THE PARADOX OF STANDARD SETTING IN GLOBALIZED AGRI-FOOD PRODUCTION SYSTEM

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Globalization has engendered increased complexity in the modern society. This complexity penetrates almost every aspect of our life. In the context of food systems, globalized food supply chains have created greater challenges for assuring food safety, with myriad actors, who are economically, socially and culturally diverse, involved in the production and distribution processes. To manage such complexity, food safety standards have been established in order to assure the public interest. Nevertheless, food safety scandals persist on a global scale, in both developed and developing countries. This has revealed a problematic system of safety standard setting as well as an urge to re-examine the current food safety system. Much of the discussion on food safety standards focuses on their impact on trade as non-tariff barriers in the era of intensified globalization. Relatively few studies have examined food safety standards in the context of globalized value chain production and the implications for safety assurance. This thesis explores the dynamics and tensions between globalized value chain production and safety standard setting in the US broiler industry between the 1980s and the 2010s. Adopting a multi-dimensional qualitative method, combining historical analysis, institutional analysis and interviews, this thesis maps the critical food safety points within the US broiler value chain and the related safety standards, and identifies the gaps between the economic benefits of value chain production and the public goal of food safety assurance.
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Chapter 1: Introduction

The organization of modern society is inherently complex. It entails exceptionally intricate sets of relations and processes, constituting a multilayered system where myriad actors interact in a nonlinear fashion. The advent of the technology boom of the Twentieth Century brought significant changes to various fields, rendering the world unprecedentedly connected via economic expansion, cultural exchanges and political coalitions. These constitute major aspects of today’s globalization. Inspired by this global convergence, Thomas Friedman whispered to his wife (and the rest of the world): honey, I think the world is flat (Friedman, 2005, p.5). In Friedman’s metaphor, a flattening world is driven by economic and culture homogenization in the course of globalization and, as a consequence, the playing field is being leveled. “BUT”, as Leamer said: “physically, culturally, and economically the world is not flat. Never has been, never will be” (Leamer, 2006).

Globalization, in its very nature, is a disruptive process that “rearranges where and how work is done and where and how profits are made” (Pearlstein, 2011). However, in the long term, globalization can only sustain itself if the disruption is fair and broadly beneficial. Hidden behind Friedman’s flattening world is unsettling heterogeneity, stemming from the inherent paradox of globalization. On the one hand, the benefits of globalization will be maximized if everyone “abides by the same set of rules, hammered out and enforced by some form of technocratic global government” (Pearlstein, 2011). On the other hand, most countries resist the existence of a global government that operates beyond their sovereignty: nor are they willing to give up their distinctive cultural and social heritage. Therefore, intensified globalization not only opens up lucrative markets but also introduces more uncertain variables in the absence of a universal governance structure.
Today, globalization is driven by four factors, namely cost, the market, the environment and competition (Czinkota & Ronkainen, 2011). The practice of international trade is oriented toward optimizing these factors by reducing costs, expanding markets, utilizing the environment and consolidating competitive advantages. Much of this optimization process is conducted via outsourcing and offshoring, engendering a globalized value chain. Simultaneously, coordination and regulation of such a complex system have become extremely challenging given the huge number of players with disparate interests as well as cultural and social diversity. It is this challenge that begs a solution to cope with such complexity: namely, standardization.

The proliferation of standards organizations (at both the national and international levels) during the past two decades mirrors the increasing importance of standardization and its indispensable role in facilitating globalization. Standards, as the interface that governs interactions (Garcia, 2013), embody powers that can be utilized to generate and maintain social order. They prescribe rules or protocols to be followed by individuals and organizations, as well as penalties in case of violation. The HACCP (Hazard Analysis of Critical Control Point) system, required by the USDA as a mandatory standard for meat/poultry processing in the US, greatly improves product safety via scientifically based methods to identify, monitor and control each point of potential contamination during production (Hulebak & Wayne, 2002). The power of standards is legitimized by their (arguably) science-based objectivity. Standards bring certainty and predictability by eliminating alternatives and regulating interactions.

Paradoxically, the scientific attributes of standards often veil the political maneuvers of standard systems. Market-driven private standards organizations make profits by selling standards (Office of Technology Assessment [OTA], 1992). Inefficient standards may prevail due to a variety of factors other than the quality of standards per se. The QWERTY keyboard
may be the best example illustrating the ways in which inefficient standards won out via network externalities and lock-in effects (David, 1985). Ineffective standards schemes may also engender new conflicts and uncertainties, which translate to economic loss and impediment for social development. This is easily seen in the continuous food safety scandals worldwide. China’s melamine milk scandal in 2008 sickened hundreds of infants, and almost destroyed the entire Chinese dairy industry. Meanwhile, standards, by the mechanism of inclusion and exclusion, create winners and losers (Grewal, 2009). The fierce standards wars in the IT industry present abundant cases of this sort. This standards paradox illustrates how standards not only reduce complexity but also generate new complications.

One issue stemming from this paradox is the rising challenge of managing the increasingly fragmented value chains of modern industries. Organizational failures in the form of inefficient standardization often undermine the public interest. This growing challenge for standard setting has co-evolved with the economic and institutional contexts of standards organizations. For one thing, government standards agencies (e.g., the USDA, FDA) have been struggling to keep pace with the dynamics of the industries. This is because of slow, arduous bureaucratic procedures, as well as a debatable lack of specific expertise in a given industry. Another complication is that standards organizations in the private sector (e.g., National Chicken Council, Midwest Poultry Consortium) are driven by the market rather than the public interest. Meanwhile, the deepening

1 China’s milk scandal in 2008: The exposure of melamine adulteration in dairy products, infant formula in particular, is known as the country’s worst contamination crisis. 13 infants died from resulting kidney damage and more than 50,000 infants were hospitalized. The industrial chemical melamine, highly topical, was intentionally added into dairy products to increase protein content to meet the national standard. The scandal raised concerns about food safety and political corruption in China, and damaged the reputation of China's food exports, with at least 11 countries stopping all imports of Chinese dairy products. Meanwhile, domestic market for China’s milk products has shrunk drastically, with a decline in annual production from 35 million tons in 2008 to 28 million tons in 2009 (Icandata, 2013).

2 Standard wars are an important part of the development of IT industry. One feature of these wars is the take-it-all effect: the winning standard, regardless of its technical superiority, usually ends up dominating the market and profits. This is easily seen in the victory of TCP/IP over OSI as the Internet protocol, the QWERTY keyboard example and etc.
fragmentation of value chains has increased the degree of structural unreliability and uncertainty with respect to accountability (of stakeholders within the chain) and safety (of the products).

In the realm of agri-food production, accelerated industrialization over the past three decades has extended the value chains across multiple countries. The challenge for standard setting looms larger, inasmuch as the variety of players involved and the difficulty in tracking and controlling the flow of inputs during the production process. Key stakeholders in agri-food production include (but are not limited to) international standards organizations (e.g., ISO, UN, WHO), national standards institutes (e.g., FDA, USDA), private standard consortia, as well as producers (e.g., growers, processing plants), retailers and consumers. Each of these entities holds disparate goals toward safety standard setting. They also have different interpretations of what counts as an efficient standardization scheme or even a credible safety standard. Repetitive agri-food scandals reflect ineffective mechanisms of safety control, implying a problematic standard setting system of agri-food production.

These problems are especially salient in the chicken industry in the United States. This is evident in the frequent salmonella outbreaks in chicken products, such as the Salmonella Heidelberg Infections in Tyson Chicken in 2014 and the Salmonella Outbreak in Foster Farm Brand chicken in 2013 (Centers for Disease Control and Prevention[CDC], 2014). The features of chicken meat production make it extremely susceptible to contamination. Besides, the drastic growth of chicken production and consumption over the recent three decades\(^3\) has presented greater challenges for standard setting in the industry to assure safety goals. Compounding the problem is the expanding value chain of chicken production spanning multiple nations (including developing countries with notorious “food safety scars”) and the disparate interests of

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\(^3\) Average annual per capital consumption of chicken in the US increased from less than 50 pounds in 1980 to 60 pounds in 2012 (USDA, 2013).
stakeholders. In August 2013, the USDA approved processed chicken imports from China, arousing huge public consternation in American society (Elliot, 2013). Meanwhile, the newly announced USDA poultry inspection standards are reportedly inefficient and inadequate to assure the safety of chicken products (Kindy, 2013).

These issues reveal a tension between the economic benefits of value chain production and the public goal of safety assurance with regard to standard setting in the US chicken industry. This disparity begs the question: what, if any, are the gaps between production and standard setting in the U.S. chicken industry? In particular, what impact does the value chain have with respect to safety standards implementation? Is there a gap between the value chain and the standardization process? What are the implications for chicken production, chicken consumption, and public policy?

This paper argues that a combination of economic, social and institutional processes in the last thirty years have shifted the landscape of standard setting in the US chicken industry. The intensified globalization during this period has increased the level of complexity for chicken production, which is characterized by expanding value chains spanning transnational contexts, making it increasingly difficult to assure safety goals. These new challenges derive from the gaps between standards institutions that are responsible for setting and monitoring the production processes, and in particular the process of standards implementation.

This thesis employs a multi-dimensional qualitative methodology, including a historical analysis of the US broiler industry over a period of thirty years (between the 1980s and the 2010s)\textsuperscript{4}, and institutional analysis of the standard-setting field. It also employs value chain analysis and conducts expert interviews. This paper looks at the institutional arrangements of

\textsuperscript{4} Although the beginning of the US modern poultry industry dates back to 1920s, my research focuses on the highly integrated and expansion-oriented period of the industry starting in the 1980s.
safety standard setting in the US chicken industry, as well as the evolution and coordination of
the US broiler value chain over the past three decades. The value chain analysis will provide a
useful tool to examine the shifting patterns of global production and the governing mechanism of
the US chicken industry (Global Value Chain Initiative, 2006). In addition, analysis in each
chapter will be informed by interviews with professionals and practitioners in the field. These
interviews will help generate grounded perspectives to the risks and challenges associated with
assuring food safety goals in the US broiler industry.

In Chapter 2, the paper conceptualizes the problem by laying out the existing literature on
globalization and complexity, as well as the literature describing the key components of a value
chain analysis, and the role of institutions with special attention to standards and the standard
setting process. Based on this theoretical framework, Chapter 3 will unpack the complexity of
the US chicken industry over the past thirty years. To achieve this, I will perform a qualitative
analysis of the value chain of the US chicken industry between the 1980s and the early 2010s,
identifying the stakeholders and examining the structure of the industry. Included will be an
analysis of the impacts of globalization on the industrialization of the US chicken production.
From there I will analyze the points of interaction within the value chain and the governance of
the value chain in relation to achieve safety goals. Finally, I will analyze the economic, social
and institutional roots where the value chain governance is embedded.

Chapter 4 will focus on the safety standards system in the US broiler industry. I will first
define food safety and safety standards in the broiler industry. Using current literature, official
documents and interviews, I will examine safety standard setting in the globalized agri-food
production system. Included will be a brief historical review of safety standards for meat and
poultry in the United States and the emergence of globalized standard setting field for food
safety. Then I will look at safety standard setting for the US broiler value chain. Specifically, I will examine the safety standards for both domestic chain and import chain of the US broiler industry. This will help understand the interplay between safety standards and value chain activities with respect to safety assurance.

Having looked at the value chain in Chapter 3 and the standardization process in chapter 4, chapter 5 will compare the two processes in order to identify the gaps between them. By identifying these disconnections, this chapter will provide a map of where policy makers might make a difference. On that basis, this thesis will propose some preliminary policy recommendations. In the concluding chapter, I will summarize the results of the study, as they have derived from the analysis, and identify the limitations of the study and the areas for future research.
Chapter 2: Theoretical Framework

Introduction

This study seeks to uncover how the globalized value chain of the US poultry industry has affected safety standard setting and implementation. It does so by first examining how intensified globalization in the past three decades has altered the “fitness landscape” for the US poultry industry, and how the industry has responded to these changes by expanding their value chains. In doing so, it focuses on the points of interaction along the value chain by looking at the key stakeholders, their interests and motivations, as well as their power relationships. Then, the paper looks at the institutional context in which the contemporary US broiler industry is embedded. In particular, it examines both the public and private sectors with respect to setting safety standards for poultry production and products, and how these standards are related to the operation of the globalized value chain of the US broiler industry.

This chapter conceptualizes a framework for analysis, building on our understanding of complexity studies and value chain governance. It begins with a review of the literature on contemporary globalization and its implications for coordination challenges in modern society. Next, it characterizes standards and the role that standardization can play in solving coordination problems. Then it describes the paradoxical nature of contemporary globalization and standardization, that is to say, the processes that engender homogeneity and complexity simultaneously. Based on this theoretical framing, this chapter concludes by describing how concepts of complexity studies, organizational field theory and value chain analysis can be incorporated to advantage in capturing the interactions within and between complex systems in modern society.
Contemporary Globalization

The end of the Cold War marks the beginning of contemporary globalization, when the stark hostility between capitalism and communism faded away, bringing about a structural transformation of the international system: from centralized and hierarchical to diffuse and decentralized (Cerny, 1999, p.193). The integration and consolidation in various fields (namely, commerce, technology, media and culture) prevailed on a global scale (Grewal, 2008, p.17). Yet, globalization is by no means unique to our time. And the failure to capture the historical trajectory of globalization would blind us from recognizing the real significance of today’s globalization (Rothschild, 1999).

Globalization comes with a long history dating back to the early modern period. Traces of early globalization can be found in Western European writers’ commentaries about life in the sixteenth century, which is characterized by:

“[The] increasing internationalization of their commercial, intellectual, and cultural affairs, and … the changes in the subjective identities of people and peoples that such internationalization brought about.” (Rothschild, cited in Grewal, 2008, p.18).

In the early nineteenth century, the German philosopher Hegel was among the first to theorize globalization. His work unveiled both the connectedness of disparate places and the increasing awareness of such connectedness (Eriksen, 2007, p.1). The nineteenth century witnessed enormous transformations worldwide: the colonial expansion, the innovation of communication and transportation technologies (e.g., the first telegraph in 1828; the first transatlantic cable in 1866), industrialization, and the proliferation of international trade. These changes rendered the world increasingly connected and interdependent. The global interconnectedness continued to intensify in the twentieth century, with a new level of technology innovation, the proliferation of mass media (mainly television), as well as the
increasing number of multinational corporations and transnational organizations (e.g., NGOs).

The historical context reveals two key features of globalization: the compression of space and the transformation of society. The conceptualization of globalization, both in earlier times and in the present, addresses these two features. As Roland Robertson (1992, p.8) concisely puts it: “Globalization as a concept refers both to the compression of the world and the intensification of consciousness about the world as a whole.” Grewal (2008, p.19) posits that, “any idea of globalization… must begin with the compression of space, a change in geographic distance as it is lived and conceived.”

In addition to the compression of physical space, the other feature of globalization: social changes, or in Durkheim’s term (as cited in Grewal, 2008), the reconfiguration of socio-economic substructures, constitute a more significant aspect of the globalizing process. As Grewal wittingly points out:

“The release from geographic constraint does not in itself bring about many transformations in the way that people live and relate to each other without a second set of social changes that enable them to cooperate in international and transnational activities” (Grewal, 2008, p.19).

Here, what Grewal means by “a second set of social changes” that “enable them to cooperate” actually touches upon the core concept in his interpretation of contemporary globalization: the network power of standards⁵, which not only emerges from but also enables globalized social coordination. This coordination is achieved via the adoption of shared standards that define the particular way in which individuals are interconnected in a network (Grewal, 2008, p.21). Based on this account, contemporary globalization can be seen as a standardization project.

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⁵ Network power of standards is based on two ideas: first, standards gain greater value when larger numbers of people use them since they provide a form of coordination that exhibits economics of scale; second, over a long period of time, the adopted standards will eliminate alternative standards that might have been freely chosen (Grewal, 2008, p.26).
This view resonates with Thomas Eriksen’s work (2007) on globalization. He conceives standardization as a key dimension of contemporary globalization. As he says, “globalization entails comparability and shared standards where there were formerly none” (Eriksen, 2007, p.8). The competition between various standards for global dominance marks the defining feature of globalization today (Grewal, 2008, p.20). It is this feature that underlies the complexity and contestation in the era of contemporary globalization.

The Paradox of Globalization

As discussed previously, the process of globalization involves both extended social coordination and the development of common standards that regulate such coordination. Since the end of the Cold War, the world has been moving toward an increasingly interconnected system, characterized by intensified global trade, massive financial flows, the division of labor on a global scale (via offshoring and outsourcing), regional political coalitions (e.g., the EU) and cultural exchanges. To function, this system must rely on a range of rules and processes necessary for effective governance. However, as Cerny (1999, p.206) argues, instead of globalization leading to the emergence of a more clearly defined and homogenous world order, the world today has become increasingly differentiated with respect to economic and political structures. No two countries in the world approximate each other in these regards. Even within the European Union, trade disputes between member states on how to define a specific product illustrate how economic, social and cultural heterogeneities persist even in the era of contemporary globalization.

