ABSTRACT

CHOJNACKI, KRYSTAL M. Targeted Systems Change Behavior: Building a Local Food Economy in North Carolina. (Under the direction of co-chairs Dr. Branda Nowell and Dr. Jeffrey Diebold).

Efforts of systems change are inherently complex and typically fall within the convergence of social and ecological systems (Ericksen, 2008a) and their respective policy domains. Addressing these complex issues often requires an alternative approach to the traditional forms of issue resolution, government and market, to a more broad approach of governance. Governance in the sense of this study is the power sharing among a varied group of societal actors who organize themselves to solve shared issues (Bovens & Hart, 1996; Jordan, Wurzel, & Zito, 2005; Webb, 2005). In these approaches of shared leadership in policymaking, with the government and market playing a supportive rather than lead role, the policy instruments available for use can vary. Instead of the traditional coercive or incentive-based policy implementation instruments, alternatives such as voluntary opt-in instruments are employed. This dissertation examines the contextual conditions that might influence successful policy adoption through a voluntary policy instrument. The research question examined in this dissertation is: what mechanism drives voluntary adoption of a policy instrument derived from an initiative of governance that does not use incentives or coercion to drive adoption; further, are they market, local infrastructure or institutional contextual factors?

In this dissertation I use the theory of diffusion of innovations (Rogers, 2003) as an overarching theory in my analysis because it incorporates a myriad of theoretical perspectives to examine adoption. Specifically, I explore market factors of demand informed by public choice theory (Buchanan & Tullock, 1962), local infrastructure factors of supply and societal concerns from the market and infrastructure perspective of innovation adoption and diffusion (Brown,

1981), and institutional mimetic factors informed by institutional theory (DiMaggio & Powell, 1983). Local food system development offers an information rich example of a complex systems change effort as it spans food production through consumption. It crosses multiple policy domains as it focuses on environmental and equitable food production and access. Spatial factors are important in local food systems that build community based system that rely on small and mid-size production that feed communities in close proximity, rather than the global food supply chain. Therefore, the contextual features of a locality are an important consideration in these food system transitions. In this dissertation, I explore the case of North Carolina's initiative of governance to build a local food economy.

A discrete-time hazard model, a form of an event history analysis, is used to analyze the contextual factors that influence adoption of a voluntary local food policy over time. The findings suggest that, while voluntary adoption of a local food policy was a rare event, proximity to other previous adopters had the greatest impact on adoption. This dissertation contributes to theory by determining the relative influence of markets, supporting infrastructure, and mimetic processes in understanding diffusion of a voluntary policy. It contributes to gaps in the literature on food system transitions (Markard, Raven, & Truffer, 2012), namely a gap in transitions within the United States (Candel, 2014; Clancy, 2014; Delaney et al., 2016). Finally, it addresses a gap in understanding what factors drive adoption of behavior change initiatives put forth by initiatives of food systems governance (Delaney et al., 2016). The results of this study inform other localities that desire similar local food system development outcomes, such as adoption of local food procurement goals, from the use of voluntary instruments by their initiatives of governance.

Targeted Systems Change Behavior: Building a Local Food Economy in North Carolina

by
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DEDICATION

This dissertation is dedicated to the three strong girls I cannot wait to see become amazing,

influential women. To Kira, Karis and Kallie, our family jewels.

BIOGRAPHY

Krystal M. Chojnacki was born in Fayetteville, North Carolina and was raised in Germany and North Carolina in a proud military family. She earned a Bachelor of Business Administration degree with a concentration in Finance from the University of North Carolina at Wilmington, and a Master of Public Administration degree from California State University, Fresno.

Continuing the tradition of public service her parents instilled, Krystal spent a year of service in AmeriCorps*VISTA which set the foundation for a career in public service. Krystal is a seasoned public administrator currently working at the Center for Environmental Farming Systems (CEFS) at North Carolina State University. Her prior work in local government spans economic development, redevelopment, and city administration serving as the first female manager of the City of Mendota at the age of 28. Krystal currently works in higher education administration at the Center for Environmental Farming Systems (CEFS) at North Carolina State University.

Krystal's research interests include local and community based food systems, governance, systems change, and policy implementation.

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For my final thanks, I borrow the words from a hip-hop legend:

"Last but not least, I want to thank me. I want to thank me for believing in me. I want to thank me for doing all this hard work. I want to thank me for having no days off. I want to thank me for never quitting. I want to thank me for always being a giver and trying to give more than I receive. I want to thank me for trying to do more rights than wrong. I want to thank me for just being me at all times....."

- Snoop Dogg, November 2018

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CHAPTER 1: INTRODUCTION

Introduction

This dissertation examines the requisite conditions for successful policy implementation that does not rely on traditional policy instruments of incentives and sanctions. Understanding the conditions that facilitate policy adoption is of growing relevance on both global and local scales as it concerns complex issues that intersect social and environmental policy domains. Successful policy implementation is contingent on the approach to issue resolution, the correct choice of policy instrument, the entity implementing the policy, and the contextual conditions within a locality that might influence adoption of the policy. These factors will be reviewed in this dissertation through examination of a complex issue of systems change. Systems change often involves interactions among several large policy domains, which makes these transitions complex. Scholars use the concept of a 'system' to understand how interactions among interdependent components lead to particular outcomes in addressing complex problems or governing behaviors (Ericksen, 2008b).

The traditional policy instruments of incentives and sanctions commonly deployed by state or market institutions are limited in redesigning systems. Rather, governance approaches to policy change within systems are viewed as more advantageous, as they engage a broader network of actors and mix of instruments to resolve issues in innovative ways (Bovens & Hart, 1996; Colander & Kupers, 2016; Jordan et al., 2005; Webb, 2005). Often, this is accomplished without the coercion or incentives utilized by traditional government or market approaches.

Local food system transitions offers information-rich examples of a systems change effort because it entails transformations in food production, procurement, distribution, consumption, and environmental stewardship behaviors and practices. These transformations

involve the integration of traditionally siloed social, environmental, and economic elements and thus are considered complex systems change efforts. Local food systems are a policy domain of interest as they are viewed as central to building local capacity to deal with increasingly complex and interconnected social and environmental forces such as growing food insecurity and climate change (Hinrichs, 2014; Vermeulen, Campbell, & Ingram, 2012). Efforts to reduce local reliance on global food supply chains through the development of more robust local food systems has required innovative approaches of governance.

This dissertation examines the implementation of a voluntary, opt-in policy, diffused through a social marketing campaign, by a network of actors involved in the governance of the local food system in North Carolina. The objective of the policy is to drive local food procurement by both consumers and institutions. There is much we do not understand about what drives institutions to voluntarily opt into policy initiatives that lack both sanctions and incentives, such as those put forth by initiatives of governance. The research question this study seeks to answer is: what mechanism drives voluntary adoption of a policy derived from an initiative of governance that does not use incentives or coercion to drive adoption? Are they market, supporting infrastructure or institutional mechanisms?

This dissertation contributes to theory by determining the relative influence of markets, supporting infrastructure, and mimetic processes in understanding diffusion of a voluntary policy. This dissertation contributes to policy discourse by providing an example of how a voluntary instrument, without coercion or incentives, can drive adoption of a desired policy objective. The results of this study inform other localities that desire similar local food system development outcomes, such as adoption of local food procurement goals, from the use of voluntary instruments by their initiatives of governance.

To address this research question I use a discrete-time hazard model, a form of an event history analysis, to analyze the length of time until event occurrence, given the event did not already occur. In this study, the event is the adoption of a local food procurement standard as an innovation among businesses/organizations in North Carolina. As sustainable agriculture and local food systems are interdisciplinary fields of study, this dissertation draws from several disciplines including sociology, agriculture, human geography, organizational psychology, and economics. In this chapter, I argue for the importance of governance as a means for resolving complex issues such as resilient food systems by juxtaposing it against more traditional policy frames. Currently, we do not know which factors influence voluntary adoption of a local food policy initiative put forth by an initiative of governance. I explore local food systems as an example of a complex issue within the sustainable development policy arena. I review North Carolina's efforts in governance of building a local food economy using a targeted, regional campaign initiative for behavior change. The theoretical foundations that are applied in this study are then reviewed in Chapter 2.

Policy Frames for Issue Resolution and Implementation

The word 'policy' is an important term for institutions as it defines interrelated decisions and goal setting made by an actor or group of actors who have the ability and power to achieve these goals (Jenkins, 1978; Rist, 1994). Further, 'public policy' denotes that such action has been taken by a state organization (Richards & Smith, 2002). Historically, policy discourse within the Academy has fallen within two distinct frames as it relates to the institution/entity that is providing solutions to societal issues: the government and the market (Colander & Kupers, 2016). Political scientists study the government frame and economists study the market frame.

Because these two perspectives differ, they are often seen as competing (Colander & Kupers, 2016; Howlett, 2005).

Within the government frame, public policy process scholars have used the policy cycle, developed by Lasswell (1956) and refined by Brewer (1974), to organize and explain the policy process (Sabatier & Weible, 2014). Understanding this process is important as it provides an explanation of how and why policies develop and exist, are implemented, and whether these policies are effective. For scholars and practitioners, the study of each part of the policy cycle offers insight and knowledge about what effectively resolves societal issues by traditional government means.

The policy cycle is comprised of initiation, estimation, selection, implementation, evaluation and termination (Brewer, 1974). These stages address general public policy issues in need of resolution. In the initial stages of the cycle, a problem or issue is identified, various actors work to get the policy on the official agenda, and the policy is proposed and set. The later stages of the cycle include policy implementation by public administrators, evaluating effectiveness of the policy, making changes to improve its effectiveness, or terminating the policy if it is proven ineffective in addressing the problem (Brewer, 1974). This is known as a top-down approach to policy implementation (Sabatier, 1986). This study is grounded in the implementation portion of the policy cycle and, more specifically, in understanding the application and choice of implementation instruments.

Policy implementation is one of the later stages of the policy process in which policy developers or public administrators apply the appropriate implementation tool to carry out a policy objective. Howlett (1991) describes these tools as "policy instruments" and notes that scholars in the implementation field have developed categories of instruments spanning state and

government or market-based instruments. Policy instruments are various techniques used to effect change (Bemelmans-Videc, Rist, & Vedung, 2011) and the type of instrument available may vary depending on the frame and what authoritative powers are afforded to the institution involved in the implementation. Within government and market frames, policy instruments are often dichotomized as instruments of regulation or instruments of economic incentives (Bemelmans-Videc et al., 2011) such as subsidies or rewards that entice individuals to change their behavior (Deborah Stone, 2012).

In the market frame, early economists studied the impact of policy on business efficiency and advocated for government to operate within its own boundaries while delivering pure public goods (Howlett, 2005). This separation gives businesses the opportunity to generate wealth by providing solutions to societal issues in the free market, by use of a market-based approach. Now, economists are paying close attention to the interactions of policies on the production and consumption of goods in the marketplace, how institutions employ material incentives as implementation instruments to achieve desired results, and how consumers respond to those incentives (Colander & Kupers, 2016). This type of solution is considered a 'bottom-up' approach to policy implementation as solutions are made at the local level (Sabatier, 1986). The government frame to policy-making employed in the United States of America is a democratic system of government where 'the few' (elected officials) are elected to represent and make policies to address issues of 'the many' (their constituents). Largely, governments have successfully utilized top-down strategies and various corresponding instruments to implement a wide range of public policies in areas such as transportation, code enforcement, law enforcement and waste.

However, not all issues can be addressed within a single frame (market/government) nor by using a specific approach (top-down versus bottom-up). Issues that are more complex in nature demand a more inclusive and democratic approach toward generating solutions that involve a larger number of citizens, institutions, as well as actors from both the market and state frames (Lamine, Renting, Rossi, Wiskerke, & Brunori, 2012). This dissertation examines the implementation of an inclusive approach that includes the government and market as participants in complex issue resolution, rather than the leads. First, we describe what a complex issue looks like in order to better understand what kind of policy approach should be employed to provide a resolution.

Complex Policy Issues and Systems Change

Complex issues tend to lie at the convergence of social and ecological systems (Ericksen, 2008b) and are thus greatly important as they affect many members of the public and have environmental and health implications. Systems approaches have traditionally been used in social and biophysical sciences to aid in addressing the complex issues that result from these interactions (Ericksen, 2008b). Resolving these issues requires a collaborative effort and innovative thinking as they could affect quality of life or even survival of humanity (Komiyama & Takeuchi, 2006). It is within these circumstances of complexity that broader stakeholder groups are involved. These include a variety of sectors, public and private; various stakeholders; and span from local to national levels, incorporating both government and market policy frames.

This dissertation focuses on one such policy area, sustainable food systems. Supporting the development of sustainable food systems to end hunger, improve nutrition, and achieve food security is a central focus area within the sustainable development policy domain (Food and Agriculture Organization of the United Nations, 2015a). Sustainable development is defined as

"…development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Nations, 1987)." It is an apt lens through which to review a highly complex policy arena because of its expansive scope that spans multiple disciplines. Adding to this complexity is sustainable development's vision that supports democracy through local participative processes (Morgan & Sonnino, 2013). This vision fully recognizes the interconnectedness between the health of the human species and the environment (Griffiths, 2006). In 2015, the Food and Agriculture Organization (FAO) of the United Nations (2015a) established seventeen sustainable development goals **(Figure 1.1)** to guide the actions of the international community over the subsequent 15 years.

Figure 1:1 *17 Sustainable Development Goals of the Food and Agriculture Organization of the United Nations* (Food and Agriculture Organization of the United Nations, 2015b).

These goals provide an example of how a single policy area calling for reform can encompass a variety of highly-interconnected systems spanning inequities in access, health interventions, finite environmental resources, economic well-being, workforce implications, and

the economics of supply chains. They demonstrate how issues can span a variety of levels of government oversight, as is the case when local issues affect and generate global issues as well as when global issues generate and affect local ones (V. A. Brown, Harris, & Russell, 2010). Further, policy goals and transitions that span large multi-level systems are known as sustainability transitions (Hinrichs, 2014; Markard et al., 2012).

Issues of this type of complexity have been described by scholars as wicked problems, not because they are morally wrong, but because they reject usual methods of resolution and therefore require alternate forms of governance (Brinkley, 2013; V. A. Brown et al., 2010; Head, 2008; Rittel & Webber, 1973). Therefore, when seeking to address a wicked problem, there are no standard procedures, top-down approaches to solutions, nor solutions that one discipline alone may offer (Thompson & Whyte, 2012). Instead, an interdisciplinary approach must be employed – one that moves beyond simple notions of instruments and the siloed policy frames of government versus the market (Colander & Kupers, 2016; Howlett, 2005). With this study, I will contribute to the body of knowledge of addressing complex issues, specifically local food systems transitions.

Local Food Systems

Local food systems are defined as when all activities of a food supply chain, spanning agricultural production through production, occur within a shared geographic locality (Schönhart, Penker, & Schmid, 2009). Local food systems can be expansive in scope, are inherently interdisciplinary, and promote the use of ecologically-conscious practices and technology for sustainable agricultural production (G. W. Feenstra, 1997; Hinrichs, 2000). This approach promotes local and environmental production practices by accounting for food miles, greenhouse gas emissions, and energy use (Hinrichs, 2003). Sustainable agriculture calls for a

resurgence of local and community-based food systems, based on small and mid-size farms producing food to feed communities within close proximity. This contrasts with more conventional agricultural practices in the global north that account for approximately 40% of all carbon dioxide emissions (Lutz & Schachinger, 2013).

An increase in the popularity of locally-produced foods over the past two decades can be attributed to the efforts of the local food movement. The growth of consumer interest in sustainable agriculture, including local foods, is often seen as consumer pushback against the neoliberal strategy of globalization in our food system (Alkon & Mares, 2012; Guthman, 2007; Schnell, 2013). The release of several prominent publications in mainstream literature including Michael Pollan's *The Omnivore's Dilemma* (2012), as well as a broad range of food-centric film documentaries such as *Food, Inc.* (2009), *Fresh* (2009) and *King Corn* (2007), have led to increased public awareness of how the food industry influences what we eat, where and how our food is produced, and, subsequently, how the manipulation of political processes impacts our health (Nestle, 2013). Hinrichs (2003) notes that the terms "globalization" and "localization" tend to be used to label opposing ends of a scale where "globalization" is assumed negative and "localization" positive. Increasingly, consumers feel distanced from nationally- and globally-based producers and the production of their food.

These spatial factors – global being far away and local being near – are tied to both social and environmental factors (Hinrichs, 2003, p. 35), again speaking to the complexity of the food system. A systems approach can assist in revealing the factors that lead to outcomes that govern a specific behavior or interest (Ericksen, 2008b); for example, in this study, the transition from conventional to sustainable food systems. This area has failed to get the attention it deserves in the sustainable transitions literature. In fact, while sustainable food system transitions are

frequently referred to as an important area for research (Hinrichs, 2014), only 3% of peer-reviewed articles on sustainability transitions are on food systems (Markard et al., 2012). Alternatively, energy, transportation and water sanitation have dominated scholarship and focus on sustainability transitions (Markard et al., 2012). This dissertation will address the gap in empirical research on food system transitions.

David Colander and Roland Kupers (2016) assert that when addressing complex issues such as this, policy and government should play a supporting role in the development of a structure designed to resolve them. By this, they mean that policy emerges from the process, bottom-up, rather than from a top-down government directive. People in the market are free to choose both individual and collective goals and decide how to obtain them, which is arguably a more democratic policy process (Colander & Kupers, 2016; DeLeon & DeLeon, 2002). This type of structure is known as governance.

Alternative Policy Process: From Government to Governance

In heeding the call from Colander and Kupers (2016) to integrate government and the market along with other institutions to address complex issues, we transition to the topic of governance. Parallel to the determination that not all public issues can be remedied with incentives or regulation, there has been a change in the manner of how complex social problems are resolved. In the 1990s, scholars began writing about the movement from government to governance (Bovens & Hart, 1996; Pierre, Pierre, Peters, & Professor, 2000; Rhodes, 1996). This movement was characterized largely by a change in the entity carrying out the tasks of government as well as the selection of the policy implementation instruments (Jordan et al., 2005; Rhodes, 1996).

The term 'governance' is defined differently among different disciplines (Rhodes, 1996). One well-recognized definition is that used by political scientists in which the term 'governance' is used as a synonym for 'government' (Stoker, 1998), defined as the formal institutions of state that use coercive powers to maintain public order (Stoker, 1998). However, most scholars, especially those in the social sciences and environmental disciplines, now associate 'governance' with "a decline in central government's ability to steer society" (Jordan et al., 2005, p. 480) on its own. In this sense, 'governance' is about power-sharing among a group of societal actors who organize themselves to solve shared complex issues (Bovens & Hart, 1996; Jordan et al., 2005; Webb, 2005). This power-sharing over issue resolution can include actors from public or private sectors, as well as involve new actors such as self-organizing networks, working toward the provision of solutions (Rhodes, 1996). For the purposes of this dissertation, the definition of governance used is "...self-organizing inter-organizational networks... that complement markets and hierarchies as governing structures for authoritatively allocating resources and exercising control and co-ordination [sic](Rhodes, 1996, p. 653)."

Building on this definition is the idea of sustainable governance that is inclusive of market and state actors, but may also include membership from the private and voluntary sectors, as well as citizens (Webb, 2005). Thus, sustainable governance "... [has] the potential to offer more robust, responsive, efficient, effective, and flexible … approaches" to address areas of mutual concern (Webb, 2005, p. 243). This environment is ripe for the development of novel innovations and alternative tools of policy development and implementation as it fosters bottom-up, local and community-driven approaches, such as those necessary to address complex issues.

One example is Elinor Ostrom's work in common pool resource management (E. Ostrom, 2010; E. Ostrom, Burger, Field, Norgaard, & Policansky, 1999). This involved the study of how

natural resource management utilizes alternative economic governance practices emerging from the bottom-up over time (E. Ostrom, 2010). As common-pool resources (water systems, forests, and pastures) are necessary for the survival of humanity, actors and representatives from a broad range of institutions, as well as citizens, must be present and work together to ensure equity and fairness in the management of these resources. Ostrom (E. Ostrom, 2010; E. Ostrom et al., 1999) studied how people in local communities around the world managed their shared natural resources and how rules of governance were established over time to sustainably manage those resources.

The case investigated in this study falls within the broader literature of food system governance. Existing literature shows an increase in scholarship in food systems governance following the food price crises in 2007-2008 and 2010, which demonstrated the relevance and significance of food systems governance, especially as it relates to food insecurity (Candel, 2014; Delaney et al., 2016). Literature reviews revealed gaps in empirical studies conducted in the United States (Clancy, 2014) and ones that focused on regional and local levels (Candel, 2014; Delaney et al., 2016). This dissertation will respond to this gap by providing an empirical analysis of a regional food systems governance initiative in the United States and will help to address the "European Bias" (Markard et al., 2012).

