) Congress codified the 1906 appropriations as the Meat Inspection Act (Johnson and Swaim 2005:341).

In 1967 the Wholesome Meat Act (WMA) was passed “to clarify and otherwise amend the Meat Inspection Act, to provide for cooperation with appropriate State agencies with respect to State meat inspection programs, and for other purposes” (Statutes at Large 1967:584). The WMA designated the 1907 statute on meat inspection as the “Federal Meat Inspection Act” (FMIA) and made several additions to it. The most notable change is that the WMA specified requirements for state inspection programs; prior to the WMA, the regulations did not apply to meat that was sold within the state in which it was produced (Johnson and Swaim 2005).

While not regulated by an act, the USDA changed the meat inspection regulations in 1996 to include Hazard Analysis and Critical Control Point (HACCP) and Sanitation Standard Operating Procedure (SSOP) requirements. The changes came in response to highly visible and escalating cases of foodborne illness from contaminated meat in the early 1990s (Juska et al. 2003). All sizes of federally inspected slaughter establishments had to be in full compliance by January 25, 2000 (Fortin 2009). As foreseen by MacDonald et al. (1996), there has been a continuing debate over the need and implications of the new inspection regulations for small slaughter establishments. Muth (2002), Antle (2000) and Hooker (2002) all report higher compliance costs for small and very small federally inspected slaughter establishments under the new regulations, though, it is not clear to what extent these challenges actually prove prohibitive.

Application of federal acts as regulations. The FMIA (i.e., Public Law 90-201 in the Statutes at Large) is codified (i.e., grouped together with other related laws and their amendments) in the United States Code at Title 21 (“Food and Drugs”), Chapter 12 (“Meat Inspection”), §601-695. The FMIA designates the authority to establish the regulations to enact the law to the Secretary of Agriculture of the United States; in turn, the Secretary of Agriculture delegates this authority to the Administrator of the Food Safety Inspection Service (FSIS) (9CFR300.2[a]). FSIS drafts the regulations, and posts the drafts in the Federal Registrar for public comment. After addressing concerns raised during the comment period, FSIS issues the “Final Rule,” or version, of the regulations; the regulations specify how the requirements of the act will be applied and enforced.

The regulations written by FSIS to enforce the FMIA are found in Parts 300-599 of Chapter III of the Code of Federal Regulations (CFR), Title 9: Animals and Animal Products. Chapter III contains *all* of the regulations that FSIS is responsible for enforcing, those authorized by the FMIA, as well as those authorized by the other acts that have been delegated to FSIS. Besides the FMIA, other relevant acts to meat inspection are the 1958 Humane Methods of Livestock Slaughter Act and the 1962 Federal State Cooperative Act (also known as the “Talmadge-Aiken Act”).¹³ In states that have signed a cooperative agreement with the USDA under the “Talmadge-Aiken” program, FSIS is allowed to use state employed inspectors to deliver federal inspection. The program “was intended to achieve Federal coverage in remote

¹³ The other acts which FSIS is responsible for enforcing are the Poultry Products Inspection Act, the Egg Products Inspection Act, the Agricultural Marketing Act of 1946, and the National Laboratory Accreditation Program.

locations to offset the higher cost of assigning Federal inspectors” (Amann 2012). Plants that are inspected under this agreement are known as “T-A” plants.

In the application of these regulations, FSIS also issues “Directives,” which are official interpretations of the regulations that are used to guide how they are applied, and “Notices,” which are temporary instructions on the application of the regulations. Unlike the regulations, Directives and Notices are not subject to public viewing or input prior to their release, and they are simply declarative statements by FSIS. Figure 1.12 shows a visual representation of the creation of federal statutes and regulations; “what inspectors enforce” is the point where the operators of slaughter/processing establishments interact with the regulations.

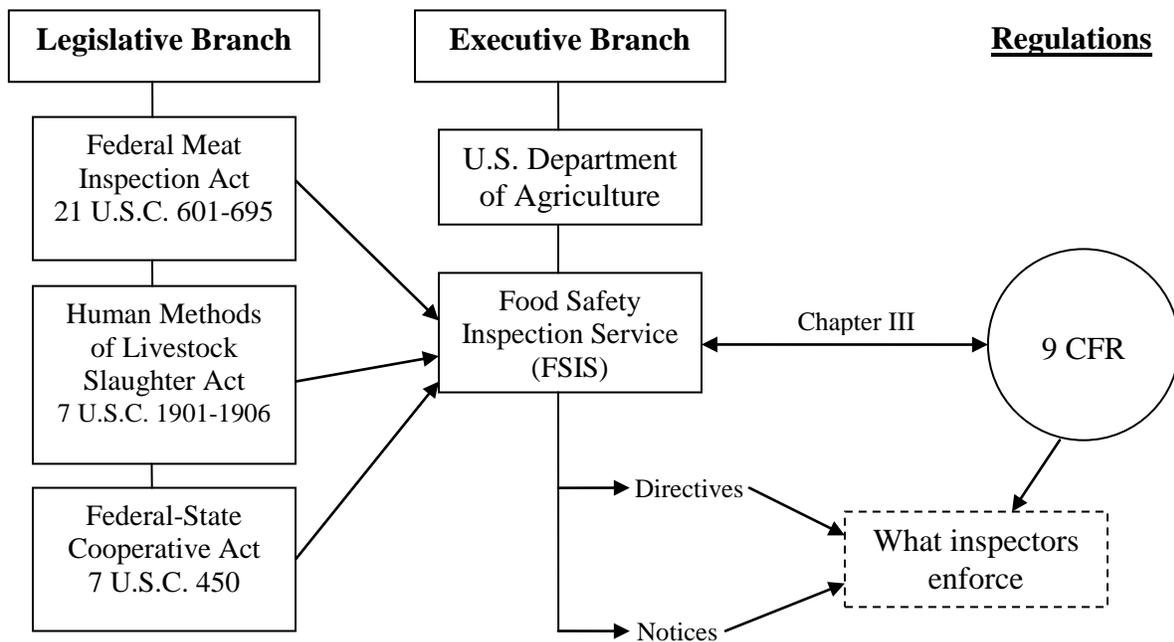


Figure 1.12. Creation of federal regulations.

History of state meat inspection. Early federal inspection was export oriented and thus focused on large slaughter/processors. Budgetary limitations frequently made federal inspection unavailable to small establishments, which put them at a disadvantage (Wiser 1986:172); this

disadvantage was not necessarily accidental. Libecap (1992) cites a combination of export and market control issues, rather than disease control or public health, as the motivations behind the early federal meat inspection laws—large meat packers wanted the verification of inspection to improve product image with both domestic and overseas consumers. In response to the international focus of federal inspection, many states set up their own inspection programs to provide an alternative source of quality verification for smaller packers. As of 1962, thirty-one states were conducting meat inspection; however, the standards of inspection varied widely (Wiser 1986:184), and state inspected products were restricted to intrastate commerce.

Partly in response to the disparity in rigor of state inspection programs, the 1967 Wholesome Meat Act (WMA) required that states either run an “at least equal to” inspection program in cooperation with the USDA (a “State-Federal” program) *or* defer entirely to federal inspection (a “Federal-State” program) (United States Small Business Administration 1971:ix). Because State-Federal programs are still managed by the individual states, the intrastate commerce restriction continues to apply. The 1962 Talmadge-Aiken Act allows for FSIS to enter into an agreement with individual states to utilize state inspectors to provide federal inspection; the inspector remains an employee of that particular *state*, but the establishment is *federally* inspected and its products may enter interstate commerce (FSIS 2004:8-9). As of 2010, nine states (Figure 1.13) had agreements with the Secretary of Agriculture under this act (Becker 2010).

To be considered “equal to” the federal requirements, a State Cooperative Inspection Program must be deemed equivalent across seven program areas: “statutory authority and food safety regulations,” “inspection,” “product sampling,” “staffing and training,” “humane handling,” “non-food safety consumer protection,” and “compliance.” It must also comply with

Types of Slaughter Establishments

Slaughter establishments can be split into three categories according to inspection type: 1) federally inspected (FI), 2) state inspected (SI), and 3) custom exempt (CE). There are no commerce restrictions on products from federally inspected establishments; in contrast, state inspected products are restricted to intrastate commerce. Under both federal and state inspection, inspectors are in the plants inspecting the animals, processes and product and ensuring that all regulations are complied with; these plants are said to operate “under inspection.” Custom exempt establishments do not operate under inspection (i.e., there is no inspector present during operations), though they are expected to comply with many sections of the federal regulations, especially those that address adulteration, misbranding and labeling of products, maintenance of sanitary conditions, and humane handling and slaughter of livestock. Custom exempt plants are inspected at least yearly for compliance; products from these establishments are restricted to personal use and must be marked “not for sale” (FSIS, 2009).¹⁴

Inspected establishments of either type may operate under inspection and as custom exempt, typically operating under inspection on certain days when the inspector is present, and as custom exempt on the other days. Establishments that are considered custom exempt only do custom exempt work. Many of these establishments, both inspected and custom exempt, process deer in season. Because deer are not an amenable species, deer processors are not subject to *any*

¹⁴ The only way to slide around this rule is if a producer sells an animal to one or more individuals prior to slaughter; the new owner(s) can then take the meat home for their own use. Many producers sell at least some of their product this way (i.e., as halves or quarters) but not all consumers are able and willing to take so much meat at once, or pay for it all up-front.

of the regulations of the FMIA, though they may be monitored by the state health department for general sanitation. Thus the deer processing activities of Inspected and CE establishments are separate from the slaughter and processing of amenable species, and are typically done on different days, shifts, or in different spaces.

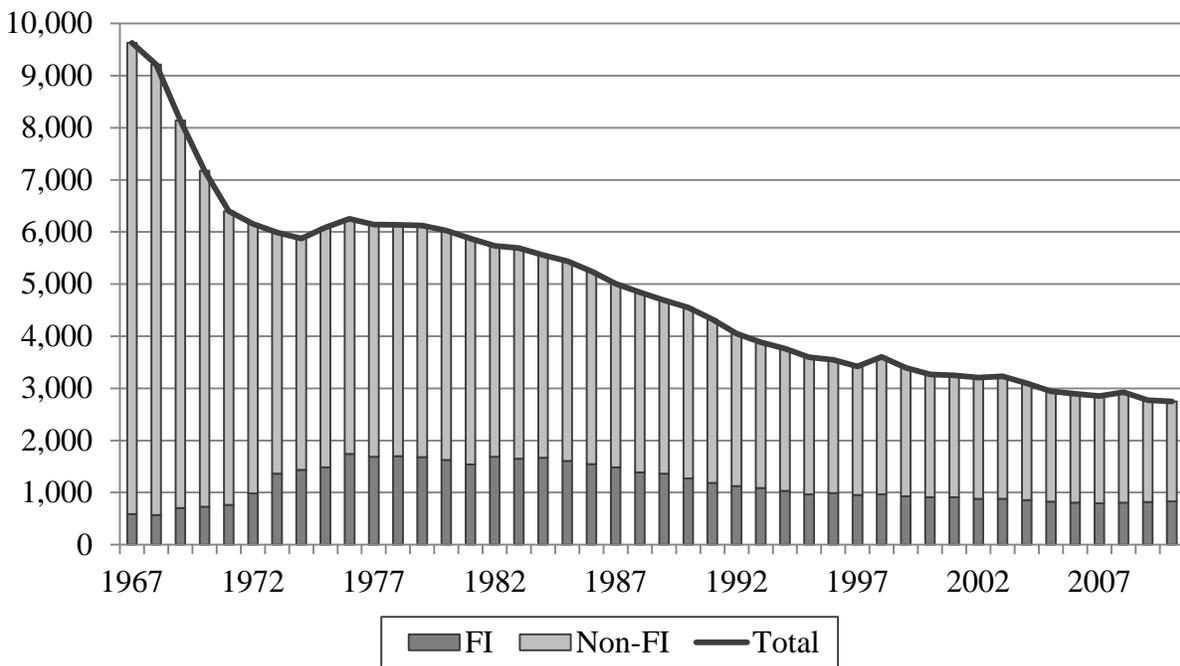


Figure 1.14. US slaughter establishments by inspection type, 1967-2010.
Source: USDA Livestock Slaughter Summaries 1969-2011.

Figure 1.14 shows the decline in the number of US slaughter establishments by inspection type. The greatest decline is among Non-FI inspected slaughter establishments which have decreased by 79 percent from 1967 to 2010. There has also been a 52 percent decrease in the number of FI establishments since the high in 1976. Figure 1.15 shows that there has been a slight increase in the number of FI establishments in recent years, from 795 in 2007 to 834 in 2010, a 5 percent increase.

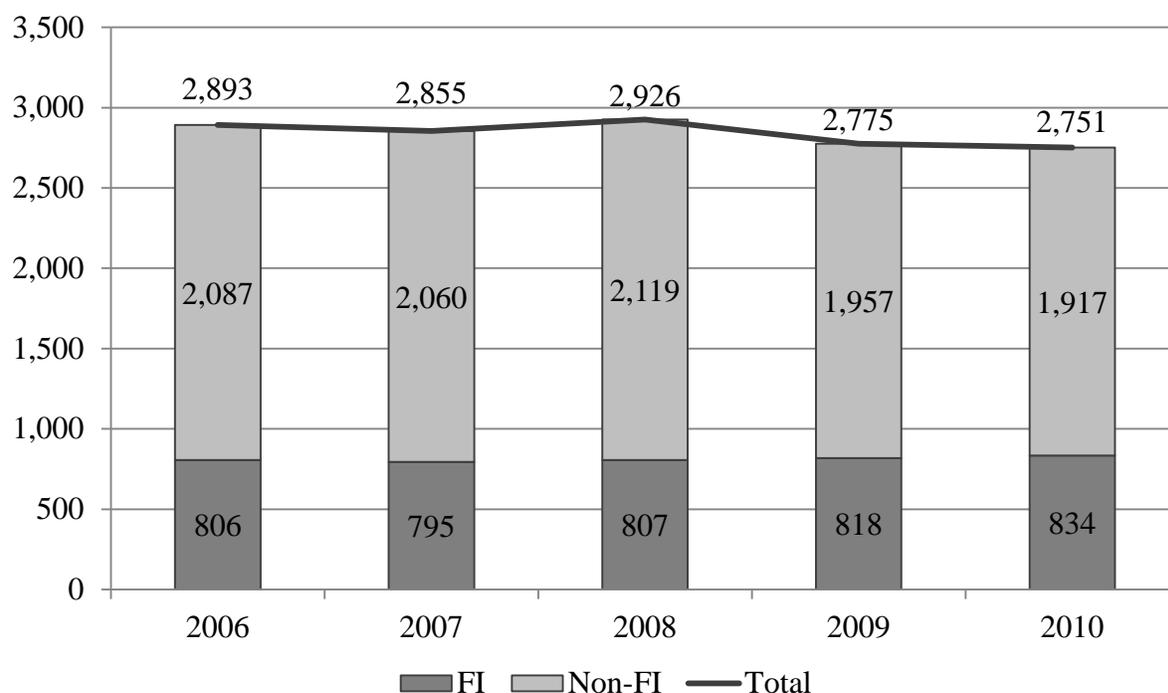


Figure 1.15. US slaughter establishments by inspection type, 2006-2010.
 Source: USDA Livestock Slaughter Summaries 2007-2011.

Road Map

The history and development of the livestock and slaughter industries brings us to the present and provides a backdrop for this thesis. The current slaughter industry is highly bifurcated, with the large, industrialized slaughter establishments on the one hand, and small and very small slaughter establishments of all inspection types on the other. It is these latter establishments which are of interest in this thesis, because they are the establishments that are most likely to provide slaughter and processing services to livestock producers with small holdings who wish to market their product themselves or through alternative channels.

The second chapter presents the conceptual basis of alternative food networks (AFNS), values-based supply chains (VBSCs), and the importance of considering the role of grades and standards when studying them. Chapter 3 details the data collected, and the method of the

analysis for both a qualitative analysis of interviews with processors and regulators, and the quantitative, longitudinal analysis of the number of slaughter establishments in a state. Chapter 4 presents the results of the analyses comparing the observed differences in meat inspection between Michigan and Alabama, and examining the effect of state inspection programs on the number of slaughter establishments. Chapter 5 contains the conclusions drawn from the findings.

CHAPTER 2: THEORY AND CONCEPTUAL FRAMEWORK

Alternative Food Networks (AFNs)

The concept of alternative food networks (AFNs) grew out of the rural development literature in Europe, especially the UK, and the local food movement in the US in the late 1990s (e.g. Feenstra 1997; Marsden 1998; Marsden, Banks, and Bristow 2000; Gilg and Battershill 1998; Ilbery and Kneafsey 1998, 1999; Lyson and Green 1999; Murdoch, Marsden, and Banks 2000). The AFN literature especially draws from the commodity/supply chain literature in terms of approach.

Feenstra's (1997:28) definition of local food systems covers the basic ideas of AFNs; she describes them as being "rooted in particular places, aim[ing] to be economically viable for farmers and consumers, use[ing] ecologically sound production and distribution practices, and enhance[ing] social equity and democracy for all members of the community." Concepts that are frequently associated with AFNs and related terms include "local," "quality" "specialty" "sustainable" and "embedded" to signify the "alternativeness" of products. As Tregear (2011:423) recently stated, AFN "tends to be employed as a universal term, to denote food systems that are somehow different from the mainstream." Related terms found in the AFN literature include:

- **System of Provision:** An early conceptual framework for studying food systems "in which the connection between production and consumption is viewed as a [vertically integrated] chain of activities" (Fine 1994:519; also see Guthman 2002; Watts, Ilbery, and Maye 2005).