Hence, integral to globalization today is a coordination challenge without a universal

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6 Other dimensions of globalization are: dis-embedding (including de-localization), acceleration (the speed of transport and communication), interconnectedness, movement, mixing, vulnerability (of blurring boundaries), and re-embedding.
governance structure to help ameliorate it. As Grewal (2008, p.50) argues, the central tension in today’s globalization is the resistance of a supranational sovereignty regime: “everything is being globalized except politics.” Grewal furthers his argument by distinguishing between transnational organizations with a political agenda (e.g., the UN and other treaty organizations) and sovereignty power operating at the global level. UN agencies and others like them are quasi-political forums created by national states in a voluntary fashion. None resemble a sovereign power operating at the international level. In the absence of a global sovereignty, the governance of globalization is primarily state-centered (Prakash & Hart, 1999, p.28). It is this disconnection between globalized exchanges and localized/regionalized governance structures that give rise to the mounting difficulties faced both by national states and the global system in providing “stability, security, prosperity and collective goods” (Cerny, 1999, p.190).

Mancur Olson perceives coordination challenges as collective action problems. Olson (as cited in Cerny, 1999, p.204) posits that, “one of the key factors which made collective action difficult in large groups [is] the inability of large groups to monitor the behavior of members who might be tempted (or determined) to free-ride.” The extensity, intensity and velocity of today’s global interactions in political, social and economic spheres have rendered collective action problems much more salient and have altered the global governance landscape leading to new complications:

“Globalization is not just about changing relations between the ‘inside’ of the nation-state and the ‘outside’ of the international system. It cuts across received categories, creating myriad multilayered intersections, overlapping playing fields, and actors skilled at working across these boundaries. People are at once rooted and rootless, local producers and global consumers, threatened in their identities yet continually remaking those identities” (Cerny, cited in Bickel, 2012).
Against the complex globalizing processes prevailing at each layer of our society today, one key force to cope with complexity has caught growing academic attention in recent years. That is standardization. As previously mentioned, contemporary globalization theorist, Thomas Eriksen, conceives of standardization as a key dimension of contemporary globalization. Similarly, James Scott examines the role of standardization (combined with simplification and abstraction) in the crafting of modern states: “[State] officials took exceptionally complex, illegible, and local social practices… and created a standard grid whereby it could be centrally recorded and monitored” (Scott, 1998, p.2). As well, the standardization of measurement, language, laws, monetary system, formal education and production and transportation, not only reduced massive coordination failures but also allowed political, economic and cultural exchanges to extend beyond national and regional boundaries. In this sense, standardization is a major solution to the problem of social coordination, enabling reciprocal interaction and cooperation in both domestic and global systems (Grewal, 2008, p.22).

Existing studies of standards and standardization fall into three major categories: the science-based technical examination of standards and standard setting in a specific industrial field (Thompson, 1954; Costin & Hagstrum, 1995; David & Geoffrey, 1996; Boström & Klintman, 2006); the econometric analysis of standards harmonization and its impact on international trade (David & W. Edward, 1994; Otsuki, Wilson, & Sewadeh, 2001; Moenius, 2004, 2006; Shepherd, 2007); and the sociological perspective on standards and its relation to issues of collective action (Lindahl, 1987; Belleflamme, 2002; Egyedi & Joode, 2003; Narrod, Roy, Okello, Avendaño, Rich & Thorat, 2009; Busch, 2011). This paper employs the sociological lens to study the mechanisms of standard setting in our society and their impacts on
the organization of social order. To understand how standardization achieves its coordinating function as well as its implications for organizing modern society, one needs to take a step back and look at the nature of standards.

The definition of standards varies in different contexts, yet they embody certain common attributes. Bowker and Star (1999) offer six dimensions of standards:

1. Standards are the rules for production.
2. Standards reach across several communities of practice (be it temporally or persistently).
3. Standards are deployed to coordinate actors and things over distance and heterogeneous metrics.
4. Standards are usually enforced by legal bodies (be they professional organizations, manufacturers’ organizations or the state).
5. There is no natural law that the best standards shall win.
6. Standards are subject to significant inertia and can be extremely expensive to change.

Simply put, standards are the rules of the game. They are social and technical devices that support and facilitate interaction (Busch, 2011). Viewing from a panoramic perspective, Garcia (2013) defines standards as “the interfaces governing interactions”, whether between individuals, machines or individuals and machines. According to Garcia, standards are the fundamental building blocks of life:

“...[It] was only by virtue of the standard interfaces inherent in the universe that the diverse entities that comprise all phenomena were able to interact, repair, coevolve, and recreate themselves” (Garcia, 2013).

Standards assume a governing role that create organizational order by “providing the rules, or protocols, to be followed in order for objects to interact” (Garcia & Burns, 2012). For this reason, the control of standards has always been a central (yet often underestimated) aspect of modern economic life (Bowker & Star, 1999). Standards facilitate trade by standardizing economic practices, laying out the business and legal frameworks for commercial activities, as well as introducing the mechanism for product differentiation (Garcia, 2012). All these
standardization efforts stabilize the market, foster trust, and lower transaction costs by suppressing opportunism. Describing the westward expansion in the United States, Garcia (2013) notes:

“…Market conditions and prices fluctuated widely from place to place. Lawlessness and opportunism were commonplace. To generate the stable conditions and levels of trust essential for trade to take place, standard economic processes and practices were required” (Garcia, 2013).

Standardized measurement, time, production and performance are required to coordinate the increasingly complex interactions of modern society. At the same time, however, it is standards that have spurred growing contention between players with a stake in the standards process. Contributing to this contention is the role of the private and public sectors in standard setting arena. Garcia (2013) elaborates on this point in her studies of information technology standards in the United States. She argues that, because standards embody the characteristics of public goods, market-driven standards (especially in network industries) are often subject to inefficiencies and market failures. Thus, they can undermine the public interest (Garcia, 2013).

To understand this contention, one needs to recognize that standards do not exist in a vacuum. They are rooted in the socio-economic context and interwoven within the institutional structure of a society. Standards are set at different levels and scopes (e.g., micro, mezzo or macro), cutting across several communities of practice. In addition, standards players, seeking their own advantage, compete with each other for control of the system. To take account of these various components, some standards scholars have begun to view the standards arena as an organizational field: A collection of organizations operating within the same domain, with similar services or products, exchange partners, competitors, funding sources and regulators.  

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7 According to Wenger and Garcia (2012), communities of practice refer to the “distinct types of communities in which rules, norms, meaning, and identity are established over time based on the ongoing interactions and negotiations that accompany participation in a shared enterprise.
By adopting an organizational field perspective, we can view the standard setting process in its entirety (Garcia, 2013). A more detailed account of organizational fields is laid out below.

**Complex Systems**

Globalization is a game of social coordination, and standardization generates the governing rules of this game (Grewal, 2008). These two processes are interdependent and co-evolving in a nonlinear fashion. As Cerny describes:

“Globalization impacts…governance by altering the deeper structures which underlie governance processes and mechanisms, altering various conditions or parameters which affect the likely mix of hierarchy, market and network – whether in terms of socio-cultural structures, economic production and consumption, or political processes and institutions” (Cerny, 1999, p.188).

Globalization involves myriad transformative processes in which the units within these processes change together with the overall environment (Prakash & Hart, 1999). It exhibits dialectic tensions between convergence and divergence, which translates into the increasing complexity of society. Meanwhile, standardization, providing a solution to complexity, consists of another set of dialectic tensions. On the one hand, it facilitates coordination by a mechanism of inclusion and exclusion; on the other hand, it engenders new complications via that very mechanism. Here, two complex systems\(^8\) coevolve: globalization and the standards system operating within it.

Given the multiple processes involved in both globalization and standardization, it is crucial to understand the interplay between these two systems and the implications for policy making that aims to assure the public interest. Such an inquiry can only be performed given a specific

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\(^8\) In complexity studies, a complex system is defined as “a system in which large networks of components with no central control and simple rules of operation give rise to complex collective behavior, sophisticated information processing, and adaptation via learning or evolution” (Mitchell, 2009).
context. This thesis focuses on the globalized agri-food system, and contextualizes the study in the US poultry industry between the 1980s and the 2010s. This paper adopts a qualitative value chain approach to unpack the structure and points of interaction within this system. In addition, this paper uses concepts from both complexity studies and organizational field theory to study the complex dynamics of the industry, the standard setting field and the interplay between them. The rest of this chapter will examine the key features of each of these analytical lenses.

**The Value Chain Approach**

A value chain refers to “the full range of activities, including coordination, which are required to bring a specific product from its conception to its end use and beyond” (Gereffi, Lee & Christian, 2009). A value chain approach permits analysis of the entire architecture of a complex network. For example, in the chicken industry, a value chain framework captures the entire structure of the industry from supplier, producer to retailer and consumer. A value chain perspective is extremely relevant in understanding the dynamics of an organizational field. It is a structural approach that not only identifies the stakeholders in a specific system, but also captures key points and interactions within the chain.

According to Gereffi, a value chain analysis consists of four major elements: an input-output structure, geography, governance, and institutions. The input-output structure maps the production process of a specific product. In the case of chicken production, the input-output structure refers to the process that takes place from the farm to the fork. Geographic factors connect the process and activities along a value chain to a physical location\(^9\). The governance structure captures the power relations of a value chain. Institutional elements map the institutional context in which the value chain is embedded, including government agencies,

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\(^9\) Given the focus, scope and limited resources of this paper, the geography element of the value chain framework is not discussed.
unions, trade associations, NGOs, etc. It is within the institutional context that the organizational field of standard setting is located (Gereffi et al., 2009).

**Key Concepts from Complexity Studies**

In the 1990s, complexity studies started to attract academic attention (Albrecht, 2001, p.409). It emerged with a focus on “understanding how interactive, dynamic systems, composed of highly interconnected yet relatively independent component parts, behave in an orderly fashion” (Cole, 2013). These studies offer a collection of new concepts for understanding the nature of systems and systematic changes. Characterized below are some key concepts that together enable a relatively thorough understanding of the dynamic interplay within and between complex systems.

*The distinction between system and environment*

In complexity studies, the concept of a system refers to a self-reproducing unit, which has “internal processes that [are] internally connected and reproduce the system” (Walby, 2009, p.51). Each component in the system participates in the production or transformation of other components. The distinction between system and environment is fairly simple: each system takes all other systems as its environment (Bertalanffy, 1968).

*Coevolution of complex adaptive systems*

The system/environment distinction enables a further elaboration on the interactions and changes between systems. The concept of coevolution captures the mutual impacts between system and its environment. Since any system consists of initial endogenous relations, the previous internal structure of a system will have complex effects upon the internal relations of the other systems in the environment. In order to respond to the changing environment, the
system changes accordingly. Since the environment contains other systems, these other systems must also change.

**Fitness Landscape**

Kauffman (1993) elaborates on the concept of coevolution among multiple systems with the notion of a fitness landscape, which was originally used to describe the evolutionary processes of species\(^{10}\). According to Kauffman (1995), “Evolution is a story of organisms adapting by genetic changes, seeking to improve their fitness.” Here, fitness is viewed as the ability of a particular genotype\(^{11}\) to survive within its environment (Monge & Contractor, 2003, p.264). Each gene is assigned a fitness value, with the higher value representing the higher likelihood to survive. The fitness value of the genotype in an individual member is calculated as the average of all genes that constitute that genotype. By doing this, a fitness landscape is generated, which shows all possible combinations of genetic traits of a population. Species evolve by attempting to “optimize their fitness by finding, selecting, and retaining the best genotypes” (Monge & Contractor, 2003, p.265), engendering a changing fitness landscape.

The concept of changing fitness landscape is applied to social sciences as an important analytical perspective to characterize changes in complex adaptive systems. In this context, fitness is interpreted as profitability, productivity or any other measure of success of actors within a system (Levinthal, 2011; Levinthal & Warglien, 1999; McKelvey, 1999a, b). Garcia shares a similar point in her studies on stakeholders’ performance in the policy field:

“The measurement of an actor’s ability to match its resources to a particular context constitutes the actor’s *fitness level*. The higher an actor’s fitness level is, the greater and more appropriate its resources,

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\(^{10}\) Kauffman introduces the notion of “fitness landscape” to understand the origins of the life on earth, by examining how complex systems self-organize and coevolve with their environments.

\(^{11}\) According to Kauffman, a genotype refers to the unique configuration of genes possessed by the individual members of each population of a given species’ (Kauffman, 1993, p.40).
and the more competitive the actor is likely to be... The context to which the actor must adapt is called the fitness landscape... [which] defines the criteria for a policy actor’s success in any given situation” (Garcia, 2004).

The concept of a “changing fitness landscape” allows researchers to incorporate the notion of power in the analysis since changes in the fitness landscape may alter opportunities and obstacles within the system, allowing actors to function more or less successfully. Moreover, as the landscape changes, some players may be able to alter the environment to their own benefits. The ability to achieve such changes so as to “advantage one system over another is a vital form of power” (Walby, 2009, p.93), and this is how the notion of power is embedded in the analysis of the dynamics of fitness landscapes.

**Organizational Field Theory**

Similar to complexity studies, organizational field theory studies the dynamic interplay between and among multiple systems. However, instead of focusing on the system as a whole, organizational field theory focuses on a narrower set of relations as outlined in the definition of an organizational field:

“...[A] population of organizations operating in the same domain, as indicated by the similarity of their services or products. Included also are those others that critically influence their performance, including exchange partners, competitors, funding sources and regulators” (Scott, 2001).

Accordingly, an organizational field is a discrete arena of institutional life, relatively self-contained and independent within its own sphere of activity (Schwartz, cited in Garcia, 2005).

According to Fligstein and McAdam (2012, p.83), an organizational field is characterized by the ongoing internal tensions between incumbents and challengers in the “contest for positioning.” In this process, efficiency or optimal order is by no means guaranteed. For example, when an organizational field becomes the battlefield of contesting actors its autonomy
is undermined (Garcia, 2005). Under this circumstance, actors in an organizational field are likely to reach out (usually to the state) for external assistance to reinforce their own positions as well as to reestablish order.

Given such internal tensions, an organizational field is subject to instability. To maintain its normal functioning, state intervention might be called for. Indeed, as argued by Garcia (2013), the relationship between an organizational field and its institutional context is self-reinforcing. Organizational fields are constitutive of the institutional context, while the institutional context undergirds as well as re-creates the order of the organizational fields. It is this self-reinforcing mechanism that makes changes within an organizational field extremely difficult. If major changes do occur, it is generally associated with fundamental structural changes in the entire institutional environment.

Conclusion

This chapter has provided the basis for framing the analysis of this thesis to unfold the tensions between the economic goal of value chain production and the public goal of safety assurance in the US chicken industry over the past three decades. The theoretical framework illustrated in Figure 1 helps to identify the key variables in determining standards outcomes and their interactions. In this multi-layered system, where myriad players compete as well as cooperate with each other within and across the layers, each circle represents a unit. Each unit can be viewed as a complex system embedded in its environment comprised of all the other units.

Within the organizational field of the US chicken industry, two sub-fields are at the core of examination: the industrial structure between the 1980s and the 2010s, and the standards setting arena. The concepts from complex studies (system/environment, coevolution and fitness
landscape) will help capture the endogenous tensions within each sub-field as well as the interplay between them. The existing body of literature on related topics has primarily focused on how standard setting field affects the structure and operation in the industry. This paper will look into the interplay between these two sub-fields, with an emphasis on the function of the value chain with regard to standard implementation.

The next chapter will examine the structure of the US chicken industry over the recent decades via a qualitative value chain analysis. It begins with a brief historical review of the development of the US chicken industry from the 1980s to the early 2010s. The value chain analysis will map the structure and key players, as well as the points of interactions within the value chain of the US chicken industry. This will shed light on the conflicts and risks emerged from the industry. Chapter 4 will unpack the mechanisms of standard setting in the US broiler industry. Analyses in this chapter will be buttressed by existing materials and documents, and complemented by interviews with professionals working in the broiler safety standard setting arena in the US. Based on chapter 3 and chapter 4, chapter 5 will identify and analyze the gaps between the operation of the value chain and the standards setting field in the US chicken industry. Throughout the analyses of the three chapters, I will refer to the concepts and definitions described in this chapter. In particular, field theories and terms from complexity studies will inform the understanding of coordination problems in the era of intensified globalization.
Chapter 3: The Globalization of the US Broiler Industry

Introduction

This chapter explores the globalization of the US broiler industry from the 1980s to the early 2010s. The previous chapter described the theoretical framework, combining complexity studies, global value chain (GVC) analysis and organizational field theory to capture the dynamics of complex systems. Concepts from complexity studies (e.g., system/environment distinction, complex adaptive system and fitness landscapes) enable a dynamic, multi-dimensional analysis of complex systems. The GVC framework captures the entire structure of an industry from the production to consumption of a specific end product on a global scale (Gereffi, 2009). According to Gereffi (2009), the analysis of a particular value chain entails four major components, the input-output structure, the geography, governance and institutions. The organizational field theory highlights the contention and interdependence within a system by identifying the manner in which incumbents and challengers position themselves against each other.