Within these bottom-up approaches of sustainable governance, innovation and local-level discretion in policy formulation and implementation play a key role. It is these local-level actors who have a keen understanding of the local situation and may be able to determine the most effective policy and instrument for implementation. Although, the instruments available for issue resolution may differ from those traditionally used by government and the market, as described in the next section.

Policy Instruments of Governance

Traditional public policy instruments, or those used by the state, are tools by which government authorities use their power to garner support for and ensure social change (Bemelmans-Videc et al., 2011). Michael Howlett (2005) notes that policy instruments used in governance incorporate state authority but also act to affect the behavior of individuals through market mechanisms. The government plays a supporting role by demonstrating influence without control, as most actions will be voluntarily led from the alternative actors involved. Therefore, the implementation narrative changes from how government will structure the system to how society will achieve collective coordination (Colander & Kupers, 2016).

In her book *Policy Paradox: The Art of Political Decision Making,* Stone (2012) notes that rather than following the laws of matter, collective efforts tend to follow the laws of passion. Collective efforts that bring together a diverse group of actors are important when changing systems of production or consumption. Further, change efforts tend to be incremental due to deeply-embedded economic, social, institutional, cognitive and technological practices (Seyfang & Smith, 2007). Citizen participation and consultation in the process of developing policies and their respective implementation strategies is central to this approach (Bemelmans-Videc et al., 2011). Ostrom (2010) defined the arena where these types of collective efforts take place as an action situation or a social space where interactions occur that are affected by external variables such as community attributes and rules.

Collective action implies the use of voluntary approaches. Voluntary approaches have often been used as the main instrument in environmental policies (Baranzini & Thalmann, 2004). Instruments of a voluntary approach are defined as an action or behavior change that is not made through coercion from state-based institutions, nor as a result of incentives being offered, for

example, from market-based institutions (Borrás & Edquist, 2013). Rather, voluntary instruments, such as consumer awareness campaigns based on persuasion, have been used as a means to change behaviors (Borrás & Edquist, 2013; Lambin et al., 2014). The logic underlying voluntary instruments is that the individual or organization perceives some gain from participation (Alberini & Segerson, 2002), either tangible or intrinsic. For example, consumers are motivated to do their part to help the environment through sustainable consumption, wherein purchasing power is used to make a public statement of activism (Seyfang, 2006; Thilmany, Bond, & Bond, 2008). Therefore, consumers are attracted to marketing campaigns that both inform them of this opportunity to contribute to environmental stewardship, as well as contribute to the economic viability of their local community via their purchasing power. By changing consumer behavior, communities gain both economic and social power as more money circulates in the local economy and communities become more self-reliant (Kurland, McCaffrey, & Hill, 2012). This further contributes to communities having a larger voice in policy development.

Traditionally, governments have led public information campaigns, which are directed mass communication efforts implemented to achieve a policy result (Weiss & Tschirhart, 1994). These campaigns have targeted complex issues such as improving health outcomes, environmental protection, wartime efforts, and the manipulation of public opinion. As a policy instrument, campaigns are used to inspire voluntary changes of behavior through both education and persuasive arguments (Bemelmans-Videc et al., 2011). Schneider et. al. (2019) argue that in this digital age, information that spurs public engagement with food system transitions is of critical importance in initiatives of governance. Within governance, other key actors, not just state institutions, are empowered to engage in these types of campaigns, particularly consumer behavior campaigns (i.e. social marketing).

Social marketing is described as a deliberate communication strategy carried out by a non-profit or public agency aimed at affecting behavioral change (Rogers, 2003). Behavioral change of individuals through marketing interventions is a critical element in social marketing theory. Alan Andreasen (2002) states that social marketing can be applied in any situation in which a socially-critical individual behavior needs to be addressed. Examples of these campaigns can be found in the implementation of health-based initiatives, including those affecting nutrition, anti-littering, anti-smoking, and public safety programs (Rogers, 2003). This is consistent with elements of "buy local" food campaigns that promote the socially-critical behaviors of nutrition and environmental stewardship, such as the case that will be reviewed in this study. Communication strategies surrounding the promotion of local food have largely been focused on the implementation of geographic branding campaigns. These campaigns have been found to be effective in promoting the sale of local food products and positively impacting local economies (Govindasamy et al., 2004; Onken & Bernard, 2010; Patterson, 2006).

We do not know much about what factors drive adoption of these types of behavior change initiatives deployed by initiatives of food system governance (Delaney et al., 2016). This dissertation provides an empirical study that illuminates what drives adoption, as the dependent variable, of a voluntary instrument deployed by an initiative of governance. In particular, this dissertation will reveal the relative influence of markets, local infrastructure, and institutions in targeted systems change efforts initiated by a local initiative of food system governance. This is performed by an empirical examination and evaluation of policy implementation at the local level and the causality indicators that influence adoption, as will be reviewed in detail in chapters 2 and 3. This dissertation will make a valuable contribution to the scholarship on food systems governance and policy instruments deployed within these systems of governance to create

targeted systems-change behavior and will offer new perspectives and value for the growth of this field of study.

Food Systems Governance at the Local Level: Local Food

Local food is an exemplary context for understanding how an initiative of governance can create behavior change through use of a voluntary instrument because of its mobilizing and convening power (Morgan, 2009). It is important to provide a definition of local food for this study because there is no consensus on a definition even among key proponents and advocates in the field (Eriksen, 2013; Hardesty, 2008; M. Ostrom, 2006; "USDA ERS - Local Foods," 2015). Defining "local food" varies among coalitions, businesses, and individuals. Some consider local food as those products that are produced in a locality nearby (e.g. 20-50 miles away), while others consider a product local if it is consumed within the same country it was produced in (Eriksen, 2013). In this study, local foods are defined as those items with primary ingredients being produced or grown in North Carolina or surrounding waters. Processed foods are considered local if their primary ingredients are produced or grown in North Carolina. This is the same definition used by the NC 10% Campaign, the case explored in this dissertation; in the "Pledge of purchase partners – Local Food Guidelines" (Appendix A) which participants are given upon joining the campaign.

The rise in popularity of local, organic, and sustainably-produced goods has propelled the growth of local food systems and food production by small-scale producers. Research on the localism movement, which advocates that consumers and firms purchase from independent businesses in their local area, has grown increasingly over the past decade (Kurland et al., 2012). The localism movement, aligned with practices of sustainable agriculture, encourages

consumers, organizations, and business to purchase sustainably-produced food from nearby producers.

Projects linking community members and local businesses directly to farmers have been instituted to improve local food economies (G. W. Feenstra, 1997; Sayed, Hendry, & Zorzini, 2014). These projects develop venues through which local food products are sold to consumers and include farmers' markets, community gardens, local farms, locally-oriented restaurants, food security and hunger organizations, retail food cooperatives, and other interconnected organizations (Hess, 2008). In order to educate consumers on the availability and benefits of local food "buy local" marketing campaigns have been initiated to develop demand for local products (Hinrichs & Allen, 2008).

In the case reviewed in this dissertation, consumers, both individual and institutional, are challenged via a social marketing campaign to change their procurement habits to benefit the growth of local food economies in North Carolina. The campaign incorporates a unique voluntary opt-in component to join, and participants pledge to spend at least 10% of their existing food dollars (not spending more than they would typically spend) on local food. In other words, rather than just promoting an idea, the campaign adds a component of citizen engagement and active participation to change the market conditions of the local food sector.

The case outlined in chapter 2 provides a unique perspective on the deployment of an implementation tool, a social marketing campaign that demonstrates collective action underway in the promotion of local foods to build a local food economy in North Carolina.

Governance of Local Food Systems in North Carolina

The Center for Environmental Farming Systems (CEFS) is an interdisciplinary, inter-institutional collaboration between North Carolina State University, North Carolina Agricultural

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and Technical State University, and the North Carolina Department of Agriculture and Consumer Sciences. Since its founding in 1994, CEFS has been a key institutional coalition member in the sustainable agriculture community in North Carolina and has maintained a unique ability to bring together diverse coalition members who have a stake in sustainable agriculture. These coalition members range from thought leaders in the field to "ordinary" residents of North Carolina and include scientists, non-profit organizations, youth and childcare organizations, producers, private businesses, elected officials, funders, and foundations. CEFS launched its Farm to Fork initiative in 2008 and hosted a statewide summit in 2009. Participants in the initiative included over 1,000 North Carolinians drawn from an array of sectors, spanning faith, education, health care, policy, and agriculture, who have ties to North Carolina food systems (Curtis, Creamer, & Thraves, 2010). As outlined below, the Farm to Fork initiative gave rise to the North Carolina 10% Campaign (NC 10% Campaign), which is the central case study in this dissertation.

The goals of the Farm to Fork Initiative were to articulate shared values of sustainable local food systems; identify and promote collaboration amongst organizations; learn from existing initiatives; and develop and prioritize actions at the state and local levels, including needed policy recommendations and program initiatives (Curtis et al., 2010). Figure 1.2 illustrates the logic model used to outline the process, steps, and outcomes for building a sustainable local food economy in North Carolina that the coalition developed and employed.

Building a Sustainable Local Food Economy in North Carolina

VISION: North Carolina has a strong local food economy where all North Carolinians regularly consume fresh, healthy foods that are grown, raised, caught, processed, distributed and marketed sustainably by local producers and businesses.

CONTEXT (Why?)
- Loss of farmland, farmers and fisheries
- Obesity, chronic diseases and health care expenditures
- Rising cost of fossil fuels and natural resource degradation
- Job loss and rural community decline

ASSETS
- Consumer demand
- Strong and diverse agricultural industry and ideal climate
- Community and institutional engagement
- Superior educational system and flexible labor pool
- Proximity between rural and metropolitan areas

INPUTS (What?)
- Structured planning and coordination
- Policy and regulatory changes
- Capital investments
- Research, training and instruction
- Consumer education and marketing

STRATEGIES (How?)
- Engage and coordinate agencies and stakeholders at state and local level
- Grow new and transitioning farmers and secure prime farmland
- Expand producers' access to larger-scale local markets
- Support food systems infrastructure and business development
- Cultivate community gardens
- Address public health and food access disparities
- Coordinate and integrate public education campaigns
- Implement farm-to-school programming and engage youth

OUTPUTS (Interim Results)
- State and local food advisory councils
- Coordinated local food system policies and regulations
- Viable business models and public/private partnerships that provide local food infrastructure and market access
- Statewide networks that expand reach and effectiveness of community-based initiatives
- Food system focused training and instruction programs that support teachers, extension agents, farmers and food entrepreneurs

OUTCOMES (Short-term impacts)
- More farmers and fisheries
- More fresh, healthy, local food widely sold to institutional, retail and food service markets
- More infrastructure and new businesses and partnerships established
- More supportive regulatory environment
- More demand for sustainably produced foods

OUTCOMES (Long-term impacts)
- Increased jobs within food economy
- Healthy North Carolinians and reduced state health care expenditures
- Increased food dollars spent locally supporting rural communities
- Reduced environmental impact and reliance on fossil fuels

Figure 1.2: *Logic Model for Building a Sustainable Local Food Economy in North Carolina* (Curtis et al., 2010).

As a result, the initiative identified nine major issue areas and challenges to be addressed and formed Working Issue Teams (WITs) comprised of stakeholders (organizations, individuals,

businesses, and associations) to develop next steps for each issue area. One of these WITs was 'Increasing Consumer Education and Outreach'; it was from that WIT that the NC 10% Campaign grew (Curtis et al., 2010). The objectives of the campaign were threefold: to conduct a statewide advocacy campaign to engage residents and organizations to consume 10% of their food from local sources; to develop a web portal to support and stimulate grassroots efforts among North Carolina communities, organizations, businesses and governments; and to increase awareness of the benefits of consuming sustainably-produced foods across all industry sectors (Curtis et al., 2010).

The NC 10% Campaign has the critical components of a social marketing campaign aimed at influencing the procurement behavior of its participants to make the procurement of local foods a normalized behavior. The innovation in this case is the voluntary opt-in local food policy that sets a procurement standard of spending at least 10% of existing food dollars on locally-sourced products. The innovation is diffused by the initiative of governance through the NC 10% Campaign, as a catalyst for behavior change. Businesses and consumers (households) in North Carolina were encouraged to actively join the campaign via a web-based platform. As an incentive, business participants are featured on the Campaign's website (http://nc10percent.com) as Campaign partners. In addition, they are listed as places that consumers can eat or buy local food. Businesses are contacted periodically by Campaign staff to provide a report of funds spent on local food procurement over time. On the consumer side, a web server sends weekly emails asking participants to report their weekly local food purchases, and thereby tracks participant spending on local food over time. This weekly reminder to consumers and the frequent phone calls to businesses by Campaign staff to report local food expenditures was employed as means to drive behavioral change. Consistent reminders of reporting local food purchases as committed

to by the voluntary pledge made when voluntarily opting into the campaign was the strategy used to change behavior. In this case it was changing the food procurement behaviors of participants to spend at least 10% of their existing food dollars on local food.

In addition, the Campaign actively advances and promotes local foods through the development and marketing of seasonal purchasing guides, meal plans, recipes and local food spotlights. The Campaign produces video spotlights of featured participants and products such as a retirement community in a video called *Freshly Retired* (NC 10% Campaign, n.d.). *Freshly Retired* documents how a chef at a continuing care retirement community in Charlotte, NC implemented a garden that residents help maintain to produce fresh, local food for their meals. The campaign's webpage (http://www.nc10percent.com/) also hosts an interactive dashboard which allows the public to view local food consumption habits at the county level, broken down between individual consumer participants and organization/business participants. Consumers are informed about where to make local food purchases, including local farmers' markets and CSA (Community Supported Agriculture) programs, and which businesses spend at least 10% of their food dollars on locally sourced food, such as restaurants and grocers. Restaurants in particular are an information-rich context in that overall American eating patterns demonstrate a larger percent of the overall food budget spent on food from restaurants (Mehta & Chang, 2008; Okrent & Alston, 2012). Restaurants will be the foci of the Campaign's institutional participants in this study.

The NC 10% Campaign is an example of an implementation instrument selected by local-level actors engaged in contributing to a complex system of governance that emerged from the bottom-up for the resolution of a societal issue: increasing awareness and consumption of good, healthy, locally-produced food. However, a critical component of understanding the

Campaign's influence and diffusion is understanding what factors contribute to participants voluntarily pledging to spend at least 10% of their existing food dollars on local food. In this study, we look at the diffusion of adoption of a local food procurement standard (10%), through pledged, voluntary participation in the NC 10% Campaign and seek to answer the following research question: What factors increase the probability of businesses/organizations adopting local food as an innovation sooner rather than later in North Carolina? Are the factors driven by isomorphism at the institutional level, or public choice as expressed by stakeholders?

Summary

In this Chapter, I reviewed the complex conditions under which traditional policy frames are not suited to resolve societal issues. In these cases, integrated, diverse networks of actors can instead engage in initiatives of governance to resolve such issues. However, governance approaches to resolving issues may use voluntary, coercive and incentive-free instruments instead of traditional policy mechanisms. In these cases there is a lack of understanding about the factors that influence opting into voluntary initiatives like the NC 10% Campaign. Are they market, local infrastructure, or institutional factors?

To answer this question, three theoretical foundations are applied. A foundation of this study is diffusion theory as articulated in *Diffusion of Innovations* by Everett Rogers (2003) and later scholars. Several key components of this theory are a focus on communication used to diffuse adoption of an innovation, the rate or speed of adoption, compatibility of the innovation with the target clientele, and proximity to other adopters. Components drawn from diffusion theory that are rooted in institutional and public choice theories, and the market and infrastructure perspective of innovation adoption and diffusion, are focal in this analysis. Public choice theory, grounded in economics, asserts that the collective sum of many individual

decisions and choices will drive action in the marketplace. Public choice theory will be used when assessing whether collective action by consumers are an important driver of adoption of a voluntary opt-in local food policy. The market and infrastructure context of innovation adoption and diffusion perspective was developed by Lawrence Brown (1981), to address the supply side of diffusion and the local infrastructure that is needed to give a potential adopter the opportunity to adopt an innovation. Institutional theory contributes insights into social aspects of organizations (both internal and external) that facilitate change, legitimacy, and survival. DiMaggio and Powell (1983a) offer propositions to aid in looking at isomorphism among institutions and through what conditions organizations are compelled to resemble others. Each of these theories will be further reviewed in Chapter 2.

The theoretical contribution of this dissertation comes from assessing the relative salience of market, local infrastructure, and institutional factors in aiding understanding of diffusion processes as they relate to addressing complex issues by governance. The policy contribution of this dissertation lies in illustrating a case of bottom-up policy implementation and how diffusion took place, to assist other states and countries with the implementation of their own social marketing campaigns to drive adoption of voluntary local food policies that support development of local food systems. Chapter 2 will review the literature on the theoretical foundations, including seminal pieces and the hypotheses they inform, on the mechanisms that influence the diffusion and adoption of a voluntary opt-in local food policy among organizations. Chapter 3 will outline the variables and event history analysis used to analyze how time as well as market, local infrastructure, and institutional covariates affect the time-to-adoption of local food as an innovation among institutions in North Carolina. Chapter 4 presents the results of the empirical

study and is followed by a discussion of the results, implications of findings and future research

directions in Chapter 5.

CHAPTER 2: LITERATURE REVIEW

Introduction

This dissertation seeks to answer the question of why organizations might voluntarily adopt an innovation derived from an initiative of governance that is neither mandatory nor incentivized. This study uses a local food system initiative as its focal case and seeks to contribute to the local food and diffusion literature by exploring the research question of what factors increase the probability of restaurants adopting a voluntary opt-in local food policy as an innovation, sooner rather than later, in North Carolina. Are these factors driven primarily by market demand as expressed by stakeholders, by local infrastructure availability, or institutional isomorphism within a locality? Additionally, this study seeks to contribute to governance policy implementation studies in providing evidence of factors that should be in place in order to increase the probability of successfully implementing a policy over space and time.

While there have been studies examining the contextual factors that influence consumer adoption, particularly in pro-environmental behaviors (Ertz, Karakas, & Sarigöllü, 2016; Feldmann & Hamm, 2015; Stern, 2002), there is a research gap with regard to the contextual factors that influence organizational adoption of a local food policy. This study focuses on these contextual factors, specifically the geographic and social contexts within which these organizations that voluntarily opt-in exist, in order to explain variation of which organizations tend to opt-in. The research question examined in this dissertation is: what mechanism drives voluntary adoption of a policy instrument derived from an initiative of governance that does not use incentives or coercion to drive adoption; further, are they market, local infrastructure or institutional contextual factors?

In this study, I use the diffusion of innovations theory as the overarching theoretical framework. Rogers (2003), author of various iterations of *Diffusion of Innovations*, is one of the foremost theorists and researchers on the diffusion of innovation. His work incorporates theorists and propositions from a number of preceding theories (Lundblad, 2003). While most of Rogers' work has focused on diffusion of innovations among individuals, he also addresses diffusion of innovations among organizations. However, most of the work was focused on organizational innovativeness and the innovation process (Rogers, 2003). With this study, I contribute research in the literature specific to diffusion of innovations among organizations.

Of most interest in this study, and reviewed in this chapter, are three overarching theoretical perspectives that the diffusion of innovations theory draws from; public choice theory, market and local infrastructure perspective on diffusion and innovation adoption, and institutional theory. Together, these theories provide causal mechanisms to explain how the geographic and social contextual features of a locality influence adoption or non-adoption among organizations. These contextual features are particularly germane to advancing our understanding of voluntary adoption of a policy, as implemented by an initiative of governance undertaking food systems change. Factors such as demand, supply, societal concerns, and mimicry among organizations might vary among geographic locations and therefore may change the conditions that would be necessary to support the opportunity for a policy's implementation. Further, most of our public data that we use in the analysis and evaluation of policy is gathered at the county level, capturing potential variation among these geographic divisions. As such, this study employs a county level analysis, reviewed more in chapter 3, as this is the level of analysis that we base policy and interventions.

Most of the work by Rogers (2003) on the diffusion of innovations is on the order of adoption and less attention is paid to the settings in which adoption takes place and whether or not they support the opportunity for adoption (Brown, 1981). This study contributes to the theory of diffusion of innovations in that it employs the geographic perspective of diffusion, by analyzing the variation among geographic contextual effects and their influence policy adoption. This is an especially important consideration when pursing systems change, such as local food system transitions, as these contextual features may need to be in place to support the transition. The case of North Carolina's (NC) local food governance initiative and the social marketing campaign it deployed to drive demand for local products, the NC 10% Campaign, introduced in Chapter 1, is an information-rich example in exploring adoption variation due to county level contextual effects.