- **Short Food Supply Chain (SFSC):** A more specific concept than AFN, SFSCs are characterized by the creation of new,
 - more direct, relationships between producers and consumers, “thereby allowing the consumer to make value-judgments about the relative desirability of foods on the basis of their own knowledge, experience, or perceived imagery” (Marsden, Banks, and Bristow 2000:425; also see Renting, Marsden, and Banks 2003).
- **Civic Agriculture:** An ‘ideal type’ concept held in juxtaposition to “commodity agriculture,” and based on the relocalization of agriculture and food production by small and medium scale producers “linked to local or regional markets, often through direct sales to consumers” (Lyson and Guptill 2004:371).
- **Alternative Food Geographies:** A term very closely analogous to AFN, it includes the geographical components of AFNs and is used mostly by European geographers studying “alternative food systems (Winter 2003, 2004, 2005; Maye, Holloway, and Kneafsey 2007; Whatmore and Thorne 2008).
- **Local Food System (LFS):** A term that refers to food systems that are defined strictly on the distance which the food travels; there is no fixed distance that defines “local,” though it is typically associated with the reconnection of small and midsize producers with consumers through direct sales (Mount 2012).

More recently, the rise of “values-based supply chains” (VBSCs) from value and commodity chain, and agriculture of the middle studies has provided an additional framework and definition. VBSCs are different from “supply chains,” which are networks of business entities that take products from producers to consumers, and “value chains,” which are supply

chains that add market value to a product. VBSCs include not only the economic value of the product, but also its moral or ethical value. VBSCs are characterized by “close cooperation between strategic partners within the chain...high-quality, differentiated products or services and high levels of performance throughout the network” which is only possible with high levels of trust between the strategic partners” (Stevenson and Pirog 2008:122-4). The VBSC concept is different from, though compatible with, the concepts/terms listed above, in that it refers explicitly to the qualities of the distribution system rather than the system as a whole. This likely stems from its strong basis in practice (Flaccavento 2009; Lerman, Feenstra, and Visher 2012) rather than academia—though it is an emerging concept in the AFN literature. In Bower et al.’s (2010) “tiers of the food system” framework, VBSCs are Tier 2, between direct sales (Tier 1) and large volume aggregating and distributing companies (Tier 3). VBSCs are frequently discussed in conjunction with local or regional food hubs.

The corpus of AFN studies have typically focused on: product and consumer linkages to the place of production, both conceptually and through certification and labeling programs; producers’ motivations for using environmentally sustainable production practices (e.g., Badgley 2003; Fairweather et al. 2009) and consumers’ interest in and willingness to pay for it, as well as an interest in local food and food miles (e.g., Åsebø et al. 2007); the construction and definition of quality (e.g., Ilbery and Kneafsey 2000; Kirwan 2006); the social and ecological embeddedness of AFNs (e.g., Sage 2003; Morris and Kirwan 2011); the social relations and dynamics of AFNs, including trust, power and governance; and the means through which communication and exchange occur between producers and consumers (e.g., farmer’s markets, community supported agriculture (CSA) programs).

There are at least four gaps in the AFN literature. The first is the study of consumers and consumption. This is noted by Tregear (2011:427) who sees a “continued narrowness of perspective which underplays the contribution that consumers make to food systems ... thus perpetuating a continued production orientation in both research agendas and policy prescriptions.” There are two specific issues that she feels are “underplayed consumer issues in AFN research: first, the full welfare implications of consumers’ engagement in AFNs, and second, the assessment of the socio-economic value or contribution of AFNs from a deep consumer perspective” (Tregear 2011:427).

Second is the consideration or inclusion of the commodity/value chain beyond the interaction between producers and consumers. This gap exists in two ways. The first is that because the AFN literature has been so interested in the reconnection of producers and consumers, it has tended to ignore other actors involved, such as processors, transporters, retailers, and farmer’s market managers. This is not surprising, given that even commodity chain studies/analyses, which are ostensibly seeking to “analyze commodity relations from production to consumption, or from field to table, ...in actuality extend only from production to distribution, or from field to supermarket shelf” (Raynolds 2002:406).

Third is the government’s role in AFN governance. “Relocalization can be seen as part of the restructuring of government toward “governance”: the devolution of decision making to local networks of self-governing actors, coordinated through multi-layered institutional structures.” (DuPuis and Goodman 2005:367). Higgins, Dibden, and Cocklin (2008:15) identify two ways in which governance of AFNs has been developed in the literature. “The first focuses on the ‘re-localisation’ of food, exploring the economic, political and social relations that characterize farmers’ markets and other forms of direct and proximate selling” (e.g., farmer’s

markets, Sage 2003 and Kirwan 2004, 2006; VBSCs, Bloom 2010). The second type of governance study in AFN literature identified by Higgins, Dibden, and Cocklin (2008:16) “examines the role of quality and environmental certification practices within ‘extended’ AAFNs, and is particularly interested in issues such as the impacts of certification schemes on farmers and farm livelihoods—with specific reference to developing nations” and fair trade labels (e.g., Raynolds 2002; Jaffee, Kloppenburg, and Monroy 2004 on fair trade coffee). What these studies of governance, especially the second type, do not consider are instances where standards, qualities or certifications are required by law, rather than being voluntary with the potential for increasing value and niche marketing opportunities.

The fourth gap in the AFN literature is the topic of grades and standards, since “there has as yet been little sustained attempt to examine the role of standards and certification in those alternative networks based upon direct and proximate marketing or in situations where farmers are moving between conventional and alternative markets” (Higgins, Dibden, and Cocklin 2008:16; cf., Bloom and Hinrichs 2010). As mentioned above, the grades and standards included in AFN studies tend to be those of quality and environmental certifications, most often organic agriculture, and place of origin (e.g., Morris and Young 2000; Ilbery and Kneafsey 2000; Verhaegen and Van Huylenbroeck 2001; Barham 2002, 2003, 2007). Grades and standards have been more extensively studied in the agrifood and commodity/value chain literature, though they tend to only consider voluntary/private standards and third-party certification programs, such as organic certification, Fair Trade, and labor and environmental standards (e.g., Tallontire et al. 2011; Fuchs et al. 2011; Busch 2011). Busch (2000:273) points out the gap in the agrifood literature when it comes to

formal standards for products and processes, always written in legal or technical jargon ... [and that] despite their ubiquity, we tend to leave their design to experts, to technicians, to regulatory scientists. Those outside the technical sciences have paid surprisingly little attention to their origins, their import, or their consequences.

This thesis contributes to the latter three gaps by examining: 1) the processing sector of an AFN (i.e., meat slaughter/processing establishments), 2) the role of formal grades and standards (i.e., statutes and regulations) in AFNs, and 2) the role of governance vs. government in AFNs as it relates to the formal food safety standards. This thesis is grounded in a political economy approach because it “emphasizes the impossibility of disaggregating the social from the economic, political, cultural or, indeed, the scientific” (Friedland 1991:17). Food safety inspection regulations include all of these elements, from the social/cultural basis of assigning responsibility for food safety to certain actors/segments of the meat production process, to the political creation of the inspection regulations, and their ostensibly scientific basis, to the economic implications of meat inspection and food safety on processors and society. In the following analysis there is also the added element of two levels of “state” in the form of inspection at the state (i.e., sub-national) level and inspection at the State (i.e., federal) level. Herbert-Cheshire and Lawrence (2002:137) argue that

the issue of state autonomy has been a dominant theme, yet ontological questions of what we mean by 'the state' have remained unaddressed. While once it may have been possible to see the state as a relatively unproblematic entity ... the emergence of new forms of governance, undertaken by a network of government, private and voluntary actors, requires new ways of thinking about the state.

Thus this thesis considers the question of the (sub-national) state vs. the (federal) State. Are there differences between them? What do these differences mean for actors in AFNs? Does the type of ‘state’ involved matter?

Processing in AFNs

Generally speaking, processing falls in the space between the field and the farmer’s market; it falls beyond the studies of motivations and primary production practices, and it comes before the producer-consumer interaction of the farmer’s market, farm stand or CSA. Processing includes the washing, sorting and packing, and possibly freezing, of fresh fruits and vegetables, as well as pickle, relish, jam, jelly and cheese making. This gap is especially visible with meat as processing is not optional as it is for produce since it is also the “harvesting” step in production. However, in many ways slaughter and processing can be thought of similarly to other “value-adding” activities. A key AFN gap that a study of meat processing highlights is that of formal grades and standards, namely statutes and regulations. This gap includes the effects of grades and standards on AFNs and the actors within.

This is not to say that there has not been *any* study or inclusion of processing or regulation in the AFN literature. Notable examples of studies that recognize the importance of processing in AFNs include Kneafsey, Ilbery and Jenkins (2001:302) who note that a lack of slaughter and processing establishments in Wales reduced the value-added potential for specialty beef and lamb producers in the region. Ilbery et al. (2004:338) identified “key intermediaries” as a limitation for “food processors trying to establish successful local added value businesses” and specifically cites the example of meat producers in rural parts of the UK being limited by “a lack of suitable slaughtering and processing facilities.” Gwin (2009) identified access to

slaughter/processing as an obstacle to scaling up grass-fed beef production for niche marketing. Similarly Mount (2012) recognizes the importance of processing and distribution systems in scaling up LFS, especially for producers of meat and other value added products. Conner, Campbell-Arvai and Hamm (2008) include processors as supply chain actors in their study of pasture-raised meat in Michigan.

AFNs and Grades and Standards (i.e., Regulations)

Studies that examine the effects of regulations on AFNs include DeLind and Howard (2008) who consider the effects of proposed food safety regulations on small scale producers following the 2006 outbreak of *E. coli* O157:H7 in the US. They specifically examine the differing impacts, health threats, and contexts that exist between large and small operations and point out that the proposed regulations not only would perpetuate and further legitimize the industrialized system that created the food safety crisis to begin with, but would also create greater barriers for small scale producers by increasing their costs.

Two studies specifically consider the role of food-safety regulations on red meat processing in the context of AFNs: Worosz, Knight, and Harris (2008) and Worosz et al. (2008). Both articles argued that meat inspection regulations and application were problematic for small slaughter and processing establishments, and these studies also include the issue of state vs. federal meat inspection programs as influencing the way in which meat inspection is experienced by small processors. Additionally, these studies found that “food safety statutes and regulations play a significant role in structuring the agrifood system,” (Worosz, Knight, and Harris 2008:189) and that “understanding this context will give us a better understanding of the range of the actual barriers that small-scale alternative producers face and it will highlight potential

opportunities to include these voices and their interests in larger policy debates” (Worosz et al. 2008:196).

Other Agrifood Literature

Agrifood articles that focus on red meat fall into three general categories: 1) labor and rural communities (e.g., Gouveia and Juska 2002; Broadway 2007; McConnell and Miraftab 2009); 2) meat consumption/eating and animal welfare (e.g., Buller and Cesar 2007; Campbell, Murcott, and MacKenzie 2011); and 3) food safety and risk, specifically the construction and perceptions of risk and safety (e.g., Juska et al. 2003; Wright, Ransom, and Tanaka 2005). Yet, none of these articles address the grades and standards of red meat within AFNs—the affect they have on the small scale slaughter/processing industry, or their implications on members of AFNs. Agricultural economists have studied the effects of regulations on the large scale slaughter industry, especially the effects of HACCP implementation (e.g., MacDonald et al. 1996; Antle 2000; Ollinger and Moore 2007), and some have included the effects of HACCP on small and very small establishments (e.g. Hooker, Nayga Jr, and Siebert 2002; Muth et al. 2002; Muth, Wohlgenant, and Karns 2007). However, none have included state inspected establishments in their analyses or considered the implications of their findings in the context of AFNs.

Relevant agrifood studies include Juska et al. (2000:250) who examine how the food safety standards for meat “have been embedded in a complex political process whereby key actors in the meat subsector (from feeders and packers to consumers) have employed coercion, persuasion, and negotiation to shape the outcomes.” They use the emergence of *E. coli* O157:H7 as a public health threat and the subsequent enactment of HACCP regulations for meat inspection

as an example of this embedding. Their paper shows the contested nature of standards and the different roles and amounts of power of groups of actors in the standard making process. They especially consider the negotiations that have taken place surrounding responsibility for contamination, and the perceived effectiveness of meat inspection methods (i.e., HACCP).

Ten Eyck et al. (2006) focused on the implementation of HACCP regulations on the wholesale cider industry in Michigan and specifically on disconnects between inspectors, processors and consumers in the implementation of the regulations. While the study is not in an AFN context, the characteristics of the cider processors are similar to those of small-scale slaughter establishments, who are typically “small processors who are often independent and work in small, family-owned businesses where the product being regulated is often only a small portion of their operation” (Ten Eyck et al. 2006:206).

Another relevant study of regulation that is not specifically AFN oriented is Henson and Heasman (1998:12), who studied the process of regulation compliance among food processing establishments in the UK including small firms and meat processors, among others. Their compliance model “indicate[s] the range of factors which influence how and when firms choose to comply with new regulatory requirements and the resultant costs and benefits of compliance.” The stages of regulatory compliance they identify in their model are: regulation identification, regulation interpretation, identification of any required changes, the decision to comply or not, choosing the method of compliance, communication of the compliance decision within the firm, the implementation of the change, and the evaluation and monitoring of compliance. Henson and Heasman (1998:22) found that firm size was a key factor in explaining differences in the ways in which firms complied with new regulations; small firms tended to wait longer to comply and

were more likely to “choose partial or non-compliance as a strategic reaction” while large firms were better able to comply and to do so in a way that gave them a market advantage.

CHAPTER 3: METHODS

This thesis uses qualitative case studies and quantitative analysis to explore the differences between state and federal meat inspection programs and the implications of inspection type on state-level slaughter industries. Semi-structured interviews with state meat inspection personnel (“regulators”) and operators of inspected slaughter establishments (“processors”) are used to compare the meat inspection programs of Michigan and Alabama—particularly the regulations and their application. Multilevel regression analysis of state-level longitudinal data is then used to assess the possible significance of these regulation and application differences on slaughter establishment numbers.

Research Questions

- In what ways do the Alabama state meat inspection regulations and program differ from the federal meat inspection regulations and program in Michigan?
- Is the existence of a state inspection program related to the number of slaughter establishments in the state?

State vs. Federal Meat Inspection Programs

Sample. Case studies of Michigan and Alabama will be used to identify and explore differences between federal and state meat inspection programs. The selection of these is convenient but not inappropriate. Alabama has a state meat inspection program while Michigan no longer does, which allows for regulatory comparisons. Additionally, these states are in different geographical and agricultural regions, thereby having the potential to represent some national variation. Each case study was designed to include members of three different

alternative beef commodity chains. The three VBSCs are direct sales between a producer and a consumer, through an account (e.g., restaurant, grocery), and through a distributor.

Data. Data was collected using semi-structured interview guides. These interviews were collected as part of a larger project on barriers and constraints in alternative beef value chains, which included interviews with producers, farmers market managers, retailers, and chefs.¹⁵ In general, participants were asked to describe their jobs (i.e., their role in the value chain) and how they came to have it, any statutes and regulations that apply to their work and their opinions and experience of them, the communities that they identify with, non-regulatory barriers that they may face in their work, and the most important topic that they feel was discussed in the interview. All interviews lasted between 30 minutes and hours, and took place at the participant's farm, home, workplace or other location chosen by the participant. No compensation was offered for participation in this study. The initial samples were purposeful, and then modified snowball sampling was used to reach connected members of these value chains. There were twenty-two participants in Michigan and twenty-nine in Alabama (Table 3.1). This analysis uses only the twenty-two interviews conducted with inspection personnel ("regulators") and operators of inspected slaughter establishments ("operators").¹⁶

¹⁵ The Michigan interviews were originally approved by Michigan State University's Institutional Review Board (IRB), and were subsequently approved for use as existing data by Auburn University's IRB under protocol number 10-052 EX 1003. The Alabama interviews were conducted with IRB approval from Auburn University as protocol 11-059 EP 1102.

¹⁶ See tables 4.2 and 4.3 on pages 59 and 60 for descriptions of these subsamples.

Table 3.1. Composition of alternative beef value chain interview samples. Number of interviews (number of individuals interviewed), Michigan, Alabama and total.

	Michigan	Alabama	Total
Producers	6 (6)	5 (7)	11 (13)
Processors	5 (5)	3 (4)	8 (9)
Regulators	5 (5)	9 (9)	14 (14)
Accounts	2 (2)	6 (7)	8 (9)
Distributors	1 (1)	0 (0)	1 (1)
Market Managers	2 (3)	2 (2)	4 (5)
Total	21 (22)	25 (29)	46 (51)

The existing Michigan interviews were collected in 2007-08 either in-person or by phone. Four of the five regulator interviews and three of the five processor interviews were recorded which allowed me to assess the existing notes for accuracy and completeness and to increase the level of detail if needed. The Alabama interviews were conducted in 2011-12 using the same interview guides and sampling method as the Michigan interviews, and all but one were conducted in-person. Eight of the nine regulator interviews and all three of the processor interviews were recorded. Notes were taken by hand during the interviews and the interview notes for all recorded interviews were checked against the recordings.

Analysis. The notes from the interviews were coded using NVivo (1999-2009) in a two-step process. First, they were coded according to the questions on the interview guides. Second, they were coded by emergent topics to identify similarities and differences between the two states, particularly those that pertain to meat inspection, regulation and enforcement.

Limitations. There are three major limitations to this analysis. The first is that no line inspectors were able to be interviewed in Michigan. This was because there was a large recall from a Michigan establishment during the study period and FSIS did not permit line inspectors to

be interviewed. The second is that the interviews were conducted by different people, so that even using the same interview guides, there are differences between the interviews. The third limitation is that the interviews were done approximately three years apart. Since the concerns, and challenges voiced by participants are likely to be influenced by current and recent events, this makes the interviews harder to compare.

Longitudinal Analysis of Inspection Programs and Slaughter Establishment Numbers

Sample. Forty states in the continental US were used in this analysis. The excluded states are Connecticut, Delaware, Maryland, Massachusetts, Maine, New Hampshire, Rhode Island and Vermont due to limitations on data availability.

Data. Existing secondary data were used for the years 1967-2010; the data were compiled using the NASS Quick Stats web-tool when possible and were otherwise collected from the originating USDA publications. The data on state inspection programs came from the FSIS website, and selected state departments of agriculture (see Appendix A).

