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PRO-SOCIAL CONSUMER AND FIRM BEHAVIOR IN IMPERFECTLY COMPETITIVE REGIONAL AGRICULTURAL MARKETS

Jill Fitzsimmons

PRO-SOCIAL CONSUMER AND FIRM BEHAVIOR IN IMPERFECTLY COMPETITIVE REGIONAL AGRICULTURAL MARKETS

A Dissertation Presented

By

JILL ANN FITZSIMMONS

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DEDICATION

To Bertie and Josh.

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ABSTRACT

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FEBRUARY 2019

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In this dissertation, I combine field research, econometric methods, and economic theory to analyze a market in which both firms' and consumers' choices are motivated by social preferences. This work contributes to the fields of behavioral economics, industrial organization, and local food systems economics. The dissertation expands the growing literature on social preferences to incorporate firms' choices that are motivated by utility maximizing objectives in an environment that allows endogenous equilibrium prices and quantities. Firms with social preferences operate in a competitive environment in which they may face downstream market power. In particular, the research focuses on intermediated Farm to School markets for local food in which producers' marketing decisions may be influenced by both market structure and the pro-social motivations embedded in local food markets.

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CHAPTER 1

INTRODUCTION

In this dissertation, I combine field research, econometric methods, and economic theory to analyze a market in which both firms' and consumers' choices are motivated by social preferences. This work contributes to the fields of behavioral economics, industrial organization, and local food systems economics. The dissertation expands the growing literature on social preferences to incorporate firms' choices that are motivated by utility maximizing objectives in an environment that allows endogenous equilibrium prices and quantities. Firms with social preferences operate in a competitive environment in which they may face downstream market power. In particular, the research focuses on intermediated Farm to School markets for local food in which producers' marketing decisions may be influenced by both market structure and the pro-social motivations embedded in local food markets.

I apply the findings to provide important information regarding the effectiveness of different policy tools to enhance Farm to School markets for local foods. Markets for local foods feature agricultural firms, whose objective functions are commonly modeled as either profit maximizing or utility maximizing, allowing for ambiguity that is convenient to exploit (Lin, 1978). Firms in local food markets are frequently described as being motivated by goals that align easily with what behavioral economists refer to as pro-social motivations: they vow support common public goods such as environmental preservation and equitable societies (Stevenson and Pirog, 2008). Consumers in local foods markets consistently demonstrate an increased willingness to pay for products that contribute to pro-social goals (Fitzsimmons and Cicia, 2018), and agricultural producers, particularly in Farm to School markets, also demonstrate that they make decisions in which they are willing to accept lower profits in local foods markets (Lehnerd et al., 2018). Finally, prevailing evidence suggests that Farm to School markets are not demonstrably profitable to producers, suggesting that participation in these markets is motivated by something other than profit maximization (Sitaker, et al., 2010).

Local food markets consist of supply chains that both move agricultural products and product information from upstream producers to downstream consumers, but also transmit information from downstream consumers upwards through the supply chain. Supply chains in markets for local foods are often referred to as “value chains,” to reflect the common set of values that supply chain actors have in common with one another, and that they seek to support through participation in the markets. The concept of a “value chain” originated with Porter (1985) as managerial economists developed theories to address the increasing role of information in modern markets. The “value” in this application is generated at each step in the series of supply chain activities that a product or service passes through in a given industry, linking the value created to each actor along the supply chain. As value is created at each step in the product or services’ development, the overall value of the final good or service is increased. The activities that Porter viewed as adding “value” included inbound logistics, outbound logistics, operations, marketing and sales, and service (1985). In 2008, Stevenson and Pirog applied the concept of the long term, inter-organizational, interdependent network of economic actors that comprise Porter’s “value-chain” to incorporate the strategic alliances among mid-tier regional food systems actors. They identified five key characteristics of local foods value chains:

- Appropriateness for situations in which economies of scale are coupled with complex products that differentiate and add value in the marketplace
- Capacity to combine cooperation with competition to achieve collaborative advantages and adapt relatively quickly to changes in the market
- Emphasis on shared vision, shared information (transparency), and shared decision making among strategic partners
- Commitment to the welfare of all participants in the value chain, including fair profit margins, fair wages, and business agreements of appropriate extended duration.