This chapter will first review the elements of the overarching theory used in this study that informs adoption: diffusion of innovations. Next, I will move to reviewing my hypothesis from the geographic market pressures for adoption that are informed by public choice theory. Then I will review two hypotheses of geographical institutional pressures, supply and societal concerns, that are informed by the market and infrastructure perspective of diffusion of innovations. Finally, I will review two hypotheses of geographical institutional pressures, proximity to other adopters and urban location factors, informed by institutional theory.

Diffusion of Innovations

Theory of Diffusion of Innovations

The theory of diffusion of innovation sets forth the classic analytic elements of diffusion studies. Everett Rogers, a rural sociologist, in his seminal book *Diffusion of Innovations* (2003), defines diffusion as the spread of a planned or spontaneous activity, and innovation as any new

idea, activity, or object that is based on perception of newness by the individual or organization. The four critical elements that come together to form the theory of diffusion of innovations are innovation, communication, time and the social system (Rogers, 2003). These elements are summarized in Figure 2.1 and will be briefly reviewed next. Figure 2.1 shows that the theory is quite comprehensive in nature and covers a wide variety of elements spanning the entire diffusion process.

Four Elements of Diffusion of Innovations

1. Innovation
- Characteristics of an innovation

Theory Elements

2. Communication
- Social Process
- Communication Channel

4. Social System
- Social Structure
  - Social Relationships
  - Network of Communication
  - Norms
- People as Influencers
- Consequences
- Types of Innovation Decisions within Organizations
- Organizational structure and Characteristics

3. Time
- Individual Innovation-Decision Processes
- Individual Adopter Categories
- Rate of Adoption
- Organizational Innovation-Decision Strategies

Figure 2.1: *Elements of Rogers' Diffusion of Innovation Theory.*

Rogers (2003) states that there are five characteristics of *innovations*: relative advantage, compatibility, complexity, trialability, and observability. Compatibility is particularly germane to the present study and measures whether or not an innovation fills a demand or necessity. A dimension of compatibility is whether the innovation is perceived by the adopter to meet the needs expressed by their clientele (Rogers, 2003). In this study, I use public choice theory to

explore how consumer demand for an innovation within a social system influences organizational adoption.

The next element of the diffusion of innovation is communication. *Communication* involves both the social process and interactions that take place between individuals and the communication vehicle used to get a message from one party to another (Rogers, 2003). These interactions can vary in scale, from media broadcasting the innovation to potential adopters to individual interactions among peers. In Chapter 1, I reviewed the vehicle for messaging in this study, the NC 10% Campaign, a social marketing campaign aimed at promoting the voluntary opt-in local food policy. The next element considered is time.

Time, within diffusion of innovations theory, spans the innovation-diffusion decision process. The process consists of five steps: knowledge, persuasion, decision, implementation and confirmation, and these steps eventually lead to either adoption or rejection of the innovation (Rogers, 2003). The rate of adoption is also a critical element in the duration of the diffusion of innovations and is typically measured by the number of individuals or organizations that adopt an innovation over a period of time. Time also includes the innovativeness of an individual or organization and Rogers (2003) specifies categories within which adopters may fall, spanning from early innovators to laggards. In this study, the focal element of time will be the rate of adoption over a period of time in the NC 10% Campaign.

The final element, a *social system,* provides the context for the diffusion process and is a structured set of interrelated system actors that work together to accomplish a shared goal. Social systems contain norms which Rogers (2003) defines as customary behavior patterns that dictate how actors in a system are expected to perform. Norms can be established within large national contexts, at the local system level wherein this study is situated, and at all levels in between

(Rogers, 2003). Since diffusion occurs, or does not, over time among actors in a social system (Rogers, 2003), the contextual factors of a social system are important. This is especially so when studying initiatives of systems change, as in the case of this study. There have not been any studies on the social systems impact, specifically the environmental contextual effects, on adoption of a voluntary local food policy; a gap this study intends to fill.

Systems approaches, such as the focus of this research on food systems change, consider the influence of economic, regulatory, social and political influences (Dunning et al., 2012). Initiatives of governance involved in food systems change efforts, similar to the one in North Carolina reviewed in Chapter 1, are simultaneously initiating a variety of policies and initiatives meant to create change in various part of a system at once. Wejnert (2002) notes that environmental context variables in the diffusion of innovations fall within four categories: geographic settings, societal culture, political conditions, and globalization and uniformity. The concept of "place" – the unique contextual factors that vary among localities – is an important consideration when conducting diffusion studies. This is because these contextual factors make the opportunity to adopt an innovation and the diffusion process unequal (Brown, 1981). Since the innovation in this study is a voluntary opt-in policy to aid in building a local food economy, there should be considerations for contextual attributes that are of importance for this unique innovation. In fact, Rogers (2003, p. 226) states that keeping an open mind and expanding attributes as needed is important, especially relative to unique innovations.

Rogers' work does not directly address these factors beyond his mention that diffusion scholars within the geography discipline are studying neighborhood effects (Hagerstrand, 1968) and supply availability (Brown, 1981). Their work builds on Rogers' work in diffusion of innovation by discussing the impact of environmental context upon the opportunity to adopt. As

such, I will incorporate propositions from the work of the aforementioned geographers on the market and infrastructure context of innovation adoption and diffusion. This is of particular importance as the social system in this study is considered at the county level, and environmental factors of the county social system such as local food production and availability are examined.

There have been a significant number of articles with focus on local government/agency diffusion of innovations (Bingham, 1977; Boyne, Gould-Williams, Law, & Walker, 2005; Grimmelikhuijsen & Feeney, 2017; Walker, 2006) and diffusion of agricultural innovations (Hagerstrand, 1968; Rogers, 2003); however, there are few empirical studies on the diffusion of commitments to procuring local food as an innovation among institutions as a voluntary policy initiative. Further, there are no studies on what contextual factors explain variation in who adopts. Berry and Berry (1999) identified three motives leading to policy adoption: copying what was successful elsewhere, responding to citizen pressure, and seeking competitive advantage. These propositions are supported by institutional and public choice literatures. By using propositions from the diffusion of innovation related to public/consumer choice, institutional mimeses, and what social system norms and infrastructure within a locality support adoption, we are able to answer this question and explain variation in adoption of this voluntary opt-in policy.

Roger's work offers a lens through which to consider the diffusion of a voluntary opt-in local food policy as an innovation that is spread through a social system. Rogers' theory includes four elements that are critical components of diffusing an innovation (See Figure 2.1). In this study, I will focus in on the contextual factors of a locality that dictate: the compatibility of the innovation as measured by consumer demand, the rate of adoption of the innovation within a given county, and the contextual features of a social system that support or reject the opportunity

for adoption of the innovation. The final two elements of roger's theory are present to support this theory's use, however are not the focus or the study, including the communication vehicle, the social marketing campaign (NC 10% Campaign), and time which is the 7 year period of the campaigns implementation. Instead this study focuses on the contextual factors of the social system as important explanatory variables for innovation diffusion.

The theory of diffusion of innovations will serve as a common link theory for this analysis as it supports several fundamental elements in both institutional and public choice theories. The diffusion of innovations theory also provides a foundation for theory expansion into the market and infrastructure context of innovation adoption and diffusion. Diffusion of innovations theory is used in this study as an overarching theory because it uses elements of a variety of theories to understand temporal adoption of innovations both from factors of market demand, local established infrastructure, and institutional mimeses. By using these three theories and examining the contextual effects within a shared social system, I intend to elucidate factors that play a significant role in restaurants' adoption of a voluntary local food procurement policy. First, I review the market demand elements of the theory that are derived from public choice theory and the mechanisms it suggests that drive adoption.

Market Factors

The most developed area of research on the diffusion of innovations is on the demand, or process of adoption (Brown, 1981; Hagerstrand, 1968; Rogers, 2003). As noted previously compatibility, measured by demand, is an important element of diffusion of an innovation. If an innovation is not compatible within a locality then it is not likely to diffuse among the organizations located within it, especially when the innovation requires voluntary adoption and is absent of any coercion or incentives to ensure adoption. In this study, I'll review the

compatibility across localities as a contextual factor that might vary, and thus is an important consideration in this study built on contextual influences. In this next section, I examine market pressures of consumer demand within a locality and predict its impact on adoption. My hypothesis, informed by public choice theory, is reviewed next.

Public Choice Theory: Diffusion through Market Demand

Diffusion of innovations theory has an established means of accounting for demand-driven diffusion from below, or pressure from adopters (Bjørnenak, 1997; Gibbs & Yu, 2018; Mylan, 2015; Redmond, 2003; Rogers, 2003). As noted previously, the diffusion of innovation theory identifies compatibility, described as whether or not an innovation fills demand or necessity, as an essential attribute of adopting an innovation (Rogers, 2003). Therefore, if there is established demand as perceived by the adopter, they are more likely to adopt an innovation in order to meet the needs as expressed by their consumers.

The diffusion of innovations theory states that the rate or speed of the adoption of an innovation is a critical component of diffusion of innovations and is typically measured by the number of individuals or organizations that adopt an innovation over a period of time. Further, while diffusion theory tends to focus on the earliest adopters, which Rogers describes as "pro innovation bias" (Rogers, 2003), these innovators only account for a small number of adopters (Redmond, 2003; Rogers, 2003). Without sufficient numbers of adopters and demand, there will be no diffusion and thus no institutional change (Redmond, 2003). This speaks to the importance of collective action, wherein a collective of individuals with common self-interests, "vote" collectively to achieve their common interest, thereby establishing demand within a community. Diffusion of innovations theory draws from elements of public choice theory, reviewed next, as it regards the impacts of collective action on adoption.

Public choice theory has its foundation in economics and focuses on economic decision-making. At the theory's core is the individualistic assumption that people's actions in the marketplace are guided by self-interest, affecting not only individual but also collective decision-making (Buchanan & Tollison, 1984; Buchanan & Tullock, 1962). In other words, group decisions are really a collection of individual decisions that when grouped together become a collective action. Buchanan and Tullock (1962) assert that it is the individual who both makes the choice and is the unit impacted by the choice that is made. However, it is important to note that the outcomes of a collective action may only reflect the interests of a specific group of people, rather than transcendent of the entire population. In the context of the diffusion of innovation theory, these individual actions are guided by the social norms that exist in their localities. Public choice theory asserts that optimal decisions rest upon the ability of participants to vote on such rules for collective decision-making (Buchanan & Tullock, 1962). In this case then, it is important to broaden our approach and include the collective of adopters.

When considering individual proponents of local foods who are seeking to take action in the marketplace by "voting with their fork" (Nestle, 2013; Pollan, 2006), these individual choices are then grouped together into a form of collective action. Nestle (2013) stated that today's local food movement is about transformative change in food choice so that it promotes health and does not degrade the environment; it is also more about personal food choice and the individual responsibility for choices as well as the social responsibility to make better choices. If members of the public are choosing to individually participate in the NC 10% Campaign by spending 10 % of their existing food budget on local food and "voting with their fork," then despite them acting in their own self-interest, many of these actions can be considered together as a type of collective action. This collective aspect of public choice, then, become social norms and can inform

organizations, politicians, and businesses in the surrounding vicinity as to what consumers want. In this way, public pressure or demand is a factor for innovation within organizations. There is empirical evidence established in the social psychology literature and beyond that confirms the link between social norms and consumer behaviors (Bosshardt, Ulli-Beer, & Wokaun, 2013; Cialdini & Trost, 1998; Ulli-Beer, 2006; Vatter, Gessner, & Wittwer, 2001).

Public choice, as expressed through efforts of collective action, is an important element that informs behavior patterns within communities. Rogers (2003) regards systems effects as those items that influence the structure or behavior of social systems members, and that are established into behavior patterns that become its norms and values. These systems effects, described in this study as contextual effects, and their influence on adoption, are the focus of this study. Social system effect variables, including norms and values, are seen as influential in the adoption of innovations (Wejnert, 2002) and researchers have found that organizations are less likely to adopt innovations that conflict with local norms and values (Herbig & Miller, 1991). The local and community context is important as Hannan et. al.(1995) assert that market forces, including demand, are predominant at the local level. In the context of public choice in this study, norms and values are perceived as the community support of the local food system as assessed by the demand for local food products within a given county. In this study, I use individual and household-level data from the NC 10% Campaign across the years 2010-2016 to assess the market/collective demand for local food in restaurants by consumers in each county of North Carolina.

Public choice literature has explored economic elements of local food such as how much consumers are willing to pay (Carpio & Isengildina-Massa, 2009; Pinchot, 2014), consumer expectations of local food establishments, such as labeling of local food menu choices available

(Yurtseven & Kaya, 2011), and understanding the belief systems underlying consumer motivations to purchase local food products (Pinchot, 2014; Zepeda & Deal, 2009; Zepeda & Leviten-Reid, 2004). For example, Yurtseven and Kaya (2011) studied local food on menus in Gokceada, Turkey, and consumers' expectations for local food at restaurants. Their study found that tourists expected restaurants to have more traditional and local food clearly marked on the menus, and that taste, authenticity, rural development, and health were the primary motivations that influenced their local food consumption. While this study was focused on tourists' expectations for local restaurants, it also states that several restaurants near Gokceada used similar local food items on their menus. While these articles allude to the notion of established demand for local products by analyzing consumers' motivations to purchase the products, and expectations for businesses to clearly identify these products, they do not directly address established demand and how it influences restaurants' voluntary adoption and use of local food. As such, I hypothesize:

> *Hypothesis 1: Restaurants operating in counties where there is pre-established market demand by consumers are more likely to adopt a voluntary opt-in local food policy.*

In summary, public choice theory and the proposed hypothesis support the proposition that demand comes first, from the social system of a locality below, and organizational actions to accommodate the demands of the market follow. In the next section, I review institutional factors, which are the result of geographical contexts, and the associated mechanisms that can drive adoption of an innovation.

Local Infrastructure Factors

As mentioned previously, demand is the most developed area of research in diffusion studies. However, there is reason to suspect additional contextual factors may be important in

facilitating or hindering adoption, especially voluntary adoption. Accessibility, or whether or not a locality has the ability and/or opportunity to adopt a given innovation, is one consideration and local infrastructure availability. In this section, I review the local infrastructure factors of supply and societal concerns. Each of these items is reviewed with the understanding that not all locations share these same contextual effects and so, in taking into account these factors and their impact on adoption, I also consider these attributes specific to their locality in our analysis. I first review Brown's (1981) work that built upon the diffusion of innovations theory by adding geographic propositions, and then move to the propositions from institutional theory that inform my hypotheses.

Infrastructure Context of Innovation Adoption and Diffusion

In his book, Rogers (2003) notes the rich tradition of diffusion of innovation research in the field of geography led by Torsten Hagerstrand, among others. Hagerstrand (1968) demonstrated the importance of space as a factor in the diffusion of innovation. He also incorporated the neighborhood effect as an important element into his models. Building on this, Lawrence Brown (1981) asserted that infrastructure dependencies, including supply availability, as well as social-structural constraints, can impede adoption in certain contexts. This supported the notion that the mechanisms behind diffusion outcomes can be place-based (Brown, 1981; Ormrod, 1990). The decisions to adopt by members of a specific place are shaped by the specific local context that exists, which might encourage or discourage adoption of an innovation (Brown, 1981; Ormrod, 1990). Understanding and being able to identify contextual or cultural conditions that must exist in a locality for the diffusion of an innovation to be successful will aid in predicting diffusions in similar localities. Brown developed a theoretical perspective to help explain how local market and infrastructure contextual factors vary, and therefore make the

opportunity to adopt an innovation unequal; thus the importance of considering context (Brown, 1981). This perspective is called the market and infrastructure context of innovation adoption and diffusion, and is outlined in his book *Innovation Diffusion: A New Perspective* (Brown, 1981).

Brown (1975, 1981) developed the market and infrastructure model of diffusion that, among other things, discusses three types of infrastructure-constrained diffusion. The first type is when the costs of adopting an innovation is great because the item is not available locally and therefore the costs for transporting it may be prohibitive. The second is a stepwise model whereby the costs of adopting an innovation may vary dependent on both infrastructure to access an innovation and supply availability of said innovation. The third is when the costs of adopting an innovation are independent of infrastructure availability and therefore not a factor in adoption. In this study, the third principle applies *if there is supply available*, then there are no infrastructure restrictions on accessing local food, as it is produced and available to purchase within the locality, without any transportation or other infrastructure constrains. By this we are assessing a localities ecological infrastructure (Wejnert, 2002).

Local infrastructure is an especially important consideration in this study that is analyzing the use of a voluntary opt-in policy instrument to develop a local food economy. Rogers (2003), in his theory of the diffusions of innovations, identifies the interaction arena within which diffusion takes place as the social system. Brown's theory posits that the environmental and contextual features discussed here are important attributes of the social system that is more influential to adoption, rather than merely providing the venue for communications exchange, as put forth by Rogers. Each of these factors are important considerations in this study as it concerns local food systems transition. Inwood et. al. (2009) noted the relevance of place-based

considerations on local food adoption, especially as concerns local food infrastructure and the associated constrains on availability and use (Kloppenburg, Lezberg, De Master, Stevenson, & Hendrickson, 2000). Studies of restaurants in Colorado (Starr et al., 2003) and Ohio (Inwood et al., 2009) both found that, while restaurants were motivated to purchase local food, the ease of access and inadequacy of supply were seen as constraints; however, there has not been an empirical study to determine the validity of this assertion. I seek to fill this gap with this study.

The population examined in this study is full-service restaurants observed at the county level in the state of North Carolina. The environmental context variables of the social system will include geographical settings such as ecological infrastructures (Wejnert, 2002) which in this study include farms and markets for direct product sales. Therefore, I look at elements of the local food supply chain such as the number of producers, suppliers, and markets in the area/county. We know that the supply chains of local-farm-to-institution are shorter than traditional supply chains (Heiss, Sevoian, Conner, & Berlin, 2015) as institutional buyers rely on access to, and availability of, locally-produced products from nearby producers through direct sales or from local farmers' markets. Therefore, in this study, the availability of locally-produced foods from direct markets within a county is an important consideration, as adoption of an innovation and diffusion is related to resource availability. As such, I hypothesize:

> *Hypothesis 2: Restaurants operating in counties with established direct markets for local food sales will be more likely to adopt a voluntary opt-in local food policy.*

Next, we continue to assess what geographical contextual factors of a social system might constrain or influence innovation diffusion and adoption. Ormrod (1990), in continuing the work on the local context and innovation diffusion, asserted that the specific place in which you reside has a unique environmental, social, economic and cultural identity that is shared, at least in part,

by residents, and that impacts the receptiveness to an innovation. Brown (1981) describes factors that may not be intrinsic to the innovation nor the adopting organization as *institutional effects*. Two classes of these institutional effects that are important to this study are societal concerns and political actions which might amplify or diminish the importance of a particular innovation. Brown (1981) describes one example of concern over environmental impact, which varies from one community to the next. These societal concerns and political actions are unique to, and vary, across different localities.

The political climate could interfere with, slow, or stop the adoption of an innovation altogether (Wejnert, 2002). Local food policy councils are a social and political place where social capital is created; a council creates a space/venue/ mechanism for diverse people in communities to engage with one another and learn ways that they can support one another through community organizing (Feenstra, 2002). Local food is largely associated with environmental food production practices; thus, a local food policy council is considered in this study as having two institutional effects; a societal concern and political action. Food policy councils are a mechanism to center attention for food system concerns in a locality (Pothukuchi & Kaufman, 1999) and demonstrate the locality's commitment to developing a local food economy. Food policy councils allow local stakeholders to have a democracy over their local food system by allowing for participation in shaping it (Hassanein, 2003). It is important to note that these types of councils are not abundant; in fact, a study published in 2018 (Calancie et al., 2018) found that there are a combined 300 in existence in the United States, Canada and North American Tribal Nations. Therefore, the mere existence of a local food policy council in a locality will vary among localities, and where one exists, will demonstrate support for local food as a social norm. As such, I hypothesize:

Hypotheses 3: Restaurants operating in counties with political support for developing the local food economy will be more likely to adopt a voluntary opt-in local food policy.

In summary, the market and infrastructure perspective developed by Brown (1981) set forth geographic mechanisms of supply adequacy and societal constraints that inform the proposed hypotheses. In this next section, we review institutional isomorphic pressures related to geography that can drive the adoption of an innovation.