Variables. Three dependent variables are used in this analysis: the number of federally inspected slaughter (FI) establishments, the number of non-federally inspected (Non-FI) slaughter establishments (i.e., the sum of state inspected and custom exempt establishments), and the total number of all commercial slaughter establishments (i.e., the sum of FI and Non-FI establishments). The independent variables fall into three key categories: regulations, agricultural structure, and industry; all variables are for each year in each state. Year is also included as a variable (see Table 3.2).

Table 3.2. Study variable names, definitions and sources.

	Definition	Source
<u>Dependent variables</u>		
Total slaughter establishments	The total number of all slaughter establishments as of Jan. 1 (March 1 prior to 1978)	LSS
FI slaughter establishments	The number of federally inspected slaughter establishments as of Jan. 1 (March 1 prior to 1978)	LSS
Non-FI slaughter establishments	The number of non-federally inspected slaughter establishments as of Jan. 1 (March 1 prior to 1978)	LSS
<u>Independent variables</u>		
State Inspection	Does the state have its own meat inspection program as of Jan. 1 (March 1 prior to 1978)? (1=yes 0=no). No data included for years prior to official establishment of an approved state program or official take-over by feds.	FSIS website, US Small Business Administration (1971) and others. See Appendix A for all sources
HACCP	Are HACCP regulations in effect? 1=yes, 0=no (Jan. 1999 is earliest effects)	FSIS website
Time trend	Year as a scale from 1 to 44	
<u>Ag. structure</u>		
Average farm size	Average state farm size in thousand acres	FLFLO
State farmland ratio	The number of farmland acres divided by total state acres	FLFLO & US Census Bureau
Cow & calf inventory	The number of live cattle and calves in the state on Jan. 1 (in millions)	MAPDI
Swine inventory	The number in millions of live hogs and pigs in the state on Dec. 1 of the year prior	MAPDI
<u>Industry</u>		
Cattle slaughtered	Number of cattle slaughtered (excluding calves) in the state that year in millions	LSS
Hogs slaughtered	Number of hogs slaughtered in the state that year in millions	LSS
Average cattle price	Average yearly live weight price per pound in 2009 dollars	MAPDI
Average hog price	Average yearly live weight price per pound in 2009 dollars	MAPDI

LLS = USDA Livestock Slaughter Summaries 1969-2011

FLFLO = USDA Farms, Land in Farms, and Livestock Operations Summaries 1968-2011

MAPDI = USDA Meat Animals Production, Disposition, and Income Summaries 1968-2011

State inspection variable. The FSIS website lists states which currently run state meat inspection programs; FSIS also lists the states which do not currently run state meat inspection programs and the date on which FSIS assumed inspection responsibilities in those states. What the FSIS website does not provide is information on states that gave up state inspection and later restarted it. Instead, these states are simply included in the list of all states with current state inspection programs. A 1971 study of the effects of the Wholesome Meat Act (WMA) by the United States Small Business Administration provided the data on the initial approval dates for state inspection programs. Data on the five states that restarted state inspection programs came from a variety of published sources or from the state's agriculture department (see Appendix A for the complete data set and detailed descriptions of the sources). These were coded according to the states' inspection program status on Jan. 1 of each year (March 1 prior to 1978). If the month of inspection transition for the years 1967-1977 was not able to be determined the following March 1 is used as the first data point for the state inspection status of that state. No State Inspection data is included in the analysis for the years prior to the official start of an approved state inspection program or the official take-over of inspection by FSIS. This means that in the analysis, those years with no data are excluded (i.e., 1967-1969).

Swine/hog variables. These variables are included in the statistical analysis, though the qualitative data focuses on beef, because hog slaughter is the largest portion of the industry. In 2010, hogs accounted for 75 percent of US red meat slaughter, by head; cattle and hog slaughter together accounted for 98 percent. Cattle and hogs are both amenable species and thus are subject to the same inspection regulations. In this data slaughter establishments cannot be separated by the species they slaughter, so both species are included. Swine inventories are taken

on December 1 of each year, and were used as the data value for the following year (e.g., the December 1, 1983 inventory is entered as the 1984 data point).

Analysis. Generalized linear mixed models with a Poisson distribution were used in this analysis and were performed using the GENLINUX command in SPSS 19 (IBM Corporation). Four models were run for the Total Slaughter Establishment dependent variable, and 2 each for the FI and Non-FI dependent variables. The choice of this model is appropriate because longitudinal data has a hierarchical, multilevel or clustered structure (Goldstein 2011; Bijleveld et al. 1998; 2005), and because the dependent variables are counts.

As a “mixed” model it includes both fixed and random effects. Fixed effects are “population characteristics ... that are assumed to be shared by all individuals” in the sample, while random effects are “subject specific effects that are unique to a particular individual” (Fitzmaurice, Laird, and Ware 2004:187). “The central idea of multilevel modeling is that a hierarchical structure in the data is accounted for via the use of random effects at various levels in the hierarchy” (Walls, Jung, and Schwartz 2006:6). Therefore, “modeling hierarchically structured data in terms of multilevel models is not only more precise ... but also conceptually more adequate than using classical regression models” (Bijleveld et al. 1998:272). The reason is that hierarchical data violates a key assumption of OLS regression—that all observations are independent of one another—because “there is much more variation between individuals in general than between occasions within individuals” (Goldstein 2011:6). In other words, multiple observations of an individual will have less variation between them than observations of multiple individuals.

A common example of hierarchical, or nested, data is students in a classroom with the classroom nested within the school. In this example, students in the same classroom would be

expected to be more like each other, by virtue of having the same teacher, than they are with the rest of the student population. The same goes for the classrooms, which are more like the other classrooms in the school, given they are under the same administration, than they are like classrooms in other schools. Therefore, if students are selected at random from a school they will not all be independent observations, since those in the same class will be slightly more like each other than they are like students in another class.

Longitudinal data is considered to be hierarchical in that the measurement “occasions are clustered within individuals that represent the level 2 units with measurement occasions as the level 1 units” (Goldstein 2011:6). This analysis uses a 3 level model, with USDA production regions as the level 3 units, the states as the level 2 units and the years of observation as the level 1 units, which are repeated measures nested within each state. In these models, region is used as the random effect; this is to try to account for similarities between states in the same region due to similar agricultural structures that might influence the number of slaughter establishments.

Linear mixed models may also be referred to as “mixed-effects models, multilevel models, hierarchical linear models, and random coefficient models” (West 2009:208). The generalized linear mixed model (GENLINMIXED command in SPSS) is used in this analysis rather than the linear mixed model (MIXED command) because it allows for the modeling of non-normal data by means of a link function. In this case, since the dependent variable is a count, the probability distribution of the dependent variable is set to be the Poisson distribution and the dependent variable is linearly related to the model by a log link-function (IBM 2010).

Additionally, missing data is accommodated by this type of model through case-wise deletion, since it does not require all level 2 units to have the same number of observations (Bijleveld et

al. 1998). This is important since the state inspection data does not start the same year for all states, and there is scattered missing data for other variables.

Limitations. This analysis has a number of limitations. One is the exclusion of nearly all the northeastern states which is a potential source of bias. Second, is not being able to break down the Non-FI category in to state inspected and custom exempt establishments because the USDA only reports them as a combined total. This is unfortunate because custom exempt and state inspected establishments are very different since state inspected establishments are subject to the full set of inspection regulations while custom exempt are not (i.e., custom exempt establishments do not have to create or maintain HACCP plans). A third limitation is the construction of the HACCP variable, which only uses one year of HACCP effects when it was actually spread over several years; the rule change for HACCP was in 1996, the largest establishments had to comply with it in 1998, and the smallest ones by 2000. Thus any effects of HACCP may not show up in the results of the model since it does not account for delayed effects. A fourth limitation was not being able to include the presence of a T-A program in the longitudinal analysis. This was due to a lack of data on T-A programs; FSIS has a record retention policy of two years so I was unable to obtain comprehensive data on past T-A programs in the time available. Some analysis of the effects of current T-A programs on slaughter establishment numbers was done separately using non-parametric methods.

Other Data

Legal data. The regulations that apply to both states (see Appendix B) were collected from the Electronic Code of Federal Regulations (<http://ecfr.gpoaccess.gov>). The directives and

notices were collected from the appropriate FSIS websites.¹⁷ The regulations were used to understand the process of meat inspection and to contextualize the interviews.

Talmadge-Adiken program data. The data on current Talmadge-Aiken (T-A) agreements came from a Freedom of Information Act (FOIA) request to FSIS. This data is analyzed using the non-parametric Mann-Whitney U-test for comparing two independent samples, to see if there is a statistical difference in the number of slaughter establishments between states that do and do not currently have a T-A program. The non-parametric method is appropriate due to the small sample size (N = 42) and the skewed nature of the establishment count variables.

¹⁷ Directives: (<http://www.fsis.usda.gov/regulations/Directives/index.asp>).

Notices: (http://www.fsis.usda.gov/regulations/FSIS_Notices_Index/index.asp).

CHAPTER 4: FINDINGS AND ANALYSIS

Context: Comparison of the Michigan and Alabama Meat Industries and Inspection Programs.

The cases of federal inspection in Michigan and state inspection in Alabama are used to examine the differences between the two types of inspection programs. This analysis begins with a brief examination of the slaughter and livestock industries of these states to provide some context for the remaining analysis.

Slaughter and livestock and industries. The slaughter industries in Michigan and Alabama have had very different histories, with Michigan initially having many more slaughter establishments (Figure 4.1) than Alabama (Figure 4.2) and a much more consistent decline in numbers. The elimination of state inspection in Michigan in 1981 is clearly visible in the increase in federally inspected (FI) establishments relative to non-federally inspected (Non-FI) establishments. In spite of having a relatively low number of slaughter establishments at the start of the study period (prior to 1967), Alabama slaughter establishment numbers increased substantially in 1979 and generally remained higher than in Michigan until 1991. The dramatic drop (50%) in the number of Non-FI establishments between January 1 of 1991 and 1992 does not have a satisfactory explanation, although it could be a delayed response to the decrease in hog slaughter (see Figure 4.6). The overall decline in establishment numbers is consistent with previously mentioned trends in slaughter consolidation.

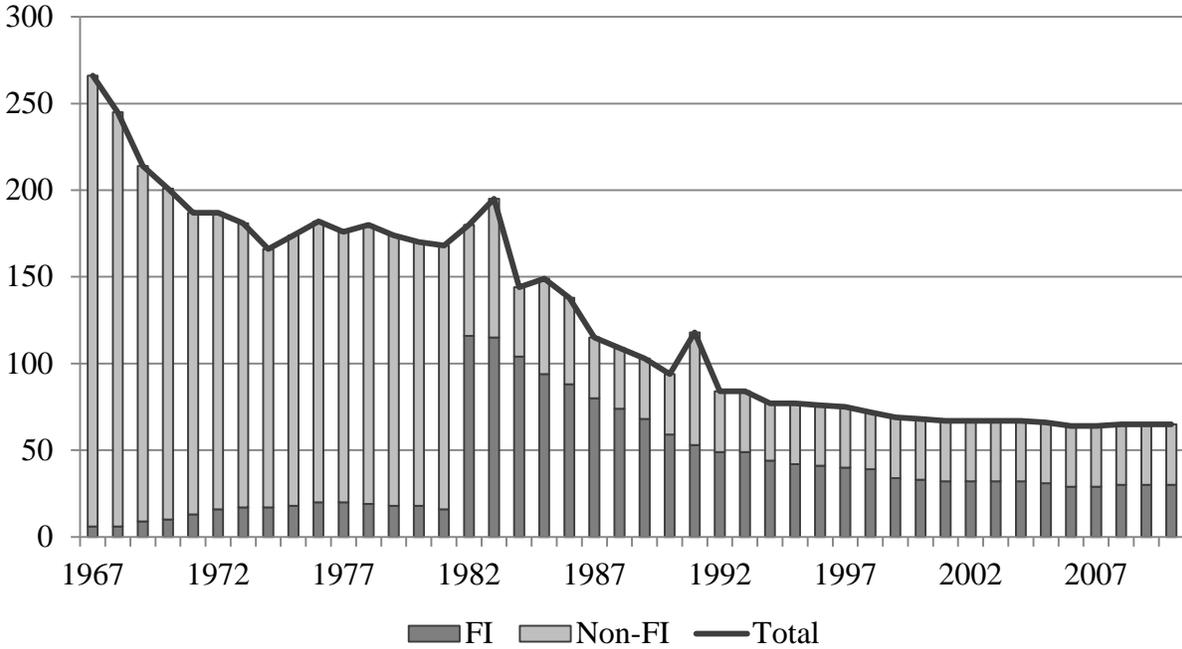


Figure 4.1. Number of livestock slaughter establishments by type in Michigan, 1967-2010.
 Source: USDA Livestock Slaughter Summaries 1969-2011.

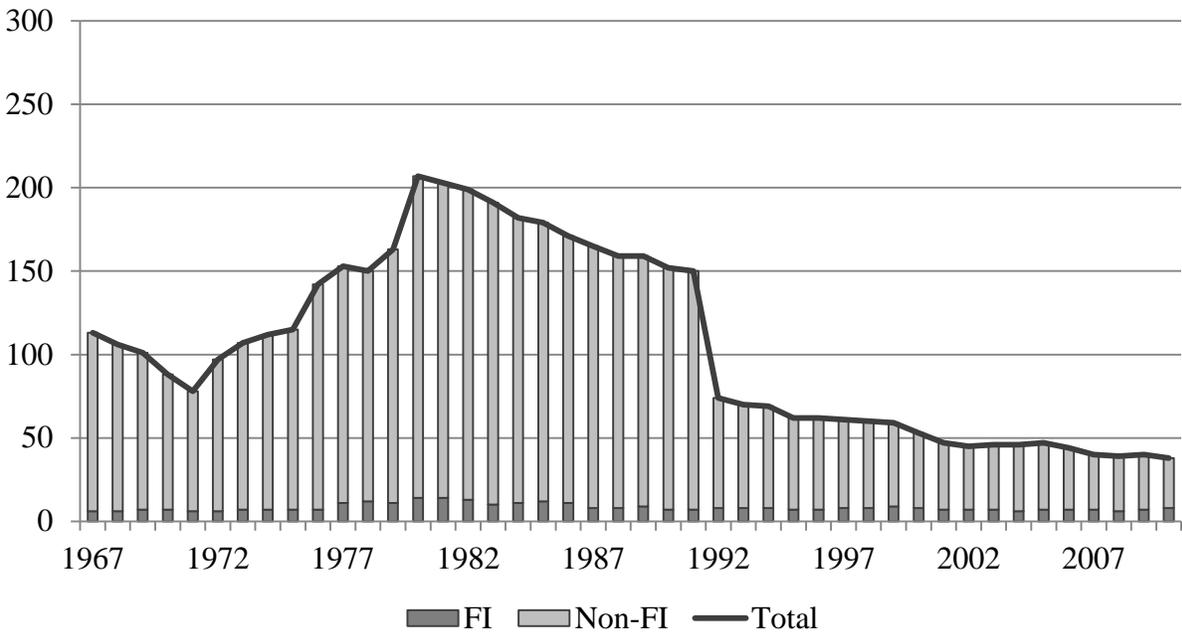


Figure 4.2. Number of livestock slaughter establishments by type in Alabama, 1967-2010.
 Source: USDA Livestock Slaughter Summaries 1969-2011.

With respect to livestock, Michigan has consistently slaughtered about half of its January 1 cattle and calf inventory (Figure 4.3), whereas Alabama has rarely slaughtered more than about 15 percent of its January 1 inventory (Figure 4.4). The cattle slaughter to inventory ratios support a known difference in the livestock sectors of these two states: Michigan is a top dairy producing state (ERS USDA 2009) while Alabama is a predominantly cow-calf producing state (McBride and Mathews 2011).

While Michigan's hog inventory has changed little, there has been a dramatic change in the number of animals slaughtered. In 1982, seven times *more* head of hogs were slaughtered than the state's December 1, 1981 hog inventory. However, by the late 1990s, hog slaughter dropped to a range between 10 to 14 percent *of* their hog inventory. Instead of shipping hogs into Michigan for slaughter, they were shipped out of the state. The large drop in slaughter without a corresponding drop in slaughter establishments and the stability of inventory, suggests that one or more large hog slaughtering plants closed or relocated; as observed, this would dramatically reduce the number of head slaughtered but have a negligible impact on the total number of slaughter establishments. Alabama's hog industry has seen a small decline in hog slaughter. Unlike Michigan, Alabama's hog inventory has decreased along with its hog slaughter; its slaughter to inventory ratio has fluctuated between the 1985 high of 132 percent and the 1990 low of 39 percent.

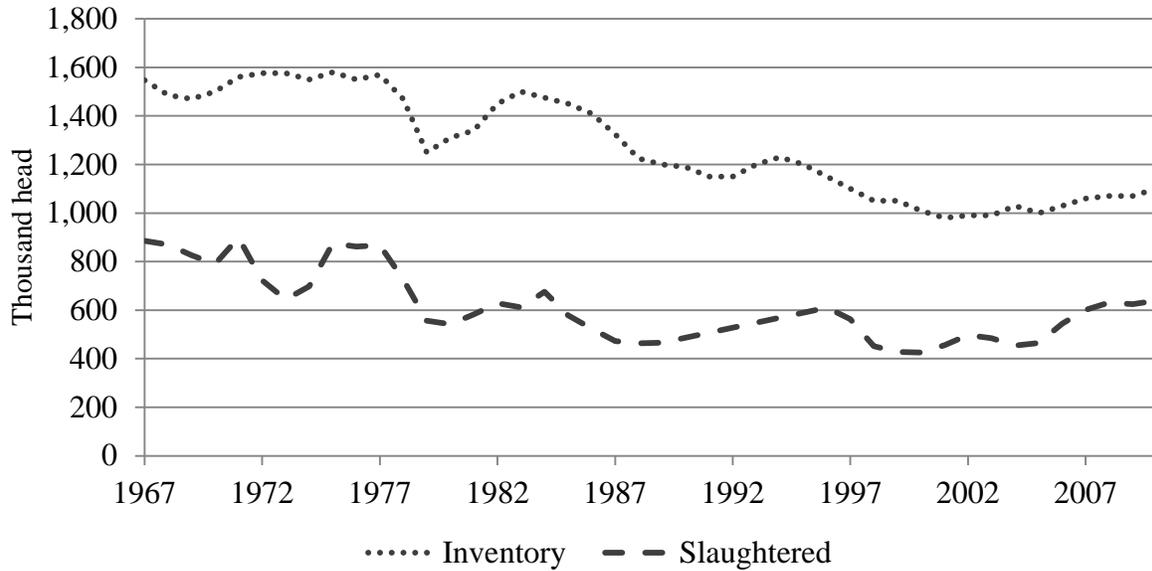


Figure 4.3. Cattle and calf inventory on January 1, and annual slaughter in thousand head, Michigan 1967-2010.