This chapter applies this macro-analytical lens to the US broiler industry between the 1980s and the 2010s. It presents an evolving picture of the input-output structure of the US broiler industry over this period, and maps the governance patterns by identifying and analyzing the points of interaction within the chain.

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12 According to US Poultry Products Inspection Act, the term “poultry” means any domesticated bird, whether live or dead. Poultry meat includes broiler meat, turkey meat, capons and stewing hens. Broiler meat constitutes over 99 percent of ready-to-cook chicken production and chicken accounted for 86 percent of all poultry production, with turkey accounting for most of the remainder (data from USDA for 2006). For the ease of analysis, the poultry meat industry or chicken industry in this thesis refers to the broiler industry.

13 Given the limited time and resources of conducting this study, the geographic component is not discussed in this thesis.

14 The concept of governance varies in different contexts. In this thesis, “value chain governance” is used to describe the relationship and coordination patterns of stakeholders in the US broiler value chain. Scholars such as Humphrey (2006) interpreted value chain governance as a term similar to “economic governance” in transaction costs economics. He proposes that, “governance takes place within a broader institutional context of the ‘rules of the game’ for economic transactions” (Humphrey, 2006). In the case of the US broiler industry, the governance is embedded in the standards infrastructure, which refers to the institutional context in this paper.
Before we delineate the operational architecture of the US broiler industry, it is necessary to clarify the historical context within which it has evolved. To this end, the chapter begins with a brief overview of the history of modern broiler production in the United States between the 1980s and the 2010s. It then unpacks the globalized value chain structure of the US broiler industry. Next, it explores the organization and coordination patterns between chain actors by analyzing three endogenous variables (complexity of transactions, codification of information, and capability of suppliers), which together determine the governance type at various segments of the chain.

*A Brief History of the US Broiler Industry between the 1980s and the 2010s*

The beginning of America’s broiler industry dates back to the 1920s on the Delmarva Peninsula, where individual farmers ordered chicks from a hatchery, raised them as broilers, and sold them to a local buyer who transported them to nearby cities for restaurants and hotel markets (Stull & Broadway, 2013, p.44). During the following decades, the broiler industry expanded rapidly, transforming chicken “from an expensive delicacy, reserved for Sunday dinner or special occasions, into an everyday, inexpensive meat” (Stull & Broadway, 2013, p.47). This transformation was facilitated by research developments in chicken genetics and nutrition, which enabled farmers to produce birds of better quality and larger size with reduced production costs. Simultaneously, fast transportation and improved storage technique allowed the

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15 Broilers are young chickens bred for meat. They account for nearly all chicken meat and most poultry meat produced in the USA.

16 World War II boosted the broiler production in the US and also redistributed the geographical distribution of broiler production. By 1950s, the “broiler belt” in the US “stretched from the Delmarva Peninsula through North Carolina, Georgia, Alabama, and Mississippi to Arkansas and East Texas” (Stull & Broadway, 2013, p.46).
local buyers\textsuperscript{17} to reach distant markets (Midkiff, 2004; Horowitz, 2006). By the late 1950s, the structure of the modern broiler industry was established:

“...[By] combining production, processing, and distribution in the same firms, the poultry industry achieved complete vertical integration (Heffernan, 1984, p.238). It also developed close working relationships with poultry specialists and university agriculture extension agents, whose job it is to provide farmers with the latest research findings. Poultry companies funded university research on avian genetics and nutrition, while extension agents worked directly with company servicemen to increase grower efficiency and expand markets” (Stull & Broadway, 2013, p.46).

By the early 1980s, the US broiler industry was almost entirely integrated and operating under a unique contract system. Over 95 percent of the broilers in the US market were grown and processed by less than 40 companies (Stull & Broadway, 2013, p.48). Lead firms (also known as “integrators”) contracted with farmers to raise their broilers to the market weight (MacDonald, 2008). The integrators owned their own hatcheries, feed mills, and processing plant. They provided the farmers with day-old chicks, feed, medication and other technical assistance. The farmers, in turn, covered the costs for fully equipped grow-out houses, labor, insurance and utilities (Stull & Broadway, 2013, p.48). A broiler grower received a payment based on performance compared to other growers. That is to say, apart from the guaranteed payment for each flock raised to the market weight, extra payments between different growers varied according to the quantity of meat delivered for the same amount of feed and chicks provided by the integrator (MacDonald, 2008). Under this organizational system, the farmers lost direct

\textsuperscript{17} The local buyers here serve as middlemen, who collect produce from small farmers and sell them to distant markets.
access to the market, whereas integrators controlled all stages of broiler production\textsuperscript{18} and processing.

Between the 1980s and the 1990s, the average annual growth of chicken production reached 4.9 percent, with per capita consumption growing from 45 pounds in 1980 to 63 pounds in the late 1990s, surpassing per capita consumption of pork (50 pounds per person in the late 1990s) and beef (70 pounds per person in late 1990s)\textsuperscript{19}. The rapid growth of chicken production was driven by a variety of factors. For one, concerns over red meat’s fat content and safety hazards resulted in a shift of consumers’ dietary preferences from beef to chicken as a cheaper and healthier choice for animal protein (Horowitz, 2006, p.103-104). For another, the proliferation of the fast food industry (led by Kentucky Fried Chicken [KFC]) further altered people’s eating habits: chicken was served as a meal to be eaten quickly and for lunch (Horowitz, 2006, p.103). In addition, the marketing strategies (through commercial campaigns and product differentiation) by large lead firms presented the American shoppers with a variety of chicken products in different cuts, sizes, and flavors (Horowitz, 2006, p.117-119). Last but not least was the advanced technology to raise and process chicken in short generation intervals (compared to beef and pork), enabling broiler companies to standardize and brand their products according to consumers’ preferences, which were increasingly health-conscious and convenience-oriented\textsuperscript{20} (Horowitz, 2006; Striffler, 2006). By the early 2000s, Americans’ annual consumption of chicken reached 81 pounds per capita. Chicken has become America’s favorite meat (Horowitz, 2006, p.127).

\textsuperscript{18} Although broiler breeding is outsourced to independent growers, the integrators still have close control over the farms via specified production criteria in their contracts with the growers.
\textsuperscript{20} The consumption patterns of broiler products shifted greatly from the early 1960s to the late 1990s. In 1962, over 87 percent of the birds consumed in the United States were whole broilers while in 1997, the percentage declined to only 13 percent.
The economic success of the US broiler industry in the twentieth century has set a standard for agriculture industrialization in the United States. “…the (poultry) industry was pioneering what some claim is ‘the most advanced form of food production in the entire world’ (Williams, 1998, ix) and others decry as ‘industrial agriculture’” (Heffernan, cited in Stull & Broadway, 2013, p.46). Some scholars conclude that the distinctive organization of the broiler industry has been an important contributing factor to the increasing productivity and output (Rogers, 1979; Lasley, Henson & Jones, 1983; Kneober, 1989; MacDonald, 2008). Vertical integration and contract systems have also spread to the beef and pork sectors, but to a much lesser extent.

The drastically increased poultry consumption in the US engendered a new problem for poultry companies: the enormous surpluses of chicken parts (such as chicken feet, legs and thighs) unfavored by American consumers, who preferred breasts and white meat to dark meat (Ollinger, Nguyen, Blayney, Chambers & Nelson, 2005). Recognizing that many consumers in Asian countries value these chicken parts and would pay higher prices for them, US poultry firms have expanded to international markets. Jim Sumner, president of the USA Poultry and Egg Export Council pointed out, “we would much rather sell our paws to China for 80 cents a pound than we would as pet food for two cents a pound” (Sumner, cited in Gardner, 2013).

As a result, broiler exports grew enormously between the early 1970s and the late 1990s. In fact, export growth between 1990 and 2000 constituted nearly 30 percent of the growth in chicken production (ERS Data), reaching the highest percentage between1960 and 2005. By 2012, broiler meat accounted for 45 percent (3.3 million metric tons) of total US meat exports. The United States has become the world’s second-largest broiler meat exporter following Brazil (Davis, Harvey, Zahniser, Gale & Liefert, 2013). As Ollinger et al. note:

“The combined pull of higher prices for some products in overseas markets and a low-cost production system that relied
on vast economies of scale led to a sharp increase in poultry exports from less than 150 million pounds in 1972 to about 4.6 billion pounds by 1999” (Ollinger et al., 2005).

Entering the twenty-first century, the US poultry industry faced new challenges. In the mid-1990s, the growth of broiler production had slowed down, resulting in price fluctuations in domestic markets. Reduced productivity growth forced the profit-driven poultry firms to search for organizational innovations and deeper market expansion. One response to this reduced productivity growth was the value adding strategy of further differentiation of processed (ready-to-eat and semi-cooked) chicken products. While integration and concentration allowed the lead firms to achieve scale economies by producing vast quantities of low-cost poultry products, their production methods also introduced high risks of bacterial contamination (Horowitz, 2006, p.125). Repetitive salmonella and avian influenza outbreaks in broiler products within and outside the US are illustrative in this regard (CDC trending records). Compounding the safety issue was the rapid growth of broiler imports to the US. Although the US maintains a small amount of broiler imports (less than 1 percent of domestic production), it is worth pointing out that the volume of imported broiler products jumped from 2,000 million tons in 1996 to 52,000 million tons in 2013, generating a 2500-percent increase (Data from USDA-ERS).

Behind these figures is a mixed bag of new opportunities and obstacles for the US broiler industry. Intensified globalization has allowed US broiler firms to brand and target their products in international markets. Simultaneously, globalization subjects the US broiler industry to international turbulence. For example, Russia used to be a leading destination for US broiler exports until 2008, when it imposed stringent restrictions on meat imports, resulting in a sharp decline in the total volume of US broiler exports (Davis et al., 2013). These challenges have

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21 Other challenges include the tension between farmers and integrators, putting the contract system under government and public scrutiny, as well as the rising concern for environmental pollution. Studies on these issues can be found in abundant volumes thus these two aspects are not addressed in this paper.
motivated the US broiler industry to develop new trade partners and expand to new markets, especially emerging markets in developing countries, where safety standards are below US requirements. But trade partnerships are not a one-way street: international trade operates according to the principle of reciprocity. Therefore, sustainable export expansion requires increased broiler imports. Jim Sumner, president of the USA Poultry and Egg Export Council said, “it (granting China access to the American broiler market) is something we’ve been pushing for as an industry for several years…(China) is one of our largest export markets and has the potential, by far, to be our largest market, and we don’t want to risk upsetting them. (Sumner, cited in Seattle Times, 2013)”

Expansion to the global markets has tremendously complicated the US broiler trade since,

“[The] movement of animal diseases, conflicting standards for processing, and policies related to domestic production and trade are common factors affecting broiler meat trade” (Davis et al., 2013).

The robustness of the globalized US broiler industry depends crucially on the standards infrastructure that not only facilitates trade exchanges but more importantly guarantees food safety. Often, the private goal of economic benefits and the public goal of safety assurance are at odds with one another. This tension is played out in the standards arena. It is this paradox that this paper addresses. However, before we can delve into the standard setting arena, we must first develop a deeper understanding of the organizational structure of the US broiler industry.

The Structure of the Globalized US Broiler Value Chain

This section provides a global value chain (GVC) analysis to explore and describe the value adding activities in the production-distribution processes in the US broiler industry. This
discussion will explicate the structure of the inter-organizational relationships and linkages between different actors within the chain.

Studies of agribusiness value chains parse the input-output process into five general stages: inputs, production, processing, distribution and retail (Humphrey, 2006; Nadvi, 2008; Gereffi, Lee & Christian, 2009) with minor variations when applied to different sectors. In the context of the US broiler industry, the input-output structure presented in this paper is based on Gary Gereffi’s framework on US-based agricultural value chain and extended framework with a global dimension, adding exporting and importing elements to the inputs, production, processing and distribution stages (Figure 4).

The US broiler industry is distinguished by its vertically integrated and horizontally concentrated organizational structure. Large poultry firms (the integrators) have assumed a dominant position, exerting direct control over the inputs, processing and distribution stages. Deepened integration is driven by the increasing dependence on R & D in all stages in order to create breeds of larger size and better quality, as well as to increase processing efficiency and branding power. Meanwhile, low profit margins and high sunk costs have pushed small poultry companies out of business, leading to growing concentration in the boiler industry. For example, two of the largest integrators, Tyson Food and Pilgrim’s Pride, together shared 48 percent of the US market in 2006, up from 30 percent in 1996 (Gereffi, Lee & Christian, 2009).

Large integrators, as shown in Figure 4, own feed mills, hatcheries, processing plants and access to domestic and international markets. They outsource broiler breeding to independent farmers under a unique contract system and provide the growers with feed, chicks, veterinary medicine and technical assistance. In turn, the contracted growers provide labor and time, as well as cover the costs of fully equipped modern grow-out houses (with heating, cooling, ventilation,
feeding and watering systems) and required facility upgrading. Upon reaching market weight in 6-7 weeks, the broilers are transported (usually scheduled by integrators) to the processing plants to be slaughtered for initial and further processing, packaging and labeling. Various chicken products are sold to different buyers, including supermarkets, fast food chains, restaurants, and other local food retailers.

Retail giants, such as supermarkets (e.g., Wal-Mart, Kroger) and fast food chains (e.g., McDonald’s, KFC) have increased their power in the chicken value chain over the past three decades through increased buying power and deepened consolidation. Fast food chains accounted for 55 percent of the chicken consumed in foodservices\textsuperscript{22} in 2005 (Gereffi et al., 2009). Wal-Mart alone represented 13.8 percent of Tyson’s entire sales in 2009 (Wikinvest, 2009). By the early 2000s, the top three fast food chains — McDonald’s (23.4%), Yum! Brand (including KFC) (10%), and Burger King (6.8%) — together constituted more than 40 percent of the domestic market (Gereffi et al., 2009), while over 60 percent of total US grocery sales were made by the 20 largest food retailers, including Wal-Mart, Kroger, Supervalu, Safeway, etc. (Gereffi et al, 2009).

From the early 1980s to 2013, drastic growth of chicken exports (as well as imports) reflected the expansion of the US broiler value chain on a global scale. Export volume of broiler meat in 2013 is 13 times the volume of that in 1980\textsuperscript{23}, generating a 1200 percent growth rate over the past three decades (USDA-ERS Data on Broiler Exports). The 3 largest foreign markets for US broiler products are Russia, China (including Hong Kong) and Mexico. Imports of

\textsuperscript{22} Foodservices here include fast food chains, restaurants, hotels and noncommercial channels such as hostels and school (Gereffi et al., 2009)

\textsuperscript{23} The volumes of broiler exports in 1980 and 2013 are 275, 000 million tons and 3,354,000 million tons respectively (ERS Broiler Export Data).
chicken products have grown remarkably between 1995 and 2013\textsuperscript{24} (Figure 2). Broiler imports multiplied 25 times during this period. The top 3 for US broiler meat imports are Canada, Chile and Mexico. In 2013, the USDA allowed processed chicken imports from China with the condition that the broilers must be born and raised in the US. This announcement has engendered public consternation for the potential safety hazards of imported broiler products. Although no empirical data exists yet to analyze the safety implications of this policy decision, it indeed indicates an increasing impact of international trade on the value chain structure of the US broiler industry and the concomitant challenges for safety regulation.

In summary, the structure of the US broiler value chain is characterized by vertical integration, horizontal concentration and global expansion. The vertical integration has improved broiler productivity significantly in recent years, as it facilitates R & D, scale economies and a timely response to market changes. Concentration is observed at both sides of the value chain: supplier (the integrators) and buyer (supermarkets and fast-food chains). With rising interdependence, three types of lead firms (integrators, supermarkets and fast-food chains) together control the way chicken is produced, sourced, marketed, and sold. Simultaneously, growing domestic broiler consumption and production has also driven the industry’s global expansion, generating a globalized value chain. Unpacking the globalized value chain structure is critical to exploring the points of interaction between value chain actors in the broiler industry and its implications for food safety, to which we now turn.

The Coordination Pattern of the Value Chain: Points of Interaction

This section addresses the linkages and relations within broiler value chain networks. In particular, it maps the coordination patterns (also known as “governance type”) and points of

\textsuperscript{24} The US did not import boiler meat until 1995. The volumes of broiler imports in 1995 and 2013 are 2,000 million tons and 51,000 million tons respectively (USDA-ERS Data on Broiler Imports).
interaction among key stakeholders with regard to safety standard setting. To this end, this section first adopts the 3-Determinant framework developed by Gereffi, Humphrey and Sturgeon to analyze the type of governance at each stage within the globalized broiler value chain. Following that, it utilizes Gereffi and Lee’s framework of Value Chain Governance and Food Standards to explore how the globalized value chain structure of the US broiler industry has altered the landscape for food safety assurance. Finally, this chapter proposes two hypotheses on the role and incentives of public and private sectors with respect to safety standard setting in the US broiler industry.