Institutional Factors

Divergent from public choice theory's focus on organizational responses to economic pressures, and from review of infrastructure and societal constraints, institutional theory looks at social pressures that define appropriate behaviors and influence managerial assumptions of efficiency and rationality (Suddaby, 2015; Zucker, 1977). This theoretical perspective has become popular within management theory to explain organizational behaviors that are not consistent with economic rationality (Suddaby, 2013). In the case of local foods, this is an interesting perspective to consider as local foods are considered more costly and inconvenient to access (Chambers, Lobb, Butler, Harvey, & Bruce Traill, 2007; Strohbehn & Gregoire, 2003). Additionally, several studies have been conducted at the institutional level involving diffusion theory, restaurants, and local food, including chefs' motivations for purchasing local food (Inwood et al., 2009), tourists' expectations of local food at restaurants (Aydin, Canbolat, & Yaman, 2018; Yurtseven & Kaya, 2011) and tourists' perceptions of local food in restaurants (Prapasawasdi, Wuttisittikulkij, Borompichaichartku, Changkaew, & Saadi, 2018; Saqib, 2019; Zhang, Chen, & Hu, 2019), especially abroad. The elements that the diffusion of innovation draws from institutional theory are reviewed next.

Institutional Theory: Diffusion through Mimetic Isomorphism

Institutional theory provides insight into social aspects both internal and external to institutional settings that affect organizations and inspire change, as organizations seek to establish legitimacy and ensure survival. Change is important for organizations as it is considered a necessary institutional process in the pursuit of legitimacy (Levi, 1990), and change can be accomplished through the adoption of an innovation. Legitimacy is a status that is corroborated by actors in a shared society (Ashforth & Gibbs, 1990; Pfeffer & Salancik, 2003) and is bestowed upon a social actor when their values and actors align with the expectations of other social actors in the system (Pfeffer & Salancik, 2003). Initially organizations adopt innovations to elevate their performance or to be a front-runner in implementing new trends. As those innovations prove effective, adoption is further diffused among other organizations to increase legitimacy and survival, ultimately creating homogenous organizations (Meyer & Rowan, 1977).

DiMaggio and Powell (1983), in their seminal article, define isomorphism as a process in which organizations that coexist in a population and that share environmental conditions are constrained in ways that make them resemble the other organizations. The authors identify three mechanisms through which institutional isomorphic change occurs: coercive or by political influence and need for social legitimacy; mimetic, where standardized processes are adopted in response to uncertainty; and, normative, a function of professionalization (DiMaggio & Powell, 1983). Mimetic isomorphism is conformity through imitation and is the process through which organizations change over time to become similar to other organizations within their environments (DiMaggio & Powell, 1983; Haveman, 1993). The contextual norms, values and traditions within an environment are influential in decision-making among institutions (Meyer &

Rowan, 1977). This study explores whether mimetic pressures, such as environmental or spatial elements, influence organizations adopting a voluntary, social marketing policy initiative.

Mimetic isomorphism might occur for a variety of reasons including to achieve legitimacy or even survival in times of uncertainty (DiMaggio & Powell, 1983). Another reason mimesis, or mimicry, might occur across organizations is through an obligatory action such that once enough actors in a social system do things a specific way, the action may become institutionalized (March, 1981). Organizations imitate other organizations within their environment, as the actions within similar populations tend to be more salient (Haveman, 1993). In short, it can be thought of as a process of mimicry across organizations that adopt new and exciting features from one like organization to another (March, 1981).

Mimetic Pressures for Policy Adoption

Mimetic pressures and policy adoption have been studied in international and national contexts, especially as they relate to environmental and sustainable policy innovations. In the case of this study, as well as in many cases across these three contexts, the policy diffusion occurs without a formal obligation (Busch & Jörgens, 2005) and instead through mechanisms of social learning, or mimesis (Jörgens, 2004). In an international context, diffusion related to policy adoption is the process by which policy innovations are communicated and adopted voluntarily over time by countries (Dolowitz & Marsh, 2000; Elkins & Simmons, 2005; Rogers, 2003). In the national context, mimeses of policy can been seen as a political strategy to achieve legitimacy (Radaelli, 2000). In this sense the motivations are norm-driven in an effort to achieve legitimacy as a nation among actors abroad (Busch & Jörgens, 2005; Diane Stone, 2004). Mimicry of successful policies can be seen as an advantage over creating an entirely new non-vetted policy (Offe, 1995).

Radaelli (2000) reviewed policy transfer and legitimacy by looking at three policies: monetary, corporate tax and media ownership, among countries in the European Union. He found support for combining policy transfer with the study of legitimacy, as nations mimic policies adopted that they feel lead to legitimacy among other nations. Similarly Busch & Jörgens (2005) analyzed the spread of three international environmental policy innovations and found that policy diffusion and convergence among countries is not a result of chance, but rather cross-national mimicry and learning. In this study, we test these findings on a smaller, local scale – among counties in North Carolina – to see if this policy transfer through mimesis holds true.

Within institutional contexts, outside pressures from the state and society to conform to norms add pressure to legitimize the activities of an organization (DiMaggio & Powell, 1983; Oliver, 1992, 1998). To earn this legitimacy, institutions /organizations seek to ensure that the social norms that reflect public and stakeholder opinion within the environments in which they exist are aligned with the newly-adopted practices (DiMaggio & Powell, 1983; Oliver, 1991). External influences on a firm's decisions are important considerations as organizations constantly seek a competitive advantage by adjusting to changes in the external environment (Hrebiniak & Joyce, 1985; Kraatz, 1998; Levinthal, 1991). These environmental and social system contextual elements are key elements in the diffusion of an innovation. For example, in their highly-cited article, Hrebiniak and Joyce (1985) found that as it concerns organizational adaptation, both strategic choice (such as adoption) and environmental determinism are necessary to support organizational adaptation, rather than just one over the other. Another highly-cited article by Kraatz (1998) found that organizations may adapt their core practices based on shifts in their environment, and that social and network ties are influential factors in organizational adaptation. These contextual and social system institutional effects are important

factors to consider in this study, as the innovation is a voluntary opt-in policy put forth by an initiative of governance for restaurants (and other organizations) to adopt local food as an innovation.

While it has been noted that mimetic forces have more impact on the diffusion of sustainable practices (Jennings & Zandbergen, 1995), there is limited literature on mimetic isomorphism as it concerns local food diffusion among organizations. DiMaggio and Powell (1983) assert that mimetic isomorphism may be utilized among institutions when organizations search for conformity through imitation. This is generally associated with the imitative actions of organizations in times of uncertainty as a means for survival. Sayed, Hendry, and Zorzini's (2014) study of sustainable procurement in higher education institutions in the United Kingdom findings showed that there were both mimetic and normative pressures from social and ethical obligations the institutions felt towards its local community to implement their sustainability and local procurement agendas. The findings also indicated that the stronger pressure was normative due to the social and ethical obligation the university felt toward its local community and economy. Ariel Pinchot (2014) conducted a literature review of the production, distribution and consumption of local food and found that at the institutional level, studies confirmed that institutional consumers of local food name support for local farms and fresh healthy foods as the primary reasons for procuring local foods. Absent in the literature is a definition of the mechanism that drives institutions to adopt local food as an innovation in the first place. This gap is the focus of the present study, and I begin discussion of this by turning to the influence and importance of geographical considerations, including the influence of earlier adopters in the social system, and the role of existing in an urban setting.

As mentioned previously, geography, or space, is argued to be a critical factor in the rate of adoption of an innovation because space and proximity are important determinants in the diffusion of an innovation. As outlined in Eriksen's (2013) meta-analysis of local food definitions and discussed in Chapter 1, geographic proximity is an important element in the definition of local food. Torsten Hägerstrand (1968) differentiates between the adjectives "geographical" and "spatial" by noting that among other things, "spatial" represents not just the distance over the earth's surface as the term is typically used, but also the relationship between men that occur within that space (Hagerstrand, 1968). Hägerstrand provided a comparison of the rate of adoption with the spatial distance between adopters. Adding to this, the rate of adoption as a component of diffusion of innovation theory is measured here by the number of organizational (restaurant) adopters in a given county over a period of time. This informs the environmental context variables within the social system that impact organizational adoption. In this study it is uniformity or when practices become institutionalized through the diffusion process (Wejnert, 2002). Institutionalization is the process in which societal expectations of acceptable actions sway the behavior or structure of an organization in some way (Meyer & Rowan, 1977; Scott & Meyer, 1994). Therefore, the greater the number of adopters in a county, the more institutionalized local food as a societal norm becomes.

Adding to this mechanism of proximity, the perceived social risk of non-adoption in an environment where the number of adopters is increasing is also an important driver of adoption (Redmond, 2003) to consider. This is especially true with the case of a successful innovation, such that when the majority has adopted an innovation, there is little to be gained from non-adoption (Redmond, 2003). Therefore, the probability of adoption by a non-adopter is a function that is increased as the number of previous adopters grow (Redmond, 2003) and is therefore a

process of cumulative causation (Mayhew, 2001; Rutherford, 2001). Combined with the mechanism of proximity, the more adopters in close proximity over time will positively influence other proximal adopters. In this study, cumulative causation is determined by lagged count of the number of restaurant adopters in a given county of North Carolina over the years 2010-2016. As such, I hypothesize:

Hypotheses 4: Restaurants operating in counties where other proximal restaurants have adopted a voluntary opt-in local food policy are more likely to adopt as well.

Hägerstrand's (1968) model also asserted that potential adopters who are located in close proximity to one another are more likely to adopt an innovation as opposed to those who are not located in close proximity to one another. In diffusion theory, early adopters are seen as influential opinion-leaders in the diffusion process because spatial proximity literature maintains that adopters who are located in close proximity to one another are more likely to adopt an innovation. Diffusion through mimetic isomorphism is facilitated when potential adopters share cross-organizational connections due to close proximal distance from one another. As such organizations, in urban, high density areas are more likely to adopt innovations because the spatial proximity is increased (Aiken & Alford, 1970; Boyne et al., 2005). Further, Tolnay (1995) notes that the population of potential adopters should be considered as a function of both distance and density, thus adding the need to consider the density of potential adopters. For this study, I utilize county-level data for my measure of proximity (urban designation) and density (count of restaurants) consistent with studies of local food that examine factors of spatial proximity conducted at the county level (Jarosz, 2008). There are 100 counties in North Carolina, a state that is 53,819 square miles total. As such, I hypothesize:

Hypotheses 5: Restaurants operating in urban counties will be more likely to adopt a voluntary opt-in local food policy because of increased spatial proximity to other potential adopters and adopters, as well as a greater potential adopter pool.

These institutional hypotheses, supported by theoretical propositions, assert that proximity is an important mechanism that supports voluntary adoption. In the case of this study, it is the adoption of a voluntary opt-in policy initiative to adopt local food as an innovation.

Summary

Currently the literature on the diffusion of a voluntary local food policy leaves room for investigating further the contextual social system elements that have been outlined in this study. This includes looking at spatial diffusion of local food and a public sector initiative and an investigation of whether the mechanism that drives adoption over time is driven by market demand, local infrastructure, or by institutional factors. For the broader field of public administration, this review establishes an entry point for this study, an empirical analysis of an initiative of governance implementation of a voluntary policy instrument to support the diffusion and adoption of an innovation. This study will examine the geographical social system contextual factors that might affect the probability of an organization voluntarily opting-in to a policy. By framing these opportunities to fill gaps in the local food and policy implementation literature we are positioned to transition into the next chapter on methods in which we will explore the data and methodology utilized in this study.

CHAPTER 3: METHODOLOGY

Introduction

        The purpose of this study is to determine the mechanisms through which institutions adopt innovations over time by market, local infrastructure, or institutional factors. This study tests this question in North Carolina by examining the diffusion of local food as an innovation among institutions. This dissertation employs an event history analysis to assess various factors that increase or decrease the probability of adoption of an innovation among institutions over time in North Carolina.

        This chapter first includes an overview of the methodological approach that is used in this study: a discrete-time hazard model, and a description of two types of functions that will be assessed for best fit, the logit and complementary log-log. Next, the secondary datasets that are used in the study are reviewed. Then a description of how the dependent, independent and control covariates are operationalized is included as well as how the dependent variable and sample set are restricted for use in this study. Finally, descriptive statistics and limitations are reviewed.

Method

Discrete Time Hazard Model

        This study utilizes the discrete-time hazard model, a form of an event history analysis (Allison, 2014). Event history analysis is a general term that covers several procedures for duration-to-event data and is a form of survival analysis (Allison, 2014; Singer & Willett, 2003). The regression analysis models the process that may cause an increase or decrease in the likelihood of first experiencing an event in a given time period (Yamaguchi, 1991). A special feature of an event history analysis is that it can deal with time-varying covariates that changes

values over time as well as censored data. In a discrete-time analysis, each period at risk is a separate observation, which allows the inclusion of time-varying explanatory variables (Allison, 2014). Time-varying explanatory variables are values that change over time; for example, the number of farmers markets in a county. Time-varying explanatory variables are easy to include in a discrete-time model because of how the model views each year at risk as a distinct observation (Allison, 2014). This study also contains right censored data, which indicates that the time of the event occurrence is unknown because it may occur after the period of observation, or not at all.

Discrete-time hazard models examine the hazard rate, or the conditional probability that an event will occur in a period given that the event did not occur in a prior period (Singer & Willett, 2003). In the case of this study, the event is if a restaurant adopts a voluntary opt-in local food policy. Each restaurant will remain in the dataset as long as they are at risk. When a restaurant adopts, they will drop out of the risk set.

Logit Function

This study employs a logistic regression analysis which is very popular when investigating binary outcomes (Singer & Willett, 2003). One of the benefits of utilizing the discrete-time method over other survival models is that it can be modeled as a log odds/logit function, which allows comparisons to be easily understood (Allison, 2014). It also allows modeling of time that is measured in discrete intervals to analyze whether or not the subject of interest experiences an event (Singer & Willett, 2003). The discrete-time method is suitable for use in this study, which has discrete time intervals, over a Cox Proportional Hazards model which is a popular model for studies with measures of continuous time. The Cox model uses a partial likelihood estimation that depends only on the order in which events occur, rather than the

exact times of occurrence (Allison, 2014). The Cox model carries assumptions that since time is

measured continuously, two events cannot occur at the same time, and therefore has trouble

handling "ties" (Allison, 2014). Alternatively, discrete-time methods do not carry this

assumption and can handle data in discrete time units, therefore it is the optimal technique for the

research question and data available for use in this study. This discrete-time hazard analysis is

performed in Stata and takes the general form:

$$ln\left(\frac{P(it)}{1-P(it)}\right) = \alpha D_{it} + \beta \ market \ Factors_{it} + \gamma \ local \ infrastructure \ factors_{it}$$

$$+ \delta \ institutional \ factors_{it} + \ \beta x_{it}$$

With *ln* indicating the natural logarithm, $P(it)$ is the probability of an event occurring during

interval *t* conditional that it has not occurred prior to *t,* and D_{it} is a vector of time indicators that

model the shape of the baseline hazard. The market factors, local infrastructure, and institutional

contextual factors in county *i* are identified by *market factors, local infrastructure factors,* and

institutional factors, and is measured in time period *t*. Finally, x_{it} is a vector of covariates (time

varying or time invariant) with coefficients β. The coefficients give the change in the logit or log

odds for each one-unit increase in the respective explanatory variable, adjusting for the other

explanatory variables in the model. The coefficients are reported in this study as log odds.

In addition to reporting the log odds, I report the average marginal effect (AME). Long

and Freese (2014) define the AME as the mean of the marginal effect calculated at the observed

values for every observation included in the estimation sample. The AME averages the effects

across each case in the sample and is regarded as the best summary of the effect variable (Long

& Freese, 2014). By looking at the distribution of AMEs for our variables of interest, I can

account for and observe the non-linearity of the relationship while also providing a more

practical interpretation of the results from the analysis in Equation 3.1.

Complementary Log-Log Function

While the logit link is one of the most common techniques for estimation of models with a binary outcome (Long & Freese, 2014; Singer & Willett, 2003), in this study I will use a complementary log-log (clog-log) link function as a specification check. As opposed to the logit that produces the odds ratio of an event occurring, the clog-log transformation produces "…the logarithm of the negated logarithm of the probability of event nonoccurrence (Singer & Willett, 2003, p. 420)." The clog-log model approaches zero slower than the logit and link functions. The clog-log distribution is preferred over a logit or probit function if the probability of an event is very small or very large, or if you believe the underlying time metric is truly continuous that has been binned into discrete intervals (Singer & Willett, 2003). Both functions will be run on the full model, with the clog-log model serving as a specification check to test the robustness of the logit results.

Data

This study utilizes several existing data sets, both publicly available and proprietary (North Carolina State University), and most of which are longitudinal. The first dataset is historic business data from Reference USA captured for all states and is the dataset from which I derive our sample. The second dataset contains data on the adoption of local foods from both businesses/organizations and individuals/households in North Carolina from the NC 10% Campaign and is the source of my dependent variable, adoption of a voluntary opt-in local food policy. The third dataset is zip code data that enables our study to examine county level ties. The fourth dataset that is employed in this study is the USDA Economic Research Service's Rural – Urban Continuum Codes. The fifth dataset contains information on the existence of a local food policy council within a given county in North Carolina. The sixth and final dataset is population

density data from the 2010 US Census. This study will utilize a multilevel analysis in order to analyze data from the county and individual business levels. A brief summary of each is provided below.

Data Sources

Historic Business Data - Reference USA Dataset (retrieved from Wharton Research Data Services): This historic business dataset was accessed through a subscription purchased by North Carolina State University Libraries. Query tools were used to aggregate data on all North Carolina restaurants with the six-digit Standard Industrial Classification (SIC) Code 581208 for Restaurants (found under the 4 digit SIC 5812 for Eating Places), in years 2010-2016. This includes eating-places that have multiple SIC designations as long as it is the primary SIC code or codes 1-4 (out of 10, most are 1-3). Each restaurant contains a unique identifier, the ABI code. This is a long dataset of yellow page listing information and business-specific data including street address, city, county, and state, as well as longitude and latitude coordinates, sales volume, employee size, zip code population counts, sales volume, years in operation, and business typology, among others. The data set owners update this database on an annual basis. The overall study sample of all potential restaurant adopters in North Carolina, drawn from this dataset, is the critical data needed to conduct a discrete-time hazard analysis. For the purposes of this study this dataset will be referred to as the "Wharton dataset."

NC 10% Campaign Longitudinal Data & Zip Code Data: The primary dataset from which I retrieved the data for the dependent variable, adopt, and the independent variable proximity to adopters, discussed later in this chapter. This dataset is a proprietary longitudinal dataset from the North Carolina 10% Campaign that contains organizational (various business types) and individual adopters of the campaign for the years spanning July 19, 2010 (the date the

campaign was launched) through December 31, 2016, in North Carolina. Initial data on each participant are captured (date, time, county, etc.) when the individuals/households or businesses/organizations voluntarily opt into participating in the local food policy, and thus pledge to adopt a procurement goal of at least 10% of their food dollars being spent on local products. This temporal information on the time of adoption, for all adopters beginning at time 0 (July 18, 2010), is one of the critical components needed to analyze diffusion over time.

Zip Code Data: In order to look at the county level effects of voluntary adoption of an opt-in local food policy data among the 100 counties in NC, data were needed to separate zip codes by county. The initial NC 10% Campaign Data only collected zip code information rather than county location. The zip code information was obtained from http://www.unitedstateszipcodes.org/zip-code-database/. Data sources for this information as cited came from the United States Postal Service, the US Census Bureau, Yahoo, Google, FedEx and UPS. This data was then added to the NC 10% Campaign database and a new column for County was added.

Rural-Urban Continuum Codes: USDA Economic Research Service's Rural-Urban Continuum Codes (RUCCs) were retrieved for use in distinguishing between urban, suburban and rural counties. These codes have been used previously related to local food systems as well as diffusion (Godette, 2016; Wojan, 1998). RUCCs allow researchers to break down county data into more distinguishable groups: metropolitan (urban) counties, metro-adjacent (suburban) counties, and non-metro adjacent (rural) counties (USDA Economic Research Service, 2013). Within each of these three subgroups, there are three degrees of urban, suburban or rural classification, totaling nine categories within the RUCCs (see Appendix B), that enable the

researcher to more finely induce causal inference. Each county in the United States is assigned one of these nine codes (USDA Economic Research Service, 2013).