Source: USDA Meat Animals Production, Disposition, and Income Summaries 1968-2011 and USDA Livestock Slaughter Summaries 1969-2011.

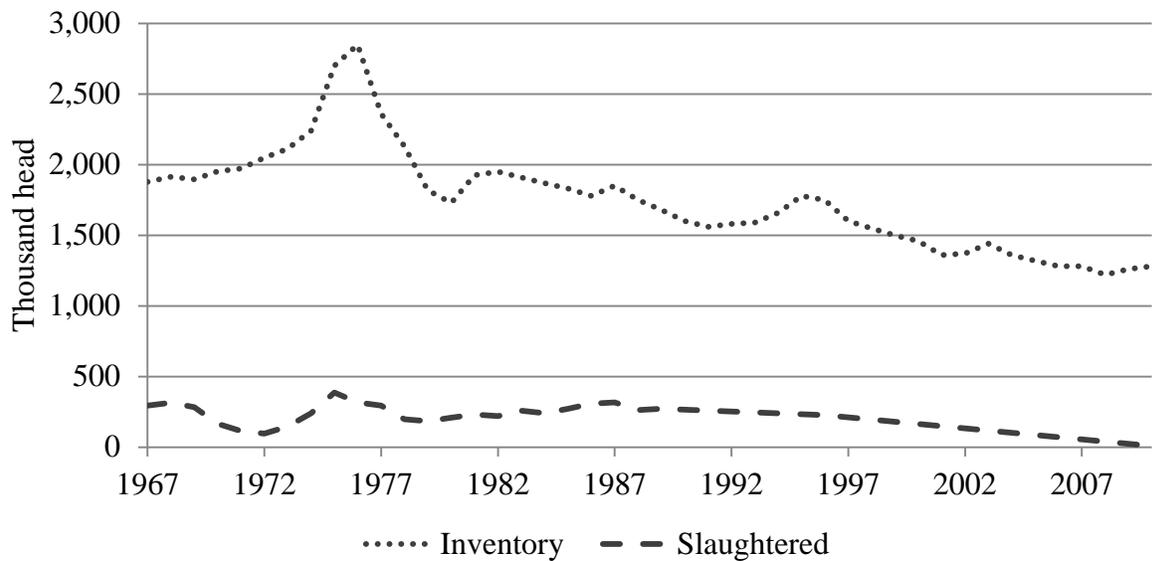


Figure 4.4. Cattle and calf inventory on January 1, and annual slaughter in thousand head, Alabama 1967-2010.

Source: USDA Meat Animals Production, Disposition, and Income Summaries 1968-2011 and USDA Livestock Slaughter Summaries 1969-2011.

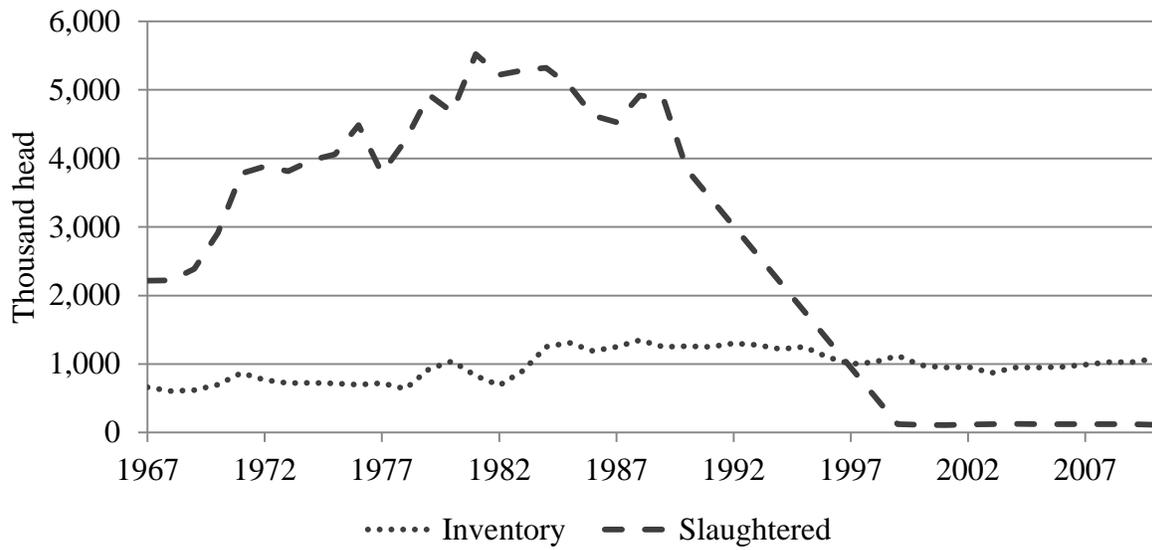


Figure 4.5. Hog and pig inventory on December 1 of previous year, and annual hog slaughter in thousand head, Michigan 1967-2010.
Source: USDA Meat Animals Production, Disposition, and Income Summaries 1968-2011 and USDA Livestock Slaughter Summaries 1969-2011.

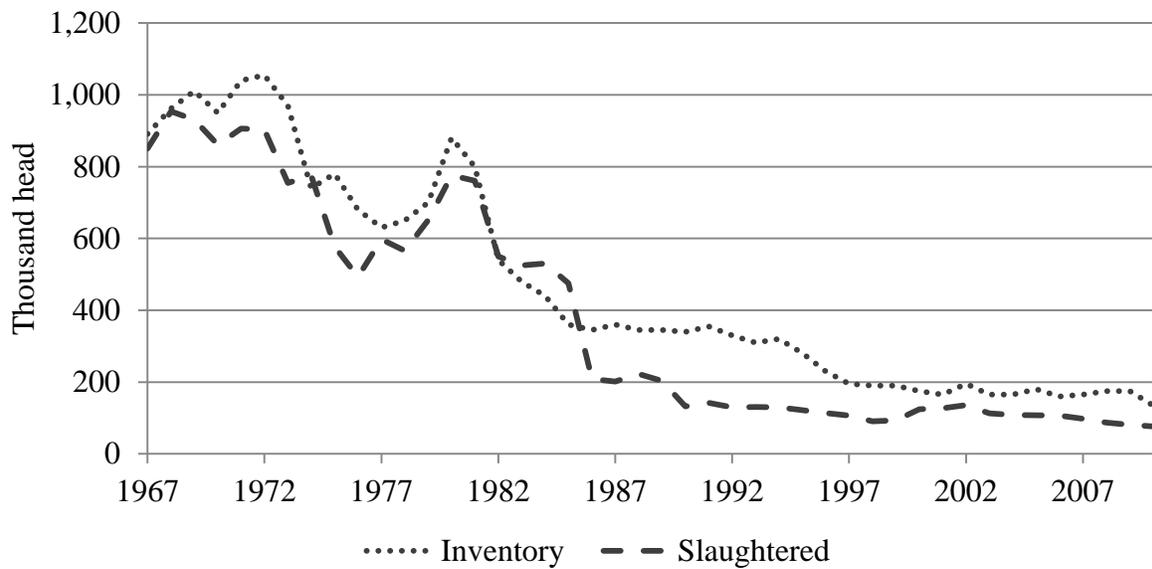


Figure 4.6. Hog and pig inventory on December 1 of previous year, and annual hog slaughter in thousand head, Alabama 1967-2010.
Source: USDA Meat Animals Production, Disposition, and Income Summaries 1968-2011 and USDA Livestock Slaughter Summaries 1969-2011.

Sample description. Five FSIS regulators were interviewed in Michigan and nine state regulators were interviewed in Alabama (Table 4.1). Four of the Michigan regulators were Public Health Veterinarians (PHV) and the fifth was an EIAO;¹⁸ one of the PHVs also served as a front line supervisor. The average time as a regulator for the FSIS employees was nine years, with the minimum being just under a year at the time of the interview. The interviewed regulators in Alabama included three line inspectors, three non-veterinary supervisors, and three veterinary supervisors; three of these individuals were also the EIAO, state director, and T-A coordinator for Alabama. The average time as a line inspector in the Alabama sample was 25 years, and 13 years for the supervisors; the shortest time as a regulator reported was 10 years.

Four of the Alabama regulators mentioned that they grew up on cattle farms and at least three of them currently raise cattle; two others had family ties to the state slaughter industry. As Ralph put it, he is not just a meat inspector, but is intimately involved in the whole industry from the ground level up, while Robert said that he understands what the establishments are going through because he has been there. All three of the line inspectors interviewed had either been recruited for their current position based on recommendations or were encouraged to apply for inspector positions by current inspectors or supervisors.

¹⁸ Enforcement Investigation and Assessment Officers (EIAOs) perform “food safety assessments” at slaughter and processing establishments. Federal EIAOs assist the front line supervisors and district offices to ensure that plants are following and documenting their HACCP plans properly; they also do assessments if the front line inspector has reported problems at an establishment.

Table 4.1. Regulator samples from Michigan and Alabama, position held at time of interview and average years of experience.

	Front Line Supervisor	Public Health Vet	EIAO			
FSIS Employees (Michigan)	X	Rachel Roxanne Ruth Richard		Reuben		
Av. Years as Regulator	9					
	Line Inspector	Non-vet Supervisor	Vet Supervisor	EIAO	State Director	T-A Coordinator
State of AL Employees	Randy Rick Ron	Rex Robert Ryan	Ralph Regina Rusty	X	X	X
Av. Years as Regulator	25	13	13			

Note: All names used are pseudonyms.

There is only limited information on the backgrounds of the PHVs in Michigan, and no info available about line inspectors. While little is known about the Michigan regulators, some comparisons can be made. The two newest FSIS PHVs interviewed (i.e., Ruth and Rachel) both went to the veterinary school at MSU, and one started with FSIS after graduating, while the other spent a year in a small animal practice. Roxanne and Richard were both dairy veterinarians prior to their employment with FSIS. None of the Michigan participants mentioned where they were from. In contrast, all three veterinarians interviewed in Alabama were originally from Alabama, two indicated that their position with the state allowed them to move back, or that they took the job because they already had moved back and were seeking employment. Three of the four Michigan PHVs stated that their primary motivation for working for FSIS was the lifestyle—

better hours, vacations and benefits. Benefits were an important reason that several of the Alabama regulators took a job with the state, though they also pointed out that the pay is low.

Table 4.2. Description of processors, Michigan and Alabama.

	Inspection Type	Type of Business	Size of Operation
Michigan			
Patrick	USDA	Slaughter/processor; meat counter; wholesale	
Philip	USDA	General store with meat counter	12-15 employees (meat aspect only)
Paige	USDA	Slaughter/processor; meat counter	Operate 2-3 days/week in spring; operate 5 days/week in fall
Percy	USDA	Slaughter/processor; meat counter	10 employees, slaughters 10-25 head of cattle and 50-200 hogs a week (seasonal)
Porter	USDA	Processor; meat counter	20 employees
Average time in business = ~28 years			
Alabama			
Price & Pauline	USDA/T-A	Slaughter/processor; meat counter	2 employees; slaughter 30 head cattle/week
Patty	USDA/T-A	Slaughter/processor	Slaughter 5-10 head of cattle per week
Paul	State inspected	Slaughter/processor	A few part time employees; slaughters 2-3 head of cattle per week
Average time in business = 12 years			

Note: All names used are pseudonyms.

Table 4.2 provides basic information on the interviewed processors. The Michigan processors tended to be older and larger operations than the Alabama processors, with the average time in business being approximately 28 years, with the minimum being 10 years. The average time in business for Alabama processors was 12 years, with a minimum of four. The

Michigan processors were also more likely to produce value added products such as sausages under inspection, with only one of the Alabama processors making value added products beyond simply grinding.

History of meat inspection. Michigan began regulating red meat establishments as early as 1895 with Public Act 193, followed by Public Act 120 in 1903, which allowed municipalities to set up their own meat inspection. Some municipalities established as program whereas others did not; on-farm slaughter and processing remained unregulated (Worosz et al. 2008:185). By the 1950s, this scattered and highly localized approach had become criticized for inconsistent, inadequate inspection, and for imposing commerce restrictions, as cities could restrict meat sales to only those inspected to their particular standards (Bowler 1964 cited in Worosz et al. 2008). Public Act 280 was passed in 1965, which established a state-wide meat inspection program. By the time the Wholesome Meat Act (WMA) was passed in 1967, Michigan had a total of 226 slaughter establishments (see Figure 4.1). Michigan gave up its state inspection program in 1981 due to financial difficulties (Worosz et al. 2008:187). The program appears to have been eliminated by ending budget allocations, rather than by repealing the law (Gavin 1981). Today Michigan only has federal inspection, and FSIS oversees the state's custom exempt establishments.

Unlike Michigan, Alabama did not have a state meat inspection law prior to the WMA, though some cities, such as Dothan and Roanoke, had ordinances that required inspection for meat, and the maintenance of sanitary conditions in slaughter and processing establishments that sold meat within city limits. Under pressure from the Alabama Meat Packers Association, the Alabama state legislature passed, with difficulty, a meat inspection law in 1969 (Associated

Press 1968; Press 1969)¹⁹. Alabama adopted part of the federal regulations as “the procedures and requirements which shall be followed...for implementation, administration and enforcement of the state meat and poultry statutes” (AL Admin Code 80-3-10.2). This currently includes 26 sections of the Code of Federal Regulations (Title 9, Volume 2, Chapter 3, Sections 302-320, 325, 329, 416, 417, 424, 430, 441, and 500), containing a total of 345 subsections (see Appendix A), as well as all directives and notices issued by FSIS. The regulations adopted by Alabama, all of which apply in Michigan as well, are the most ‘operational’ in the sense that these sections specify what inspectors and establishments must, and must not *do*.

Description of Meat Inspection

Meat inspection²⁰ is the application of the regulations. The following description of inspection draws on the interviews with regulators, especially the Alabama line inspectors, and

¹⁹ The state law can be found in the Code of Alabama 1975, sections 2-17-1 to 2-17-38. The regulations that apply the state law are in the Alabama Administrative Code, where they are grouped by the state agency which enforces them; the meat inspection regulations are under the Alabama Department of Agriculture and Industry and found in Chapter 80-3-10.1-4.

²⁰ Inspection is different from grading. Meat grades (e.g., prime, choice, select) are an “evaluation of traits related to tenderness, juiciness, and flavor of meat” (FSIS 2012). Grading is voluntary and can only be done by USDA Agricultural Marketing Service (AMS) graders which stamp the carcass with its grade designation; higher grades of meat can be sold at higher prices, but meat can be sold without a grade so long as no grade claims are made.

this narrative was compared to the written regulations. This description should apply generally to federal or state inspection in any state²¹.

When an establishment conducts its operations according to the regulations and it is observed and confirmed by an inspector, the establishment is said to operate ‘under inspection,’ in contrast to ‘custom exempt’ (see Chapter 1). Some establishments may operate under inspection on some days and as custom exempt on other days, but are still referred to as ‘inspected;’ the term ‘custom exempt’ applies to establishments that only operate under the custom exemption and do not have approved HACCP plans. In the federal regulations there is an exemption from inspection for retail establishments/businesses that cut or otherwise prepare meat but that only sell it to the final consumer; these include restaurants, grocery store meat counters and other meat retailers (sometimes called a ‘meat market’).

Red meat inspection is primarily carried out by line inspectors whose job it is to monitor the plants’ activities, verify that they are operating within the parameters of the regulations, ensure that safe and wholesome products are produced, and that the products are properly identified and labeled. The inspectors’ job begins when the vehicle transporting the animal comes onto the property of the slaughter establishment, at which time the humane handling regulations apply. Humane handling includes the safe unloading of the animals into the holding pens (i.e., at walking speed, free of excessive force), the conditions in and of the pens (i.e., no physical hazards, water is available, food is available if held over twenty-four hours, protection

²¹ Inspectors also check that products are labeled properly; all labels must be approved by the inspection service (state or FSIS depending on the inspection type). Meat inspection does not verify labeled claims; inspectors only check that any quality claims made on labels have documentation from AMS.

from elements if needed). Humane handling continues up to the point of slaughter and specifies that the animal be rendered unconscious with one blow prior to being killed by having its' throat slit and that there are no signs of consciousness during this process.

Prior to slaughter, the inspector performs a visual, ante-mortem, inspection of the animals, both in motion and standing still, from all sides, to check for illness, abnormality or other conditions that would affect the animals' ability to be used as human food. Any animal that shows a condition or abnormality is separated from the other animals and held as 'suspect' for the veterinarian to inspect. Once the vet examines the animal, it can either be deemed healthy and penned with the rest of the animals for regular slaughter, be tagged for special post-mortem inspection and slaughtered last, or be deemed unfit for use as human food and be condemned. Animals can be held for further observation if symptoms are unclear; condemned animals must be humanely killed by the establishment if they are not already dead.