3-Determinant Framework and its application in the US broiler industry

Based on existing theoretical discussions and empirical studies of global value chain governance, Gereffi, Humphrey and Sturgeon derive a framework to capture the dynamics at various value chain segments that shape the coordination pattern at various points of interaction. The 3-Determinant framework identifies three endogenous variables that together determine the governance types within a particular value chain. They are: complexity of transactions, codifiability of information, and capability of suppliers (Table 1). Each variable is assigned a binary value of high and low. Depending on the values of the three variables, five types of governance for a particular value chain can be found: market, modular, relational, captive and hierarchy (Figure 5).

Market governance exists in interactions where the information needed to complete the transaction is simple and easily codified, and suppliers are able to meet the requirements (or product specifications) of the buyers without asset-specific investment. Market-governed interactions are often expected in exchanges of highly standardized products. When interactions require exchanges of highly complex information, the governance type depends on the capability
of supplier and the extent to which the complex information can be codified (Humphrey & Memedovic, 2006). In the case of high supplier competence, the governance type can be modular or relational contingent on the extent to which the complex information can be codified. If the codifiability of information is high, the governance type becomes “modular”. In modular governance, the information needed for completing the transaction, though complex, can be easily communicated between the supplier and the buyer. Suppliers in a modular relationship can produce a variety of customized products using generic machinery and technical standards, without making asset specific investment. Buyers, in turn, can switch to another supplier with ease. In contrast, when the complex information for transaction cannot be codified, exchanges are based on relational linkages. In relational governance, the supplier and buyer possess unique competences that complement each other, thus they establish strategic alliances to sustain complex interactions.

In the case of low supplier competence, the value chain actors are coordinated via either a captive or hierarchical pattern. When the product specifications can be codified, buyers (e.g., lead firms) exert dominant control over suppliers by providing resources in order for suppliers to complete the transaction. Suppliers therefore are held captive by the assistance and interventions from the buyers, as well as being subject to huge switching cost. When product specifications cannot be codified, buyers (e.g., lead firms), driven by potential economic gains, develop and integrate various industrial sectors needed to manufacture products, generating hierarchical linkages within the value chain.

The 3-Determinant framework enables a dynamic analysis of the incentives of different value chain actors during their interactions with each other. Changes of each variable will result in shifting coordination patterns. For example, changes in product specification may create more
complex information needed for transaction, thus lowering information codifiability and supplier competence. Within the same value chain, governance type varies at different segments with different actors, generating multiple governance structures. We now apply this model to the US broiler industry and explore the coordination patterns at each interface connecting two segments within the broiler value chain.

As discussed earlier, the US broiler value chain has grown increasing integrated, concentrated and globalized, with myriad actors involved in the value chain operation. Using the 3-Determinant framework I will present a comprehensive analysis of the coordination patterns at the three major interfaces within the value chain — the input-production interface, the production-processing interface, and the processing-distribution-retail interface. The complexity of transactions in the US broiler value chain is high, resulting from the deepened product differentiation and growing heterogeneity of trading partners as the industry expands on a global scale. Thus, the coordination pattern at each interface depends on information codifiability and supplier competence.

**Input-production interface:** Small independent farmers and integrators form the supplier-buyer linkage at this interface. Driven by technology advance and scale economies, modern broiler production has been entirely industrialized. The integrators, with direct control over key inputs (feeds, chicks, etc.) for broiler production, contract out the broiler-raising process to small farmers, and specify stringent conditions for production and quality. Small farmers depend on the integrators for chicks, feeds, veterinary medications, etc. in order to raise broilers. They are left with a narrow range of prescribed tasks and are deprived of direct market access. In sum, the codifiability of information is high and the capability of the supplier is low. The input-production interface is governed by a captive relationship between small farmers and integrators.
Production-processing interface: The production-processing interface is controlled entirely by integrators. Due to shifting market demands and preferences, as well as the challenge of managing the complex webs of inputs and outputs, large poultry firms have integrated all stages of broiler production except for the raising phase. This has enabled lead firms to respond timely to market changes, improve productivity and quality facilitated by R&D and direct control over resources, inputs and processing. In sum, the codifiability of information is low and there are no suppliers other than integrators capable of processing broiler meat at this stage. The production-processing interface is under the hierarchy governance of the integrators.

Processing-distribution-retail interface: Integrators and retailers (including supermarkets, restaurants, food retailers and fast-food chains) construct another supplier-buyer linkage in the processing-distribution-retail interface. As mentioned previously, most segments of the value chain are concentrated and vertically coordinated by a few powerful lead firms with recognizable brands and large processing and buying power (Gereffi & Lee, 2009). Integrators (e.g., Tyson Foods, Perdue, Pilgrim’s Pride) supply differentiated broiler products (fresh chicken in whole or cut-up parts, or patties, breaded strips nuggets, etc.) according to the varied demands of different types of buyers. Integrators have developed “specialist competence” in inputs, processing and distribution, while retailers, supermarkets and fast-food chains in particular, with the proximity to consumers, have “specialist competence” in the consumption patterns of fresh and processed chicken. Boosted consumption and sophistication of chicken processing entails close coordination between integrates and their major buyers (Gereffi et al., 2009). Here, supplier competence is high, and supplier and buyer have specialist competences that complement each other. The codifiability of information can be high or low depending on specific markets. In the US domestic markets, where integrators and large supermarkets have established sophisticated
mechanisms for cooperation, the codifiability of information is more likely to be high, generating a modular governance structure. In the case of exporting and importing segments, due to the challenge and difficulty of coordinating between the immensely diverse, sometime conflicting requirements of foreign countries and establishments, the codifiability is more likely to be low, generating a relational governance structure.

*Value Chain Governance and the Food Standards Model*

Supplier-buyer linkage constitutes the most fundamental unit of analysis in understanding the structure, coordination and power distribution within a particular value chain. The degree of concentration in the value chain for supply (suppliers) and demand (buyers/retailers) determines the degree of power asymmetry, thus the pertinent governance patterns. Based on this premise, Gereffi and Lee derive an analytical framework to address the relationship between value chain governance and food safety standards (Gereffi and Lee, 2009). As shown in Figure 6, the 2 by 2 matrix includes four scenarios depending on the degree of concentration in the markets for supply and demand.

The typology in Gereffi and Lee’s model is based on the premise that,

“[T]he more a particular value chain is concentrated and governed through tight explicit coordination by a few consolidated actors, the more value chain is likely to obtain comprehensive private standards to regulate food safety and quality. Conversely, fragmented value chains at both the supply and demand ends are likely to encounter more limited public standards” (Gereffi & Lee, 2009).

The framework shown in Figure 6 summarizes four categories of supplier-buyer linkages and the pertinent types of food safety standards that prevail in particular segments within the value chain. When both suppliers and buyers (retailers) of a particular value chain segment are

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25 “Explicit coordination” refers to “non-market forms of coordination of economic activity”. The term is first used by Clemons et al. (1993) (Gereffi, Humphrey & Sturgeon, 2005).
highly concentrated and competence, the coordination is governed by bilateral oligopolies (Box A). Competition is driven by product differentiation with regard to food safety and quality. Both suppliers and retailers are motivated to develop safety and quality standards to differentiate their products with superior quality and better safety assurance in order to enhance their competitive advantages. In this scenario, private standards driven by suppliers and retailers are expected to be the dominant mechanism for regulating food production with comprehensive safety and quality requirements (Gereffi & Lee, 2009).

In box B, where buyers are concentrated while suppliers are fragmented, buyers control and influence myriads aspects of supplier activities by imposing their own private standards. In contrast, producer-driven linkages (box C) entail highly concentrated suppliers and fragmented buyers. Brand-name suppliers are likely to dominate various stages of the value chain and thus develop the incentives to establish private standards to insure safety in the production process. In both scenarios shown in box B and C, public standards are called for to facilitate regulation of the fragmented suppliers or retailers. Lastly, in box D, where both suppliers and buyers are fragmented, production is most susceptible to safety hazards. Actors under such structure usually have no brand recognition and transactions between them are price-based. In this circumstance, there are almost no incentives for the private sector to invest in food safety standards, rendering public intervention and regulation crucial in assuring food safety.

As identified in the previous section, the US broiler value chain contains two sets of supplier-buyer linkages: (1) between small farmers and integrators; (2) between integrators and retailers. For the former, buyers (integrators) are highly integrated and concentrated while suppliers are fragmented, leading to a buyer-driven governance pattern. For the later, both buyers (including foreign buyers who import broiler products from the US) and the suppliers (including
foreign suppliers who export broiler products to the US) are concentrated. The suppliers and buyers are highly competent with recognizable brand names. In this case, the exchanges are governed by bilateral oligopolies.

Based on the analysis above, this paper raises two hypotheses regarding the value chain governance and its implications for food safety standards in the US broiler industry:

**Hypothesis (i):** At the fragmented segments of the chain (upstream), where private incentives for investing in safety standards are weak, safety regulation is primarily driven by the public sector.

**Hypothesis (ii):** At the concentrated segments of the chain (downstream, including domestic and import chain segments), where private incentives for investing in safety standards are strong, safety regulation is primarily driven by the private sector.

Bearing in mind these two hypotheses, the next chapter explores the organizational field of safety standards setting in the US broiler industry, and the institutional dimension of the GVC analysis. Included will be a historical analysis, complemented by interviews with stakeholders in the standard setting arena. Informed by the analysis and interviews, chapter 5 will analyze the veracity of the two hypotheses in order to identify the gaps between the value chain governance and the standard setting field in the US broiler industry.

**Conclusion**

This chapter explores and describes the industrialization and globalization of the US broiler industry between the 1980s and the 2010s via the lens of GVC analysis. Specifically, it examines the input-output structure of the globalized value chain of the US broiler industry. It also characterizes the coordination patterns of various segments within the chain. The unit of analysis is the supplier-buyer linkage at each interface connecting two segments within the value chain. According to Gereffi and Lee's framework, the degree of concentration at each side of the
supplier-buyer linkage determines the rules and standards that govern the interactions between value chain players. Finally, it brings up two hypotheses of the relationship between value chain governance and safety standards.

Chapter 4 provides a contextualized study of the safety standard setting field in the US broiler industry. It elaborates on the institutional contexts in which the value chain of the US broiler industry is embedded. Included is a historical study of the standards setting field with respect to food safety. Analysis in this chapter is informed by interviewing experts and professionals working on broiler safety in both government agencies and universities. Based on chapter 3 and chapter 4, chapter 5 analyzes the hypothesis to identify the gaps between the value chain production and the standard setting field, which may contribute to food safety hazards in the broiler industry.
Chapter 4: The Standards System in the US Broiler Industry

Introduction

The previous chapter has described the globalized value chain structure of the US broiler industry, and the coordination patterns between value chain actors. The supplier-buyer linkage constitutes the very basic relationship within a given value chain. For any value chain, multiple sets of supplier-buyer linkage connect the myriad segments together and undergird the operation of the chain. The degree of concentration at both sides (supplier and buyer) determines the degree of power asymmetry, and thus the governing type of the interface between two connecting segments within the chain. In a globalized value chain with myriad actors and supplier-buyer linkages, a multi-dimensional governance structure is expected.

In the US broiler industry, two sets of supplier-buyer linkage are present: growers and integrators, integrators and retailers. Captive governance coordinates the former, while relational or modular governance coordinates the latter. In the captive relationship, small, independent growers are held captive by the intervention and resources of the integrators, generating a buyer-driven segment of the chain. In the relational or modular relationship, both integrators and retailers are highly competent with complementary specialist expertise, thus generating a bilateral-oligopoly segment of the chain.

According to Gereffi and Lee, “the extent to which each side of the value chain — supplier and buyer — is concentrated, and the way the interface between the two is governed” determines the incentives and leverage points for value chain actors with respect to standard setting in the globalized agri-food system (Gereffi & Lee, 2009). Based on this premise, chapter 3 concludes with 2 hypotheses about the relations between the coordination patterns within the value chain
and the expected safety standards to sustain the robustness of the industry. In order to further explore the validity of these two hypotheses, we need to present a thorough picture of the safety standards system in the US broiler industry, including the mechanisms of standard setting, implementation and monitoring in contemporary globalization.

This chapter elaborates on the institutional dimension — the safety standards infrastructure — of the globalized US broiler industry. Chapter 4 begins with an overview of the emergence and nature of the globalized standard setting field for assuring food safety. Included is a description of the growing complexity of the standards systems in the context of globalized agribusiness. It next examines the critical food safety points along the globalized US broiler value chain, and looks at how food safety standards are incorporated at various stages from input to retail. Included will be an analysis of safety standards for the domestic chain and the import chain26, paying special attention to the safety standards system for broiler imports from developing countries, such as China27. Analyses in this chapter are based on existing documents, studies and interviews with policy makers from the USDA and food safety experts from academic institutions.

**Safety Standards Setting in the Globalized Agri-food Production System**

**Food safety and the safety standards system**

Standards, as described by Loconto, Stone and Busch (2012), are “exemplary measures against which people and things are judged.” They are agreed upon criteria, or “external points of reference” used to assess the performance, technical and physical characteristics, production

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26 The export chain of the US broiler industry, although constitutes an important part of the transactions in the industry, is not discussed in this paper. This is because broiler exports are mainly subject to the safety requirements of the foreign nations. This paper focuses on the safety standards for the chicken products in the US market.

27 Four Chinese processing plants eligible for processing American chicken: Qingdao 9-Alliance Group, Ltd; Zhucheng Waimao Co., Ltd; Weifang Legang Food Co., Ltd; Zhong’ AO Holdings Group Co., Ltd.
and delivery conditions of a product or service” (Nadvi & Waltring, 2004, p.56). In agricultural commerce, standards, safety standards in particular, serve as the interface that governs and facilitates the interactions between myriad value chain actors to assure food safety goals.

The term “food safety” has been used in various contexts. Broadly defined, food safety refers to “the conditions and practices that preserve the quality of food to prevent contamination and foodborne illnesses” (Heit & Zieve, 2012). Accordingly, food safety standards regulate pesticide use and residue limits, food additives, hygiene requirements, HACCP, and traceability requirements (Gereffi & Lee, 2009). Similarly — albeit slightly more nuanced with respect to food safety — food quality refers to the attributes of the product, including internal (e.g., chemical, physical, and biochemical) and external factors (e.g., appearance, labels). Food quality itself is a standard accepted by the consumers to inform their buying decisions (Ferre, 1973). Examples of quality standards include grading schemes, product specifications on cleanliness, labeling requirements, and nutritional claims (Gereffi & Lee, 2009). Although there is a high level of overlap between food safety and quality assurance with respect to safety standard setting, this research focuses primarily on safety standards. The decision to focus on safety standards in the context of US broiler industry reflects the current debates in the field: the tensions between value chain production and the safety standards system. The recurrent scandals in the industry imply a problematic standards system that deserves further scholarly and policy attention.

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28 Based on the typology of food standards given by the World Bank, safety and quality standards are two major types of standards that regulate food safety in the modern society. A third and also recently emerged type is social and environmental standards, which include recycling standards, organic production standards, labor standards, fair trade standards, corporate social responsibility standards, and animal welfare standards (World Bank, 2005). Although the three types of standards are interdependent and without discrete boundaries between one another, this paper will not address the social and environmental standards due to the limited scope, time and resources.

29 Food safety and food quality are two concepts often used together in the discussion of food standards. There is also a blurring boundary between food safety and food quality.
A brief history of safety standards for meat and poultry in the United States

The use of standards in agribusiness has existed for many years, with a main purpose of controlling and monopolizing commerce during most of this period. But it was not until the early twentieth century that standards were established to regulate food safety (World Bank, 2005). By the 1900s, as a response to the prevalent unsanitary and hazardous conditions in meat-packing establishments, the US Congress assigned the Department of Agriculture (USDA) the major responsibility for assuring the safety of meat products by implementing ante- and postmortem inspection of livestock slaughtered for domestic consumption (Hulebak & Schosser, 2002). In 1906, the Federal Meat Inspection Act (FMIA)30, one of the early public standardization efforts to assure meat safety, was put in place. This Act specified sanitary requirements for slaughtering and processing31, mandated ante-mortem inspection of every live animal and postmortem inspection of every carcass, as well as regular on-site inspection of meat-processing establishments conducted by government inspectors under the supervision of veterinarians32 (Hulebak & Schosser, 2002). In the early period of safety standardization, implementation and maintenance of the safety standards were ensured by government inspection. It is worth pointing out that, although the slaughtering inspection was conducted on an animal-by-animal or carcass-by-carcass basis, the processing inspection focused primarily on the overall operation as opposed to each unit along the production line (Hulebak & Schosser, 2002).