USDA - Food Environment Atlas: This USDA Economic Research Service public dataset includes over 275 county level variables across the US on food environment factors such as store/restaurant proximity, and community characteristics. The data were gathered in 2007 and 2012. One objective of this dataset was to provide a spatial look at access to healthy food. Three subset categories of this dataset will be used in this analysis; 1) "Local Foods," which contains data on local food production, farmer's markets, as well as health indicators, 2) "Restaurant Availability and Expenditures," which contains count, percent, and dollar data on restaurant establishments and expenditures, and 3) "Socioeconomic Characteristics" for economic data (Economic Research Service (ERS), 2012).

Local Food Policy Councils: Local food policy councils have continuously emerged throughout the State of North Carolina as an important partner in the promotion of local food initiatives in a given county. Local food policy council data was acquired from Community Food Strategies, an initiative of the Center for Environmental Farming Systems at North Carolina State University, for use in this study. The dataset contains information on the year of establishment and dissolution of councils within the counties of NC over the period of this study.

Population Density: Population density data at the county level in North Carolina was acquired from the United States Census Bureau, American FactFinder website (Bureau, 2010). The information was retrieved from the most recent 2010 United States Census.

In the datasets that refer to the type of organization this study is interested in - restaurants - several terms are used to describe the same type of establishment (i.e. restaurant, full-service restaurant, eating-place). For the purposes of this study, I will use the term 'restaurant'

throughout for consistency. Table 2 provides a description of the data sample, reviews how each variable will be measured, and denotes the data source from which the variable was derived.

Sample Restrictions

The panel dataset used in this study includes all restaurants in the state of North Carolina in the years 2010 thru 2016 that have a six digit SIC code of 581208 for Restaurants in any of the 1-4 possible SIC classifications. The beginning dataset contains 110,572 total non-unique observations spanning the years of the study. This dataset already accounts for late-entrants and censored restaurants who "died/went out of business" within the period of the study. The dataset was adjusted for several reasons including theoretical and general data cleaning. First, by using a variable in the Wharton dataset that indicates if the restaurant is a 1) Headquarter, 2) Branch, 3) Subsidiary, and 3) Single location (variable had a 100% fill rate), I eliminated potential chain businesses by dropping any branch (-40,668) or subsidiary (-28) designations. This is supported by the literature in that food service businesses that are independently owned and single unit restaurants have more flexibility when it comes to procurement, especially as it relates to sustainable local agriculture, as opposed to that of national chains or larger bureaucratic organizations (Inwood et al., 2009; Sharma, Moon, & Strohbehn, 2014; Starr et al., 2003). I kept the designation of 'headquarter' because a definition was not provided in the codebook and thus could infer a single location.

After cleaning the data and correcting address errors, standardizing address variations, and standardizing the unique identifier (ABI number) if it contained multiple numbers for the same business, I was then able to delete duplicates (-792) by year and unique identifier. Next, I deleted observations (-2) for a specific city that crosses two county lines, which became an issue in merging in my independent variables that matched a single county. After margining in my

adopter variable (DV), as is detailed below, I dropped rows of observations for years after they

adopted as they are no longer in the risk set (-349). Finally, the application used in this study,

Stata, uses list-wise deletion and excludes cases that have missing values (Long & Freese, 2014).

Because this is public data, imputation was not appropriate. This resulted in a reduction in the

number of observations in the logit models from 68,733 to 62,957.

This left a starting sample of 62,957 non-unique observations spanning years 2010 thru

2016 as outlined in Table 3.1.

Table 3.1: *Summary of Sample Construction.*

Sample	Number of Full-Service Restaurants in North Carolina Observations
Original Restaurant Population	110,572
Reason for removal from sample:	
Dropped if designated as a branch	-40,668
Dropped if designated as a subsidiary	-28
Dropped duplicate observations after cleaning	-792
Dropped for multiple county designation	-2
Dropped observations after adoption	-349
Dropped missing values Direct Farm Sales PC	-1,452
Dropped values from Period 7	-4,324
Final Sample	62,957

A frequency distribution of the total number of observations by each year of the study is outlined

in Table 3.2.

Table 3.2: *Frequency of observations by year.*

Year of study	Frequency
2010	8,900
2011	8,588
2012	9,535
2013	10,588
2014	10,148
2015	10,137
2016	5,061
Total	**62,957**

Estimation Sample

Using the 62,957 non-unique observations of restaurants in North Carolina, a person-period dataset was created to support a discrete-time hazard analysis. A person –period dataset is fundamental to fitting the model to the data (Singer & Willett, 2003). To create a person-period dataset the data has been transformed from data by year to data by period a given restaurant is at risk of an event occurring. Since there are seven possible periods, there are seven periods in this study; the data is transformed from year format into the number of periods they are 'alive' in the study. This helps to pool any late entrants and right censored observations. An example of this can be seen by using Table 3.3, wherein each year of the study there are a total of 17,330 new entrant observations in the study, across the 7 years of the study. Table 3.3 represents the first year a restaurant appears in the data, so any year entered after 2010, the first year of the study, is a late entrant.

Table 3.3: *Translating Annual data to a Person Period Dataset.*

Year	Total # of restaurants who first entered the dataset by year.
2010	8,900
2011	1,277
2012	1,728
2013	2,102
2014	1,254
2015	1,191
2016	878
Total	**17,330**

This translates to there being 17,330 observations in the first period at risk, across the various years of the study. In a person period dataset, each of these first years observations are binned into the first period within a dataset. Table 3.4 is a life table for the observations in the study using the person-period format. A life table is frequently used in this type of modeling to

provide cross-tabulation of the size of the risk set in each period, and the number of

people/organizations (restaurants in this study's case) who experience the event (Singer &

Willett, 2003).

Table 3.4. *Hazard of adopting a voluntary opt-in local food policy among restaurants in North Carolina, 2010-2016.*

Period at risk	Number at risk in the beginning of the period	Adopt = 0	Adopt = 1	Proportion of restaurants who adopt
1	17,330	17,281	49	0.283%
2	13,449	13,427	22	0.164%
3	10,821	10,799	22	0.203%
4	8,754	8,747	7	0.080%
5	6,985	6,984	1	0.014%
6	5,618	5,617	1	0.018%

The number at risk in the beginning of the period, when totaled, equals my starting

sample total of observations (62,957). As noted above, there are 17,330 at risk observations in

the first period of the dataset (as noted above this aggregates all the years). The adopt variable

shows the number of restaurants that do not adopt (adopt =0) in the first period they are at risk,

and those who do adopt during the same period (adopt =1). The proportion of restaurants who

adopt is the number of adopters in a given period divided by the number at risk in the beginning

of the period. Period 7 was omitted from the life table because there were no adopters in that

period.

In looking at these figures, the proportion of restaurants who adopt overall is quite low,

indicating this is a rare event. For example, in the first period we see that 0.28% of restaurants

adopt a voluntary opt-in local food policy in the first year they are at risk in the study. In the

second period, we see this reduces to 0.16% (or 22) of the 13,449 non-censored restaurants at

risk of adopting a voluntary opt-in local food policy, did indeed adopt it. The distribution of

these hazard rates in column five over time is the baseline hazard function for this study. This is

defined in Equation 3.1 as the coefficients of the period identifiers. The hazard of adoption of a

voluntary opt-in local food policy is highest for restaurants during the first period of the study, or

in the first year of the NC 10% Campaign's outreach efforts, as described in Chapter 1. The

hazard rate then lowers in period 2 (0.16%), has a slight increase again period 3 (0.20%), a

decline in period 4 (0.08%), a sharp decline in period 5 (0.01%), then a slight increase in period

6 (0.02%). This indicates that restaurants are at their highest risk, albeit marginal, of adopting a

voluntary opt-in local food policy in the first 3 periods they were exposed to the NC 10%

Campaign.

Operationalization of Variables

Dependent Variable

The dependent variable (DV) in a discrete time hazard model is whether the event of

interest occurs, and thus is the conditional probability of the event of interest occurring in time

period t given that the person/org has not experienced the event prior to t (Allison, 2014c;

Diebold, Moulton, & Scott, 2017; Singer & Willett, 2003). In the case of this study, it is whether

a restaurant adopts a voluntary opt-in local food policy within a given period within the study.

The dependent variable is operationalized as a dichotomous variable coded 1 if the restaurant

adopts, and 0 if they do not. After a restaurant has adopted, it is dropped from the data set in any

year that follows as that restaurant is no longer at risk of the event occurring since it has already.

Sample Construction of the Dependent Variable: The initial NC 10% Campaign dataset

included 1,156 businesses/organizations. The business/organization listing included several types

that were considered "Promotional Partners" and were therefore removed from the sample as

their purpose was to help promote the adoption of local food through advertisement of the

campaign. These business/organization types included: Community/Association, Farm, Farmers Market, Government, Non-Profit, and Regional Database. The remaining businesses/organizational types were Corporation, Food Service, Health/Hospital, Restaurant, Retail/Grocer/Cooperative, School/College/University, and others totaling 493. The data sample was restricted to only organizations that are restaurants with the six-digit SIC code of 581208 for Restaurants in any of the 1-4 possible SIC classifications. This resulted in a starting number of 202. After a review of the businesses categorized as Food Service, within the initial NC 10% Campaign dataset, 3 additional businesses contained an SIC code of 581208 for restaurants in 1-4 possible SIC classifications. These 3 were added to the sample.

Next, in order to verify that each of the restaurants in the NC 10% Campaign dataset were also represented in the population sample dataset, the businesses were manually verified. This resulted in a loss of (-81) that were not found at all in the Wharton dataset with an SIC classification code as a restaurant in the four possible classifications. This may have been because the restaurant was classified as a "café" or another designation that would be assigned a different SIC code. Five (-5) were not included as they were shown as having "adopted" in the NC 10% Campaign dataset prior to their data showing up in the Wharton dataset. Next, (-16) were removed because they were reporting as having "adopted" in the NC 10% Campaign dataset prior to having a designation of a restaurant as an SIC code in SICE code 1-4. Finally, there was (-1) duplicate that was deleted resulting in a final total N of 102 adopters. The sample construction of the dependent variable is represented in Table 3.5.

Table 3.5: *Summary of Dependent Variable Construction.*

Sample	Number of Full Service Restaurants Adopters in North Carolina
Original Restaurant Adopter Sample	202
Additions from Food Service with restaurant SIC code	3
Reason for removal from sample:	
No SIC for restaurant in SIC 1-4	-81
Adopted before data is available in Wharton	-5
Adopted before classified as a restaurant in Wharton	-16
Duplicate	-1
Final Sample	102

The adopters across the years in this study span the state of North Carolina as shown in Figure 3.1. The image aid in displaying both the distribution across the State as well as the counties that had adopters over various years. Overall there are 31 counties that have adopters in at least one year of the study, so of the 100 counties in North Carolina 31% had at least one restaurant voluntarily adopt the local food policy of spending at least 10% of their existing food dollars on local food.

Figure 3.1: *Distribution of Adopters across North Carolina during the Years of the Study.*

Table 3.6 provides a description of the adopters by year of the study as well as the number of counties that had adopters within a given year. The table indicates that both the number of adopters and number of counties with adopters follow a similar pattern in that they decline in the second year of the study, increase again in the third, and then steadily decline for the remainder of the study.

Table 3.6: *Adopter Descriptives.*

Year of Study	Number of Adopters	Number of Counties that had Adopters
2010	32	12
2011	24	11
2012	26	13
2013	11	9
2014	5	5
2015	2	2
2016	2	2

Of the 31 counties that had adopters, Table 3.7 displays 12 counties who have adopters in multiple years of the study. These counties with multiple adopters over the span of the study are shown visually on Figure 3.1 and are mostly located central to the state where the larger metro areas in North Carolina are located. The counties with adopters across four years of the study are Durham, Guilford, and Mecklenburg. The county with adopter across five years of the study is Wake.

Table 3.7: *Counties with Multiple Adopter Descriptives.*

Counties with Adopters in Multiple Years of the Study	Adopter Number
Adopters in 2 years	6
Adopters in 3 years	2
Adopters in 4 years	3
Adopters in 5 years	1
Adopters in 6 years	0
Adopters in 7 years	0

There were no counties with adopters in all six or seven years of the study, which may indicate that market saturation occurs early on.

Independent Variables

The independent explanatory variables of interest, informed by theory in Chapter 2 and thus included in this study are summarized in Table 3.8, including if they are time-varying or not, and which hypothesis the variable is associated with from Chapter 2. In Chapter 2, I noted that the diffusion of innovations theory was the primary theory used in this study, but that it drew propositions and mechanisms that might drive adoption from other existing theories including public choice, market and infrastructure perspective on diffusion and adoption, and institutional theories. The independent variables are described further in the sections below.

Table 3.8: *Summary of Independent Variables.*

Variable	Time Varying Yes/No	Associated Hypothesis
Market Factors		
Consumer Demand	Yes	Hypothesis #1
Consumer Demand by Population Density	Yes	Hypothesis #1
Local Infrastructure		
Farmers' Markets	Yes	Hypothesis #2
Farm with Direct Sales	Yes	Hypothesis #2
Farms with Direct Sales Per Capita	Yes	Hypothesis #2
Local Food Policy Council Existence	Yes	Hypothesis #3
Institutional Factors		
Proximity to Adopters	Yes	Hypothesis #4
Restaurant Count	Yes	Hypothesis #5
Period 1-7	No	N/A

Consumer Demand (demand): Consumer demand is a lagged time varying continuous covariate from consumer adoption data in the NC 10% Campaign dataset. The initial NC 10% Campaign dataset included 8,047 individuals/households total across the period of the study. This variable will be pooled at the county level by year, and operationalized as the number of consumers (Count) that adopt within each year of the study. This variable will be lagged to show the number of adopters in a given county, in the previous year (t-1). An average county in NC had 19 individual/household adopters in year 2010, 26 in year 2011, 16 in year 2012, eight in year 2013, six in year 2014, three in year 2015 and two in year 2016. The trend of average individual/household adopters within and average NC county shows an increase in the second year of the study and then a steady decline through the years that remain. This variable is informed by public choice theory and is a measure of market demand from below.

Consumer Demand by Population Density (demandbypopden): Consumer demand by population density is a lagged time-varying continuous covariate that uses data from the NC 10%

Campaign dataset and US Census Bureau data. This variable will be at the county level and operationalized as the number of consumers (Count) that adopt within each year of the study divided by the population density of each county (per square mile). The population density data is from the 2010 US Census. Similar to the consumer demand variable this also informed by public choice theory as a measure of market demand from below, constrained by the population density within a given county.

Farmers' Markets (fmarkets): This is a time varying covariate from the USDA ERS Food Environment Atlas data set that provides a count of the number of farmers' markets in each county. A farmers' market is defined as "... a retail outlet in which two or more vendors sell agricultural products directly to customers through a common marketing channel ("USDA ERS - Local Foods," 2015, p. 45)." This data is available for 2009 and 2016 and is lagged for the years in between and after the years in which I have data. An average county in NC had two farmers markets in years 2010 thru 2015 and three in the year 2016. The average change by year in farmers markets was one unit/market. This variable is a measure of the local infrastructure and supply available, as informed by the market and infrastructure perspective on diffusion, and whether the county can provide the opportunity to adopt.

Farms with Direct Sales (farmsdirsales): This is a time varying covariate from the USDA ERS Food Environment Atlas data set that provides a count per county of farms that sell at least some products directly to consumers. This includes "... sales from roadside stands, farmers markets, pick-your-own, door-to-door, etc. ("USDA ERS - Local Foods," 2015, p. 43)." This data is available for 2007 and 2012 and is lagged for the years in between and after the years in which I have data. An average county in NC had 37 farms with direct sales in years 2010 thru 2011 of the study, and 45 in years 2012 thru 2016. The average change by year in a county in NC

was an increase of 7.63 farms with direct sales. This variable is another measure of the local

infrastructure and supply available, as informed by the market and infrastructure perspective on

diffusion, and whether the county can provide the opportunity to adopt.

Farms with Direct Sales Per Capita (dirsalespc): This is a time varying covariate from

the USDA ERS Food Environment Atlas data set that provides the dollar value of direct farm

sales divided by the number of residents per county. This includes "... sales from roadside

stands, farmers markets, pick-your-own, door-to-door, etc. ("USDA ERS - Local Foods," 2015,

p. 38)." This data is available for 2007 and 2012 and is lagged for the years in between and after

the years in which I have data. The average county An average county in NC had $5.00 dollars

of direct farm sales per capita in years 2010 and 2011, and $6.00 dollars in years 2012 thru 2016.

The average change by year in a county in NC was an increase in $1.16 dollars of direct farm

sales per capita. This variable is also a measure of the local infrastructure and supply available,

as informed by the market and infrastructure perspective on diffusion, and whether the county

can provide the opportunity to adopt.

Local Food Policy Council Existence (locfpc): This is a time varying covariate that is

operationalized as a dichotomous variable, 1 indicating that there is a local food policy council

serving the county in the given year and 0 that there is not a local food policy council serving the

county in a given year. This dataset is also an episode dataset, with the episode being each year

in the period of study, in which the time varying covariate will be held constant. On average in

NC in year 2010, 2% of the counties had a local food policy council. In years 2011-2012, 12% of

NC counties had a local food policy council. Subsequent year percentages of counties in NC that

had a food policy council are 15% in year 2013, 19% in year 2014, 14% in year 2015, and 16%

in year 2016. The trend shows a steady increase until year 2015 with a 5% decrease from the

prior year, and then increases again in 2016. This was due to the dissolution of a local food policy council in five NC counties in year 2015. This variable is a measure of the local infrastructure and institutional effects such as societal concerns and political support and is also informed by the market and infrastructure perspective on diffusion.

Proximity to Adopters (proxadopt): This is a lagged time varying continuous covariate that is the number of restaurant adopters in each county (count), aggregated and updated in each year of the study. Those at risk will be more likely to adopt in time *t* if their spatial neighbor(s) have adopted in *t-1*. An average county in NC had one proximal adopter in years 2010 thru 2012 and none for years 2013-2016. This follows the trend displayed in Table 3.7 of a reduction in overall adopters over the course of the study that would result in a reduction of proximal adopters (lagged). Informed by institutional theory this variable is a measure of the spatial proximity to other adopters and its influence on adoption.

Restaurant Count (rescount): This is a time varying covariate from the USDA ERS Food Environment Atlas data set that provides a count per county of the number of full- service restaurants in each county. Full-service restaurants are defined as those with the North American Industry Classification System (NAICS) Code 722110 (Economic Research Service (ERS), 2012) which is the parallel classification to the SIC code used in this study - 5182 Eating Places. This data is available for 2009 and 2014 and is lagged for the years in between and after the years in which I have data. An average county in NC had 70 restaurants in years 2010 thru 2013 and 73 in years 2014 thru 2016. The average change by year in the number of restaurants was an increase of three. Also, informed by institutional theory this variable is a measure of spatial proximity to cross-organizational connections and its influence on adoption

Period 1-7 (Period1-7): The period variables are those that were created by making a person period data set as described previously in this chapter. This is a binary dummy variable with a 1 indicating each period they are "alive" in the dataset and are at risk for the event (adoption) to occur. A 0 indicated that they are not "alive" in a given period. After adoption occurs, each period thereafter for a given restaurant has been dropped from the dataset. These variables capture fixed effects and unobserved variables that may have impacted adoption in the given period. Therefore, if there was something in this year that may have impacted adoption, the year variable captures it.

Control and Fixed Effect Variables

Two control variables were considered for use in the model and will be outlined below. These two covariates are:

Median Household Income (medhhinc): This is a time invariant/fixed covariate that is the median household income values from 2015 in dollars by county. USDA ERS (2012) indicates that this value is the aggregate income of all members of the household above 15 years of age.

Population Density(popden): This is a time invariant/fixed covariate that is the total population within a county divided by the land area per square mile. This data is from the 2010 US Census by county in North Carolina.

Urban (rucc_recode): Urban counties are time independent/fixed covariates that are distinguished into three main levels: Counties in metro areas, Suburban Areas adjacent to a metro area, and rural counties not adjacent to a metro area, with three sub levels under each designation. These categories are represented in the categorical Rural-Urban Continuum Codes outlined in detail in Appendix B. Vales from the Rural-Urban Continuum Codes were aggregated into a factor variable with three categories of counties: Urban (1), Suburban (2), and Rural (3).

Urban will be used as the comparison category in my model. There are 47,866 observations with an Urban (1) county designation, 12,899 with a Suburban (2) designation, and 2,192 with a Rural (3) designation. There are 90 adopters located within an Urban (1) county, 11 within a Suburban (2) county, and one, within a rural (3) county which shows that 88% of all adopters in NC are located in an urban county. These descriptive statistics are summarized in Table 3.9.