Once the animal has been killed the inspector performs the postmortem inspection of the head and viscera of each animal for abnormalities or signs of disease, which is carried out by palpation and/or incision of the heart, lungs, liver and kidneys especially, as well as of the lymph nodes. If signs of disease are found in the head or viscera then the carcass is checked and either passed by the inspector if there are no abnormalities in the carcass or held for inspection by the vet. Only the vet has the authority to condemn a carcass if there is a systemic abnormality, though the establishment could voluntarily condemn it. The line inspector has the authority to require affected parts be removed (i.e., cut out) before passing the carcass, but cannot condemn an entire carcass. The inspector performs a final carcass check for visible contamination and, if it passes, stamps the carcass with the mark of inspection. The line inspector must be present for

inspected slaughter to monitor humane handling and slaughter and the ante and post-mortem inspection of the animal; this process is known as continuous inspection²².

An additional component of meat inspection is checking that the establishment is following their sanitation and food safety programs by reviewing their records. Hazard Analysis and Critical Control Point (HACCP) plans are written documents that identify each step in the production process on a flow-chart. Each step is assessed for any chemical, biological, of physical hazard that may be present or could occur; the plan describes how any hazard will be reduced or eliminated at that step or at a future step—a critical control point (CCP). A ‘critical limit’ is established in the HACCP plan for each CCP based on what has been shown through peer reviewed research to be effective. The inspector checks that the establishment is following their HACCP plan by reviewing the records the establishment uses to document execution of the plan. For example, a critical control point (CCP) could be that the carcass has to be chilled to 40 degrees Fahrenheit within twenty-four hours of going into the cooler so as to prevent the growth of any bacteria that might be present. An employee checks and records the temperature of the carcass when it goes into the cooler and again the next day. The inspector checks that this has been done and that the CCP limit (e.g., required temperature) has been met. A slaughter establishment has to have a HACCP plan that is specific to their operation and approved by FSIS for each category of process/product they do/make. There are nine categories of HACCP plans

²² Continuous inspection also applies to the further processing of a carcass either at the plant where the animal was slaughtered or at a different one, and means that the inspector visits the establishment at least once every day that operations occur to check HACCP and SSOP compliance. The inspector *must* be present for all slaughter, but does not need to be present for all processing. (See definition for “continuous inspection” at <http://www.fsis.usda.gov/Help/glossary-c/index.asp>).

including slaughter (i.e., all amenable species), raw not-ground product (e.g. steaks, roasts, primals), and raw ground product (e.g., hamburger).²³ Taking product samples for microbial testing is an additional requirement of the HACCP regulations and they are used to illustrate the effectiveness of the establishment's HACCP program. Additional testing is carried out by the inspection service (i.e., FSIS or the state inspection program). The type, number and frequency of samples are partially determined by the species and the product being produced.

Each establishment must also have sanitation standard operating procedures (SSOPs) which is a written program that specifies what the establishment is going to do to guarantee/maintain sanitary conditions. The SSOP contains two parts. One is a pre-operational sanitation program, which is a daily, pre-use inspection of the facility and equipment. If unsanitary conditions are found then a corrective action must be taken—the deficiency must be identified and corrected in the manner specified in the HACCP plan. The second part is a separate operational sanitation program that ensures that sanitation is continuously monitored throughout operations. Both parts of the SSOPs are primarily concerned with product contact surfaces—hands, outer protective clothing, knives, table tops, saws—but the establishment may include other things, as well. Like the HACCP plan, the SSOPs are written by each plant according to their operation and require documentation of their execution and any corrective actions that might be taken.

²³ The remaining six types of HACCP plans are for products that are: 1) Thermally processed—commercially sterile; 2) Not heat treated—shelf stable; 3) Heat treated—shelf stable; 4) Fully cooked—not shelf stable; 5) Heat treated but not fully cooked—not shelf stable; 6) Product with secondary inhibitors—not shelf stable.

Differences between Federal Meat Inspection in Michigan and State Meat Inspection in Alabama

Application of inspection. State inspection programs are required by the WMA to be “at least equal to” the federal inspection standards. As previously mentioned, Alabama has adopted twenty-six sections of the federal regulations as its own, including all directives and notices. However, “equal to” is different from “same as,” which leaves room for some differences in application between state and federal inspection programs. Research participants indicated that sampling is the primary way that the Alabama state inspection program is different from the federal program. The Alabama state inspection program requires sampling proportionate to the amount of product an establishment produces; this is considered being “equal to” the federal sampling requirements (i.e., the same proportion of product is sampled) though it is not the “same as” the federal sampling requirements, which requires sampling on a schedule (e.g., monthly).²⁴ The state inspection program submits a report to FSIS every year on its “equal to” status. FSIS conducts an on-site review of the state inspection program every three years.

Regulator attitudes. The most noticeable difference between the two inspection programs is the way in which the state regulators expressed their relationship as regulators to the processors they inspect, and how they see their role in state meat inspection and the slaughter industry. The federal regulators in Michigan clearly stated that FSIS does not help establishments develop HACCP plans or provide advice on compliance. Richard, a Michigan PHV said that they

²⁴ The Public Health Information System used by FSIS includes other factors when determining sampling frequency and does make some adjustment for establishment size. However, the minimum establishment size considered is 1,000 pounds of production output a day; thus, all establishments that produce less than that are sampled at the same rate.

will indicate what is unacceptable, but not what must be done to fix it; if the establishment proposes changes to fix the problem the inspectors can say if it 'sounds like that would make it acceptable,' but will not make recommendations on what the establishment could or should do. The position of the inspectors is that they will oversee and will document what establishments are not doing, but the establishments themselves are responsible for obtaining the information necessary to comply with the regulations.

In contrast, most of the Alabama state regulators expressed some form of willingness or desire to be supportive of, and work with, the small plants they inspect, by looking at blueprints before building starts and providing assistance with HACCP program development. The Alabama Department of Agriculture and Industries (ADAI) ran HACCP training sessions aimed at small establishments before the regulations went into effect, and as a result only a few establishments ended their inspection (i.e., became custom exempt) because of the regulation change. Robert, a non-vet supervisor, felt that one of the important things that the state inspection program does is to help the small and family-owned establishments remain in business. Rex also felt this way and added that “the state is willing to become a resource for these [small and very small] plants, where the federal government will not.” State inspection supports these smaller establishments by accounting for establishment size in sampling, and by regulators’ willingness to provide regulatory support. This difference in perspective could be partially a result of most of the state regulators having a background themselves in the Alabama livestock and slaughter industries.

*Advantages of state inspection program.*²⁵ The significance of the more helpful attitude of the state regulators compared to the federal regulators becomes apparent when one considers the 345 9CFR subsections adopted by Alabama for meat inspection. Not only do many of these subsections have multiple parts, but they are in dense, regulatory language (see Appendix C). Rex pointed out that the federal government likes to use “big words,” which works in Washington, but “Mom and Pop” don't understand them. In contrast, the state tries to explain the rules in a way that they will be understood.

Both FSIS and ADAI regulators noted repeatedly that the regulations were written with only large establishments in mind. This has two major implications. First, Rich indicated, that one of the most difficult parts of inspection is interpreting the regulations because “the plants are all a little bit different and they do things a little bit different so having those gray areas where you have to kind of fit something, or make something fit, or see if it fits is probably the most difficult.” Line inspector Ron concurred, saying that “there are a hundred different situations where I have to take that federal regulation and make it fit in the little mom and pop setting;” he

²⁵ An additional difference that became apparent through the research process, which was also mentioned by one of the public health vets in Michigan, is the lack oversight/knowledge of custom exempt establishments under FSIS supervision. This lack of knowledge was corroborated when I obtained a list of Michigan custom exempt slaughter establishments through an FSIS FOIA request. A quick internet search of the first fifteen establishments on the list indicated that at least three of the establishments that were NOT indicated as doing slaughter actually DO slaughter. This list was supposedly checked by an FSIS Deputy District Manager whom I spoke with by phone while trying to obtain the list. The regulations require CE establishments be checked once a year. In contrast, one of the Alabama line inspectors told me that he visits his custom exempt establishments once a month.

has to read *all* the notices and directives as FSIS issues them, many of which are changes to some aspect of inspection, and determine if they apply to the establishments he inspects.

The second implication is that small establishments have fewer resources to put towards regulatory compliance. While large establishments have personnel, if not entire departments, whose only job is to monitor regulatory changes and update HACCP plans accordingly, small establishments do not. Therefore, it is up to the owner, or an employee, to keep up with all the documentation required for compliance in addition to their other work. Rex pointed out that it is easy for the big companies to make changes, because they have the money and the personnel to make it happen. The federal EIAO, also observed that “[the small and very small operators] can’t keep up with the regulations because they are trying to run a business.” Processor Percy felt that the time he spent on paperwork was “non-productive” in that it meant he had less time to spend on customer service, production or sales. For Percy, compliance wasn’t the issue; he knew he could comply with the regulations, but he wasn’t sure if he could make enough money to stay in business at the same time.

For these reasons, having a state inspection program to facilitate the interaction between processors and the regulations eases some of the burden on small plants trying to comply with regulations that were written for a different sector of the industry. As an example, Michigan processor Porter reported repeated instances of being given conflicting information by federal line inspectors and EIAOs. This happened when he got written up by the EIAO for his HACCP plan not being good enough, however the line inspectors had not previously given him noncompliance reports for the problem, which left him to assume that his HACCP plan was acceptable. This adds an extra level of stress and frustration for processors. In contrast, according to regulator Rex, the state inspection program discusses regulation changes internally to make

sure that all the inspectors understand new directives so that “everyone understands exactly what is expected and will get the job done.” Rusty said that HACCP was challenging for the small plants for the first six months to a year. At issue was learning what recordkeeping needed to be done and how to do it. Today, the state bears some of the burden interpreting the FSIS rule and requirements. He added that each time FSIS comes to conduct a “food safety assessment” (FSA) at a T-A plant they seem to want something different and it is not uncommon for the assessments to be contradictory to previous ones.²⁶ This indicates that the state assumes the job of interpreting the regulations for the small and very small state and T-A establishments that it inspects.

Additional benefits of state inspection. An additional consideration when evaluating the role/purpose of state meat inspection is that state inspection can provide an intermediary step for plants seeking federal inspection. Starting with state level meat inspection has two key benefits: 1) state regulators will provide support for setting up HACCP and SSOP programs, and 2) the establishment gains experience keeping the necessary records in a more supportive framework. These benefits make the transition to federal inspection much easier—the only procedure that changes is the sampling (i.e., sample types and frequency) as mentioned previously. Thus, having a state program may actually encourage some plants to become federally inspected that might not do it otherwise.

Paul the processor provides one such example: Paul had been a deer processor in Alabama for twenty-plus years before becoming custom exempt two years ago so that he could

²⁶ FSAs are conducted by FSIS at T-A plants only. Rusty said that the state inspection program tries to have an inspector present at the entry and exit meetings for FSAs.

process wild hogs. Deer processors in Alabama are unregulated; however, wild hogs are only considered feral, and are thus still subject to inspection regulations as an amenable species. To be approved as a custom exempt establishment, Paul had to add pens, a kill floor and a cooler. After a few months as custom exempt Paul applied for state inspection. At the time he was interviewed (fall 2011) he planned to apply for federal inspection in the spring; Paul has customers who want to sell their meat across state boundaries. Paul's state inspector does not foresee any problems making the transition to federal inspection; it is the inspector's opinion that the more difficult transition is from custom exempt to state inspection.

An additional advantage for Paul is that Alabama has a Talmadge-Aiken (T-A) program, which gives him two notable benefits. First, state inspected establishments that apply for federal inspection are usually given to the state as a T-A establishment, in which case Paul's establishment will continue to be inspected by the same inspector. In other words his state inspector, with whom he already has a relationship, will become his federal inspector. Second, as Rusty noted, because Alabama has a T-A program Alabama inspectors are aware of all the federal rules and notices, and thus are in a better position to advise an establishment on what is involved in the transition to federal inspection. The Alabama regulators also know when the state program is reviewed that it will be at least equal to the federal program. As Rusty states, this is because "we don't change our inspection program any between a federally inspected T-A plant that we are at and a state plant that might be next door; we do everything the same."

Regulators in both Michigan and Alabama mentioned repeatedly that the regulations, and especially the sampling requirements, do not consider the size of the establishment.²⁷ Therefore, small establishments operate at a disadvantage. According to Rick, the combined effect of a state inspection program and a T-A program could help reduce this disadvantage for small plants even “if that small plant was a T-A plant rather than a federal plant because then the state is still doing the same exact thing for the T-A plants as we do for our small state operated plants.” However, in spite of the potential benefits of having both state inspection and a T-A program, Alabama still has fewer slaughter establishments than Michigan.

Results of Longitudinal Analysis

The qualitative analysis indicated that there are differences between state and federal inspection, and suggests that state inspection programs *could* encourage greater numbers of slaughter establishments. The purpose of this longitudinal, statistical analysis is to determine if the differences observed qualitatively are great enough and consistent enough across states, to have a statistically significant influence on the number of slaughter establishments. In addition to state inspection, other variables that could reasonably be expected to have an influence on the number of slaughter establishments are included.

Table 4.3 shows descriptive statistics for the variables used in the analysis. Nearly all the variables are skewed to the right. The dependent variables are particularly skewed, as indicated

²⁷ In 2011 federal inspection changed their inspection method from a “performance based inspection system (PBIS)” to a public health inspection system (PHIS).” The PHIS considers establishment sizes, but not below 1,000 pounds of meat produced per day (i.e., all establishments in this category are sampled at the same rate).

by the mean being larger than the median. This indicates non-normal distribution but is consistent with the Poisson distribution used in the multilevel model.

Four identical models were run for each of the three independent variables. Model 1 is the ‘base model’ which includes the **state inspection, HACCP** and **year** variables. Model 2 contains the base model (i.e., Model 1) as well as the agriculture structure variables: **average farm size, state farmland ratio, cow & calf inventory**, and **swine inventory**. Model 3 contains the base model as well as the industry variables: **cattle slaughtered, hogs slaughtered, average cattle price**, and **average hog price**. Model 4 is the full model which contains all the variables used in Models 2 and 3. The results of these four models for each of the dependent variables are shown in Tables 4.4 (FI establishments), 4.5 (Non-FI establishments) and 4.6 (total establishments). Each model is labeled first by the dependent variable used (i.e., 1 for **FI**, 2 for **Non-FI**, 3 for **total**) and then by the number of the model (i.e., 1-4 referring to the independent variables included as described above). Thus Model 1.2 indicates a regression run on the **FI establishments** dependent variable with the Model 2 variables (i.e., **state inspection, HACCP, year, average farm size, state farmland ratio, cow & calf inventory, swine inventory**).

The common results of the analysis of the **FI** and **Non-FI establishments** (Tables 4.4 and 4.5) will be discussed together, and then the ways in which they differ will be highlighted. The results of the **total establishments** models will be discussed last. As a reminder, the **total slaughter establishments** variable is the sum of the **FI slaughter establishments** and the **Non-FI slaughter establishments** variables.

Table 4.3. Descriptive statistics for study variables, 40 US states, 1967-2010.

	Mean	Median	Minimum	Maximum	Std. Deviation
<u>Dependent variables</u>					
Total slaughter establishments	114.030	90.500	4.000	561.000	89.791
FI slaughter establishments	30.490	20.000	0.000	363.000	39.210
Non-FI slaughter establishments	83.480	61.000	0.000	486.000	74.107
<u>Independent variables</u>					
State inspection	0.620	1.000	0.000	1.000	0.485
HACCP	0.280	0.000	0.000	1.000	0.450
Time trend	23.530	22.000	4.000	44.000	11.469
Ag. Structure					
Average farm size	0.782	0.303	0.070	6.650	1.094
State farmland ratio	0.484	0.456	0.098	0.972	0.235
Cow & calf inventory	2.725	1.834	0.040	16.600	2.569
Swine inventory	1.453	0.403	0.000	16.300	2.626
Industry					
Cattle slaughtered	0.919	0.269	0.001	8.213	1.620
Hogs slaughtered	2.248	0.525	0.001	31.149	4.140
Average cattle price	1.091	1.001	0.420	15.640	0.528
Average hog price	0.891	0.811	0.300	1.960	0.421

N = 1356

Across the models for both **FI** and **Non-FI establishments** (Models 1.1-1.4 and Models 2.1-2.4), **time trend**, **average farm size**, **state farmland ratio**, and **cow & calf inventory** variables show a consistent result in both sign and significance level. **Time trend** is negative and significant across all the models, indicating that the number of establishments has gone down over time; this result is as expected (see Figure 1.1). **Average farm size** is negatively related to establishment numbers meaning that larger average farm sizes are related to fewer slaughter establishments of either type. Higher **state farmland ratios**, meaning the more of the state that is farmland, or the more agricultural the state, and larger **cow & calf inventories** are both

significantly related to larger numbers of slaughter establishments. **Cattle slaughtered** is nearly the same, with the only difference being the level of significance between Models 1.4 and 2.4.

The most significant and substantive difference between the two sets of models is in the **state inspection** variable, which is negative and significant for **FI establishments**, and positive and significant for **Non-FI establishments**, which indicates that state inspection programs do have a statistically significant relationship with higher numbers of **Non-FI slaughter** establishments. **HACCP** has a negative effect in all of the eight models but is only significant in Model 2.2 for **Non-FI establishments**. This lack of significance may be due to the protracted nature of HACCP adoption and the limitations of this variable.

It is notable that while the cattle and calf inventory is consistently positively related to slaughter establishment numbers, swine inventory gives a mixed result, showing a negative and significant relationship to **FI establishments** (Model 1.4), and a positive and significant relationship in Model 2.2. **Hog prices** were insignificant in both sets of models, though, **cattle prices** were significant for FI establishments, but not for Non-FI establishments. This may be due to the generalness of the variable which does not account for the production structures of hogs or cattle.

Table 4.6 shows the results of the models run on **total slaughter establishments** (Models 3.1-3.4); because this variable is the sum of the other two dependent variables, the models yield some interesting results that appear to combine the results of the other two sets of models. Most notable are the differences between Models 3.2 and 3.3. In Model 3.2 **state inspection** is significant and positive as seen in the **Non-FI establishment** models (Models 2.1-2.4), while in Model 3.3 it significant and negative as seen in the **FI establishment** models (Models 1.1-1.4).