A number of papers identify that supply chain actors in local foods markets operate in value chains that reflect these characteristics. For example, local foods value chains are shown to be characterized by trust (Roy, Hall, and Ballantine, 2017), principles over profit (Poulston and Yu, 2010), mutually supportive economic relationships (Conner et al., 2010; Stevenson, Pirog, and Ostrom, 2011), and the achievement of the goals of local foods systems (Sharma, Moon, and Strohbehn, 2014). Local food systems supply chain actors have advanced the role of value chains, and sales of local food reached $8.7 billion in 2015 (NASS, 2017), but as the market has grown, so has its complexity. Local foods are increasingly marketed through intermediated supply chains, instead of directly to consumers (NASS, 2017; Ralston, 2017). Intermediated supply chains for local food require that supply chain information passes both downstream to consumers and upstream to firms, and implies that firms make choices that are influenced by pro-social preferences.

While it is straightforward to model firms' utility maximizing choices as a function of pro-social preferences and exogenous prices, to date, economists have not derived supply curves from those choices. Without supply curves, it has not been possible to model a partial equilibrium model in which prices and quantities are endogenous, or to model the effect of intermediary market power.

This dissertation attempts to develop a framework for understanding the relationships among market forces that operate to improve economic efficiency and those that operate to achieve pro-social values in a way that allows prices and quantities to be endogenous. In addition to contributing to theory that advances the application of behavioral economics to firms in a competitive market environment, I seek to provide policy makers with a framework through which the effect of policies to promote local foods can be evaluated. To provide a concrete application, most of this dissertation focuses on understanding the key components of a specific value chain – the Farm to School market for local foods. The second chapter veers from the Farm to School application to provide empirical evidence of how human values can influence consumer decision making in markets for local foods.

In the second chapter this dissertation, "Consumers' Human Values and Preferences for Social Outcomes of Regional Food Attributes," written with Gianni Cicia, (2018) we investigate heterogeneity in consumers' human values and willingness to pay (WTP) for social outcomes of credence process attributes that might have some positive social impact on purchases of early potatoes in Italy and Germany. Consumers' identification with cross-cultural human values is measured according to the Schwartz' Portrait Values Questionnaire, and the distribution of preferences for product attributes that claim a positive social impact among respondents with different human values is modeled using mixed logit analysis. Parallel survey studies were conducted in each country with the intention of comparing the impact of human values using the Schwartz Values framework on willingness to pay for early potatoes with several credence process attributes that may signal a positive social outcome as a result of purchase (price, country of origin, carbon footprint certification, ethical certification, and method of production). This paper aims to help clarify the role, if any, that pro-social consumer values have in influencing the willingness to pay for specific food credence process attributes that claim to have a social impact. To the best of our knowledge this is the first paper to focus on the role human values have in influencing the willingness to pay for specific extrinsic credence food attributes.

In the third chapter, “Food Service Authorities’ Motivations to Buy Regional Food,” and fourth chapter, “Market Channel and School Meal Costs in Farm to School Programs” written with Jeffrey O’Hara, I analyze school food authorities’ local food procurement choices. The third chapter uses primary historical data from the Massachusetts Farm to School program to analyze how different social forces converge to promote a common goal of increasing the volume of local food in Massachusetts’ schools. The paper identifies the role of state government, non-profit organizations, agricultural business organizations, public health and nutrition organizations, food service organizations, and economic development agencies in creating partnerships to develop viable farm to institution markets. I investigate barriers to implementation, and frame the potential trade-offs that need to be considered when stakeholders invest in infrastructure needed to sustain the markets.