30 The Federal Meat Inspection Act applies to cattle, hogs, sheep and goats but not to chicken products. This is because poultry production and distribution had not become industrialized and the consumption of chicken was still very low compared to other types of meat at that time.
31 Here, processing refers to the cutting and boning of whole carcasses and the production of further processed products such as sausages, ham and bacon. Processing was also considered as an extension of slaughtering (Hulebak & Schosser, 2002).
32 In the early twentieth century, the meat inspection program was based on organoleptic methods, such as sight, touch and smell. The major threats to public health were the transmission of diseases from sick animals to human beings and the unsanitary conditions for slaughtering and processing. The continuous on-site inspection allowed the government to remove diseased animals from the meat supply and to control unsanitary practices and the use of dangerous preservatives (Hulebak & Schosser, 2002).
Safety standards for poultry meat did not exist until after World War II\(^\text{33}\), when the production and consumption of chicken increased drastically. Meanwhile, the volume of further processed and semi-cooked chicken products quadrupled from 1940s to 1970s (Hulebak & Schosser, 2002). Initiatives to standardize chicken production were called for to ensure food safety and to deal with the new complexity (e.g., new technology, new ingredients and new processes) in the broiler industry. These new dynamics posed new challenges for safety assurance. For one, the advent of agricultural industrialization improved productivity enormously, enabling the mass production of meat and poultry products. This rendered the traditional slaughtering inspection on an animal-by-animal (or carcass-by-carcass) basis extremely costly. For another, highly diversified chicken products introduced new possibilities for contamination and adulteration at various points during processing. These new complications required new standards solutions to facilitate and regulate the expanding production of the industry.

Driven by growing public concerns about unobservable safety hazards in the production and processing stages, the US Congress published the Food Additives Amendment of the Federal Food, Drug, and Cosmetic Act in 1958. The Amendment forbids any use of non-FDA-approved food additives and requires pre-market approval of the type, condition and level of food additives to be used (Stevens & Nabors, 2007). Simultaneously, food safety regulation in the United States became increasingly science-based and data driven. In 1967, the USDA Food Safety and Inspection Service (FSIS) established the National Residue Program as the primary standardization initiative to regulate and control the use of pesticides and other chemical contaminant in meat and poultry (Hulebak & Schosser, 2002).

\(^{33}\) Before World War II, chickens were raised and produced mainly on small farms for self-consumption or sale in the nearby areas. Consumers judged the quality of chicken products by look and smell (Hulebak & Schosser, 2002).
With deepened vertical integration and horizontal expansion of the US broiler industry from the 1980s, the nature of food safety as well as the landscape for safety standards setting has been altered. On the one hand, sophisticated production introduced new areas to be standardized and monitored to ensure food safety. For instance, in the late 1970s, microbiological standards were recommended by agricultural scientists to monitor and regulate the safety of finished meat products. On the other hand, the rapidly growing scope and scale of the meat and poultry industry created imperatives for the FSIS to establish more efficient and effective mechanisms for safety inspection. It was during this period that debates on the role of public and private sectors in safety regulation emerged. Some argued that major responsibilities for safety assurance and inspection should be shifted from the government to the industry and the public sector should act as a verifier instead of an inspector. Others worried about the effectiveness of industry’s self-regulation and emphasized the important role of the public sector in assuring food safety goals.

In the 1990s, voices\textsuperscript{34} for changes in the food safety regulation amplified in the wake of the 1993 Jack in the Box E. coli outbreak in the US\textsuperscript{35}. The FSIS responded with a series of structural changes and new policy initiatives. One significant standardizing effort was the establishment of Hazard Analysis and Critical Point Systems (HACCP) Rule, which undergirds the basis for safety assurance of today’s meat and poultry production. It was with this rule that FSIS clarified its safety goal:

\textsuperscript{34} A number of organizations, including Government Accounting Office (GAO), the National Academy of Sciences (NAS), the National Advisory Committee on Microbiological Criteria for Foods (NACMCF), and consumer groups, advocated changes for the safety inspection mechanisms, describing the conventional inspection system as “overwhelmed by the practical realities of modern meat and poultry slaughter and processing” (Hulebak & Schosser, 2002).

\textsuperscript{35} 1993 Jack in the Box E. coli Outbreak: In 1993, over 700 people were sickened by eating undercooked beef patties in hamburgers, most of which were from Jack in the Box restaurants in the US. The outbreak has been known as “the most notorious food poison outbreak in contemporary history” (Wikipedia).
“...to reduce the risk of foodborne illness associated with the consumption of meat and poultry products to the maximum extent possible by ensuring that appropriate and feasible measures are taken at each step in the food-production process where hazard can enter and where procedures and technologies exist or can be developed to prevent the hazard or reduce the likely it will occur” (Hulebak & Schosser, 2002).

The introduction of HACCP as the principal safety standard for meat and poultry processing has, to a great extent, migrated safety responsibility from the government to the industry\(^\text{36}\).

Since the 1990s, the globalization of the agricultural industry further shifted the landscape for safety regulation and standards setting, as reflected in the emergence of international standards organizations and the rise of private sector governance. The following section will address the globalized aspect of safety standard setting.

*The emergence of globalized standard setting for food safety*

With the industrialization and the globalization of the contemporary agricultural system, the geographic, social and cultural diversity of the myriad stockholders (such as growers, processors, distributors, retailers, policy makers, etc.) who are engaged in agri-food production have expanded concomitantly. Today, the supply, production, processing, and distribution of agri-food products have become increasingly remote from the state’s control (Bingen & Busch, 2006). By the 1980s, the value chains of agri-food production and distribution were extended beyond national boundaries, as a result of, and accelerated by the advance in food production technology and convenient transportation, as well as the prevailing neoliberalism in international trade (Henson, 2008). Increasingly, the architecture of these extended value chains have become

\(^{36}\)In July 1996, the USDA-FSIS approved a final rule on pathogen reduction, which requires mandatory adoption of HACCP system in US poultry industry. The final rule specifies that poultry establishments under Federal inspection must “take responsibility for, among other things, reducing the contamination of meat and poultry products with disease-causing (pathogenic) bacteria by implementing a system of preventative controls designed to improve the safety of their products, known as HACCP” (FSIS Compliance Guideline; HACCP System Validation). Poultry establishments are required to design and implement effective and validated HACCP systems to meet safety standards.
vertically integrated and horizontally concentrated, as is reflected in the growing size and diminishing number of key food suppliers in the global agri-food market (Henson, 2008). For example, five large companies control over 50 percent of the market share in the US broiler industry, generating buyer-driven supply chains that are extending internationally through global sourcing and the proliferation of multinational food producers and retailers (Henson, 2008).

Along with the restructuring of the agri-food system, the nature of food safety changed. Agricultural industrialization and globalization has contributed to improved productivity, sheer abundance of food all year round, and highly value-added agricultural products (e.g., fully-processed food), while introducing new and arguably greater safety hazards associated with the extended value chain production (Gereffi & Lee, 2009).

“In elongated but fragmented supply chains, agri-food products are exposed to possible contamination at multiple processing stages managed by different actors” (Humphrey, cited in Gereffi & Lee, 2009).

According to Büthe (2009), the globalized nature of the contemporary agribusiness increases safety risks, whether they are real or imagined, via two mechanisms. The first relates to the non-compliance with established food safety standards and the other derives from substantive disparities in sanitary and pertinent standards for production, processing and so forth. Moreover, such variations differ across nations in the degree of stringency or fundamental principles for standard setting (Büthe, 2009).

Driven by these risks, the regulatory field of food safety in the contemporary agri-food system has also been transformed significantly. This transformation is characterized by the emergence of global governance agencies (e.g., WTO, ISO) and a growing tension between national and global, public and private sectors with respect to food safety assurance. The
landscape for safety standard setting on a global scale has been altered as a result. As Higgins and Lawrence described,

“...[T]here is a broad recognition that the regulatory dynamics underpinning agriculture in Western nations have shifted dramatically. Where, previously, the nation-state exercised considerable control over the regulation of agriculture, the rise of transnational corporations (TNCs) in the agribusiness industries, and global governance agencies...has resulted in a reconfiguration of political power in which the state is no longer the predominant actor” (Higgins & Lawrence, 2005, p.1).

In the 1990s, international organizations, such as UN/ECE, ISO, etc.37, started to construct safety standards in order to facilitate agricultural trade while achieving food safety goals on a global scale. In the Sanitary and Phytosanitary (SPS) Agreement published by the WTO, member states are required to conform38 to the standards developed by the Codex Alimentarius Commission39, which serve as prima facie evidence in trade disputes concerning food safety standards (Kennedy, 2000; Bain, Deaton & Busch, 2006; Büthe, 2009). Within this global institutional framework, Annex A(3) of the SPS-Agreement defines international standards for food safety as the standards established by the Codex Alimentarius Commission (Büthe, 2009), which specify the use of “food additives, veterinary drugs and pesticide residues, contaminants, methods of analysis and sampling, and codes and guidelines of hygienic practice” (Annex A, Paragraph 3 of the SPS Agreement).

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37 In the 1980s, four international organizations were actively engaged in setting food safety standards, including the United Nation Economic Commission for Europe (UN/ECE), the International Organization for Standardization (ISO), the Organization for Economic Cooperation and Development (OECD), and the Codex Alimentarius Commission (Büthe, 2009).

38 The SPS-Agreement subjects the WTO member states to commit themselves to using “international standards” where appropriate and needed. That is to say, the existing international standard can achieve the desired level of food safety and consumer protection while facilitating multilateral trade. However, if a nation decides to adopt domestic regulations which are different from the established international standards, they country is obliged to prove via internationally acknowledged scientific methods, that the risks do exist and can only be addressed by the domestic regulation. If not, these domestic regulations are challenged as non-tariff barriers to trade (Büthe, 2009).

39 The Codex Alimentarius Commission is a body designated by the WTO to set international standards for food safety. It is comprised of technical experts who establish and develop technical or scientific standards for food safety assurance on a global scale (Büthe, 2009).
With intensified globalization and the emergence of the international organization — Codex — designated to set food safety standards that are legally binding on a global scale, the landscape of agri-food safety governance has shifted from state-based national regulation to an increasingly complex multi-layered regulatory system. As Higgins and Lawrence characterize the new dynamics underpinning the regulatory mechanism of the contemporary agriculture system,

“Globalization…gives rise to new arrangements of regulatory space that are neither state- nor market-based. Multi-level partnerships, developed decision-making and ‘joined-up’ institutional arrangements help to create a complex pattern of spatial reconfigurations” (Higgins & Lawrence, 2005, p.6).

One feature of these “multi-level partnerships” is the growing engagement of the private sector in global food safety governance and the concomitant emergence of public-private partnerships as well as tensions. Traditional transnational companies (TNCs), with their dominant control over the modus operandi of globalized value chains, have high stakes in the food safety regulation arena because safety standards determine market access. Their influence has occurred in two interrelated ways. First, there has been an increase in the number of private standards, developed by international retailers (e.g., Wal-Mart, Tesco, Whole Foods) and imposed on their suppliers to ensure food safety. Second, even though TNCs are not necessarily directly engaged in policy making, they are able to exert pressure on both national states and the international organizations with respect to safety standard setting (Held, McGrew, Globlatt & Perraton, 1999).

Along with the increase of private sector engagement in safety standard setting came the imperative to enforce and monitor these private standards. Given the enormous number and diversity of actors participating in agricultural trade, it is impractical for the TNCs to undertake
full obligation for standards setting, enforcement and monitoring. Therefore, these tasks are contracted out to different independent standards agencies, namely, standards development organizations (SDOs), standards certification bodies (CBs)\(^ {40}\) and standards accreditation bodies (ABs)\(^ {41}\), constituting a tripartite standards regime that coordinates the various processes in the global economy today (Loconto et al., 2012).

The rationale underpinning the new dynamics of food safety governance in today’s agricultural commerce is two-tiered. For one, increasing engagement of the private sector in safety standard setting is considered to be a more efficient mechanism to assure food safety (Pierre, cited in Higgins & Lawrence, 2006). This is because the public sector is, more often than not, constrained by its limited capacity in terms of capital, resources and expertise to identify and respond to potential safety risks and market capriciousness. For another, increased global interconnectedness has limited national sovereignty in global governance, thus shifting the focus of public sector intervention from “encouraging national growth ‘through the promotion of social responsibility and the mutuality of social risk’” (Rose & Miller, 1992, p.192), to one of facilitating the conditions for entrepreneurial self-governing” (Higgins & Lawrence 2006, p.5).

Both public-private partnerships and the trend to industrial self-regulation redefine the domain of safety governance, and accordingly, “the social logic of welfare bureaucracies are replaced by new logics of competition, market segmentation and service management” (Rose, cited in Higgins & Lawrence 2005, p.5).

\(^{40}\) A standards certification body is responsible for auditing the product, process or company for compliance to specific standards and once the conformity is assured, the CB issues a certificate indicating credible compliance (Loconto et al., 2012).

\(^{41}\) A standards accreditation body is responsible for certifying the competence and credibility of a CB to conduct certification audits for specific standards, as well as the capability of SDOs to develop and set standards (Loconto et al., 2012).
Notwithstanding the seeming legitimacy of new regulatory arrangements in safety governance as a response to the globalization of agriculture business, repetitive food safety hazards outbreaks persist on a global scale, revealing a debatable systematic deficiency in thoroughly addressing safety issues. Moreover, consumer groups (and NGOs), whose interests are often under-represented in the international safety standard setting arena, contest the claim of a significant private sector impact on global food safety governance. Their concerns have engendered a series of queries: 1. How does the existing safety standards system manage the value chain production to assure safety? 2. On what basis are these safety standards developed? 3. What mechanism is in place for the safety standard system to keep up with the capricious and globalized nature of safety hazards?

Exploring these questions will enable the identification of the gaps between the extended value chain production and the safety standards system in the globalized agri-food system. The following section examines these queries in the context of the US broiler industry. The empirical analyses are based on secondary materials and supplemented by insights gained through interviews with policy makers, agricultural economists and poultry scientists.

**Safety Standards System in the US Broiler Industry**

This section examines the current US broiler industry with a focus on the critical food safety points along the broiler value chain (domestic chain and import chain) and the related safety standards. In particular, it looks at the dynamics within and between value chain segments and the incentives at both buyer side and supplier side to invest in safety standards.

Food safety in the US is regulated by multiple agencies at both federal and state levels. “Food safety… in the United States is governed by no less than 30 federal laws and regulations administered by 15 federal agencies” (Longley, 2013). At the federal level, the USDA-FSIS and
the FDA are the main government agencies authorized by federal laws to regulate food safety. In the broiler industry, the USDA ensures the wholesomeness, safety and proper labeling of all broiler products by inspecting the slaughtering, processing and distribution of all broiler products sold in the US market (including imported broilers) (Murray, 2013). The FDA primarily oversees the chicken feed. In addition, the US Environmental Protection Agency controls pesticide use and animal waste on the farm (Terry, 2014). At the state level, local government agencies, such as the local health department, also develop regulations and inspection programs to assure food safety. In addition, all establishments in the United States that produce raw chicken products (including farms and processing plants) are required to register in the Public Health Information System (PHIS) for real-time monitoring.

The US safety standards system for broiler products is designed to address the core issue associated with the high-risk profile in the industry: foodborne illnesses. According to CDC statistics, since 1999, about 48 million Americans have gotten sick annually from foodborne illness. That is to say, 1 in 6 Americans will get sick from foodborne bacteria, viruses and microbes each year, resulting in about 128,000 hospitalizations and approximately 3,000 deaths (CDC records). The Poultry Products Inspection Act (PPIA), Food Safety Modernization Act (FSMA) and Animal Feed, together with other policies, regulations and directives, undergird the public safety standard system that regulates the various stages along the value chain of broiler production to ensure food safety. The following section will map the safety standards to the critical food safety points along the domestic and import broiler value chain.

Domestic Value Chain

Safety standards can be found in domestic value chain production from the point of input all the way to the retailing segment. At the input stage, regulation of chicken feed is primarily established and enforced by the FDA. The standards are intended to regulate the nutrition formulation of the feed as well as to specify the minimum tolerance level of bacteria (e.g., Salmonella Enteritidis) presence in the feed. The FDA also specifies the types of approved medication to be used in the broiler breeding stage. The USDA-Animal and Plant Health Inspection Services (APHIS) regulates the health of the live broilers (including the broiler chicks). The APHIS specifies criteria for identifying health hazards to the chickens. However, as indicated by Dr. Michael Ollinger, an agricultural economist at the USDA-Economic Research Service (ERS) in an interview with the author, APHIS regulations do not apply to the safety hazards brought by the chickens to people. “Many of the bacteria do not harm the chickens, but do harm people. And there is, to my knowledge, no agency to step on that area” (Michael Ollinger, personal interview, March 25, 2014).