The AIC and BIC values indicate that the best model, in all three sets of models, is Model 2, the agriculture structure model. The only substantial difference between Models 1.2, 2.2, and 3.2 is that in Model 2.2 **swine inventory** is positive and significantly related to the number of **Non-FI establishment**. This suggests that the reason for Michigan having more slaughter establishments than Alabama might be the differences in hog inventories between the states (Figure 4.5).

Table 4.4. Four generalized linear mixed models of state inspection, HACCP, year, ag. structure and industry variables on federally inspected (FI) slaughter establishments, 40 US States, 1969-2010.

	Model 1.1	Model 1.2	Model 1.3	Model 1.4
Intercept	4.487***	3.551***	3.854***	3.376***
State inspection	-1.144***	-0.937***	-1.156***	-1.052***
HACCP	-0.047	-0.055	-0.078	-0.088
Time trend	-0.025***	-0.020***	-0.018***	-0.017***
Ag. Structure				
Average farm size		-0.320***		-0.287***
State farmland ratio		0.715***		0.907***
Cow & calf inventory		0.154***		0.115***
Swine inventory		0.003		-0.124***
Industry				
Cattle slaughtered			0.189***	0.077***
Hogs slaughtered			0.013**	0.063***
Average cattle price			0.066*	0.070**
Average hog price			0.157	0.068
AIC	2,905.55	2,598.39	2,662.17	2,669.59
BIC	3,121.58	2,814.29	2,878.07	2,885.35
F-test	343.682***	267.775***	230.550***	181.096***
N = 1356	* $p < .05$	** $p < .01$	*** $p < .001$	

Table 4.5. Four generalized linear mixed models of state inspection, HACCP, year, ag. structure and industry variables on non-federally inspected (Non-FI) slaughter establishments, 40 US States, 1969-2010.

	Model 2.1	Model 2.2	Model 2.3	Model 2.4
Intercept	4.517***	3.764***	4.323***	3.736***
State inspection	0.326***	0.420***	0.330***	0.409***
HACCP	-0.077	-0.126*	-0.087	-0.121
Time trend	-0.020***	-0.014***	-0.020***	-0.015***
Ag. Structure				
Average farm size		-0.165***		-0.154***
State farmland ratio		0.816***		0.904***
Cow & calf inventory		0.079***		0.059***
Swine inventory		0.001***		-0.022
Industry				
Cattle slaughtered			0.107***	0.038**
Hogs slaughtered			0.013***	0.012
Average cattle price			0.015	0.027
Average hog price			0.004	-0.004
AIC	2,737.46	2,371.20	2,562.52	2,395.88
BIC	2,953.50	2,587.10	2,778.42	2,611.65
F-test	103.552***	115.762***	94.687***	74.511***
N = 1356	* $p < .05$	** $p < .01$	*** $p < .001$	

Table 4.6. Four generalized linear mixed models of state inspection, HACCP, year, ag. structure and industry variables on total slaughter establishments, 40 US States, 1969-2010.

	Model 3.1	Model 3.2	Model 3.3	Model 3.4
Intercept	5.214***	4.317***	4.899***	4.181***
State inspection	-0.068*	0.061*	-0.066*	0.038
HACCP	-0.070	-0.119**	-0.092	-0.136**
Time trend	-0.021***	-0.014***	-0.018***	-0.012***
Ag. Structure				
Average farm size		-0.252***		-0.242***
State farmland ratio		1.059***		1.120***
Cow & calf inventory		0.094***		0.078***
Swine inventory		-0.009		-0.054***
Industry				
Cattle slaughtered			0.118***	0.033**
Hogs slaughtered			0.012***	0.024***
Average cattle price			0.016	0.030
Average hog price			0.072	0.062
AIC	2,210.77	1,733.57	1,979.60	1,737.14
BIC	2,426.81	1,949.47	2,195.50	1,952.90
F-test	103.603***	147.178***	101.066***	96.641***
N = 1356	* $p < .05$	** $p < .01$	*** $p < .001$	

The qualitative analysis suggested that the presence of a T-A program had the potential to influence the number of slaughter establishments, however due to a lack of data it was not included in the longitudinal models. Table 4.7 shows the results of non-parametric Mann-Whitney U-tests comparing the effect of a current T-A program and a T-A history on the numbers of slaughter establishments on January 1, 2010. The Mann-Whitney U-test is used instead of the parametric *t*-test for independent samples due to the small sample number and because there is no assumption of normality. The results of this analysis show no statistically significant difference between the number of slaughter establishments in states that currently have a T-A program and those that do not.

Table 4.7. Mann-Whitney U-tests of TA program status and history on number of total, FI and Non-FI slaughter establishments, 42 US states, 2010.

	N	Total Establishments		FI Establishments		Non-FI Establishments	
		Sum of ranks	U	Sum of ranks	U	Sum of ranks	U
<u>TA program status</u>			136.5		134.5		139.5
Current TA program	9	205.5		207.5		202.5	
No current TA program	33	697.5		695.5		700.5	

Note: No significance for $p < .05$ using asymptotic significance (2-tailed)

CHAPTER 5: CONCLUSIONS

Summary

This thesis sought to examine two questions related to state meat inspection programs. First, what are the differences between state and federal meat inspection? Second, is having a state inspection program significantly related to a higher number of slaughter establishments? These questions are motivated by a curiosity as to why, even with the growing demand for red meat in Alternative Food Networks (AFNs), there remains a bottleneck at the slaughter and processing step. I used the cases of Michigan and Alabama to qualitatively examine differences between state and federal meat inspection regulations and the application of those regulations, and then a longitudinal statistical analysis to assess the importance of state inspection programs on a states' number of slaughter establishments.

Even though the regulations in Michigan and Alabama are nearly the same, I found state inspection to be more supportive, and in some ways “easier,” for small and very small establishments than federal inspection. At least four reasons for the “ease” of state inspection emerged from the data. First, state inspection presents a more supportive inspection environment. One explanation for this finding is that the state regulators have both a similar background and a vested interest in the state slaughter industry. Second, sampling more proportionately to output reduces the absolute number of samples they are required to take. Third, state inspection acts as an intermediate step between custom exempt and federal inspection (FI). As an intermediary, the state facilitates an establishment's initial transition to inspection by providing assistance and resources in establishing the required protocols (i.e., HACCP, SSOPs). Fourth, a Talmadge-Aiken (T-A) program may further facilitate small establishments' transition to FI in two ways: T-

A establishments are typically inspected by the same state inspector with whom they already have a relationship; and state T-A inspectors are fully versed in FI requirements so they are able to accurately advise establishments in the transition process. These findings are consistent with those of Slaughter et al. (2001:16) in Kansas and Minnesota, who reported that the greater flexibility of state inspection, compared to federal inspection, was beneficial to small establishments. Additionally, they found that “state inspectors were more willing than their Federal counterparts to spend time explaining rules and regulations to plant owners, and that state inspectors were also more inclined to work together with an owner to devise ways of coming into compliance with standards.”

The statistical analysis supports several findings from the qualitative analysis, and it suggests other factors that may also contribute to slaughter establishment numbers. State inspection was statistically important to higher numbers of Non-FI establishments, and lower numbers of FI establishments. HACCP had a negative effect on establishment numbers, but it was not very significant; however, this may be due to the limitations of the variable as mentioned in Chapter 3. Smaller farms were positively related to higher numbers of slaughter establishments of both types. Larger cattle inventories were positively associated with higher numbers of establishments. Livestock prices, especially hog prices, were not consistently significant. Having a T-A program was not found to be significantly related to higher numbers of slaughter establishments of any type.

Consistent with DeLind and Howard (2008), it was found that the regulations have been written for the large scale industry and they have a disproportionate effect on the small scale industry. DeLind and Howard (2008) point out that the small scale processing sector is not at fault for the widespread and highly publicized foodborne illness outbreaks that trigger regulatory

or statutory changes, nor do they have the same potential for causing harm due to smaller volume of production. The findings also support Ten Eyck et al. (2006) who found a disconnect between Michigan Department of Agriculture inspectors and cider processors, largely due to a lack of inspector knowledge of the cider making process. In contrast, this analysis found less disconnect between the state regulators in Alabama and Alabama processors than between the federal regulators and the Michigan processors, due to a greater understanding of the business and a greater personal interest in the outcome.

Analysis Findings

The combined qualitative and quantitative analyses indicate that state inspection programs *do* have a significant effect on the slaughter industry of a state. The statistical analysis found state inspection programs to be positively related to the number of Non-FI establishments. This is consistent with the findings from the interviews, and common sense, since state inspected establishments would not exist in states without an inspection program and thus increase the number of Non-FI establishments. It is interesting, however, that state inspection programs have a *negative* effect on the number of FI establishments. This suggests that state inspection may be a viable alternative to federal inspection, and given the option, establishments choose to remain under state inspection rather than federal inspection. However, state inspection appears to make little difference to the total number of slaughter establishments. It is important to remember that while FI establishments may be very small, Non-FI establishments are much more likely to be small or very small because they are restricted to intrastate sales. Because of their smaller size, Non-FI establishments are much more likely to do custom work for individual producers and thus support state meat production and AFNs, at least on the local level. Thus, it is recommended

that states start or maintain a state meat inspection program if the desired outcome is to promote alternative/local food systems that include red meat.

Limitations and Future Research

There are four main limitations to this study that would benefit from future research. First, custom exempt requires attention as their current and potential role in AFNs is unclear. In this project, custom exempt establishments were on the periphery—no custom exempt operators were interviewed. It would be of interest to know why these establishments choose not to be inspected. Some may have, for instance, tried inspection but failed to achieve the mandated standards or may have dropped inspection once their program was in place. The second limitation is that, due to the USDA reporting methods, there is no way to distinguish between custom exempt and state inspected establishments in the statistical analysis. This makes it impossible to see if custom exempt and state inspected establishments' numbers are related to different variables, due to the inspection differences between or some other reason. Third, while this analysis supports a state's decision to start or maintain a state meat inspection program to promote red meat AFNs, it does not consider the financial implications of doing so—is the benefit to the state economy worth the cost of the program?

Contribution to AFN Literature

The following subsection discusses how this project contributes to the study of AFNs and specifically how it helps fill the gaps in the literature as identified in Chapter 2.

Standards. Red meat producers face a particular challenge to participating in AFNs as compared to producers of other products. Slaughter/processing establishments are an *inherent* step in the red meat production process, and these establishments *are required by law* to comply

with the inspection regulations. Other standards and certifications commonly found in the AFN literature are voluntary (e.g., organic certification, certified humane) and make price premiums possible. Premium pricing can increase producer profits by offsetting the cost of compliance and increasing marketing opportunities. However, red meat producers do not experience price premiums for food safety inspection and record keeping; for both producers and processors, compliance costs are the cost of doing business, only some of which can be passed onto the buyer. Moreover, red meat producers do not have the option of having the wholesomeness (i.e., safety) of their product certified by a non-governmental agency (i.e., there are no known third-party certifiers of for red meat food safety), or communicated through an alternative channel (e.g., verbally rather than by a label). Furthermore, the regulatory challenges faced by AFN-participating red meat processors are significant. It is logical that at least some regulations contribute to the shortage of small slaughter establishments.

Actors. This research highlights the need to extend the study of AFNs beyond the producer-consumer interaction and better connect the production and distribution sides of AFNs. Because slaughter/processing are a critical production step for meat, producers and processors are largely co-dependent; without processors there is no product to sell and without producers there will be no processors. Because slaughter and processing are part of the creation and maintenance of quality attributes for meat (e.g., safety, organic) they are an important part of VBSCs, as well. These findings also indicate that there is a difference between the state (sub-national) and the State (federal) that ought to be considered in future studies. As demonstrated by this project, even when the regulations are the “same,” what matters is who interprets the standards, who oversees standard compliance, and who enforces standard implementation (i.e., what level of government and what agency).

Conclusion

This research is on the actors and standards that are specific to red meat; however, it has implications for other actors in AFNs. Food safety regulations are fundamentally different from other, voluntary, quality standards in that they are required by law, and producers and processors cannot opt out. The 2011 US Food and Drug Administration's (FDA) Food Safety Modernization Act (FSMA)²⁸ increased regulations for "food facilities," which "includes any factory, warehouse, or establishment ... that manufactures, processes, packs, or holds food" (21 USC §350d), to require hazard analysis and the implementation and monitoring of preventative controls (21 USC §350g). While there are exemptions for very small businesses and certain on-farm activities, the FSMA will likely have significant implications for producers, depending on the products produced, production scale, and end consumer, as well as the values-based supply chains (VBSCs) in which they engage, since food hubs and distributors do not come under the exemption. Thus, in the interests of furthering our understanding of AFNs, and to increase marketing and purchasing choices for both producers and consumers respectively, it is important to understand the effects that formal standards have on members of AFNs.

²⁸ The FSMA (Public Law 111–353) amends the Federal Food Drug and Cosmetic Act.

REFERENCES

- "Meat and Poultry Inspection." *Alabama Administrative Code (2006)*. Alabama Department of Agriculture and Industries. Chapter 80-3-10.
- Pathogen Reduction; Hazard Analysis and Critical Control Point (Haccp) Systems; Final Rule*.
- Chap. 839, 26 *U. S. Statutes at Large* 414 (1890).
- Chap. 555, 26 *U. S. Statutes at Large* 1089 (1891).
- Chap. 3913, 34 *U. S. Statutes at Large* 674 (1906).
- Chap. 2907, 34 *U. S. Statutes at Large* 1260 (1907).
- Federal Food, Drug, and Cosmetic Act*. 21 U.S. Code, Sections 301-399d (1938).
- Humane Methods of Livestock Slaughter Act*. *U.S. Code* (1958).
- Federal State Cooperative (Talmadge-Aiken) Act*. *U.S. Code* (1962).
- Wholesome Meat Act*. Public Law 90-201 81 *U. S. Statutes at Large* 584 (1967).
2005. "Generalized Linear Mixed Models." *Encyclopedia of Statistics in Behavioral Science*, edited by B. S. Everitt and D. C. Howell. *West Sussex, UK: John Wiley & Sons, Ltd.* 2. Retrieved February 24, 2012
(<http://www.wiley.com/legacy/wileychi/eosbs/pdfs/bsa261.pdf>).
- Adam, Ketherine, Radhika Balasubrahmanyam, and Holly Born. 1999. Direct Marketing. *Business Management Series*. Appropriate Technology Transfer for Rural Areas (ATTRA). Fayetteville, AR.
- Amann, Denise M., DVM. 2012. Staff Officer, Outreach and Partnership Division, Office of Outreach, Employee Education & Training, Usda-Fsis. E-mail to author, January 25.
- Antle, John M. 2000. "No Such Thing as a Free Safe Lunch: The Cost of Food Safety Regulation in the Meat Industry." *American Journal of Agricultural Economics* 82(2):310-322.
- Åsebø, Kjartan, Anne Moxnes Jervell, Geir Lieblein, Mads Svennerud, and Charles Francis. 2007. "Farmer and Consumer Attitudes at Farmers Markets in Norway." *Journal of Sustainable Agriculture* 30(4):67-93.
- Associated Press. 1968. "Meat Inspection Legislation Sought." *The Gadsden Times*, April 16, pp. 13. Retrieved October 31, 2010

<http://news.google.com/newspapers?id=rt8pAAAIBAJ&sjid=5dYEAAAIBAJ&pg=4314,1965353&dq=history+of+alabama+meat+inspection&hl=en>.

———. 2000. "State Meat Inspections Assist Small Operations." *The Bryan Times*, April 5, pp. 9.

<http://news.google.com/newspapers?id=FsszAAAIBAJ&sjid=hE4DAAAIBAJ&pg=6413,447044&dq=state+meat+inspection+minnesota+meat-inspection+-recall&hl=en>.

Azzam, Azzeddine. 1998. "Captive Supplies, Market Conduct, and the Open-Market Price." *American Journal of Agricultural Economics* 80(1):76-83.

Badgley, Catherine. 2003. "The Farmer as Conservationist." *American Journal of Alternative Agriculture* 18(04):206-212.

Barham, Elizabeth. 2002. "Towards a Theory of Values-Based Labeling." *Agriculture and Human Values* 19(4):349-360.

———. 2003. "Translating Terroir: The Global Challenge of French Aoc Labeling." *Journal of rural studies* 19(1):127-138.

———. 2007. "The Lamb That Roared: Origin-Labeled Products as Place-Making Strategy in Charlevoix, Quebec." Pp. 277-297 In *Remaking the North American Food System: Strategies for Sustainability*, edited by C. C. Hinrichs and T. A. Lyson. Lincoln, NE: University of Nebraska Press.

Becker, Geoffrey S. 2010. *Meat and Poultry Inspection: Background and Selected Issues*. CRS Report for Congress. Congressional Research Service. Washington, DC.

Bijleveld, Catrien C. J. H., Leo J. Th. van der Kamp, Ab Mooijaart, Willem A. van der Kloot, Rien van der Leeden, and Eeke van der Burg. 1998. *Longitudinal Data Analysis: Designs, Models and Methods*. Thousand Oaks, CA: SAGE Publications Inc.

Bloom, J. Dara, and C. Clare Hinrichs. 2010. "Moving Local Food through Conventional Food System Infrastructure: Value Chain Framework Comparisons and Insights." *Renewable Agriculture and Food Systems* 16(1):13-23.

Bower, Jim, Ron Doetch, Michael Fields, and Steve Stevenson. 2010. *Tiers of the Food System: A New Way of Thinking About Local and Regional Food*. UW-Madison Center for Integrated Agricultural Systems. Madison, WI. Retrieved Jan. 18, 2012
<http://www.cias.wisc.edu/wp-content/uploads/2010/09/tiers082610lowres.pdf>.

Brester, Gary W., and John M. Marsh. 2001. "The Effects of U.S. Meat Packing and Livestock Production Technologies on Marketing Margins and Prices." *Journal of Agricultural and Resource Economics* 26(2):445-462.