The fourth chapter analyzes perceptions of costs of procuring local foods in regards to school food authorities' choice of procurement channel. We combine two years' of USDA's Food and Nutrition Service national Farm to School Census data with USDA's National Agricultural Statistics Service Census of Agriculture and Local Food Marketing Practices Survey data to test, among schools participating in farm to school programs, whether procuring directly from producers is more likely to lower costs than procuring through a distributor. Procuring local foods may add costs to school food programs, since procuring local foods requires additional staff effort and local foods may command a premium price. If the costs of locally procured foods are higher than those of alternative products, we would expect to see constraints on local foods procurement in the absence of continued policy interventions to mitigate costs. If, however, certain local food procurement strategies are more effective at reducing school meal costs relative to others, we might expect to see school food authorities (SFA) purchase local foods in greater quantities. Procurement through intermediated channels, such as distributors, is hypothesized by Farm to School advocates to provide economies of scale to the market to reduce overall costs for SFAs, as well as to provide a supply chain capable of aggregating product from small and medium sized farms that could not individually meet volume requirements of institutional buyers. Alternatively, intermediated market channels may provide the opportunity for relatively concentrated distributors to exercise market power, limiting the ability of SFAs to negotiate prices and procurement terms, and resulting in overall higher costs to procurement. We find that schools that exclusively buy from intermediaries are five percentage points less likely to report lower costs from undertaking Farm to School procurement initiatives. In contrast, schools that procure local foods from both producers and intermediaries are four percentage points more likely to report lower costs. There are several possible mechanisms that can explain our finding. One possible mechanism is that profit maximizing producers who market directly to schools are offering a low price to cultivate a diverse marketing portfolio, or that utility maximizing producers are offering a low price to supply product to schools to achieve social objectives. Alternatively, intermediaries either may not be achieving cost savings when aggregating from local producers or if they are, not passing the cost-savings along to SFAs.

In the fifth chapter, “Producer Costs and Returns from New England Farm to Institution Sales,” I present the results of field research that inform the development of the theoretical model of utility maximizing producer choice of markets in Chapter 6 that allows price and quantity to be endogenous when both firms and consumers choices are influenced by social preferences. I interviewed producers in six New England states who market at least some product to Farm to Institution markets about their costs and returns in selling to farm to institution markets. Interviewees represented diversified fruit and vegetable growers in each of the six New England states, and a broad range of farm operations sizes and farm marketing strategies. Farm to Institution marketing ranged from less than 1% of total sales to about 11% of total sales of the farm operations interviewed. Notably, while very few farm operations specifically track costs and returns to farm to institution marketing, only two producers target this market for future growth. The barriers cited to increased participation include low prices, volume requirements, and logistical challenges.

The sixth chapter of my dissertation, “Equilibria and Welfare in Markets With Social Preferences,” written with Nathalie Lavoie and Dan Lass, develops a behavioral model of producer choice for high-quality local food markets in which marketing choices may be influenced by social preferences, while allowing price and quantity to be determined in the market. We draw upon theory from behavioral economics and industrial organization, as well as field research results, to develop a theoretical model that advances the existing literature on producer choice of market channels, in which price is treated as exogenous. Non-pecuniary motivations in marketing choices are increasingly identified in the literature as relevant to producer decision making. The paper provides a theoretical framework to model the potential effects of policy interventions when producers may be motivated by non-pecuniary factors and downstream intermediaries may exercise oligopsony power. The model is informed by an analysis of structured interview results from in-depth field interviews with agricultural producers in six New England states and a literature review. We apply the model to producer marketing choices in farm to school markets, which policy makers currently provide demand-side support by subsidizing school food purchasers’ procurement of local foods. We find that if policy makers wish to increase the quantity of local product supplied to schools, supply-side subsidies are likely to more effective than demand-side subsidies. Effective interventions could include mitigating producers’ transaction costs. We also find that market power in the distribution sector may, in certain cases, serve to counteract policy-makers’ goals to increase quantity of local foods supplied to schools. It is also possible that distributors enjoy higher efficiency, perhaps as a result of economies of scale, which can increase the quantity supplied to the market. Future work using this framework will include evaluating interventions like promoting farm to school markets to producers, or providing technical assistance to producers, to establish contracts with intermediaries that support price pass-through and communicate information about downstream market activity.