Broiler chicks are raised in the grow-out houses for 6-7 weeks when they reach the prescribed market weight. The broiler raising stage is considered most susceptible to safety hazards and contamination. This is because,

“Young birds are more susceptible to Salmonella colonization of the gastrointestinal tract during the first few days by vertical transmission from infected parents or by horizontal transmission at the hatcheries during feeding, handling, and transportation” (Bailey, 1988).

Every effort is dedicated to convert minimum input to maximum output on the farms, and safety risks prevail during the entire growing operation stage. The sanitation condition of the

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43 Chicken feed primarily contains corn and soybean, with additional vitamins and minerals added. No hormones or steroids are allowed in chicken feed or the raising period (National Chicken Council).
establishment and the over-crowdedness of the chicken confinement with over 20,000 birds growing from “what were two-ounce balls of down to 2.5 -5 pounds each” increase the possibility of cross contamination (Midkiff, 2004). Both public and private guidelines have been developed with respect to the housing, hatchery, and out-grow sanitary conditions of broiler breeding. However, on farm practices and animal treatment are not addressed or specified in the Poultry Products Inspection Act.

Responding to this high-risk profile and industrial pressure on improving productivity, the FDA approves and specifies the use of certain antibiotics in the broiler breeding stage to reduce pathogen levels and to accelerate broiler growth. This, however, has fostered the rise of dangerous antibiotic-resistant bacteria (Hayes, Wilson, Christensen & Bonifield, 2013). The FDA said in an interview with CNN that many of the antibiotics used in animals are also used to treat humans when they get sick, and bacteria illness becomes fatal if overuse makes germs resistant to medication (FDA, cited in “FDA hopes to curb antibiotic use on farms” by CNN Health, 2013).

According to CNN Health, current federal regulations do not mandate data collection on the use of drugs on animals. Dr. Gail Hansen, a veterinarian and senior officer for the Pew Campaign on Human Health and Industrial Farming, argues that the massive use of antibiotics in chicken feed and water reflects the unhygienic conditions of broiler breeding. “If you need to keep animals healthy with drugs, I would argue you need to reexamine the system” (Hansen interviewed by Jen Christensen, 2013). However, different voices exist about the use of antibiotics (sometimes called antibacterial chemicals) during the breeding. The National Chicken Council (NCC) claims that “the majority of the antibiotics that may be used in poultry

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44 The National Chicken Council has developed the NCC Animal Welfare Guidelines and Audit Checklist, which specifies the treatment of broilers at various aspects during that growing stage. In the public sector, the USDA-APHIS has also developed initiatives with regard to the broiler welfare.
production are not used in human medicine...any threat to human health from antibiotic use in livestock and poultry production is negligible, if it exists at all” (NCC, 2013).

Dr. Joe Eifert, an associate professor at Virginia Tech’s Department of Food Science and Technology, told the author in a telephone interview that he does not think the chicken industry is contributing to the development of antibiotic-resistance bacteria but he also points out that the field is highly complicated given the diversity and scale of chicken farms in the US,

“We usually say antibacterial chemicals, the chemicals are ones that kill a lot of bacteria. In general, they are not chemicals that people would consume…I don’t think there is any problem with that or relation with any development of antibacterial resistance or pathogens that affect humans. But…there are a lot of farms out there. It is hard to prove where the antibiotic resistance starts or how it starts, and where that might get worse. I don’t have data to tell about everyone. As far as I [have] read, the industry is trying to stop using some of the ones that they know can lead to antibiotic-resistance development” (Eifert, telephone interview, March 26, 2014).

Upon reaching the prescribed weight, live broilers are transported to processing plants, where they are slaughtered, processed and packaged. The integrator-owned processing plants operate under regulations specified in the PPIA and the Code of Federal Regulations (CFR). All broiler processing establishments are required to develop and implement the Sanitation Standard Operating Procedures (SSOPs) and HACCP plan, which controls the critical contamination points during the broiler processing. In addition, performance standards are also in place to control and reduce pathogenic microorganism (e.g., Salmonella) and cross-contamination in the processing stage. The FSIS inspectors conduct on-site carcass-by-carcass inspection as mandated by law. The newest USDA inspection plan aims to move on-site inspection to offline inspection with fewer government inspectors at the plant and to shift the inspectors’ focus to critical food safety tasks such as pathogen sampling, sanitation conditions verification, food safety hazards
control at critical points (“USDA Seeks to Modernize Poultry Inspection in the United States”, 2012). The new program has promised to increase the efficiency of inspection with reduced costs, accelerating the line speed by 25% (140 birds/min to 175 birds/min) and saving over $250 million annually for production costs (“USDA Seeks to Modernize Poultry Inspection in the United States”, 2012). Meanwhile, the poultry company is rendered increasingly responsible for on-site inspection by their own employees. Some have contested the integrity of self-inspection, arguing that the new plan is a severe violation of conflict of interest (Kindy, 2013; Leonard, 2013).

After differentiated processing, the finalized broiler products are distributed to the retailing segment. As competition in the food industry becomes increasingly quality-driven, the large retailers, such as Wal-Mart, Whole Foods, and Safeway, have taken initiatives to differentiate themselves by superior food quality and credible safety assurance. As a result, in addition to meeting the generic and basic government regulations45 (e.g., 101.43 CFR, the Voluntary National Food Regulatory Program Standards, Retail Food Safety Initiative), retailers have increasingly invested in private safety standards as a strategy to enhance competitiveness in the global market. For example, in 2008 Wal-Mart announced that it had become the “first nationwide US grocer to adopt Global Food Safety Initiative (GFSI) standards. These standards require all suppliers of Wal-Mart’s private label and other products to have their factories “certified against one of the internationally recognized Global Food Safety Initiative (GFSI) standards” (Walmart, 2008), which include Safe Quality Food (SQF), British Retail Consortium, International Food Standard (IFS), and etc. Whole Foods adopts the 5-Step Animal Welfare

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45 According to FDA(2014), “the ultimate goal of all retail food regulatory programs is to reduce or eliminate the occurrence of illnesses and deaths from food produced at the retail level.” Retrieved at http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/ProgramStandards/ucm121796.htm
Rating Standards for their chicken suppliers, which must be audited and certified by a third-party player against animal welfare standards (e.g., natural environment, outdoor accessibility).

*Import Chain*

Safety regulation for broiler imports starts long before the broilers reach the US border, and it is primarily governed by the USDA-FSIS. For any broiler import to be sold in the US market, it must pass a multi-tiered safety verification and inspection network. As mandated by the PPIA, all chicken imports must meet all the requirements specified in the five areas (Table 2).

The five required criteria are mutually interconnected. For the purposes of this paper, we elaborate primarily on the equivalence determination requirement, which specifies the standards for determining whether the safety system in a foreign establishment, although different from that in the US, can achieve the same food safety objectives or outcomes.

The equivalence program consists of two major steps: (i) documentation review; (ii) on-site and remote audits. The program starts whenever a country files an application for equivalence determination. The FSIS responds to the request with a questionnaire of 500 questions that are directly derived and related to the Code of Federal Regulation (CFR). Here, the standards used for judging the effectiveness of safety regulation in a foreign establishment is the same with those for domestic inspection. Along with the questionnaire, the foreign applicant is required to provide all the pertinent documentation materials to supplement the validity of the information provided in the questionnaire.

In the documentation review, certain aspects are addressed to reflect the safety schemes of the foreign establishment, as Dr. Andreas Keller, Director of International Equivalence at USDA-FSIS, described,

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“We are looking at what process you (foreign establishment) have in place, how you implement and how you verify, what is your laboratory structure...it is to the details of what we require here in the US... [But] how the county (foreign establishment) gets here is what in the equivalence determinant is not set...for us, how you here does not matter [as long as] the documentation has demonstrated to us that they have mechanism and means in place to ensure the food safety of that product and verification and enforcement as well as [measures] in case of violation” (Andreas Keller, personal interview, March 25, 2014).

Once the FSIS has reviewed and approved the finished questionnaire (a “desired outcome”), the equivalence program turns to an audit mode, where FSIS inspectors conduct on-site audit and verify safety system of the foreign establishment. Once the foreign establishment passes the on-site audits, the FSIS will classify it as being equivalent. However, before the final rule is made to allow imports into the US, several policy procedures are required including internal discussion and public comment. Once all the questions and doubts are properly addressed, the foreign country (or the establishment) is cleared to export broilers to the US.

Safety inspection continues at the US border. Broiler products are subject to APHIS regulations at the ports of entry and the FSIS sampling inspection for pathogens, water, residues, etc. All data are recorded in the PHIS system. Based on the information, the FSIS continues its inspection via remote-audits on a yearly basis to ensure the consistent safety performance of the foreign establishments as well as on-site audits once every 1 to 3 years depending on specific contexts.

For the import chain, “equivalence” is the key concept for determining the effectiveness of the safety system of the foreign establishments that export broilers to the United States. The emphasis on safety outcomes (the performance standards) rather than safety approaches (the process standards) creates the flexibility to enable broiler trade between countries with vastly different institutional systems for food safety regulation. However, this practice may also
engender new complications and unintended consequences. Since different approaches are allowed to achieve the “desired” outcomes, industries are economically motivated to develop the most cost-efficient approach to address the safety issues in order to meet the export requirement. In the worst-case scenario, the approach itself may introduce new contaminants that may be not be identified in the existing safety system until it causes severe consequences.

In the case of China, where the efficacy of government regulation has long been contested and industrial self-regulation is far from mature, the food industry has been operating with a high safety risk profile. This is evident in the frequent food safety scandals in China. Furthermore, because of the industry and the government’s close economic and political ties, the integrity of the nation’s food safety system (including standard setting, implementing and monitoring) is compromised. For this reason, the worst scenario might take place in the export sector. In fact, this scenario has already been witnessed in China’s milk industry. Melamine, an industrial chemical rich in nitrogen, was “added to watered-down milk to fool quality inspectors with artificially high protein levels” (Fairclough, 2008). In 2008, the melamine contaminated infant formula resulted in nearly 300,000 children suffering from kidney failures and six infant deaths.

Conclusion

This chapter has examined the safety standards system for globalized agri-food production in the United States. Specifically, it looks at the co-evolution between the safety standards system and the value chain in the era of contemporary globalization. Driven by the proliferation of global agri-trade, the domain of food safety regulation has moved beyond national boundaries. This is evident in the rise and growing power of the international standards organizations. Meanwhile, a private safety regulation space has been generated to meet the increasing demand of the industry to differentiate firms based on safety and quality standards.
Tensions between the safety standards and the value chain production are highlighted in the US broiler industry. To this end, the chapter maps the safety standards onto the critical safety points along the domestic chain and the import chain. For the domestic chain, the tension between the efficiency of food chain production and safety assurance is reflected in the controversies around setting standards for the use of antibiotics. For the import chain, the “equivalence” determinant program facilities trade between institutionally diverse nations but it may also introduce new safety complication.

Building on Chapter 3 and chapter 4, the next chapter analyzes the dynamics and tensions between different value chain stakeholders with respect to safety standards and explores the gaps between value chain production and safety standard setting. Following that, the paper discusses the role of public and private sectors in assuring food safety goals for the globalized value chain production of the US broiler industry.
Chapter 5: Analysis and Policy Recommendation

Introduction

The intensified globalization during the past three decades has substantially transformed our agri-food system. This transformation is characterized by extended value chain production and the changing nature of food safety and regulation. As a result, the contemporary food system has evolved into an excessively complex network, spanning beyond national boundaries and involving myriad largely diverse stakeholders in the production, distribution and regulation processes. This has concomitantly altered the landscape for safety regulation, engendering new dynamics between the public and private sector with respect to safety assurance. Here, two complex adaptive systems unfold in front of us: the agri-food industry and the safety regulation system. To better interpret our contemporary food system and its implication for food safety assurance, it is crucial to look at both systems and the linkages between them.

In the previous chapters, we have examined the two systems in the context of the US chicken industry between the 1980s and the early 2010s. In chapter 3, we unpacked the structure of the US broiler industry by looking at the organization and governance of the globalized broiler value chain. Utilizing Gary Gereffi’s framework on value chains and standards (see chapter 3), we examined the incentives of the value chain actors with respect to investing in safety standards based on their position within the chain and their concentration levels. The chapter considers two hypotheses: (i) At the fragmented segments of the chain (upstream), where private incentives for investing in safety standards are weak, safety regulation is primarily driven by the public sector; (ii) At the concentrated segments of the chain (downstream, including domestic and import chain segments), where private incentives for investing in safety standards are strong, safety regulation is primarily driven by the private sector. Support for these two hypotheses will be explored in
this chapter.

Chapter 4 examines the safety regulatory system for broiler production in the United States. In particular, it looks at both the history of safety standards setting for broilers within the US and the globalization of the safety standard setting field. Informed by existing studies and interviews with safety standard setters, the chapter identifies critical food safety points in the value chain production and maps various safety standards to these critical safety points. Chapter 4 concludes by highlighting the tensions between current broiler production and existing safety standards.

Building on chapters 3 and 4, chapter 5 provides an explicit analysis of the “tensions” between the two complex systems. It first characterizes the tensions as gaps between the value chain production and safety standards setting, and then discusses the implications for food safety assurance. Next, it re-examines the two hypotheses put forward in chapter 3. Subsequently, the chapter interprets the results from the perspective of organizational field theory. Finally, chapter 5 provides preliminary policy recommendations with respect to safety standards setting in the US broiler industry.

The Gaps between Industrial Production and Safety Regulation

Previous chapters have explored the historical evolution and the current dynamics within and between the value chain production and the safety standards in the US broiler sector. This section identifies the gaps between the two systems. In this thesis, a safety gap is identified where safety regulation (or standards) is absent or arguably insufficient at a given critical safety point. In addition, substantial differences between safety regimes, which may contribute to potential safety hazards, are also counted as safety gaps. Based on the analyses above, two principal gaps are identified both at the upstream and downstream of the US broiler value chain with respect to safety assurance.
Upstream gap

Analyses in the broiler industry and the safety regulation system have exhibited safety gaps at the upstream segments of the broiler value chain: the broiler chick breeding. As described in chapter 4, the breeding stage is highly susceptible to biological hazard. According to Dr. Michael Ollinger at USDA-ERS,

“The agency (APHIS) that oversees chick production is only concerned about their health, the health of animals...they are not concerned necessarily about the human health. So there is not any oversight at all really through here (USDA) or not much...as of now there is no real regulatory body overseeing the chicks themselves...the APHIS is regulating the chicks, [and] chicks harbor salmonella. Salmonella does not bother chickens, so APHIS does not care. But salmonella affects human health.”  
(Michael Ollinger, personal interview, March 25, 2014)

This regulatory absence is by no means fortuitous. Hidden behind are the controversial debates over how crucial the broiler breeding stage is to the overall safety of the final products. The answer to this question ultimately determines the legitimacy of the operation of the entire US chicken industry for the past 60 years. On the one side, the broiler firms, poultry scientists and the public sector advocate for the existing operation of the chicken industry. The USDA safety inspection in the broiler industry begins at the slaughterhouse, asserting that any kind of contamination that occurs at prior stages can be corrected in the slaughterhouse. On the other side, however, consumers groups, food safety activists and NGOs have been demanding operational changes in the US chicken industry. High levels of salmonella in chicken products (especially fresh products) and repetitive salmonella outbreaks have aroused public consternation. Successful examples in European countries (such as Denmark) in eradicating salmonella in chickens highlight the possibility of an ideal situation (e.g., zero-salmonella) for chicken safety. Up till now, it seems that if the US adopts the Denmark model — a comprehensive approach to
attack salmonella in flocks, poultry barns animal feed and slaughterhouses (Terry, 2014) — then the puzzle could be easily solved. BUT, reality is, more often than not, much trickier.

The pro-industry side responds to this approach with its scientific-based and data-driven “proactive policies”. To address the high level of salmonella presence in chicken products, the USDA-FSIS has lowered (only recently) the standard of salmonella level in young chicken carcasses from 20% to 7.5% (Alvarado, cited in Spinner, 2014). The new standard depends closely on the chicken industry’s ability to establish relevant interventions to reduce the level of Salmonella (Alvarado, cited in Spinner, 2014). It is also reported that, according to the USDA-FSIS, “the actual percentage positive (for salmonella in late 2013) was 2.6% which is significantly less than the performance standard indicating that the industry really is doing a great job at controlling risks for food-borne risks for consumers” (Alvarado, cited in Spinner, 2014). Notwithstanding this optimism, salmonella outbreaks continue. Following the 2013 Foster Farm outbreak, salmonella in chickens produced by Tyson sickened 9 people early in 2014. As indicated by Dr. Ollinger, the high level of salmonella can be traced back to the breeding stage, where chicks are crowded in unsanitary conditions. And as the broilers go through different stages, the number of salmonella just multiplies47.

Besides, some pro-industry voices say that the reason for repetitive salmonella outbreaks is not because chicken products are unsafe, but rather it is due to the rapid information sharing via social media. At the same time, government, researchers and poultry companies blame consumers for not being fully aware of the proper handling of food and suggest implementing pertinent educational problems of food safety.