Table 3.9: *RUCC recode variable observation and adopter designations.*

RUCC Recode Value	Number of Observations	Number of Adopters
1	47,866	90
2	12,899	11
3	2,192	1

Year (archiveversionyear): This is the year, factor variable spanning the years of the study 2010, 2011, 2012, 2013, 2014, 2015 and 2016. This year variable is included in the model as a fixed effect to account for any within year variation.

ABI Number (abinumber): This is a unique identifier for each restaurant in the study. This variable is included in the model to cluster standard errors and to capture observations in the data set that are related to one another. This will be discussed more in Chapter 4.

These variables will be added to the model in Chapter 4 to see if they help to explain variation in our model.

Table 3.10: *Correlations between Independent Variables.*

	Demand by Population Density	Farmers Markets	Farms with Direct Sales	Direct Farm Sales Per Capita	Local Food Policy Council Existence	Proximity to Adopters	Restaurant Count
Demand by Population Density	1						
Farmers' Markets	0.237	1					
Farms with Direct Sales	0.348	0.525	1				
Direct Farm Sales Per Capita	-0.083	-0.151	0.076	1			
Local Food Policy Council	0.238	0.278	0.397	0.050	1		
Proximity to Adopters	0.570	0.553	0.646	-0.245	0.292	1	
Restaurant Count	0.264	0.631	0.250	-0.425	0.053	0.585	1

Correlation of Variables

Pearson's R was employed to check for correlations between the explanatory variables in the model. Correlations were anticipated since some variables were used to construct other covariates. After an initial run, there was a nearly perfect positive correlation between the Consumer Demand (demand) variable and the Demand by Population Density (demandbypopden) (0.679) and Proximity to Adopter (proxadopt) variables (0.911). When the demand variable was dropped, because the demand by population density is seemingly a better measure, the correlations were reduced between the demand by population density and therefore I dropped the demand variable from the model. After removing demand from the model, the coefficients are relatively low, therefore multicollinearity is not a concern in this analysis. The correlation table of the independent variables used in this model is displayed in Table 3.10.

Descriptive Statistics

The descriptive statistics of the explanatory variables of interest in this model are displayed in Table 3.11. The mean and standard deviations (in parenthesis) are included in the second column along with the minimum and maximum values of each explanatory variable.

Table 3.11: *Descriptive Statistics of Independent Variables.*

Variable	Mean (SD)	Minimum Value	Maximum Value
Adopt/Event (DV) (0/1)	0.002	0	1.00
	(0.040)		
Demand by Population Density (Count)	0.377	0	3.153
	(0.438)		
Farmers' Markets (Count)	3.409	0	17
	(3.533)		
Farms with Direct Sales (Count)	62.585	0	168
	(41.565)		
Direct Farm Sales Per Capita ($)	2.96	0	33.478
	(4.111)		
Local Food Policy Council Existence (0/1)	0.167	0	1
	(0.373)		
Proximity to Adopters (Count)	3.766	0	23
	(6.143)		
Restaurant Count (Count)	277.626	1	892
	(296.831)		
Period 1 (0/1)	0.275	0	1
	(0.447)		
Period 2 (0/1)	0.214	0	1
	(0.410)		
Period 3 (0/1)	0.172	0	1
	(0.377)		
Period 4 (0/1)	0.139	0	1
	(0.346)		
Period 5 (0/1)	0.111	0	1
	(0.314)		
Period 6 (0/1)	0.089	0	1
	(0.285)		

Notes: The variable type is include in parentheses after the variable name.
(0/1) Indicates a dichotomous variable that takes the values 0 or 1.
The standard deviation is included under the mean in parentheses.

There are several notable characteristics identified by looking at our means. First, with

the adopt/event variable the occurrence of the event, adopting a voluntary opt-in local food

policy, is rare. Second, the mean of the Farms with direct sales is 62. This is a count variable

and is interesting because North Carolina has 100 counties and thus the size of them are not very large. This is consistent with the smallholder nature of the farm size in North Carolina from its historic tobacco production. The average amount spent on products directly from farms is $2.96 which is rather low when compared to the $33 maximum, indicating that most counties are not spending a lot on purchasing product directly from farms in their areas. Finally, the average RUCC code is noteworthy as the average county code is an urban county designation in metro areas.

Summary

In this Chapter I have reviewed the discrete-time hazard model that will be applied in this study. The explanatory variables that will be used in the model have been outlined along with the source from which the data originated. Noteworthy descriptive statistics at the covariates means were discussed. Next, in Chapter 4, both the logit and complementary log- log models will be modeled to select the model that best fits the data in explaining variation and results will be discussed.

CHAPTER 4: RESULTS

Introduction

This dissertation investigates what contextual factors influence the adoption of a voluntary opt-in policy. As discussed in Chapter 3, a discrete-time hazard model, a type of event history analysis, will be used to analyze what factors might influence adoption. The results of the discrete time hazard model are presented in this chapter. The first section reviews the hazard model and link function used in this study and presents results of five models testing different theories to explain variation in adoption: the baseline hazard; a model with the public choice variable; a model with the market and infrastructure perspective on diffusion supply variables; a model with the institutional theory variables; and finally the full diffusion of innovations model. The next section presents the results as average marginal effects and the marginal changes in the probability of adoption, which is a more intuitive interpretation of the results. Finally, the chapter concludes with an interpretation of the results that will inform the discussion in Chapter 5.

Hazard Models

The discrete-time hazard models explored in this study use the logit link function and complementary log-log link function. As we saw in the descriptive statistics in Chapter 3, Table 3.7, the occurrence of the event/adoption of a local food procurement standard of at least 10% by a restaurant is a rare occurrence. As such, I have modeled both the logit and complementary log-log link functions on the full model to determine which link function best fits the data.

Logit versus Complementary Log-Log Link Functions

Results from the logit link function and the complementary log-log (clog-log) link function are presented in Table 4.1. These methods were both run on the full model, with the clog-log model serving as a specification check to test the robustness of the logit results. In

reviewing the results, the coefficients and standard errors presented in the table are almost identical with only slight variation at the third decimal place. The statistically significant coefficients are the same and thus consistent in both models, again with only slight variation at the third decimal place.

The Bayesian Information Criterion (BIC) is used here and displayed in Table 4.1 as an information measure that we can use to compare nested and non-nested models (Long & Freese, 2014; Raftery, 1995). As we look at comparing models, models with a smaller BIC indicates a better fit. Here again, similar to when we compared the coefficients, the BIC is the same with slight variation on the second decimal place. In addition, when we look at the standard errors in both models, they are almost identical to the second and third decimal points. Because the two models are quite similar, I conclude that the clog-log model does not provide me with any additional information to explain variance and therefore there is no reason to adopt that link. Instead, I use the more widely known and commonly used logit link function (Singer & Willett, 2003) as it is more readily used across social science for binary outcome models.

Table 4.1: *Comparison of full model results for the logit and clog-log discrete-time hazard models of restaurant adoption of a voluntary opt-in local food policy North Carolina.*

	Model	
	Logit	Clog-log
Period 1	0.713 (1.098)	0.713 (1.098)
Period 2	0.015 (1.140)	0.014 (1.139)
Period 3	0.621 (1.164)	0.620 (1.164)
Period 4	0.318 (1.181)	0.318 (1.180)
Period 5	-1.168 (1.480)	-1.168 (1.479)
Demand by Population Density	-0.786 (0.689)	-0.786 (0.689)
Farmers' Markets	0.084 (0.049)	0.084 (0.049)
Farms with Direct Sales	-0.005 (0.005)	-0.005 (0.005)
Direct Farm Sales Per Capita	0.004 (0.024)	0.004 (0.024)
Local Food Policy Council Existence	-0.519 (0.525)	-0.517 (0.523)
Proximity to Adopters	0.162*** (0.038)	0.161*** (0.038)
Restaurant Count	-0.002** (0.001)	-0.002** (0.001)
Year fixed effects	Yes	Yes
Urban/suburban/rural control	Yes	Yes
Clustered by restaurant	Yes	Yes
N	62,957	62,957.000
BIC	1,618.075	1,618.039

Notes: BIC, Bayesian information criterion. Variables listed are: coefficient and standard errors in parentheses.
*** Statistically significant at the 0.01% level. **Statistically significant at the 0.05% level. *Statistically significant at the 0.10% level.

Logit Link Function

The discrete-time hazard model with a logit link cumulative distribution function in

equation 3.1 in Chapter 3 produces parameter estimates expressed as log odds with standard

errors. The parameter estimates represent the change in the log odds that a restaurant in North Carolina adopts a local food procurement standard of at least 10% in a given period conditional on not having already experienced the event as a function of the various explanatory variables.

Baseline Hazard Function and Models

In this analysis I will present both nested and non-nested models to see if there are any implications in explaining variance. Interpretations of the results will be made on the nested model.   Begin with a review of the non-nested models. Table 4.2 presents the coefficients and standard errors of the hazard models in this study using the logit link function. The first model I ran, Model 1, is the baseline hazard function, or the value of the logit hazard when all predictors are zero (Singer & Willett, 2003). Model 1 includes the event variable, the variable of interest, and all period variables that serve as a function of time in my model. Each of the models have clustered standard errors by restaurant using the unique identifier for each restaurant (abi number), specifying that the observations are independent across the clusters but are not necessarily independent within clusters. Specifying the model this way leads to robust standard errors but does not affect the coefficient estimates (Long & Freese, 2014). It also allows any lack of precision in my estimates to be constrained by year. Each model also includes year fixed effect to factor any within year variation. The models in Table 4.2 are not nested but are run separately to test the three competing theories, with the exception of the baseline hazard (Model 1) and the full model (Model 5).

Table 4.2: *Results for theory informed discrete-time hazard models of restaurant adoption of a voluntary opt-in local food policy North Carolina.*

	Model 1	Model 2	Model 3	Model 4	Model 5
Period 1	0.767 (1.097)	0.720 (1.093)	0.700 (1.098)	0.701 (1.097)	0.713 (1.098)
Period 2	0.064 (1.137)	0.017 (1.133)	0.003 (1.140)	-0.001 (1.138)	0.015 (1.140)
Period 3	0.666 (1.160)	0.636 (1.153)	0.613 (1.163)	0.618 (1.160)	0.621 (1.164)
Period 4	0.383 (1.173)	0.371 (1.168)	0.337 (1.175)	0.314 (1.181)	0.318 (1.181)
Period 5	-1.155 (1.476)	-1.111 (1.461)	-1.183 (1.477)	-1.166 (1.476)	-1.168 (1.480)
Demand by Population Density		0.660*** (0.183)			-0.786 (0.689)
Farmers' Markets			0.064 (0.034)		0.084 (0.049)
Farms with Direct Sales			0.006* (0.003)		-0.005 (0.005)
Direct Farm Sales Per Capita			-0.019 (0.029)		0.004 (0.024)
Local Food Policy Council			-0.498 (0.451)		-0.519 (0.525)
Proximity to Adopters				0.121*** (0.023)	0.162*** (0.038)
Restaurant Count				-0.002* (0.001)	-0.002** (0.001)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Urban/suburban/rural control		Yes	Yes	Yes	Yes
Clustered by restaurant	Yes	Yes	Yes	Yes	Yes
N	62,957	62,957	62,957	62,957	62,957
BIC	1,571.398	1,587.632	1,612.388	1,570.365	1,618.075

Notes: BIC, Bayesian information criterion. Variables listed are the coefficient (log odds), and standard errors in parentheses. *** Statistically significant at the 0.01% level. **Statistically significant at the 0.05% level. *Statistically significant at the 0.10% level.

In Model 1, only periods 1-5 are reported. Period 6 was not reported because that was the reference variable. Period 7 and the 4,434 observation in that period were omitted because there was no variation as there were no adopters and thus no events in period 7 (See Table 3.4 in Chapter 3). Model 2 adds only the public choice theory or market pressure variables to the baseline model. Model 3 adds only the institutional theory variables to the baseline model. Model 4 is the full model with all variables of interest. The period parameter estimates in Model 1 are the baseline for the entire sample and show a decrease overall over time in the magnitude of the period/time indicators, with a slight increase in the third period. However, as each model adds predictors, the magnitude of the time indicators decrease slightly in Models 2, 3, and 4 that only include public choice theory (Model 2), market and infrastructure perspective of the diffusion of innovations (Model 3), and institutional theory (Model 4) explanatory variables respectively. This change is more pronounced in the full model, Model 4, with the effect of time being largest in period 3.

It is important to note that the two control variables (median household income and population density) were dropped from the model. This was because when running the model with and without them there were minor changes (BIC without the control variables 1387 and with the control variables 1388). The inclusion of those two controls did not add information to the model but rather took out variation and were removed from the model.

The BIC in these models increase slightly as more explanatory variables are added increasing the complexity of the models. Model 5 has the highest BIC but only marginally over the other models and it is the model that we are theoretically interested. Now I turn to the results of the nested models in Table 4.3.

Table 4.3: *Results for nested discrete-time hazard models of restaurant adoption of a voluntary opt-in local food policy North Carolina.*

	Model 1	Model 2	Model 3	Model 4
Period 1	0.767 (1.097)	0.720 (1.093)	0.694 (1.095)	0.713 (1.098)
Period 2	0.064 (1.137)	0.017 (1.133)	-0.002 (1.137)	0.015 (1.140)
Period 3	0.666 (1.160)	0.636 (1.153)	0.614 (1.159)	0.621 (1.164)
Period 4	0.383 (1.173)	0.371 (1.168)	0.334 (1.174)	0.318 (1.181)
Period 5	-1.155 (1.476)	-1.111 (1.461)	-1.171 (1.473)	-1.168 (1.480)
Demand by Population Density		0.660*** (0.183)	0.407 (0.234)	-0.786 (0.689)
Farmers' Markets			0.063 (0.036)	0.084 (0.049)
Farms with Direct Sales			0.005 (0.003)	-0.005 (0.005)
Direct Farm Sales Per Capita			-0.011 (0.027)	0.004 (0.024)
Local Food Policy Council Existence			-0.418 (0.438)	-0.519 (0.525)
Proximity to Adopters				0.162*** (0.038)
Restaurant Count				-0.002** (0.001)
Year fixed effects	Yes	Yes	Yes	Yes
Urban/suburban/rural control		Yes	Yes	Yes
Clustered by restaurant	Yes	Yes	Yes	Yes
N	62,957	62,957	62,957	62,957
BIC	1,571.398	1,587.632	1,621.919	1,618.075

Notes: BIC, Bayesian information criterion. Variables listed are the coefficient (log odds), and standard errors in parentheses. *** Statistically significant at the 0.01% level. **Statistically significant at the 0.05% level. *Statistically significant at the 0.10% level.

Table 4.3 also presents the coefficients and standard errors of the hazard models in this study using the logit link function. Table 4.3 is similar to Table 4.2 in that Model 1, the baseline hazard, is the same. In addition, the last model, Model 5 in table 4.2 and Model 4 in Table 4.3, are both the same full model. What varies among the non-nested and nested models is the significance of farms with direct sales. In Model 3 of non-nested Table 4.2 you can see that this variable is significant at the 0.10% level but when nested with the public choice variables in Model 3 of Table 4.3. Farms with direct sales it is not, and it is also not significant in the full model which means that when considered together with other contextual factors farms with direct sales does not influence adoption.

Interpretations of Logit Results

In keeping with review of Table 4.3, with the variables considered together in the full model (Model 4) the coefficients of the explanatory variables indicate the direction of the relationship to adoption as well as the significance while holding all other explanatory variables constant. In Model 4, there are two statistically significant explanatory variables, which means the result is not attributed to chance. Proximity to adopters is very statistically significant at the 0.01% level while restaurant count is significant at the 0.05% level. The results are reported in Table 4.3 as log odds, which maps the probability from negative infinity to positive infinity, but interpretation of the log odds are not meaningful to many audiences (Long & Freese, 2014). It is more common to interpret the results of a logistic regression as an odds ratio, a positive value greater than or less than one, the exponentiated value of the log odds coefficient. Therefore, I convert the two significant values to odds-ratios by computing their exponentiated values. Proximity to adopter interpreted as an odds ratio: for a one unit change in proximity to another adopter within the same county, the odds of adopting are 1.18 times larger than that without a

previous proximal adopter. The significant negative coefficient for restaurant count, indicates

that the variable is negatively related to adoption. Interpreted as an odds ratio, for a one unit

change in the restaurant count of a county, the odds of adopting are .98 smaller than that without

a one unit increase in the number of restaurants. The remaining variables in the model have no

significant relationship to adoption but I will note the direction of the coefficient on adoption.

The explanatory variables of interest: demand by population density, farms with direct sales, and

local food policy council existence, each are negatively related to adoption. While explanatory

variables farmers markets and direct farm sales per capita are positively related to adoption.

Due to the inherent non-linearity of logistic regression because the change in the outcome

of a given explanatory variable is a function of its own value and that of all other variables in the

model (Diebold et al., 2017). Therefore, substantive interpretation of the results from Model 4 in

Table 4.3 requires interpretation of the average marginal effects of the non-linear functions of all

the estimated parameters and explanatory variables at their means.

Average Marginal Effects

The average marginal effects (AME) of a discrete change in time yields the average

change in probability when an explanatory variable increases by one unit. The AME is a

summary measure of the marginal effect of a given variable that is appealing because it is

practical in both computation and conceptualization (Long & Freese, 2014). The coefficients

produced are a number between 0 and 1 and allow for more ease of interpretation than the log

odds. The AME's of interest discussed in this section are those explanatory variables informed

by public choice, market and infrastructure perspective on diffusion of innovation, and

institutional theories. AME's are interpreted as the effect on a probability, so for every one-unit

change in a continuous explanatory variable, the dependent variable is impacted by the

percentage point represented in the explanatory variables coefficient.