CHAPTER 2

CONSUMERS' HUMAN VALUES AND PREFERENCES FOR SOCIAL OUTCOMES OF REGIONAL FOOD ATTRIBUTES

Authors: Jill Fitzsimmons and Gianni Cicia

2.1 Introduction

For decades, research has suggested that consumer decisions are not exclusively rational and self-regarding (Camerer and Fehr, 2006), that consumers within demographic classes have widely varying preferences that are not fully explained by basic demographic profiles (Bruno et al., 1972; Worlsey and Lea, 2008), and that preferences for product attributes measured in choice experiments may not be complete and stable (Lusk and Briggeman, 2009). Consumer choices for credence process attributes may be influenced by other-regarding preferences or bounded rationality, or they may represent an intermediate stage of decision making. Credence process quality attributes of products indicate "the characteristics of the processes used to produce them," for which consumers are unable to judge the quality of the product, even after they have inspected, purchased, and used the product (Caswell, 1998). Consumers who purchase products with credence process product attributes that signify social outcomes provide a context to test the hypothesis that some consumer purchases are motivated by other-regarding preferences, given that the attributes expressly indicate that the purchase has an impact on public goods.

Consumers might consider some process attributes to increase individual welfare while simultaneously creating positive social outcomes (Hughner, et al., 2007; Lusk, Norwood et al., 2006). For example, consumers might benefit individually from the characteristics of processes used to produce food products; Food produced organically or locally might be perceived as fresher, more nutritious, or safer (Lusk, Brown et al., 2006). At the same time, consumers might also believe that organic or local foods benefit others, in addition to benefiting themselves, by reducing environmental impacts or making a positive contribution to the consumer's regional economy (Caswell, 1998). Other process attributes, such as "fair trade" or "low carbon emissions" labeling, are less likely to have a distinct and noticeable impact on a given individual's welfare. Instead, these process attributes are intended to promote social values of equitable treatment of labor, and environmentalism. Individuals who make choices to promote social values are likely motivated by something in addition to gains in individual welfare, and researchers may be able to identify those motivations, beyond simply attributing the motivation to a "warm glow" (Andreoni, 1990).

To help clarify the role that values have in influencing willingness to pay (WTP) for specific credence process attributes that promote social outcomes, we use the Schwartz Portrait Values Questionnaire (PVQ) to provide a conceptual and empirical framework to measure human values, and relate consumers' WTP for social outcome attributes to their human values profile (Schwartz et al., 2001). Our results suggest that there is an empirical relationship between Schwartz Human values and a stated preference for credence process product attributes that promote values-related social outcomes for a potato product. Consumers in both Italy and Germany who value the environment and social equitability have a higher WTP for product attributes that promote environmental benefits, labor, etc. and consumers who value self-gratification, personal success, and social power have a lower WTP for these product attributes, all else equal.

Consumers' affinities for products with credence process attributes that promote social outcomes such as environmentalism, social equitability, or ethnocentrism, are more likely to be based on consumers' values than their demographic characteristics. An emerging body of economic literature seeks to identify and measure the role that these previously unobserved consumer values have on influencing consumers' WTP for product attributes, in general. In this paper, we use a robust cross-cultural survey tool, the PVQ, to identify consumer heterogeneity in WTP for a potato product with attributes that promote social outcomes based on human values. We apply the tool to consumers in Germany and Italy and analyze the results using a mixed logit model to capture additional heterogeneity by allowing coefficients to have a distribution. Instead of imposing the ***a priori*** framework of Schwartz Human Values, we allow our econometric models to identify significant relationships in the data, and find that these relationships confirm the Schwartz Values framework, suggesting that the PVQ has promise as a tool for identifying future relationships between consumers' heterogeneous values and valuations for credence process attributes.

The paper is organized as follows: Section 2 reviews the literature on the relationship between human values and consumer decision-making; Section 3 describes the data collection methodology; Section 4 describes the model applied to uncover the effect of human values on consumer decision making in the two new potato markets; Section 5 presents the results of our analysis, and Section 6 concludes.

2.2 Human Values and Willingness to Pay for Food Attributes

Consumer demand analyses have focused on a wide range of credence attributes. Food safety, nutrition information, and product traceability have been widely shown to be important to consumers (Hobbs, 2003; Golan et al., 2004; Verbeke & Ward, 2006; Van Rijswijk et al., 2008; Lusk & Briggeman, 2009; Ubilava & Foster, 2009; Louriero, et al., 2007). Food safety, nutrition, and traceability attributes are primarily vertically differentiated, but consumers have heterogeneous preferences for many process attributes. Consumers may interpret process attributes as important signals of other types of attributes that we would expect all consumers to value. For example, consumers may perceive that products grown near to the point of purchase are fresher, more nutritious, taste better, and are safer (Boyle, 2004; Scarpa and Del Giudice, 2004; Feldmann and Hamm, 2015; Cavallo and Piqueras- Fiszman, 2017). On the other hand, the growth in "conscious consumerism" suggests that consumers who value process attributes beyond the utility given by consumption of the product may not be solely motivated by self-interest (Manieri et al., 1997). Examples of credence process attributes that a "conscious consumer" might purchase include credence process attributes like environmental production and protection, sustainable development, assurances towards worker protections, and equal labor remuneration.