“Most food-borne illnesses are caused by cross-contamination and improper handling of products by either consumers or

untrained retail and restaurant employees” (Alvarado, cited in Spinner, 2014).

Although we admit the importance of educational programs for improving the public’s awareness of potential food hazards, this is not the solution to eradicate or effectively control foodborne illnesses, especially not for a product being produced and consumed on such a large scale. Moreover, blaming consumers for food-borne illnesses is fundamentally flawed. Consumers have no control over broiler products shelved at the retail stores, where the chicken products are already highly contaminated with salmonella before being purchased by consumers. Moreover, if most of the contaminations take place in the consumers’ kitchens, there is no reason not to conceive of it as a critical food safety point for standardized solutions.

Finally, the prospect of adopting the Danish or European models is also highly contested by the pro-industry group. The scale and institutional contexts of the US and Denmark chicken industries are remarkably different. The US industry slaughters 8.5 billion chickens annually while Denmark slaughters just 100 million (Terry, 2014). For decades, chicken has been loved as a healthy source for animal protein at affordable prices in the United States. The marginal profit for chicken products is extremely low, at about 1%48. The industry has to depend on large-scale production to prosper. Adopting the Danish model would raise the price dramatically, and drive the industry out of business (Terry, 2014). Denmark’s success lies in its ability to generate collective changes via a top-down approach. Yet in the US, the safety regulatory system is intentionally fractured, with different agencies assigned with different authorities. No single agency is capable of initiating a top-down reform. As a result, “no single agency appears to have a legal mandate to fight bacteria that can kill people but do not harm to animals on the farm” (Terry, 2014).

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48 Source: Eifert J. (March 26, 2014). Telephone interview.
Downstream gap

In the analyses in chapter 4, we also identified a potential safety gap at the downstream segment of the import chain, which occurs where there is off-shored production and limited safety regulation. It should be noted that our analysis was highly speculative due to the lack of empirical data on this issue. Nevertheless, we consider it imperative to examine this emerging issue based on our existing understanding as well as to speculate possible outcomes. Of particular concern is the food safety management of chicken imports from countries with notorious food scars, such as China. Our speculative analysis is based on the premise that in complex systems unintended consequences occur and solutions to one aspect of complexity introduces others.

As described in chapter 4, the USDA “harmonizes” different safety regulation regimes via the Equivalence Determination Program, where the legitimacy of a foreign safety regime is judged based on its performance compared to the domestic system in the United States. The equivalence program allows various methods, approaches and processes so long as they all achieve the desired outcomes (as compared to the domestic situation). This regulatory mechanism can be effective if it addresses two subsequent questions: (i) the domestic safety standards, as benchmark indicators in the equivalence program, are comprehensive enough to exclude potential safety hazards; and (ii) the domestic regulatory authority can exert sufficient control to ensure constant compliance of the foreign establishment.

Based on the analyses of the previous safety gap as well as that in chapter 4, we have good reason to lack complete confidence in domestic safety standards. For one, the domestic safety standards for chicken products are highly contested in terms of salmonella levels, in-plant inspection and so forth. For another, the mechanism for monitoring compliance of a foreign
establishment is heavily based on documentation reviews and the foreign country’s self-discipline to ensure compliance. The USDA-FSIS has advocated its global safety strategy as “we trust but we verify”. To fully assess the extent in which “verification” can eliminate potential imported safety hazards requires data on the overall safety performance of imported chicken products. Unfortunately, these data, as claimed by an USDA official, will not be shared during the period of the study. Nevertheless, we can still speculatively assess the effectiveness of the verification system based on precedents such as the Chinese-made chicken jerky treats that resulted in sickening hundreds of dogs. The US government agencies are still unable to locate the cause (Manning, 2013).

Therefore, we speculate that off-shored production and limited safety regulation constitutes another safety gap within the globalized chicken industry. It stems from the fundamental differences between the institutional contexts where the production and safety regulation are embedded. China, for example, as a fragmented authoritarian state, holds bureaucratic power and profits within large enterprises. Local governments prioritize economic development with a focus on quantity rather than quality. In addition, absence from a transparent legal system and press freedom, the institutional context in China fosters private-public conspiracy that undermines safety goals. Under these circumstances, the documentary-based and periodical safety inspection from the USDA-FSIS is far from sufficient to detect malpractice in advance, engendering potential safety hazards.

The Hypotheses

Now that we have examined the dynamics and tensions at the upstream and downstream segments of the chain, in this section we assess the two hypotheses put forth in chapter 3.

Informed by the analyses above, we reject hypothesis (i) and partially accept hypothesis (ii).

Hypothesis (i):

*At the fragmented segments of the chain (upstream), where private incentives for investing in safety standards are weak, safety regulation is primarily driven by the public sector.*

As highlighted previously, the fragmented segments of the value chain are most vulnerable to safety hazards due to the lack of private incentives to invest in safety standards. We hypothesized that safety regulation is primarily driven by the public sector. However, our findings have indicated the exact opposite.

At the fragmented segment of the US broiler value chain, there is a dearth of both private and public incentives directly linked to safety regulation. The fragmented private players (small farmers) at this stage are blocked from direct market access and do not have a brand name immediately recognizable to the consumers. In actuality, small farmers are more likely to invest in a manner (e.g., use of cheap antimicrobial chemicals to accelerate broiler growth) that allows them to maximize the broiler meat output with the lowest cost possible. For the public sector, the safety authority starts at the slaughterhouses, the concentrated and regulated segments of the chain, as opposed to the farms, the fragmented segments. This regulatory arrangement is anything but accidental. Midkiff argues that there are valid reasons for it.

“It is always easier to deal with a few ‘professional’ officers of large companies or agribusiness organizations than with un- or disorganized farmers’ groups…The USDA…leadership would prefer to deal with those who can provide assurance to the agency that their members will fall into line.” (Midkiff, 2004, p.70-71)

Surprisingly, we have seen some private sector effort, albeit indirectly, to address safety issues at the broiler farming stage. Private safety standards, mandated by some large retailers, have specified and required good breeding practice (e.g., high sanitary conditions, no or limited
use of antimicrobial chemicals). Although it remains uncertain to what extent these private efforts can make a difference in the long term, we can at the very least identify the fact that private incentives at the concentrated segments of the value chain can spread and influence the fragmented segments.

Hypothesis (ii):

*At the concentrated segments of the chain (downstream, including domestic and import chain segments), where private incentives for investing in safety standards are strong, safety regulation is primarily driven by the private sector.*

We have examined two branches at the downstream segments of the US broiler value chain: the domestic branch and the import branch. Our inclusion of the import chain is based on the economic rational that if a domestic establishment (buyer) is able to outsource at an offshored location, the capacity and concentration of the establishment is presumed to be high. Likewise, if a foreign establishment (supplier) operating in a developing country is able to export to the US, the establishment is supposed to be consolidated and capable so as to meet all the safety requirements of the US. Therefore this thesis interprets the supplier-buyer linkage at the import branch as relational or modular.

The empirical analyses in chapter 4 have demonstrated a proliferation of private standards during the last twenty years. At the downstream segment of the domestic chain, both suppliers (the integrators) and retailers (the fast food chains and supermarket chains) are highly consolidated with recognizable consumer brands. Moreover, they have the capital to invest and implement their own private standards to enhance their competitiveness in the quality-based market competition (Gereffi, 2009). Safety regulation at the import branch of the broiler chain, however, is heavily governed by public standards and government agencies. The USDA is the principal agency for ensuring imported broiler safety. All broiler imports are mandated to satisfy
the public standards set by PPIA and CFR and we have not observed an active role of private standards governing the import branch in the US broiler industry. This is partially due to the trade volume and interconnectedness between the US buyer and the foreign supplier. Despite the concentration at each side the supplier-buyer linkage at the import branch, the volume of US broiler imports is extremely small, accounting for less than 1% of domestic production (USDA-ERS). As a result, the degree of interdependence between supplier and buyer is low. Therefore, the economic incentives for both parties to invest in private standards may also be low.

**An Organizational Field Perspective**

Up till now, we have explored the dynamics within and between the US broiler industry and the safety regulatory system between the 1980s and the early 2010s. Comprehensive as the analyses may be, the two systems are loosely connected with each other. To incorporate these separate analyses into one picture, we employ the framework of organizational field theory.

As explained in chapter 2, organizational field theory allows a systematic approach to examine the dynamics and interplay between and among multiple complex systems. Crucial to this approach are: identifying the existence of the field, assessing the positions and connections among field players (incumbents and challengers\(^5\)), and examining the ongoing tensions within and between fields (or subfields).

In our study, we identify the entire US broiler system as an organizational field, consisting of two sub-fields: the broiler industry itself and the safety regulatory system. Accordingly, field players include the value chain actors engaged in the transactions in the broiler industry, and the safety regulators, both public and private. We conceive of the US broiler system as a settled

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50 Incumbents are those actors who wield disproportionate influence within a field and whose interests and views tend to be heavily reflected in the dominant organization” of the field, while “challengers occupy less privileged niches within the field and ordinarily wield little influence over its operation” (Fliqstein & McAdam, 2012, p.13).
organizational field based on the fact that the industry is highly consolidated and regulated, as well as highly recognized to be interdependent among field players. Now we are able to reframe the research question in organizational field terms: (i) the field in question is the US broiler system; (ii) the issue at hand is what accounts for the high level of safety risks in chicken products.

In the organizational field of the US broiler system, big integrators, as incumbents, have largely influenced the organization and operation of the broiler system by creating a set of understandings about how the field should be governed. These collective meanings are historical in nature and have shifted significantly over the past 60 years (see chapter 3). Integrators first appeared as the middlemen between broiler farmers and retailers in the 1920s (Midkiff, 2004). As such, they possessed unique advantages with respect to information about market dynamics and distant transportation. Their profits depended on two factors: quantity and price differences. As the demand for chickens soared during the following decades, the integrators sought to maximize output and raise retail price via value-adding activities, contributing to the contemporary organization of the broiler industry: mass production (in the form of vertical integration and contract farming) and value-added processed products (e.g., chicken nuggets).

Concomitantly, the meaning of food safety has shifted as well (see chapter 4). It has become a contested subject within the field between incumbents (e.g., integrators) and challengers (e.g., consumer groups, food safety advocates and NGOs). As noted above, this contestation is played out in the upstream gap. Debates over safety regulation at the broiler breeding stage are not about what to do but rather about whether to do anything at all. Thus we see an inherent tension between incumbents and challengers on the conceptualization of safety hazards. Incumbents create and maintain food safety meanings that do not disrupt the existing order of the field. To
this end, they also establish allies with other field players to stabilize the field despite ongoing tensions. In the US broiler system, the large broiler companies are the major consumers of the safety standards\(^5\). The industry can exert substantial influence in the subfield of safety standards setting via itself and its strategic allies (such as lobbying groups, research agencies, etc.), whereas the challengers are largely fragmented, disorganized and often at a disadvantaged position with regard to information asymmetry.

One can only fully understand the dynamics of a given field by “embedding it in the broader environment of other fields that powerfully shape its fate over time” (Fligstein & MaAdam, 2012, p.203). We have examined the field via a historical lens. This allows us to capture the changing context within which the field has evolved. This thesis argues that two interrelated historical processes have contributed to the organization and the concomitant contention within the US broiler field. One is intensified globalization between the 1980s and the early 2010s. The opening up of global markets (especially in the developing countries) has stimulated further integration and consolidation of the US broiler industry, resulting in a low-margin and volume-driven profit paradigm. This paradigm is sustained by the existing arrangement of broiler production: concentrated breeding of broiler chicks and industrialized processing, which together allow maximized output of broiler meats at low costs. Meanwhile, as production and distribution are being globalized, the incumbents need mechanisms to help stabilize the order. This explains the proliferation of the international public and private safety standards since the 1990s. Fligstein and McAdam posit that,

“…[I]n established fields of any size, incumbents are spared the burden of zealously safeguarding the stability of the…field by virtue of the presence of a set of…governance units that serve, through their actions, to routinize and enact key features of the

field…credential committees, certifying agencies, lobbying groups… are created to help institutionalize and stabilize field practice and understandings” (Fligstein & McAdam 2012, p.205).

This has also shifted the landscape for government safety regulation from a Keynesianism to a neoliberal paradigm, which has contributed to the formation of a fractured safety regulation system in the US and the emergence of safety policies based on industrial self-regulation (e.g., HACCP). This regulatory philosophy naturally supports standardizing the already-regulated segments of the value chain, leaving the fragmented segments problematic.

Finally, we feel reluctant to include the downstream gap into the framework of the organizational field as described here. This is because the import segment of broiler chain, albeit highly contested, is still emerging and thus is subject to policy modifications. Our purpose here is to speculate the possible safety hazards within this segment under the current safety regulatory scheme. We hope to collect more empirical data to generate more grounded analyses.

**Policy Recommendation**

Drawing upon the analyses above, this section provides preliminary policy recommendations for safety standard setting in the US broiler industry aimed to help ameliorate food safety risks and assure the public interest. We devise our suggestions based on the safety gaps identified earlier and ground our discussions within the framework of organizational field theory.

As discussed previously, safety standards, as well as safety standard setting do not exist in a vacuum. They are socially constructed and embedded in particular institutional contexts. Standards embody power in the sense that they generate and maintain order via a mechanism of inclusion and exclusion. Flora argues that “standards ultimately reflect the power of those whose
norms and values – and self-interest – get translated into enforceable rules and regulations concerning the many qualities of products” (Flora, 2009). This argument unveils the fact that safety standards are inherently subject to disagreements and contentions among different stakeholders, who seek to achieve their own ends by participating in the standard setting arena. Inasmuch as the diversified interests of standards participants, gaps are inevitable. In other words, gaps are institutionalized in the very process of standard setting.

In the US broiler industry, three major types of stakeholders are involved in the setting of safety standards: the public sector (e.g., the government), the private sector (e.g., poultry companies, retailers) and the civil society (e.g., consumer groups and NGOs). Despite the fact that these groups all operate within the same overarching institutional framework, they differ from each other in terms of purpose, resource and capability with respect to safety standard setting. Government agencies (e.g., USDA), with the obligation to ensure the public interest, reach out for accountable partners in the private sector that can guarantee constant compliance to assure safety goals. For this matter, public regulation and intervention come in at the highly-regulated segment of the US broiler value chain and hold large poultry companies accountable for implementing effective safety rules. This policy decision consequently leaves the fragmented segments of the US broiler value chain ‘free’ from regulation. The legitimacy of this decision is further buttressed by the way federal agencies conceptualize safety hazards during chicken production.

In the private sector, food safety initiatives must serve its economic objectives. Poultry companies and supermarket chains do not per se pursue – however promulgated – the public interest, but first of all seek to expand market and make profits (Peters et al., 2009). They build allies with public standards players not merely for providing the public good but also and more
importantly for minimizing barriers that may impede their economic expansion (Peters et al., 2009). Notwithstanding the profit-driven nature of private sector players, their standardizing efforts may have spillover effects that indirectly benefit the public and incrementally alter the industrial structure. In previous discussions, we have revealed that large retailers, in order to consolidate their comparative advantages in the quality-based competition in the global food market, have adopted more stringent private standard schemes that regulate conduct in the fragmented segment of the value chain to ensure food safety.

This new dynamic is closely associated with the rise of civic engagement (e.g., consumers and NGOs) in food safety surveillance. Consumer groups (e.g., Consumer Research, Consumers Union) have become increasingly aware of and concerned with malpractices in the industrialized broiler business, partially due to the frequent media exposure of broiler safety scandals in recent decades. Though not directly involved in the safety standard setting process, consumer groups can indirectly impact the broiler industry by virtue of group action (e.g., boycott, public pressure) to achieve functional or even structural goals52.

The impact of consumer groups with respect to safety standard setting is best illustrated in the Ford Pinto case in the 1970s. The Pinto was designed and marketed as a small and affordable vehicle prototype in early 1970s. It soon became popular but concerns about its safety also emerged. It was charged that the gas tank of pinto could rupture and catch fire in rear-end collisions (Motavalli, 2010). Debates on the pinto’s fuel tank lasted for years. On the one side, accumulated accident reports indicated the potential safety risk of the gas tank. On the other side, the auto industry promulgated the narrative that fatal traffic accidents were caused by unskilled drivers or unsafe road conditions, not crashworthy cars (Lee & Ermann, 1999). In addition, as

52Herrmann argues that consumer groups seeking changes in an industry focus on changes which can benefit themselves instantly as well as the long-term fundamental change in the socioeconomic context. The former is called functional goal and the latter structural goal (Herrmann, 1993).
argued by Eastman, the prevailing industrial conduct successfully rationalized the acceptance of less safety guarantees for cheaper cars and safety devices on them as add-on options rather than standard equipment (Eastman, 1984).