- Broadway, Michael. 2007. "Meatpacking and the Transformation of Rural Communities: A Comparison of Brooks, Alberta and Garden City, Kansas." *Rural Sociology* 72(4):560-582.
- Broadway, Michael J., and Donald D. Stull. 2008. "'I'll Do Whatever You Want, but It Hurts': Worker Safety and Community Health in Modern Meatpacking." *Labor: Studies in Working-Class History of the Americas* 5(2):27-37.
- Broadway, Michael J., Donald D. Stull, and Bill Podraza. 1994. "What Happens When the Meat Packers Come to Town?" *Small Town* 24:24-28.
- Buller, Henry, and Christine Cesar. 2007. "Eating Well, Eating Fare: Farm Animal Welfare in France." *International Journal of Sociology of Food and Agriculture* 15(3):45-58.
- Busch, Lawrence. 2000. "The Moral Economy of Grades and Standards." *Journal of rural studies* 16(3):273-283.
- . 2011. "The Private Governance of Food: Equitable Exchange or Bizarre Bazaar?" *Agriculture and Human Values* 28(3):345-352.
- Campbell, Hugh, Anne Murcott, and Angela MacKenzie. 2011. "*Kosher* in New York City, *Halal* in Aquitaine: Challenging the Relationship between Neoliberalism and Food Auditing." *Agriculture and Human Values* 28(1):67-79.
- Conner, David S., Victoria Campbell-Arvai, and Michael W. Hamm. 2008. "Value in the Values: Pasture-Raised Livestock Products Offer Opportunities for Reconnecting Producers and Consumers." *Renewable Agriculture and Food Systems* 23(1):62-69.
- Crowley, Martha, and Daniel T. Lichter. 2009. "Social Disorganization in New Latino Destinations?" *Rural Sociology* 74(4):573-604.
- DeLind, Laura, and Philip Howard. 2008. "Safe at Any Scale? Food Scares, Food Regulation, and Scaled Alternatives." *Agriculture and Human Values* 25(3):301-317.
- Donato, Katharine M., Charles M. Tolbert II, Alfred Nucci, and Yukio Kawano. 2007. "Recent Immigrant Settlement in the Nonmetropolitan United States: Evidence from Internal Census Data." *Rural Sociology* 72(4):537-559.
- DuPuis, E. Melanie, and David Goodman. 2005. "Should We Go 'Home' to Eat?: Toward a Reflexive Politics of Localism." *Journal of Rural Studies* 21:359-371.
- Durham, Catherine, Jerry Gardner, and Laura Ann Geise. 2009. Northwest Meat and Livestock Processor and Producer Survey on State Inspection Program. SR 1089-E. Oregon State University Extension Service. Salem, OR. Retrieved Jan. 11, 2012 (<http://extension.oregonstate.edu/catalog/pdf/sr/sr1089-e.pdf>).

- ERS USDA. 2009. "Dairy: Background." Washington, DC: Economic Research Service, USDA. Retrieved June 6, 2012 (<http://www.ers.usda.gov/briefing/dairy/background.htm>).
- Fairweather, John R., Lesley M. Hunt, Chris J. Rosin, and Hugh R. Campbell. 2009. "Are Conventional Farmers Conventional? Analysis of the Environmental Orientations of Conventional New Zealand Farmers." *Rural Sociology* 74(3):430-454.
- Feenstra, Gail W. 1997. "Local Food Systems and Sustainable Communities." *American Journal of Alternative Agriculture* 12(01):28-36.
- Fine, Ben. 1994. "Towards a Political Economy of Food." *Review of International Political Economy* 1(3):519 - 545.
- Fitzgerald, Amy J., Linda Kalof, and Thomas Dietz. 2009. "Slaughterhouses and Increased Crime Rates: An Empirical Analysis of the Spillover from "the Jungle" into the Surrounding Community." *Organization & Environment* 22(2):158-184.
- Fitzmaurice, Garrett M, Nan M. Laird, and James H. Ware. 2004. *Applied Longitudinal Analysis*. Hoboken, NJ: John Wiley & Sons, Inc.
- Flaccavento, Anthony. 2009. Healthy Food Systems: A Toolkit for Building Value Chains. Appalachian Sustainable Development. Abingdon, VA. Retrieved Dec. 8, 2011 (<http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELPRDC5091499>).
- Food Safety and Inspection Service. U. S. Department of Agriculture. 2004. *Fsis Directive 5720.2, Revision 3: State Cooperative Inspection Programs*. Washington, DC.
- . U.S. Department of Agriculture. 2008. *"At Least Equal to" Guidelines for State and Meat and Poultry Cooperative Inspection Programs*. Washington, DC.
- . U. S. Department of Agriculture. 2009. *Fsis Directive 5720.3: Comprehensive Review Methodology of State Meat and Poultry Inspection Programs*. Washington, DC.
- . U. S. Department of Agriculture. 2009. *Fsis Directive 5930.1, Revision 4: Custom Exempt Review Process*. Washington, DC.
- Fortin, Neal D. 2009. *Food Regulation: Law, Science, Policy, and Practice*. Hoboken, NJ: John Wiley & Sons, Inc.
- Friedland, William H. 1991. "Introduction: Shaping the New Political Economy of Advanced Capitalist Agriculture." Pp. 1-34 In *Towards a New Political Economy of Agriculture, Special Studies in Agriculture Science and Policy*, edited by L. B. W. H. Friedland, F. H. Buttel, A. P. Rudy. Boulder, CO: Westview Press.

- FSIS. 2012. "Inspection & Grading of Meat and Poultry: What Are the Differences?". Washington, DC: Food Safety Inspection Service, USDA. Retrieved June 11, 2012 (http://www.fsis.usda.gov/Factsheets/Inspection_&Grading/index.asp#3).
- Fuchs, Doris, Agni Kalfagianni, Jennifer Clapp, and Lawrence Busch. 2011. "Introduction to Symposium on Private Agrifood Governance: Values, Shortcomings and Strategies." *Agriculture and Human Values* 28(3):335-344.
- Gavin, Jennifer. 1981. "'Bumped-Aside' Bills Go Back on the Main Line This Week." *The Argus-Press*, March 23, pp. 16. Retrieved November 26, 2010 (<http://news.google.com/newspapers?id=EHkiAAAAIABAJ&sjid=-qwFAAAAIABAJ&pg=2459,1835648&dq=michigan+ends+state+meat+inspection+1981&hl=en>).
- Giedion, Siegfried. 1975. "Mechanization and Death: Meat." Pp. 209-256 In *Mechanization Takes Command*. New York, NY: Norton.
- Gilg, Andrew W., and Martin Battershill. 1998. "Quality Farm Food in Europe: A Possible Alternative to the Industrialised Food Market and to Current Agri-Environmental Policies: Lessons from France." *Food Policy* 23(1):25-40.
- GIPSA. 1996. *Concentration in the Red Meat Packing Industry*. Grain Inspection Packers and Stockyards Administration, US Department of Agriculture. Washington, DC. Retrieved April 22, 2011 (<http://archive.gipsa.usda.gov/pubs/packers/conc-rpt.pdf>).
- . 2000. *Packers and Stockyards Statistical Report: 1998 Reporting Year*. GIPSA SR-00-1. Grain Inspection, Packers and Stockyards Administration, US Department of Agriculture. Washington, DC. Retrieved Sept. 27, 2011 (<http://www.gipsa.usda.gov/Publications/psp/stat/statreport98.html>).
- . 2001. *Assessment of the Cattle and Hog Industries Calendar Year 2000*. Grain Inspection, Packers & Stockyards Administration, US Department of Agriculture. Washington, DC. Retrieved April 2, 2012 (<http://www.gipsa.usda.gov/Publications/psp/asses/assessment2000.pdf>).
- . 2002. *Captive Supply of Cattle and Gipsa's Reporting of Captive Supply*. Grain Inspection, Packers & Stockyards Administration, US Department of Agriculture. Washington, DC. Retrieved April 2, 2012 (http://www.gipsa.usda.gov/Publications/psp/captive_supply/captivesupplyreport.pdf).
- . 2008. *Packers and Stockyards Statistical Report: 2006 Reporting Year*. GIPSA SR-08-1. Grain Inspection, Packers and Stockyards Administration, US Department of Agriculture. Washington, DC. Retrieved Sept. 28, 2011 (http://www.gipsa.usda.gov/Publications/psp/stat/2006_stat_report.pdf).

- . 2011. *2010 Annual Report: Packers & Stockyards Program*. Grain Inspection, Packers and Stockyards Administration, US Department of Agriculture. Washington, DC. Retrieved September 28, 2011 (http://www.gipsa.usda.gov/Publications/psp/ar/2010_psp_annual_report.pdf).
- Goldstein, Harvey. 2011. *Multilevel Statistical Models*. 4th ed. West Sussex, UK: John Wiley & Sons, Ltd.
- Gouveia, Lourdes, and Arunas Juska. 2002. "Taming Nature, Taming Workers: Constructing the Separation between Meat Consumption and Meat Production in the U.S." *Sociologia Ruralis* 42:370-390.
- Guthman, Julie. 2002. "Commodified Meanings, Meaningful Commodities: Re-Thinking Production-Consumption Links through the Organic System of Provision." *Sociologia Ruralis* 42(4):295-311.
- Gwin, Lauren. 2009. "Scaling-up Sustainable Livestock Production: Innovation and Challenges for Grass-Fed Beef in the U.S." *Journal of Sustainable Agriculture* 33(2):189-209.
- Henson, Spencer, and Michael Heasman. 1998. "Food Safety Regulation and the Firm: Understanding the Compliance Process." *Food Policy* 23(1):9-23.
- Herbert-Cheshire, Lynda, and Geoffrey Lawrence. 2002. "Political Economy and the Challenge of Governance." *Journal of Australian Political Economy* 50:135-145.
- Higgins, Vaughan, Jacqui Dibden, and Chris Cocklin. 2008. "Building Alternative Agri-Food Networks: Certification, Embeddedness and Agri-Environmental Governance." *Journal of rural studies* 24(1):15-27.
- Hinman, Robert B., and Robert B. Harris. 1942. *The Story of Meat*. Chicago, IL: Swift & Company.
- Hooker, Neal H., Rodolfo M. Nayga Jr, and John W. Siebert. 2002. "The Impact of Haccp on Costs and Product Exit." *Journal of Agricultural and Applied Economics* 34(1):165-175.
- IBM. 2010. *Ibm Spss Statistics 19 Command Syntax Reference*. Armonk, New York: IBM Corporation.
- Spss Statistics (Version 19) [Software]. Armonk, New York: IBM Corporation. Retrieved from (www.ibm.com/software/analytics/spss/).
- Ilbery, Brian, and Moya Kneafsey. 1998. "Product and Place: Promoting Quality Products and Services in the Lagging Rural Regions of the European Union." *European Urban and Regional Studies* 5(4):329-341.

- . 1999. "Niche Markets and Regional Specialty Food Products in Europe: Towards a Research Agenda." *Environment and Planning A* 31:2207-2222.
- . 2000. "Producer Constructions of Quality in Regional Speciality Food Production: A Case Study from South West England." *Journal of rural studies* 16(2):217-230.
- . 2000. "Registering Regional Speciality Food and Drink Products in the United Kingdom: The Case of Pdos and Pgl." *Area* 32(3):317-325.
- Ilbery, Brian, Damian Maye, Moya Kneafsey, Tim Jenkins, and Catherine Walkley. 2004. "Forecasting Food Supply Chain Developments in Lagging Rural Regions: Evidence from the Uk." *Journal of Rural Studies* 20(3):331-344.
- Jaffee, Daniel, Jack R. Kloppenburg, and Mario B. Monroy. 2004. "Bringing the "Moral Charge" Home: Fair Trade within the North and within the South." *Rural Sociology* 69(2):169-196.
- Johnson, Dennis R., and Jolyda O. Swaim. 2005. "The Food Safety and Inspection Service's Lack of Statutory Authority to Suspend Inspection for Failure to Comply with Haccp Regulations." *Journal of Food Law & Policy* 1(2):337-373.
- Johnson, Renée. 2009. *Recent Acquisitions of U.S. Meat Companies*. CRS Report for Congress. Congressional Research Service. Washington, DC.
- Juska, Arunas, Lourdes Gouveia, Jackie Gabriel, and Susan Koneck. 2000. "Negotiating Bacteriological Meat Contamination Standards in the Us: The Case of *E. Coli*. O157:H7." *Sociologia Ruralis* 40:249-271.
- Juska, Arunas, Lourdes Gouveia, Jackie Gabriel, and Kathleen P. Stanley. 2003. "Manufacturing Bacteriological Contamination Outbreaks in Industrialized Meat Production Systems: The Case of *E. Coli* O157:H7." *Agriculture and Human Values* 20(1):3-19.
- King, Robert P., Michael S. Hand, and Gigi DiGiacomo. 2010. Case Study on Local Food Supply Chains: Research Design. The Food Industry Center, University of Minnesota. St. Paul, MN. Retrieved May 24, 2012 (http://foodindustrycenter.umn.edu/prod/groups/cfans/@pub/@cfans/@tfic/documents/asset/cfans_asset_250521.pdf).
- Kirwan, James. 2004. "Alternative Strategies in the Uk Agro-Food System: Interrogating the Alterity of Farmers' Markets." *Sociologia Ruralis* 44(4):395-415.
- . 2006. "The Interpersonal World of Direct Marketing: Examining Conventions of Quality at Uk Farmers' Markets." *Journal of rural studies* 22(3):301-312.

- Kneafsey, Moya, Brian Ilbery, and Tim Jenkins. 2001. "Exploring the Dimensions of Culture Economies in Rural West Wales." *Sociologia Ruralis* 41(3):296-310.
- Lerman, Tracy, Gail Feenstra, and David Visser. 2012. A Practitioner's Guide to Resources and Publications on Food Hubs and Values-Based Supply Chains. UC Sustainable Agriculture Research and Education Programs, University of California, Davis. Davis, CA. Retrieved May 24, 2012
http://russellranch.ucdavis.edu/resources/publications/KYF%20grey%20literature%20review%20GF%204-15%20FINAL_wcover.pdf.
- Libecap, Gary D. 1992. "The Rise of the Chicago Packers and the Origins of Meat Inspection and Antitrust." *Economic Inquiry* 30(2):242-262.
- Lockie, Stewart. 2009. "Responsibility and Agency within Alternative Food Networks: Assembling the "Citizen Consumer"." *Agriculture and Human Values* 26(3):193-201.
- Lowe, Marcy, and Gary Gereffi. 2008. A Value Chain Analysis of the U.S. Pork Industry: Report Prepared for Environmental Defense Fund. Center on Globalization, Governance & Competitiveness, Duke University. Durham, NC. Retrieved March 4, 2012
http://www.cggc.duke.edu/environment/valuechainanalysis/CGGC_Pork%20IndustryReport_10-3-08.pdf.
- . 2009. A Value Chain Analysis of the U.S. Beef and Dairy Industries: Report Prepared for Environmental Defense Fund. Center on Globalization, Governance & Competitiveness, Duke University. Durham, NC. Retrieved March 4, 2012
http://www.cggc.duke.edu/environment/valuechainanalysis/CGGC_BeefDairyReport_2-16-09.pdf.
- Lyson, Thomas A., and Judy Green. 1999. "The Agricultural Marketscape: A Framework for Sustaining Agriculture and Communities in the Northeast." *Journal of Sustainable Agriculture* 15(2-3):133-150.
- Lyson, Thomas A., and Amy Guptill. 2004. "Commodity Agriculture, Civic Agriculture and the Future of U.S. Farming." *Rural Sociology* 69:370-385.
- MacDonald, James M. 2003. "Beef and Pork Packing Industries." *Veterinary Clinics of North America: Food Animal Practice* 19(2):419-443.
- MacDonald, James M., and Michael E. Ollinger. 2000. "Consolidation in Meatpacking: Causes & Concerns." *Agricultural Outlook* June-July:23-26.
- . 2005. "Technology, Labor Wars, and Producer Dynamics: Explaining Consolidation in Beefpacking." *American Journal of Agricultural Economics* 87(4):1020-1033.

- MacDonald, James M., Michael E. Ollinger, Kenneth E. Nelson, and Charles R. Handy. 1996. "Structural Change in Meat Industries: Implications for Food Safety Regulation." *American Journal of Agricultural Economics* 78(3):780-785.
- Marsden, Terry. 1998. "New Rural Territories: Regulating the Differentiated Rural Spaces." *Journal of rural studies* 14(1):107-117.
- Marsden, Terry, Jo Banks, and Gillian Bristow. 2000. "Food Supply Chain Approaches: Exploring Their Role in Rural Development." *Sociologia Ruralis* 40(4):424-438.
- Maye, Damian, Lewis Holloway, and Moya Kneafsey, eds. 2007. *Alternative Food Geographies: Representation and Practice*. Oxford, UK: Elsevier.
- McBride, William D., and Jr. Mathews, Kenneth. 2011. *The Diverse Structure and Organization of U.S. Beef Cow-Calf Farms*. Economic Information Bulletin Number 73. USDA Economic Research Service. Washington, DC.
- McConnell, Eileen Diaz, and Faranak Miraftab. 2009. "Sundown Town to "Little Mexico": Old-Timers and Newcomers in an American Small Town." *Rural Sociology* 74(4):605-629.
- Morris, Carol, and James Kirwan. 2011. "Ecological Embeddedness: An Interrogation and Refinement of the Concept within the Context of Alternative Food Networks in the Uk." *Journal of rural studies* 27(3):322-330.
- Morris, Carol, and Craig Young. 2000. "'Seed to Shelf', 'Teat to Table', 'Barley to Beer' and 'Womb to Tomb': Discourses of Food Quality and Quality Assurance Schemes in the Uk." *Journal of rural studies* 16(1):103-115.
- Mount, Phil. 2012. "Growing Local Food: Scale and Local Food Systems Governance." *Agriculture and Human Values* 29(1):107-121.
- Murdoch, Jonathan, Terry Marsden, and Jo Banks. 2000. "Quality, Nature, and Embeddedness: Some Theoretical Considerations in the Context of the Food Sector." *Economic Geography* 76(2):107-127.
- Muth, M. K., S. A. Karns, M. K. Wohlgenant, and D. W. Anderson. 2002. "Exit of Meat Slaughter Plants During Implementation of the Pr/Haccp Regulations." *Journal of Agricultural and Resource Economics* 27(1):187-203.
- Muth, M. K., M. K. Wohlgenant, and S. A. Karns. 2007. "Did the Pathogen Reduction and Hazard Analysis and Critical Control Points Regulation Cause Slaughter Plants to Exit?" *Review of Agricultural Economics* 29(3):596-611.