Margins at Specified Intervals

In this next section, I explore the margins at various intervals of values of the significant

variables. This is because an essential method of interpretation is evaluation of the predictions as

substantively interesting values of the explanatory variables (Long & Freese, 2014). This

method of interpretation allows us to see any non-linearities and interpret at what value the

significant indicator is most compelling. To first visually explore this, I present several graphical

renderings of explanatory variables to demonstrate this point. The x-axis represents the potential

values of the given variable (min to max), and the y-axis shows values of probability of adoption.
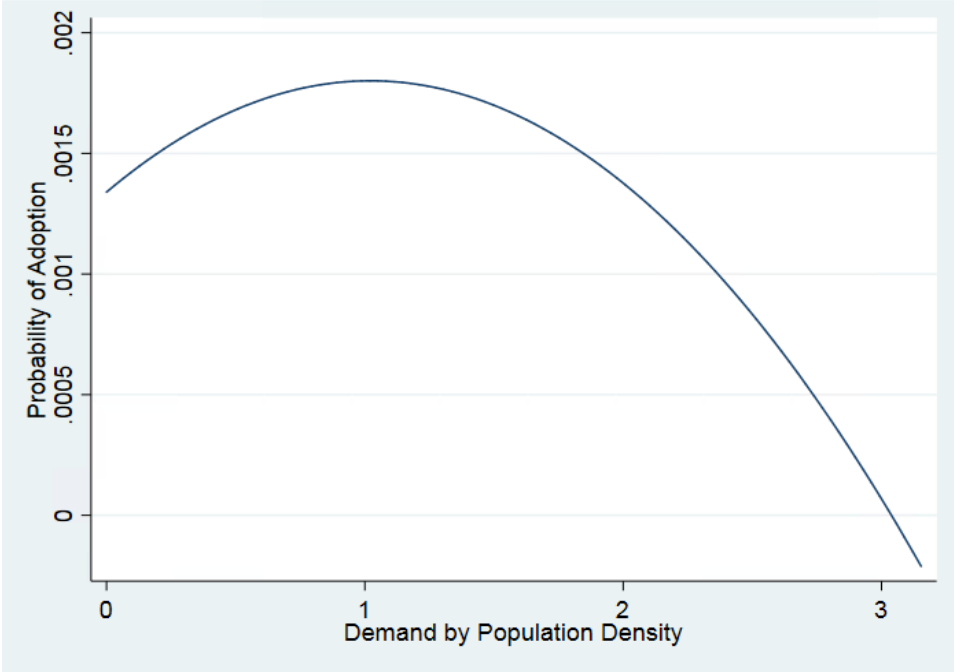

Figure 4.1: *Probability of adoption by Demand by Population Density.*

Figure 4.1 is a graphical representation at the margins of the consumer demand in a county

divided by the population density. Here we see that to a certain point as demand increases, so too

does the probability of adoption. However, once demand by population density is just over one, demand decreases and continues to with each one-unit decrease.
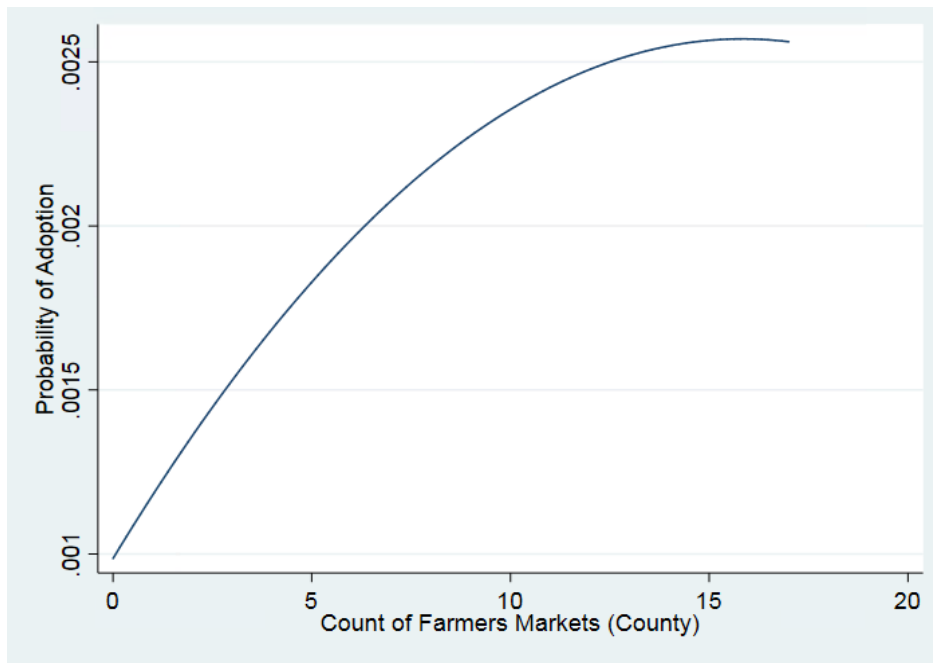

Figure 4.2: *Probability of adoption by Count of Farmers Markets.*

Figure 4.2 represents the margins of the count of farmers markets within a county related to the probability of adoption. We see a steady increase in the probability of adoption related to the increasing count of farmers markets within a county until about 14 farmers markets when relationship begins to take a negative turn and potentially begin to decrease the probability of adoption.   In Figure 4.3 we look at the margins of proximity to adopters within a county related to the probability of adoption. Here we see that as the number/ count of proximal adopters in a county increases, so too does the probability of adoption and at a begins to decrease in rate around 10 adopters. Finally, Figure 4.4 represents the margins of the count of restaurants within a county related to the probability of adoption. Similarly to the demand by population density graph (4.1) we see that to a certain point, about 400, the number of restaurants increases the

probability of adoption, and then as the number of restaurants continues to increase, the

probability of a restaurant adopting a voluntary opt-in local food policy begins to decrease.
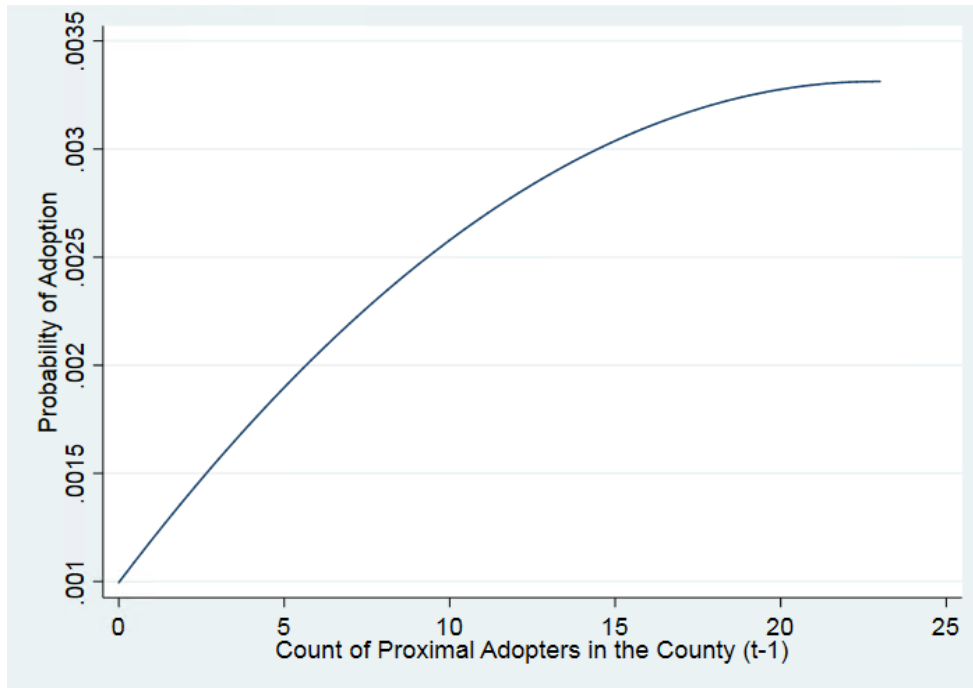

Figure 4.3: *Probability of adoption by Count of Proximal Adopters (t-1).*
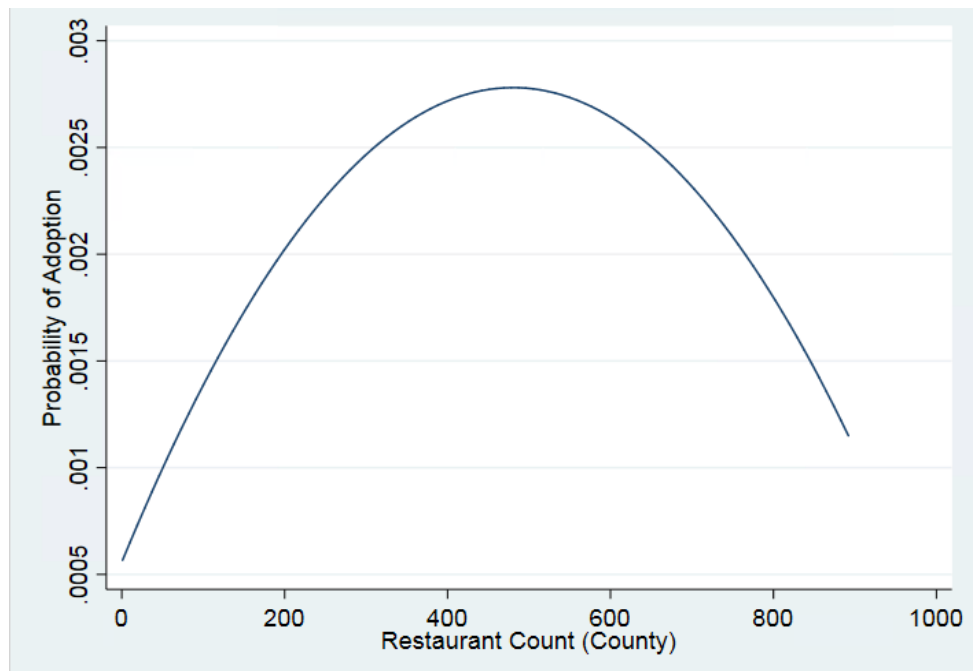

Figure 4.4: *Probability of adoption by Count of Restaurants.*

Table 4.4: *Average marginal effects of explanatory variables on adoption of a voluntary opt-in local food policy by restaurants in North Carolina.*

Market Demand/Public Choice Variables				
Demand by population Density				
10%	25%	50%	75%	90%
0.061	0.115	0.240	0.456	1.065
-0.002	-0.002	-0.002	-0.001	-0.0008*
(0.002)	(0.002)	(0.002)	(0.001)	(0.000)
Local Infrastructure Variables				
Farmer's Markets (Count)				
	25%	50%	75%	90%
	1	2	6	7
	0.0001*	0.0002	0.0002	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)
Farms with Direct Sales (Count)				
10%	25%	50%	75%	90%
17	33	47	93	120
-0.00001	-0.00001	-0.00001	-0.000008	-0.000007
(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Direct Farm Sales Per Capita ($)				
10%	25%	50%	75%	90%
0.098	0.584	1.297	3.989	7.657
0.000007	0.000007	0.000007	0.000007	0.000007
(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
Institutional Theory Variables				
Proximity to other Adopters in the County (t-1) (Count)				
	25%	50%	75%	90%
	0	1	4	11
	0.0002***	0.0002***	0.0003**	0.001
	(0.000)	(0.000)	(0.000)	(0.005)
Restaurant Count (by County)				
10%	25%	50%	75%	90%
27	60	124	416	846
-0.00001	-0.00001	-0.00001	-0.000003**	-0.000001****
(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Notes: Variables listed are: percentile margin interval at values (10%, 25%, 50%, 75%, and 90%), value of the variable at the percentile, coefficient, and standard errors in parentheses.

*** Statistically significant at the 0.01% level. **Statistically significant at the 0.05% level. *Statistically significant at the 0.10% level.

Shown in Table 4.4 are the AME's of the significant variables in the model over various intervals of their min and max values shown in the descriptive statistics in Table 3.7. The coefficients here are consistent with that of the logit model as it shows that, some explanatory variables while significant at the margins, the relationships are very weak in influencing adoption. By reviewing the variables at the margins, one new statistically significant variable, at 0.05%, has emerged; farmer's markets at the 25th percentile have a positive association with adoption. Another new statistically significant variable at 0.10%, demand by population density, at the 90th percentile has a significant negative association with adoption. Proximity to adopters continues to be statistically significant but at varying degrees and at varying percentiles. It is statistically significant at the 0.01% level at the 25th and 50th percentiles, significant at the 0.05% level at the 75th percentile, and then is no longer significant in the 90th percentile or when there are 11 adopters. Restaurant count also continues to be statistically significant at the 0.05% level at the 75th percentile, and significant at the 0.01% level in the 90th percentile, albeit both are negative associations with adoption.

It is interesting to note that the magnitude of the parameter estimates of the marginal effects displayed in Table 4.4 present various patterns along a continuum. The variables farmers markets and proximity to adopters both yield an additive pattern along the continuum representing a positive association with adoption. The demand by population density, farms with direct sales, and restaurant count each yield a reductive pattern along the continuum. This explains the effect in Table 4.3, which is a negative trend for each of these variables compared to the lowest category (interval one) the probability is lower at the 75th and 90th percentiles. Finally, direct farm sales per capita variable displays the same parameter estimate across the continuum, and none of the values are statistically significant

The final AME, local food policy council existence is a binary factor variable. Its interpretation warrants a different format as its only reasonable change is from 0 to 1; this change is summarized in Table 4.5. This table aids in our interpretation of the parameter estimate informed by the market an infrastructure perspective on diffusion of innovations. As we can see in the table, local food policy council existence is negatively associated with adoption and is not statistically significant.

Table 4.5: *Discrete change from 0 to 1 of local food policy council existence on adoption of a voluntary opt-in local food policy by restaurants in North Carolina.*

Local food policy council existence				
Change from:	Change	From	To	p-value
No LFPC Exists to LFPC Exists	-0.001	0.002	0.001	0.233

In summary, Tables 4.4 and 4.5 presents the trend in the pattern of my explanatory variables and the effect they have on adoption. When reviewed at the margins, a more robust picture of the impact of our explanatory variables on adoption, is revealed.

Interpretations at Margins

Overall, it is important to note that of the variables we are interested in analyzing to test our hypotheses (market/institutional), despite the statistical significance of some explanatory variables, the coefficients are so low and close to or beyond zero that there is no substantive impact of these variables on adoption. This becomes clear through the interpretation of the statistically significant results as it relates to our hypotheses.   These results in relation to our hypotheses will be assessed by using the AME's reported in Tables 4.4 and 4.5.

Hypothesis 1: Restaurants operating in counties where there is pre-established market

demand by consumers are more likely to adopt a voluntary opt-in local food policy.

The direction of the coefficient of consumer demand by population density in Tables 4.3 and 4.4 shows that demand by population density, while significant at the 90th percentile, is negatively related to adoption. The variables at the 10th, 25th, 50th, and 90th percentiles demand by population density, while not significant, displayed a negative association with adoption. The statistically significant result at 0.10% at the 90th percentile, displayed a similar association and is interpreted as: On average at the 90th percentile of demand by population density, with a value of 1.065, the probability of adoption decreases by 0.08 percentage points. As such, Hypothesis 1 is not supported.

Hypothesis 2: Restaurants operating in counties with established direct markets for local food sales will be more likely to adopt a voluntary opt-in local food policy.

Hypothesis 2 was analyzed by using three variables, the farmers market variable, farms with direct sales, and direct farm sales per capita. In tables 4.3 and 4.4 the farmer's market and direct farm sales per capital parameter estimates are positive indicating they are positively related to adoption although they are not statistically significant. The parameter estimates for farms with direct sales are negative in both tables 4.3 and 4.4 indicating it is negatively related to adoption. Although these parameter estimates indicate the directionality of the association, they are not statistically significant at any margin of farms with direct sales or direct farm sales per capita, and therefore both could be the result of mere chance. The farmers markets count variables at the 50th, 75th, and 90th percentile show a positive association with adoption but are not statistically significant. The farmers market variable at the 25th percentile is statistically significant at the 0.10% level and is interpreted as: on average, at the 25th percentile of farmers markets count, with a value of 1, adoption increases by 0.01 percentage points. This hypothesis is not supported with the explanatory variables farms with direct sales and direct farms per capita, however it is

statistically significant and supported with farmers markets at the 25th percentile or when they have a value of 1 farmers market.   Hypothesis 2 is partially supported.

Hypothesis 3: Restaurants operating in counties with political support for developing the local food economy will be more likely to adopt a voluntary opt-in local food policy.

Hypothesis 3 is not supported. The coefficient in Tables 4.3 and 4.5 show negative coefficients which indicates that the existence of a local food policy council is negatively related to adoption. On average, having a local food policy council in a county decreases a restaurant's probability of adopting a 10% local food procurement standard from 0.002 to 0.001, a change of -0.001. This variable is not statistically significant and therefore could be the result of chance.

Hypothesis 4: Restaurants operating in counties where other proximal restaurants have adopted a voluntary opt-in local food policy are more likely to adopt as well.

Hypothesis 4 is supported and is the strongest indicator of adoption among the variables of interest. The proximity to adopters variable in Table 4.3 is statistically significant at the 0.01% level. In Table 4.4, where the margins are displayed, the proximity to adopter variable is statistically significant at the 0.01% level at the 25th and 50th percentile and is interpreted as: On average, at the 25th and 50th percentile of proximity to adopters count, at the values of 0 and 1, adoption increases by 0.02 percentage points. Again in Table 4.4, the proximity to adopter variable is statistically significant at the 0.05% level at the 75th percentile of proximity to adopter count and is interpreted as: On average, at the 75th percentile of proximity to adopters count, at the value of 4, adoption increases by 0.03 percentage points. This variable was not significant at the 90th percentile but also displayed a positive association, but that could be the result of chance.

Hypothesis 5: Restaurants operating in urban counties will be more likely to adopt a

voluntary opt-in local food policy because of increased spatial proximity to other

potential adopters and adopters, as well as a greater potential adopter pool.

Hypothesis 5 is by the variable restaurant count within a county. This variable has negative

coefficients in Tables 4.3 and 4.4 showing that restaurant count has a negative association with

adoption, across the board. In Table 4.4 this variable is not significant at the 10th, 25th, and 50th

percentile, at the values of 27, 60, and 124 restaurants in a county, respectively. Restaurant

count is statistically significant at the 0.05% level at the 75th percentile and is interpreted as: On

average, at the 75th percentile of restaurant count in a county, at the value of 416, adoption

decreases by 0.0003 percentage points. Restaurant count is also statistically significant at the

0.01% level at the 90th percentile and is interpreted as: On average, at the 90th percentile of

restaurant count in a county, at the value of 846, adoption decreases by 0.0001 percentage points.

In sum, due to the statistically significant results showing a negative association with restaurant

count and adoption of a voluntary opt-in local food policy, Hypothesis 5 is not supported.

Overall, the values reported, while significant, show no substantive impact as they are all

at the 0%. This will be discussed further in Chapter 5.

Summary

In conclusion, the discrete-time hazard model using the logit link function reveals that

there are several statistically significant variables in the model; however, the effect size is

extremely weak. This might suggest that the overall model is not explaining as much as expected

in the variation of adoption and that the model may not be well-specified. Chapter 5 follows

with a discussion of the results and implications.

CHAPTER 5: DISCUSSION

Introduction

This dissertation examines how market, local infrastructure, and institutional features of the environment influence the diffusion of voluntary opt-in policy initiatives. These types of voluntary policy implementation instruments, that are not coercive or provide incentives to garner adoption, are often used when community driven initiatives of governance seek to resolve a societal issue. In these cases, the government and market who are the traditional implementers of policy, play a supporting role to a broader group of stakeholders in issue resolution. In this study's case, the issue of focus is developing a local food economy in North Carolina by the implementation of a voluntary opt-in local food policy put forth by a local initiative of governance.

The research question explores what factors: market, local infrastructure, or institutional, influence the adoption of a voluntary opt-in local food policy by restaurants in North Carolina. By using the diffusion of innovation as a frame to analyze our research question, I was able to draw from propositions it incorporates from public choice, market and infrastructure perspective on diffusion of innovation, and institutional theories to examine what mechanisms drive adoption over time within a community context. The idea that contextual factors of a social system both define the conditions of an environment, as well as help define the established norms of stakeholders, has not been readily explored in context of local food in the literature, and is where this study makes an important contribution. The findings reveal that there is some mimetic process that appear to be at work as the most significant finding and effect on adoption is the proximity to prior adopters. This might suggest that these types of initiatives might be well-served by making other restaurants aware of who else has adopted and is participating and

building a connection there. Overall, the findings reveal that while some factors are significant, the associations are weak and therefore contextual factors are not noticeably influential in adoption. This is likely because the voluntary opt-in local food policy was not widely adopted by restaurants overall, and so by nature the effect will be small. The fact that some contextual factors, while significant only have a small effect on influencing adoption, is an important finding in advancing our understanding of local food system governance. These contributions along with limitations and direction for future research will be discussed in this chapter.

Review of Study

This study reviews a complex policy issue at a systems level that required an alternative policy frame for issue resolution in the form of a diversion from the traditional policy frames of the market or government frames. These traditional frames are limited in their ability to resolve complex policy issues (Colander & Kupers, 2016; Howlett, 2005). Instead, an initiative of governance was deployed, incorporating a wide range of stakeholders, to embark on a food systems change effort. In this study, we reviewed a policy implementation instrument that was completely voluntary in nature, void of any coercion or incentives to garner adoption. This study is grounded in the sustainable food systems policy domain that is expansive in scope and democratic in its local level participatory process (Morgan & Sonnino, 2013). Local and community based food systems are of growing interest on local, national, and global scales because of our increased reliance on a globalized food system (Alkon & Mares, 2012; Guthman, 2007; Schnell, 2013), which is vulnerable to shocks in the supply chain, severe weather events, trade disputes, or even war, and could disrupt how we feed a growing population. In response, this resurgence of local, community-based food systems is a call from community members to both stabilize their food supply but also gain access to fresh, sustainably produced food. This

study contributes to the food system transition literature that has been identified as a research gap within the field (Markard et al., 2012).

The initiative of governance launched a social marketing campaign, the NC 10% Campaign to garner behavior change by adopting a local food procurement standard set-forth by a voluntary opt-in local food policy. This program is focused on obtaining institutional and individual/household adoption of a 10% local food procurement standard. By flushing out the type of organization to look at private full service restaurants, the most robust institutional adopters of the voluntary policy, I was able to focus on an influential group of stakeholders in local food systems. This study then sought to answer the research question: what mechanism drives voluntary adoption of a policy instrument derived from an initiative of governance that does not use incentives or coercion to drive adoption; further, are they market, local infrastructure, or institutional factors? Propositions from the theory of diffusions of innovations (Rogers, 2003) that draw from public choice (Buchanan & Tullock, 1962), market and infrastructure perspective (Brown, 1975, 1981), and institutional theories (DiMaggio & Powell, 1983b) were used to guide the hypotheses that were tested; the results are outlined in *Table 5.1*. Finally, a discrete time hazard model using a logit link was used to analyze the data and to help explain variance in the model.