The controversies ended following Mark Dowie’s exposé in 1977, Pinto Madness, which highlighted the deliberate circumvention of the fuel tank problem based on a notorious cost-benefit analysis that showed settling burn victims’ lawsuits would save the company more than $70 million than correcting the design flaw (Motavalli, 2010). Regardless of the debatable accuracy of Dowie’s exposé, the resultant public anger pressured the National Highway Transpiration Safety Administration (NHTSA) to mandate Ford to issue a recall for 1.5 million pinto cars for a safety repair (functional goal) and the establishment of the fuel tank integrity standard by the NHTSA (structural goal) (Lee & Ermann, 1999).

The controversy in the Pinto case reveals the institutionalized nature of the gaps between standard setters and the larger society with respect to safety assurance. Primary standard setters are bounded by the regulatory framework and prevailing industrial practices and ideologies (Lee & Ermann, 1999). Similar to the Pinto case, the safety gaps in the US broiler industry also exhibit institutional features. Their existence is the product of the institutionalized arrangements of the field of the US broiler system. To the degree that this field is settled, with legal rules defining the order of the US broiler field, as well as internal and external ties that reinforce the underlying order of the field, abrupt systematic changes are unlikely to happen or persist. Under such circumstances, channels for incremental modifications are called for to generate a new sub-field in order to exert influence.

“Changing existing field is…exceedingly difficult. Besides the coercive force embodied in these systems, people accept them as real and natural. This makes them virtually impossible to change. So, attention has turned instead to the creation of new
social fields. Here, absent the force of the “taken for granted,” we find a real change for agency, that is, for individual actors or groups to make a real difference in the organization of social space.” (Fligstein & McAdam, 2012, p.179)

One may ask, who might generate and mobilize such a new space (or sub-field), counterbalancing the dominance of incumbents to narrow down the safety gaps identified above. The answer is most likely the challengers. As we have seen in our discussion of the safety gaps, they are the consumers, food safety advocates, and NGOs. Yet addressing the safety gaps requires systematic transformations, buttressed by public-private partnership between and within key stakeholders: government agencies, large broiler companies, retailers as well as consumer groups and NGOs. Two key issues need to be answered with respect to safety standard setting in the broiler industry: who participates and in what procedures. The first issue relates to the fundamental issue of interest representation in the standard setting process, while the second issue relates to the credibility and accountability\textsuperscript{53} of the safety standards put forward.

Theoretically, a broad and balanced representation of relevant interests, as well as open and transparent procedures will suffice to legitimatize the standardizing process. In actuality, however, representativeness and openness usually stop at a superficial level. For instance, although consumers and NGOs are invited (as observers) to standardizing initiatives, they are excluded, in both pubic and private standards setting contexts, from the decision making process. Another example is the public comment procedure before finalizing a given safety standard. Cheit (1990) argues that the comment mechanism is more, if not completely, a procedure for gaining approval than a channel for changes. “Responses to comments are tailored to protect the agency, not to answer to commenter” (Cheit, 1990, p.217).

\textsuperscript{53}Accountability in the context of standard setting refers to the inclusion of a mechanism to question and doubt. Peters et al. argues that accountability serves three interrelated functions: to safety guard interests, to prevent the concentration of powers and to enhance learning and effectiveness (Peters et al., 2009, p.524).
Given such ineffectiveness of the representation and openness in the current standard setting arena, a more strategic alliance between the public and private sector is called for to mitigate the gaps between standard setters and the broader society with respect to safety assurance. As discussed by Cheit, Peters el at., the best strategy might be to build on the comparative advantages of both public and private stakeholders in setting safety standards. The private sector is advantaged by its resources and expertise in its own industry as well as by its flexibility to respond to market demands via private standardization schemes.

“…in the highly complex context of global economy, national governments lack the information and the capacity to regulate issues which transcend the nation state” (Peters el at., 2009, p.522).

Nevertheless, as discussed previously, private standard setters are bounded by their economic objectives that may compromise the pursuit of food safety. Moreover, national states remain the dominant political institutions in the era of contemporary globalization: at the international level, national states are recognized as the legitimate representatives of their population; at the domestic level, the state serves as the overarching institutional framework within which economic and social changes take place (Peters el at., 2009, p.497).

Identifying the areas where public and private standard setters can complement each other in safety standard setting requires contextualized interpretation and is extremely difficult given the intertwinements and overlaps among myriad stakeholders and the variety of interests with respect to safety assurance. Economists argue that “the optimal levels of safety can be achieved when consumers select their own levels of risk” (Cheit, 1990, p.229). This argument holds true only if the consumers are fully aware of the safety risks they bear when purchasing an item. Ironically, consumers usually stand at the disadvantaged end along the continuum of information
asymmetry.

The challenge remains to find a way where public and private sector can work beneficially in a complementary manner. Based on the analyses above, we propose a regulatory triangle (Figure 7), consisting of government agencies, consumer groups and the industry, which together facilitates safety standard setting and the public goal of safety assurance. These stakeholders exert influence on the US broiler value chain production both directly and indirectly. Government agencies, with the highest capacity to collect information and enforce policies outcomes, should not only inform but also empower the consumer groups in safety standard setting. Specifically, government is obliged to contribute to the capacity building of consumer groups either through research funding (that enable consumer-owned research groups to conduct food safety testing) or educational programs. Well-informed consumers are more likely to demand better performance of the industry with respect to safety assurance. This market-place demand may indirectly create private (or even public) incentives to regulate the least fragmented segments of the value chain and generate structural changes that might mitigate the safety gaps in the US broiler industry.

Conclusion

This chapter examines the safety gaps between the value chain production and the safety standard setting field in the US broiler industry. The upstream safety gap emerges at the broiler breeding stage, where the unsanitary conditions of broiler breeding in massive volumes are left with no or few regulatory oversight. This regulatory absence reflects the contestations between different stakeholders in the industry with respect to food safety. The analysis of the downstream safety gap at the import chain segment is somewhat speculative. Our goal here is to examine potential safety hazards in the globalized segment of the chain. In addition, we re-examined the
two hypotheses, raised in chapter 3, of the expected safety governance for different chain segments. The empirical analyses reject hypothesis (i) and partially accept hypothesis (ii). There is an absence of both public and private incentives directly linked to safety regulatory in the fragmented segments of the value chain. However, private incentives for safety regulation at the downstream of the chain can exert influence on the fragmented segments. We have observed a proliferation of private safety governance at the downstream (highly concentrated) segments of the chain in the US broiler industry. The import segment of the chain is primarily regulated by the public sector. This chapter also integrates the dynamics between and within two complex systems – the industrial production and the safety regulatory – within the framework of organizational field theory. Constant contestations between incumbents and challengers are played out in the organizational field of the US broiler industry, as integrators (incumbents) and consumer groups (challengers) differ in conceptualizing safety hazards. Finally, this chapter provides preliminary policy recommendations for safety regulation in the US broiler industry. It argues that by fostering strategic partnership between the public and private stakeholders within the framework of the safety regulatory triangle, government agencies, the industry and consumer groups should cooperate in safety standard setting in a complementary manner, so as to mitigate the tensions between the profit-driven industrialized production and the public interest with respect to safety assurance.
Summary

This thesis is an initial attempt to explore the increased complexity in the globalized agri-food system with respect to food safety assurance. It contextualizes the study in the US broiler industry between the 1980s and the early 2010s, a period characterized by outward expansion. Adopting a multi-dimensional qualitative methodology, combining historical analysis, institutional analysis, value chain analysis as well as interviews, this paper probes the dynamics within and between the US broiler industry and the food safety regulatory system (or the safety standard setting field). This thesis first constructs an analytic framework based on exiting literatures on globalization, value chain analysis, complexity studies, and organizational field theory in chapter 2. Globalization is the broader contexts within which the issues of interest (e.g. the US broiler industry and the safety regulatory system) have evolved. Value chain analysis enables the capture of the structure of industrial organization and the points of interaction between value chain actors. Concepts from complexity studies allow us to identify complex systems in the analyses and to interpret the internal and external dynamics within and among the systems. Finally, organization field theory provides a theoretical anchor to integrate the dynamics and interactions during emergence, settlement, crisis and resettlement phases within and among multiple complex systems within one analytical framework,. This thesis takes a realist stand, utilizing these interconnected concepts to characterize and explain the complexity and dynamics in the US broiler industry and the implications for food safety.

Chapter 3 and 4 unpack two complex systems at play, the US broiler value chain and the safety regulatory system. Both chapters begin with a historical analysis of the evolution and changing dynamics of the two systems during the past three decades. Globalization is a theme
identified in both systems, which has substantially altered the dynamics within and between the industry and the safety regulatory field. Specifically, for the US broiler industry (see chapter 3), intensified globalization extended the value chain production, introducing new actors into the industry, and concomitantly new safety hazards. For the safety regulatory system, globalization has altered the landscape for safety standards setting: national governments are no longer the sole players for food safety assurance. The private sector has become a key player driving food safety governance.

Building on the empirical analyses in chapter 3 and 4, chapter 5 provides an in-depth interpretation of the dynamics within and between two complex systems, as well as their interplay with the broader institutional contexts. The interpretation here is grounded within the framework of organizational field theory. We conceive of the two complex systems as interdependent sub-fields of the organizational field of the US broiler system. The field is under constant contestation among field players (e.g. integrators, retailers, consumers and the state). The specific position in the field determine the specifically opportunities and constraints for a player to maneuver in field contestations. In the analyses, the safety gaps between the industry and the regulatory system exhibit institutional roots. For example, the controversy around safety hazard in the broiler breeding reveals the institutionalized disparity between the incumbents (the integrators) and the challengers (the consumers and food safety advocates). Last but not least, this paper points out that for policy makers to made a difference in addressing the high risk profile of the US chicken products, one strategy is to open and establish mechanisms that can foster the emergence of new sub-fields to counter the prevailing dominance of the field in order to ameliorate the already institutionalized safety gaps.
**Limitations**

This thesis represents an initial effort to probe the complexity of the globalized agri-food safety and its implications for food safety assurance. It takes a realist stand to characterize and explain the high safety risk profile of the US broiler industry. The study is limited by various factors. First, the study is constrained by the limited access to data. Many of the safety standards setters expressed reluctance to engage in an interview. In cases where critical actors were interviewed, the interview process was strictly supervised and censored. And the author was told that the data about safety hazards from broiler imports could not be shared. Therefore, this paper is compromised by a shortage of empirical data.

Secondly, the concepts and frameworks used in this paper may be criticized as a handy device to tailor selected cases to support the designed argument. Our response to this criticism is that, for one, we admit the limited validity of the frameworks and concepts used in this paper. And such limitations are common in most sociological frameworks. However, this does not prevent these frameworks from being utilized, in a realist fashion, to conduct explorative analyses. For another, the results generated after analyzing empirical data turn out to be quite different from the hypotheses we originally put forward. The differences further illustrate the explorative nature of the study. Thirdly, due to the limited time, resources and scope of this study, this paper does not address the technical aspects in the analyses of the safety hazards identified in the broiler value chain and thus it is unable to provide a through assessment of the severity of the safety hazards.

**Future Research Agenda**

The issues addressed in this paper continue to emerge. The importance of studying emerging issues is crucial to understand the potential risks and inform decision-making. However, such a
study is compromised by a shortage of empirical data. We hope in the future, more empirical data about the imported food safety hazards and the circulation of broiler imports can be either generated or made available so that we can more comprehensive and grounded studies can be conducted.

In addition, due to the technical nature of safety hazards, we would suggest future studies can include de-black boxing analyses of the safety hazards to generate a more balanced assessment of the safety hazards and the pertinent standards and policies. Finally, research on food safety and safety standards is interdisciplinary in nature. Therefore, collaboration between scholars with different research backgrounds on the same issue will be more likely to generate fruitful outcomes.
Figure 1. Analytical Framework

Figure 1. The layered structure illustrates the intertwinement in complex systems. Enclosed in each layer is a complex system. Each system co-evolves with the other systems (the environment). Within the organizational field of the US chicken industry, the industry and the regulation unit (standards organizations) constitute two major sub-fields. The size of the sub-field reflects its relative power. This paper will examine the endogenous tensions within each of the sub-fields as well as the dialectic tensions within them.
Figure 2. US Broiler Meat Export and Import between 1989 and 2013

Source: “Chickens, turkeys, and eggs: Annual and cumulative year-to-date U.S. trade - All years and countries”. USDA Economic Research Service Data.
Figure 3. Major US Broiler Trade Partners in 2013 (million pounds)

![Diagram showing trade volumes between US and other countries]

Source: “Chickens, turkeys, and eggs: Annual and cumulative year-to-date U.S. trade - All years and countries”. USDA Economic Research Service Data
Figure 4. Input-Output Structure of Globalized US Broiler Value Chain

Source: Author
Figure 5. Three-Determinant Framework

Source: Gereffi, Humphrey and Sturgeon

Figure 6. Value Chain Governance and Food Standards Framework

Source: Gereffi and Lee
Figure 7. The Regulatory Triangle

- Industry
  - Public and Private Safety Standards Setting
  - Value Chain Operation (US Broiler Industry)
    - Input (Fragmented)
    - Output (Regulated)
- Consumer Groups
  - Safety Demands
  - Safety Assurance
  - Public Comments, etc.
  - Inform and Empower
- Government Agencies
  - Direct Influence
  - Indirect Influence

Source: Author
Table 1. Definition of Three Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity of transaction</td>
<td>The complexity of information that needs to be transferred between value chain actors in order for the transaction to be successfully completed</td>
</tr>
<tr>
<td>Codifiability of information</td>
<td>The extent to which the information needed for transaction can be codified and therefore transferred efficiently and without investment in transaction-specific relationships</td>
</tr>
<tr>
<td>Capability of suppliers</td>
<td>The level of supplier competence in relation to the requirements placed upon them</td>
</tr>
</tbody>
</table>

Source: Humphrey and Memedovic

Table 2. Required Criteria For Broiler Imports

1 Products must originate from **certified countries and establishments** eligible to export to the United States.

2 The Animal and Plant Health Inspection Service (APHIS) restricts some products from entering the United States because of animal disease conditions in the country of origin.

3 Countries and establishments become eligible following an **equivalence determination process** by FSIS.

4 Imported products must meet the same **labeling requirements** as domestically-produced products.

5 After filling the necessary forms for U.S. Consumer and Border Protection, and meeting animal disease requirements of APHIS, all imported chicken products must be presented for inspection by FSIS at an official import establishment.

Source: USDA-FSIS
### Table 3. Value Chain Operation, Critical Safety Points and Safety Standards

<table>
<thead>
<tr>
<th>Type</th>
<th>Stage</th>
<th>Operation</th>
<th>Critical Safety Points</th>
<th>Safety Standards</th>
<th>Primary Safety Standards</th>
<th>Primary Standard Setters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Chain</td>
<td>Input</td>
<td>Feed</td>
<td>Nutrition, bacteria multiplication</td>
<td>Guidelines or requirements for nutrition content and bacterial level</td>
<td>Public (e.g. FDA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chicks</td>
<td>Health hazards to chicks</td>
<td></td>
<td>Requirements, programs for animal health</td>
<td>Public (e.g. USDA-APHIS)</td>
<td>Learning standards are insufficient</td>
</tr>
<tr>
<td></td>
<td>Medication</td>
<td>Antibiotics</td>
<td></td>
<td>Approved types of antibiotics</td>
<td>Public (e.g. FDA)</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>On farm</td>
<td>Health hazards (e.g. pathogens and bacteria)</td>
<td>Sanitary hazards, Multiplication of pathogens and bacteria, Cross-contamination, Antibiotic-resistance bacteria</td>
<td>Limited standards set by integrators</td>
<td>Absent or insufficient</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slaughtering</td>
<td>Cross-contamination, Introduction of new bacteria, use of antibiotics that potential fosters antibiotic-resistance bacteria</td>
<td></td>
<td></td>
<td>Public (USDA-FSIS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Initial</td>
<td>Multiplication of pathogens and bacteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Further</td>
<td>Antibiotic-resistance bacteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional</td>
<td>Processing</td>
<td>Distribution</td>
<td>Multiplication of pathogens during storage and handling processes, etc.</td>
<td></td>
<td>Public (USDA-FSIS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transport within and between states</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partial Import Chain</td>
<td>Processing at foreign establishments</td>
<td>USDA-certified Slaughtering</td>
<td>Cross-contamination, etc.</td>
<td>Equivalence Program (of limited capacity )</td>
<td>Public (e.g. USDA-FSIS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Port of Entry (POE)</td>
<td></td>
<td>N/A&lt;sup&gt;54&lt;/sup&gt;</td>
<td>POE Inspection</td>
<td>Public (e.g. USDA-FSIS; APHIS)</td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td>State-level Transportation</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Retailing</td>
<td>Supermarkets, Fast-food chains</td>
<td>Cross-contamination during storage and handling process</td>
<td></td>
<td>Retailer-initiated safety standards</td>
<td>Private (e.g. GFSI, SQF)</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Author*

<sup>54</sup> N/A: information is not available during the time of this study.
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