- Nelson, Kenneth E. 1985. *Issues and Developments in the U.S. Meatpacking Industry*. ERS Staff Report No. AGES 850502. National Economics Division, Economic Research Service, USDA. Washington, DC.
- Ollinger, M., and D. Moore. 2007. "Food Safety Approaches to Examining Haccp Costs and Performance and Technologies." *Agribusiness* 23(2):193-210.
- Ollinger, Michael, Sang V. Nguyen, Donald Blayney, Bill Chambers, and Ken Nelson. 2005. *Structural Changes in the Meat, Poultry, Dairy, and Grain Processing Industries*. Economic Research Report 3. USDA Economic Research Service. Washington, DC.
- Perry, David 2011. "Slaughterhouse Shortage Stunting Area's Eat-Local Movement." *The New York Times*, April 7. Retrieved April 7, 2011
(http://www.nytimes.com/2011/04/08/us/08bcslaughterhouse.html?_r=1&hp).
- Pollan, Michael 2006. *The Omnivore's Dilemma: A Natural History of Four Meals*. New York, NY Penguin Press.
- Press, Associated. 1969. "2 Days Left. Showdown Time for Legislators." *The Tuscaloosa News*, August 25, pp. 1. Retrieved June 9, 2012
(<http://news.google.com/newspapers?id=HxgfAAAIBAJ&sjid=DZwEAAAIBAJ&pg=2548,5545916&dq=alabama+meat+inspection+act&hl=en>).
- Purcell, Wayne D. 1990. "Economics of Consolidation in the Beef Sector: Research Challenges." *American journal of agricultural economics* 72(5):1210.
- Qsr Nvivo (Version 8.0.335.0 SP4) [Software]. (1999-2009). Doncaster, Australia: QSR International Pty Ltd. Retrieved from (www.qsrinternational.com).
- Raynolds, Laura T. 2002. "Consumer/Producer Links in Fair Trade Coffee Networks." *Sociologia Ruralis* 42(4):404-424.
- Renting, Henk, Terry K. Marsden, and Jo Banks. 2003. "Understanding Alternative Food Networks: Exploring the Role of Short Food Supply Chains in Rural Development." *Environment and Planning A* 35:393-411.
- Sage, Colin. 2003. "Social Embeddedness and Relations of Regard: Alternative 'Good Food' Networks in South-West Ireland." *Journal of Rural Studies* 19(1):47-60.
- Severson, Kim. 2010. "In New York, Local Meat Is Easier to Find " *The New York Times*. Retrieved June 17, 2012
(<http://www.nytimes.com/2010/06/09/dining/09livestock.html?pagewanted=all>).
- Skaggs, Jimmy M. 1986. *Prime Cut: Livestock Raising and Meatpacking in the United States 1607-1983*. College Station, TX: Texas A&M University Press.

- Slaughter, Kara, Sam Cordes, Alan Tomkins, and Lyn Kathlene. 2001. Potential Impacts of State Meat and Poultry Inspection for the State of Nebraska. University of Nebraska Public Policy Center. Lincoln, NE.
- Stevenson, G. W., and R. Pirog. 2008. "Values-Based Supply Chains: Strategies for Agrifood Enterprises of the Middle." Pp. 119-143 In *Food and the Mid-Level Farm: Renewing an Agriculture of the Middle*, edited by T. A. Lyson, G. W. Stevenson and R. Welsh. Cambridge, MA: The MIT Press.
- Stull, Donald D., and Michael J. Broadway. 2004. *Slaughterhouse Blues: The Meat and Poultry Industry in North America*, In Series *Case Studies on Contemporary Social Issues*. Edited by J. A. Young. Belmont, CA: Wadsworth/Thomson Learning.
- Stull, Donald D., Michael J. Broadway, and David Griffith, eds. 1995. *Any Way You Cut It: Meat Processing and Small-Town America*. Lawrence, KS: University Press of Kansas.
- Tallontire, Anne, Maggie Opondo, Valerie Nelson, and Adrienne Martin. 2011. "Beyond the Vertical? Using Value Chains and Governance as a Framework to Analyse Private Standards Initiatives in Agri-Food Chains." *Agriculture and Human Values* 28(3):427-441.
- Ten Eyck, Toby A., Donna Thede, Gerd Bode, and Leslie Bourquin. 2006. "Is Haccp Nothing? A Disjoint Constitution between Inspectors, Processors, and Consumers and the Cider Industry in Michigan." *Agriculture and Human Values* 23(2):205-214.
- Tregear, Angela. 2011. "Progressing Knowledge in Alternative and Local Food Networks: Critical Reflections and a Research Agenda." *Journal of rural studies* 27(4):419-430.
- United States Small Business Administration. Select Committee on Small Business United States Senate. 1971. *The Effects of the Wholesome Meat Act of 1967 Upon Small Business: A Study of One Industry's Economic Problems Resulting from Environmental-Consumer Legislation Prepared by the Small Business Administration*. Washington, DC: U.S. Government Printing Office.
- USDA, FSIS 2010. "Slaughter Availability to Small Livestock and Poultry Producers - Maps ". Retrieved April 22, 2011 (http://www.fsis.usda.gov/PDF/KYF_maps-050410_FOR_RELEASE.pdf).
- Verhaegen, Ingrid, and Guido Van Huylenbroeck. 2001. "Costs and Benefits for Farmers Participating in Innovative Marketing Channels for Quality Food Products." *Journal of rural studies* 17(4):443-456.

- Walls, Theodore A., Hyekyung Jung, and Joseph E. Schwartz. 2006. "Multilevel Models for Intensive Longitudinal Data." Pp. 3-37 In *Models for Intensive Longitudinal Data*, edited by T. A. Walls and J. L. Schafer. New York, New York: Oxford University Press.
- Warren, Wilson J. 2007. *Tied to the Great Packing Machine: The Midwest and Meatpacking*. Iowa City, IA: University of Iowa Press.
- Warriss, P.D. . 2000. *Meat Science: An Introductory Text*. New York, NY: CABI Publishing.
- Watts, D. C. H., Brian Ilbery, and Damian Maye. 2005. "Making Reconnections in Agro-Food Geography: Alternative Systems of Food Provision." *Progress in Human Geography* 29(1):22-40.
- West, Brady T. 2009. "Analyzing Longitudinal Data with the Linear Mixed Models Procedure in Spss." *Evaluation & the Health Professions* 32(3):207-228.
- Whatmore, Sarah, and Lorraine Thorne. 2008. "Nourishing Networks: Alternative Geographies of Food." Pp. 235-247 In *Reading Economic Geography* edited by T. J. Barnes, J. Peck, E. Sheppard and A. Tickell. Oxford, UK: Blackwell Publishing Ltd.
- Williams, Willard F., and Thomas T. Stout. 1964. *Economics of the Livestock-Meat Industry*. New York, NY: The Macmillan Company.
- Winter, Michael. 2003. "Geographies of Food: Agro-Food Geographies – Making Reconnections." *Progress in Human Geography* 27(4):505-513.
- . 2004. "Geographies of Food: Agro-Food Geographies – Farming, Food and Politics." *Progress in Human Geography* 28(5):664-670.
- . 2005. "Geographies of Food: Agro-Food Geographies – Food, Nature, Farmers and Agency." *Progress in Human Geography* 29:609-617.
- Wiser, Vivian. 1986. "Meat and Poultry Inspection in the United States Department of Agriculture." *Journal of NAL Associates* 11:169-205.
- Worosz, M. R., A. J. Knight, C. K. Harris, and D. S. Conner. 2008. "Barriers to Entry into the Specialty Red Meat Sector: The Role of Food Safety Regulation." *Southern Rural Sociology* 23:170-207.
- Worosz, Michelle, Andrew Knight, and Craig Harris. 2008. "Resilience in the Us Red Meat Industry: The Roles of Food Safety Policy." *Agriculture and Human Values* 25(2):187-191.
- Wright, Wynne, Elizabeth Ransom, and Keiko Tanaka. 2005. "The "All-American Meal": Constructing Confidence in the Case of Bse." *Illness, Crisis & Loss* 13(2):95-115.

Yeager, Mary. 1981. *Competition and Regulation: The Development of Oligopoly in the Meat Packing Industry*. Greenwich, CT: Jai Press.

APPENDIX A

State inspection program data/dates.

Year in which state inspection program:	Started [^]	Ended ^o	Restarted ^z
AL	1971*		
AK	1970†	July 31, 1999	
AZ	1971*		
AR	1970†	June 1, 1981	
CA	1969†	April 1, 1976	
CO	1971*	July 1, 1975	
CT	1971*	October 1, 1975	
DE	1971*		
FL	1969†	December 2, 1997	
GA	1971*		
HI	1971*	November 1, 1995	
ID	1970†	July 1, 1981	
IL	1971*		
IN	1971*		
IA	1971*		
KS	1970†		
KY		January 14, 1972	
LA	1971*		
ME	1971*	1980	June 16, 2003
MD	1969†	April 1, 1991	
MA	1971*	January 12, 1976	
MI	1971*	October 3, 1981	
MN		1971*	December 27, 1998
MS	1971*		
MO	1971*	August, 1972	January 11, 2001
MT		1971*	1987
NE	1971*	October 1, 1971	
NV	1971*	July 1, 1973	
NH	1971*	August 7, 1978	
NJ	1971*	July 1, 1975	
NM	1970†	August 13, 2007	
NY	1971*	July 16, 1975	
NC	1971*		
ND		April 15, 1970.	October, 2000
OH	1971*		
OK	1970†		
OR	1971*	July 1, 1972	
PA	1971*	July 17, 1972	

Year in which state inspection program:	Started [^]	Ended ^o	Restarted ^z
RI	1971*	October 1, 1981	
SC	1970†		
SD	1971*		
TN	1970†	October 1, 1975	
TX	1971*		
UT	1971*		
VA	1971*		
VT	1971*		
WA	1970†	June 1, 1973	
WV	1971*		
WI	1971*		
WY	1970†		

Sources:

*by June

† by December 15

[^] Data from pages 27, 40-41: United States Small Business Administration. Select Committee on Small Business United States Senate. 1971. *The Effects of the Wholesome Meat Act of 1967 Upon Small Business: A Study of One Industry's Economic Problems Resulting From Environmental-Consumer Legislation Prepared by the Small Business Administration*. Washington, DC: U.S. Government Printing Office.

^o Data from FSIS website

http://www.fsis.usda.gov/regulations_&_policies/listing_of_states_without_inspection_programs/index.asp

(Retrieved Feb. 9, 2012) except for:

- ME data from: Mack, Sharon. 1999. "Bill would reinstate state meat inspection act." *Bangor Daily News*, April 29, pp. A6. Retrieved February 9, 2012 (<http://news.google.com/newspapers?nid=2457&dat=19990429&id=CqJJA AAAI BAJ&sjid=Sw0NAAAAI BAJ&pg=1736,3947790>).
- MN and MT data from pages 27, 40-41: United States Small Business Administration. Select Committee on Small Business United States Senate. 1971. *The Effects of the Wholesome Meat Act of 1967 Upon Small Business: A Study of One Industry's Economic Problems Resulting From Environmental-Consumer Legislation Prepared by the Small Business Administration*. Washington, DC: U.S. Government Printing Office.
- MO data from Missouri Meat and Poultry Inspection Program via email on July 7, 2011.
- ND data from page 2: Wulff, Scott M., Timothy A. Petry, Delmer L. Helgeson, and Randal C. Coon. 1986. "Feasibility of Establishing Small Livestock Slaughter Plants in North Dakota." Agricultural Economics Report No. 208. North Dakota State University in cooperation with N.D. Agricultural Products Utilization Commission. Fargo/Bismarck, ND.

^z Restarted program data from following sources:

- ME data from Main Department of Agriculture, Food and Rural Resources website <http://www.maine.gov/agriculture/qar/inspection.html> (Retrieved July 7, 2011).
- MN data from FSIS news bulletin <http://www.fsis.usda.gov/oa/news/1998/minnesota.htm> (Retrieved July 2, 2011).
- MO data from FSIS news bulletin <http://www.fsis.usda.gov/Frame/FrameRedirect.asp?main=http://www.fsis.usda.gov/OA/news/2001/mostat e.htm> (July 1, 2011).
- MT data from page 20: Tiedeman, R. Jake, and Dennis E. Burson. N.d. "Exploring Requirements for a State Meat and Poultry Inspection Program in Nebraska." University of Nebraska. Lincoln, NE. Retrieved Jan. 11, 2012 (http://www.agr.state.ne.us/meat_inspection_report/state_meat_inspection_report.pdf).
- ND data from North Dakota Department of Agriculture via phone on July 14, 2011.

APPENDIX B

Sections of 9CFR relevant to small red meat slaughter and processing establishments, Alabama adopted sections highlighted.

9CFR	Section Title	Number of Sub-Sections
300	“Agency Mission and Organization.”	5
301	"Terminology; Adulteration and Misbranding Standards."	2
302	"Application of Inspection and Other Requirements."	3
303	"Exemptions."	2
304	"Application for Inspection; Grant of Inspection."	3
305	"Official Numbers; Inauguration of Inspection; Withdrawal of Inspection; Reports of Violation."	5
306	"Assignment and Authorities of Program Employees."	5
307	"Facilities for Inspection."	7
309	"Ante-Mortem Inspection."	18
310	"Post-Mortem Inspection."	24
311	"Disposal of Diseased or Otherwise Adulterated Carcasses and Parts."	38
312	"Official Marks, Devices and Certificates."	9
313	"Humane Slaughter of Livestock."	7
314	"Handling and Disposal of Condemned or Other Inedible Products at Official Establishments."	11
315	"Rendering or Other Disposal of Carcasses and Parts Passed for Cooking."	3
316	"Marking Products and Their Containers."	16
317	"Labeling, Marking Devices, and Containers."	34
318	"Entry into Official Establishments; Reinspection and Preparation of Products."	33
319	"Definitions and Standards of Identity or Composition."	57
320	"Records, Registration, and Reports."	7
321	"Cooperation with States and Territories."	2
325	"Transportation."	18
329	"Detention; Seizure and Condemnation; Criminal Offenses."	9
331	"Special Provisions for Designated States and Territories; and for Designation of Establishments which Endanger Public Health and for Such Designated Establishments."	6
335	"Opportunity for presentation of views before report of criminal violations."	1
350	“Special Services Relating to Meat and Other Products.”	7
391	“Fees and charges for inspection services and laboratory accreditation.”	5
416	"Sanitation."	13
417	"Hazard Analysis and Critical Control Point (HACCP) Systems."	8
424	“Preparation and Processing Operations.”	4
430	“Requirements for specific classes of product.”	2
441	"Consumer Protection Standards: Raw Products."	1
442	“Quantity of contents labeling and procedures and requirements for accurate weights.”	5
500	“Rules of Practice.”	8

Note: Other Sections of Chapter III that apply to red meat but are not included in this table are 9CFR: 322, 327, 351, 352, 354, 355 which cover import and export of meat/product, pet food products, and inspection of non-amenable species. Section 390 pertains to public information; 439 covers accreditation of laboratories; 362, 381 and 590 and 592 apply to poultry and egg inspection.

APPENDIX C

9CFR § 303.1 Exemptions. Part (a) only. Formatted as found on Electronic Code of Federal Regulations (<http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=8e3f81e25facc54db4360134d51229e0&rgn=div8&view=text&node=9:2.0.2.1.4.0.22.1&idno=9>)

(a) The requirements of the Act and the regulations in this subchapter for inspection of the preparation of products do not apply to:

(1) The slaughtering by any individual of livestock of his own raising, and the preparation by him and transportation in commerce of the carcasses, parts thereof, meat and meat food products of such livestock exclusively for use by him and members of his household and his nonpaying guests and employees;

(2) The custom slaughter by any person of cattle, sheep, swine, or goats delivered by the owner thereof for such slaughter, and the preparation by such slaughterer and transportation in commerce of the carcasses, parts thereof, meat and meat food products of such livestock, exclusively for use, in the household of such owner, by him and members of his household and his nonpaying guests and employees; nor to the custom preparation by any person of carcasses, parts thereof, meat or meat food products derived from the slaughter by any individual of cattle, sheep, swine, or goats of his own raising or from game animals, delivered by the owner thereof for such custom preparation, and transportation in commerce of such custom prepared articles, exclusively for use in the household of such owner, by him and members of his household and his nonpaying guests and employees: *Provided*, That the following requirements are met by such custom operator;

(i) Establishments that conduct custom operations must be maintained and operated in accordance with the provisions of §§416.1 through 416.6, except for: §416.2(g)(2) through (6) of this chapter, regarding water reuse and any provisions of part 416 of this chapter relating to inspection or supervision of specified activities or other action by a Program employee. If custom operations are conducted in an official establishment, however, all of the provisions of part 416 of this chapter shall apply to those operations.

(ii) If the custom operator prepares or handles any products for sale, they are kept separate and apart from the custom prepared products at all times while the latter are in his custody;

(iii) The custom prepared products are plainly marked “Not for Sale” as provided in §316.16 of this subchapter, immediately after being prepared and are kept so identified until delivered to the owner; and

(iv) If exempted custom slaughtering or other preparation of products is conducted in an official establishment, all facilities and equipment in the official establishment used for such custom operations shall be thoroughly cleaned and sanitized before they are used for preparing any products for sale.