Table 5.1: *Summary of Hypotheses and results based on Average Marginal Effects.*

Hypothesis	Supported	Partially Supported	Not Supported
Market Factors			
Hypothesis 1: Restaurants operating in counties where there is pre-established market demand by consumers are more likely to adopt a voluntary opt-in local food policy.			✓
Local Infrastructure Factors			
Hypothesis 2: Restaurants operating in counties with established direct markets of local food sales will be more likely to adopt a voluntary opt-in local food policy.		✓ Farmer's Markets	
Hypothesis 3: Restaurants operating in counties with political support for developing the local food economy will be more likely to adopt a voluntary opt-in local food policy.			✓
Institutional Factors			
Hypothesis 4: Restaurants operating in counties where other proximal restaurants have adopted a voluntary opt-in local food policy are more likely to adopt as well.	✓		
Hypothesis 5: Restaurants operating in urban counties will be more likely to adopt a voluntary opt-in local food policy because of reduced spatial proximity to other potential adopters and adopters, as well as a greater potential adopter pool.			✓

Discussion of Findings

As more policy issues overlap and impact environmental, societal, and economic systems, they become overwhelmingly complex to resolve (Eriksen, 2013) and might require initiatives of governance for resolution. As such, it is important to understand what factors play

contributing roles to obtaining resolution to these issues and thus where best resources may be allocated to achieve desired results. In this study, I employed the diffusion of innovations theory to examine market and institutional factors, informed by public choice and institutional theories respectively, to assess whether they were the mechanism to spur adoption of the local food procurement standard. More specifically, I looked at contextual factors within the social system in which the market or institution exists. Using a commonly used binning group – the county - I was able to assess whether these contextual elements help in predicting adoption. The discussion of the findings that follows will be based on the Average Marginal Effects (AME) in Table 4.4 in Chapter 4.

Market Findings

The first hypothesis explored was that of potential market drivers of adoption. In the case of local food, there has been a call for consumers to express their support for creating local food economies by buying local food, and thus voting with their forks, as explored in Chapter 1. This means that consumers would spend their food budget dollars on foods that have a local origin. Investigation into these market mechanisms is important. It helps to contribute to the gap in literature on food systems transitions (Ericksen, 2008a) and helps to fill a gap regarding whether market demand from consumers influences a restaurant's adoption of a voluntary opt-in local food policy.

My hypothesis associated with market factors included assessing the consumer demand for local food. Counter to my hypothesis, I found that consumer demand for local food was negatively associated with adoption. This finding was statistically significant as being negatively associated with adoption, at the 90th percentile. This is when the number of consumers demanding the product was among its highest in the study. Consumer demand not being a factor

in influencing adoption might be associated with the level of demand within a county. While demand was established, it was a lower percent of the overall population as outlined in Table 3.7, since the values only fell between 0 to 3.153, indicating the max number of local food consumers quantified as those consumers who voluntarily opted into the local food policy was 3 people per square mile. The cause of this negative association may be due to the notion that decisions to adopt local food are not driven by consumer demand but are rather due to internal intrinsic values of the chef or restaurant; there has been recent attention to this in the literature (Jump, 2019; Nelson, Beckie, & Krogman, 2017; Roy, Hall, & Ballantine, 2015).

Another factor that might provide an explanation is the construct validity. The consumer demand dataset was comprised of the individual/household consumers who adopted the same voluntary-opt-in policy within a county. There could be a better measure of demand that includes more people than those who actually took action as was used in this study. In summary, market-based contextual factors are not a significant influence adoption of local food procurement standard.

Local Infrastructure Findings

The market and infrastructure perspective of innovation diffusion and adoption provided propositions as to how supply availability, and the local social context, play a role in providing the local infrastructure that might allow a restaurant the opportunity to adopt an innovation. The first hypothesis in this study asserted that the availability of local food supply with established direct markets for local food sales within a county would be positively related to adoption of a voluntary opt-in local food policy by a restaurant in a given county. The variables used to assess this were two count variables, farmer's markets, farms with direct sales, and an average expenditure dollar amount: direct farm sales per capita. As reviewed in Chapter 4, the count of

farms with direct sales and direct farm sales per capita were both non-significant factors in

adopting a voluntary opt-in local food policy analysis and thus could be the result of mere

chance. Of interest however, was the direction of the coefficients for farms with direct sales, they

were negatively associated with adoption at each of the margins (10%, 25%...etc.). This might be

due to an oversaturation in the market and thus the novelty of local food may become obscure for

restaurants. This would warrant further study.

The statistically significant variable associated with supply and local infrastructure was

the number of farmer's markets. At its margins, each percentile demonstrated a positive

association but the 10th and 25th percentile, with a value of one farmer's market, increased the

probability of adoption by 0.01 percentage points. This means that having at least one farmer's

market is an important factor, albeit with a weak association, for restaurants to adopt a voluntary

opt-in local food policy. As the number of markets increase, the association remains positive but

the significance is lost and this could be a result of chance.

The next hypothesis tested was whether the existence of a local food policy council

impacted adoption. This was not a significant finding in this analysis and interestingly, the

results revealed a negative association between the existence of a local food policy council and a

restaurant voluntarily adopting a local food policy. Although these findings could be the result of

chance, since the result was not statistically significant, I will still discuss some potential

explanations for this interesting phenomenon. This could be because restaurants are generally

private institutions, so the existence of a governing body can imply coercive authority. For

example, restaurants are regulated by local governments to comply with business licensure and

backflow requirements, to name a few. While many local food policy councils may not have

coercive authority and may function as advisory boards to town/city council and county commissions, these bodies could still be viewed as coercive in nature.

Another reason local food policy councils may have had a negative association may be their limited time in existence. Calancie et. al. (2018) found that the average food policy council has been in place for 6.7 years, so perhaps these governing bodies have not been in existence long enough to gain legitimacy and make substantive change. In reviewing the local food policy dataset, there is only one food policy council of the 24 total in the study that has been in existence longer than six years. Martinez (2016) notes that at the local level, zoning changes and fiscal incentives are used to strengthen local food systems. If a food policy council is still in its infancy and not matured, then these changes are likely to not have been made and therefore the benefits not experienced by the restaurants. In this case, the mere fact that a local food policy council is established, and not providing these types of incentives, might be relating negatively to adoption of local food by privately owned restaurants. Both of these assertions warrant further examination.

Institutional Findings

The final set of hypotheses, which explored the diffusion of this local food procurement standard, is informed by institutional theory. The hypotheses were associated with proximity and asserted that the closer in proximity to previous adopters and restaurants who were able to adopt, the more likely a restaurant would be to adopt. It is in these institutional informed hypotheses that we have our most significant effects on adoption of a voluntary opt-in local food policy

The most significant institutional factor that is positively associated with increasing the probability of adopting a local food procurement standard is if a restaurant is located in a county with other proximal adopters. At its margins in Chapter 4, Table 4.4 the only non-significant

factors was at the 90th percentile. The lower percentiles (10%, 25%, 50%, and 75%) with values ranging from zero to four proximal restaurants, were the statistically significant influential levels of proximal adopters at the 0.01% level (10%, 25%, and 50%) and 0.05% level. This means that factors of mimetic isomorphism, such as the need to seek legitimacy, and cumulative causation where the more adopters in close proximity will influence other adopters, are significant factors in the adoption of an opt-in local food policy by restaurants in North Carolina.

Although significant, I must note that the association here is again weak, but again that is likely due to the fact that voluntary adoption of the local food policy was not widely adopted, but was rather a rare event, which means overall the effect size will be small. This is an interesting finding as it is consistent with the literature that being in close proximity to other adopters influences the rate of adoption. It shows that there is some mimetic process at work and that with these types of voluntary policies, focusing on marketing the fact that other proximal institutions have adopted and building some connection there, would have a positive impact in adoption of a voluntary policy overall.

The final hypothesis tested in this study was whether or not cross-organizations connections, due to close proximal distance from other potential adopters, increased adoption. The findings revealed that the number of restaurants in a county was statistically significant for negatively impacting adoption, meaning that as the number of restaurants in a county increases, the probability of adopting is decreased across each margin. The two significant margins were at the 75th and 90th percentile with values of 416 and 846 restaurants per county. Although the association here is weak, this may be due to market saturation, which means that survival and establishing an edge in the market, a driver of mimetic isomorphism, is no longer a factor when a county can support large numbers of restaurants. It is interesting to note that both the count of

farms with direct sales and restaurants in a given county were negatively associates with adoption. This could provide an alternate explanation of competition as a factor, in that in more competitive markets, local food does not have as much latitude and may not be perceived as an innovation that can aid in ensuring survival. Again, this would need to be examined further.

Contributions

As we saw in Chapter 1, the sustainable development policy arena is quite expansive and includes a wide number of objectives meant to develop our intersected social and environmental systems in a way that is equitable, economically beneficial and that does not deplete our natural resources (Food and Agriculture Organization of the United Nations, 2015b). There is a lot of work in this policy arena that is quite meaningful to many, including myself, and I am delighted to contribute to the large amount of work and research needed to make successful interventions that bring forth lasting change that will benefit future generations. By using the lens of public administration and three seminal theories that inform the work of our field, I add to the knowledge base on sustainable transitions. It is my intent with this dissertation to clearly communicate my results and explain how they can be used in critical decision making processes, which is an important component of translating research into practice (Gooden & Berry-James, 2018).

The relevance of this study is particularly salient now in contributing to literature and practice, as we see a rise in mainstream culture's interest in local foods, as among other things, a push back to the globalization of the food system (Alkon & Mares, 2012). In fact, scholarship on food systems transitions from global to local increased following the food price crisis of 2007-2008 and 2010, due to increasing concerns of food insecurity (Candel, 2014; Delaney et al., 2016). Further, this aligns with the global sustainable development goals to develop sustainable

food systems in an effort to end hunger, improve nutrition, and achieve food security (Food and Agriculture Organization of the United Nations, 2015b). The sustainable development vision is one sought accomplished through local participative processes and democracy (Morgan & Sonnino, 2013). This study, reviews a local level participatory initiative of governance aimed at transitioning the North Carolina food system to a local, sustainable system.

Contribution to Literature

Diffusion of innovations used four key elements: the innovation, communication, time, and the social system to understand the diffusion of an innovation (Rogers, 2003). This study was grounded in the social system and understanding the norms that exist within the contextual environments. As such, it contributes to gaps in the literature in diffusion of innovations theory by investigating whether the contextual factors of a social system play a role in driving the adoption of a voluntary policy innovation. The findings also reveal that when taken together, some contextual matters do indeed play a role (demand by population density, farmers markets, proximity to other adopters, and restaurant count), in positively or negatively influencing adoption, and even one (proximity to adopters), at a very statistically significant role at the 0.01% level. However, the overall role they play in adopting an innovation is minor. In other words, the contextual factors examined in this study are not strong indicators in explaining influences of adoption. From a theoretical space, we see that when using propositions from public choice, market and infrastructure perspective on diffusion of innovations, and institutional theories, to examine diffusion of a voluntary policy, that institutional factors were most significant.

Further, this study contributes to several gaps in literature. First, it adds to a few peer reviewed articles that are available on food systems transition, an area of sustainability

transitions that has not seen much focus (Markard et al., 2012). This study provides insight into the effect of contextual factors in garnering adoption of a policy towards food systems change. Namely, that when trying to grow institutional adoption, that knowledge of other proximal adopters has a positive effect on obtaining adoption. Second, it contributes to the gap in the literature of regional initiatives of food systems governance in the United States at the local level (Candel, 2014; Clancy, 2014; Delaney et al., 2016). This contribution aids in addressing the "European Bias" on studies of food system transitions (Markard et al., 2012) by providing an example within the context of the United States. This is important as the policies, geography, supply, and demand for food system transition likely vary across these domains. Finally, this study helps to fill a gap in what factors drive adoption of behavior change initiatives put forth by initiatives of food systems governance (Delaney et al., 2016). Namely, the findings suggest that while the initiative was not widely adopted (rare event) by restaurants overall, which impacted effect size, that there were significant contextual factors that influenced adoption of the voluntary local food policy.

Contribution to Practice

This study contributes to our field and to practice in a number of ways: by informing our understanding of the drivers of voluntary opt-in policy instrument, deployment by an initiative of governance, and its adoption by restaurants. We continue to see initiatives of governance involving non-traditional stakeholders leading efforts to resolve these complex, system-level policy issues that exist at the nexus of the environment, society and the economy (Ericksen, 2008a). Understanding how policy instruments used in these types of efforts are received, and what factors influence their adoption, is of growing importance. Efforts of food system

transitions often launch several simultaneous initiatives meant to garner system level change and it is important to know which initiatives are successful at achieving change.

This study contributes to local food system development efforts by providing insight into what areas their resources are best spent to garner adoption of local foods by restaurants. While there have been studies on the internal factors that might motivate a restaurant to adopt local food, such as chefs and restaurant managements preferences (Inwood et al., 2009; Sharma et al., 2014), the impact of contextual environmental factors and their influence on adoption has been examined in a fragmented fashion, if at all. This study reveals that increasing voluntary adoption policies among institutions in a locality would benefit most from making potential adopters aware that there are other, previous proximal adopters.

Limitations and Future Research

As with any study there are limitations that are important to note. The first limitations of this study I'll review include the data constraints such as self-selection bias, limited external validity, and data access issues. Then I will move to constraints due to the fact that the event of interest, voluntarily opting-in to a local food policy, was a rare event, and the adopters were private organizations. Finally I'll review construct validity and missing variables limitations before identifying future research areas.

Self –Selection Bias: Self-selection bias exists in this study primarily in the NC 10% Campaign dataset as individuals and organizations self-select voluntarily to participate in the campaign and monitor their procurement of local food. There could have been other restaurants who were already using such a standard or had limitations in terms of time and staffing available to take the step of formally opting into the campaign online.

Limited External Validity: This study utilizes data from North Carolina so the findings may not be generalizable to other states. For example, North Carolina is uniquely suited to accommodate smallholder agricultural production because of its history of smallholder commodity tobacco producers. The small-scale production associated with local food and the reduction in demand for the production of tobacco has led the way to the transition of farm land from tobacco production to other vegetable and fruit production. As such, this study lacks generalizability and should only be applied to the context unique to North Carolina.

Data Access Issues: Business data for years 2010 – 2016 was acquired from the reputable ReferenceUSA historic business dataset. While this dataset is quite expansive, it is noted that their efforts of data mining cannot achieve 100% capture of the business community and therefore there may be some missing data. Additionally, Food Policy Council data, which varies in count over the years of this study, shows a dip in the 2017 count that is attributed to councils dissolving or to a change in how the organization gathering the data classified a food policy council. Finally, while attempting to test my hypotheses, I was limited by the reality of the data and measures of theory that exists at the county level (or does not).

Rare Event: In addition to these, it is important to note that this study examined a rare event that occurred across the entire state of North Carolina comprised of 100 counties with only 102 adopters; thus the hypotheses in this dissertation are tested on a very limited number of adopters. Finally, by using publically available data as well as two datasets that were previously collected but not yet analyzed, this study may be missing other important variables; for example, I test a measure of contextual market factors that might influence adoption, and seven contextual institutional factors.

Private Sector Focus: It is important to note that the foci of this study was private sector firms – specifically restaurants' – adoption of this policy initiative. Private sector businesses have motivations and pressures such as to make a profit, that are different from pressures that might face public institutions. Future research might include other public institutions such as schools to see if these contextual factors might play a more significant role, if at all, in adoption. We know from the accountability literature that public institutions are expected to be more transparent and responsive to the will of the public that it serves.

Construct validity: Construct validity refers to how well operationalized a concept or idea if a relationship is causal (Drost, 2011). Earlier in this paper, I mentioned that my market variable, consumer demand was the number of individuals/households who voluntarily adopted the local food policy in this study. This operationalization of demand leaves out other individuals/ households who might 'demand' local food but who did not voluntarily opt in to the focal policy. As there is not alternative existing measure of local food demand at a county level, which will also be discussed next, this measure was employed in this study.

Missing variables: There are several variables that while missing from this analysis, could provide important information in future research. The first variable would be expenditures per capita on restaurants at the county level. Restaurants are an information-rich context to use in exploring this question as most American households spend the majority of their food dollars on food purchased from restaurants (Mehta & Chang, 2008; Okrent & Alston, 2012). Food away from home (FAFH) has been a readily analyzed in assessing consumer behavior (Byrne, Capps, & Saha, 1996; McCracken & Brandt, 1987; Stewart, Blisard, Bhuyan, & Nayga, 2004) and restaurant expenditures is a common measure for demand (McCracken & Brandt, 1987; Stewart et al., 2004). Currently this variable is available by the USDA Economic Research Service Food

Environment Atlas (Economic Research Service (ERS), 2012) but it is only available as a statewide measure which does not show variation among counties, as was the level of analysis in this study.

In addition to restaurant expenditures, more information on the availability of supply available at the county level from alternative business models that serve as aggregation and distribution centers. Food hubs, for example help to address the scale efficiency and other disadvantages of smaller producers gaining entry into more mainstream food markets (Woods, Velandia, Holcomb, Dunning, & Bendfeldt, 2013). Regional intermediary distributors have been found to have the ability to play a role in the farm to food service supply chain by acting as a value chain partners in identifying needs, and brokering commitments from supply chain actors (Givens & Dunning, 2019). The addition of these contextual effects to the existing model would account for these new, more novel regional distribution factors in influencing adoption within a county.

Future studies might benefit from adding more contextual factors that could contribute to a restaurant adoption such as the size of restaurants, what markets they serve (more affluent), the expenditures per capita at restaurants, and whether or not there are aggregators and large distributors offering local options and employing a GIS analysis to assess the influence of spatial distance. It would be informative to have multiple cases to compare similarities and differences in contextual environments and their relationship to adopting local food. Finally, adding internal (to the restaurant) variables gathered by qualitative methods would greatly add to the robustness of understanding what mechanism is driving adoption. This includes exploration of the internal intrinsic values of the chef or restaurant owner. Each of these items would add to our

understanding of how contextual effects influence voluntary adoption of a local food policy and add to this important growing body of work.

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APPENDICES

Appendix A

Pledge of Purchase Partner
REPORTING GUIDELINES
for the NC 10% CAMPAIGN

The NC 10% Campaign is a statewide collaborative initiative led by the Center for Environmental Farming Systems, (CEFS) and North Carolina Cooperative Extension (NCCES) promoting locally grown food, farmers and the businesses and people who grow, prepare, distribute and sell food in North Carolina.

WHAT COUNTS AS LOCAL?

Raw ingredient standard

The 10% Campaign adheres to a standard that represents "Local" as defined by "origin in North Carolina".

The NC 10% Campaign defines local as: Raw products and whole ingredients originating in North Carolina or surrounding waters. (grown, or produced)

This standard must be verifiable.

For example: Eggs from a North Carolina producer must be verified to be entirely from North Carolina and may not be mixed with eggs from another source to represent a single product.

Processed products standards

The 10% Campaign accepts processed foods with:

- Primary ingredients that are produced or grown in North Carolina. (Point of origin)

- No Single Primary ingredient may be a mixture or combination of local and non-local sources.

For example: A tomato salsa must have a local primary ingredient.

Tomatoes must be grown in North Carolina, and not a mixture of tomatoes from NC and outside sources.

Retailers, Wholesalers, and consumer standards

The 10% Campaign is flexible in terms of what counts toward a Pledge of Purchase partnership, such as a local product line, or a specific commodity purchase.

For example: Sweet potatoes may be the only local item purchased, but it may meet the required 10% pledge of purchase of overall food purchases.

If there is a question on a product, we prefer to only count what is verifiable.

Example of NC 10% Campaign Partner Dashboard

HOW DO I REPORT?

The NC 10% Campaign tracks the total amount ($) spent by our partners on locally-grown foods. Check out our homepage for the current total (www.nc10percent.com). Please report how much your company/organization/agency spends – in a dollar ($) amount - on foods that are grown, raised, or caught in NC.

Restaurants report directly on their Partner Dashboard via an automatic weekly email reminder.

All other partners report directly to NC 10% Campaign staff via email reminder. Reported values ($) can be sent in the body of the email or as an attached spreadsheet. The frequency of reporting will be determined at signup and is based on the structure of the company/organization/agency.

MAKE THE CHOICE. MAKE A DIFFERENCE. MAKE IT LOCAL.
www.nc10percent.com
nc10percent@ncsu.edu
@NC10Percent

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Appendix B

Table: *Rural-Urban Continuum Codes*

RUCC Code	Sub-Sample Group
Metropolitan **(Urban Counties)**	
1	Counties in metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
Metro-Adjacent **(Suburban)** Counties	
4	Urban population of 20,000 or more, adjacent to a metro area
6	Urban population of 2,500 to 19,999, adjacent to a metro area
8	Completely rural or less than 2,500 urban population, adjacent to a metro area
Non-Metro- Adjacent **(Rural)** Counties	
5	Urban population of 20,000 or more, not adjacent to a metro area
7	Urban population of 2,500 to 19,999, not adjacent to a metro area
9	Completely rural or less than 2,500 urban population, not adjacent to a metro area