In this paper, we suggest that the concept of food quality extends from food characteristics that benefit the purchaser to social outcomes that result from purchase. We identify and measure the relationship between human values and consumers' choices for products that claim a social outcome by labeling products as possessing credence process attributes (Bond et al., 2007; Lusk and Briggeman, 2009). Therefore, we try to examine whether individuals' values explain product choices with attribute claims for social outcomes.

Economic studies that rely on demographic market segmentation alone are inadequate to account for consumer decisions that are motivated by other-regarding preferences (Bruno et al., 1972; Kamakura and Novak, 1992; Cicia, 1993; Camerer and Fehr, 2006; Lusk and Briggeman, 2009; Cicia et al., 2010; Naspetti and Zanoli, 2011; Cembalo et al., 2016; Caracciolo et al., 2016; Roselli et al., 2018). These studies tend to predict consumers' choices based on food attributes and consumers' observable demographic characteristics. Little research is available on the influence of personal values on consumer's purchasing decisions, though values and beliefs are likely pivotal predictors of food consumption (Cicia, et a., 2002; Rigby and Burton 2003; Alfnes, 2004; Scarpa and Del Giudice, 2004; Michaelidou and Hassan, 2008; Lusk, Norwood et al., 2006; Ubilava and Foster, 2009).

To address this gap, an emerging body of economic and other social science research investigates how values and beliefs likely affect consumers' food choices for vegetarian diets, organic production, environmental outcomes, food safety, country-of-origin labeling and preferences for domestic or local products (Allen and Baines, 2002; Umberger et al., 2003; Lea and Worsley, 2005; Lusk, Brown et al., 2006; Spash and Vatn, 2006). Many of the economic studies have used ad hoc mechanisms to identify the values and beliefs that drive decision making, but there is progress in linking the measurement tools economists use with more robust tools from other disciplines that measure values and beliefs. Prominent social psychologists such as Rokeach (1973); Azjen (1985); Inglehart et al. (1998); Schwartz (1994) have developed different conceptual frameworks to identify how individuals' values and beliefs influence choices. The conceptual frameworks include both theoretical mechanisms by which values are filtered through intermediate stages of decision making, and decision-making contexts and tools based on these frameworks to identify and measure stable values that persist in individuals over time. These tools have been extended to apply to individuals' economic choices in different circumstances, and additional tools such Food Values (Lusk and Briggeman, 2009) have further extended the application of social psychologists modeling of values-based decision making to the sphere of food decisions. Behavioral economists have also used experimental tools, for example, Ultimatum and Dictator Games and Becker-DeGroot-Marschak mechanism to measure individual consumers' preferences for pro-social outcomes, like altruism and fairness.

The Food Values (FV) tool developed by Lusk and Briggeman (2009) eliminates the malleability of stated and revealed preferences for food attributes by determining consumers' food values systems. Lusk and Briggeman point out that consumer choices for unfamiliar food attributes may not be complete and stable representations of preferences. Instead, choices reflect decisions made as trial and error, and within the context of a decision task; the choices made, then, represent an intermediate stage of decision making and not an absolute, time-invariant statement of preference. To address this, Lusk and Briggeman designed the FV tool to identify and measure abstract attributes, consequences, and end states (186) of food consumption that may be able to explain consumers' choices between food products, referred to as "food values". Lusk and Briggeman applied the FV tool to consumers' preferences for organic food. They found that, on average, consumers placed the most importance on price, food safety, nutrition, and taste, as expected, but also that there is significant heterogeneity across consumers. Respondents who ranked naturalness, fairness, and the environment as very important were more likely to have purchased organic food in the past, and stated higher willingness to pay for organic food. Consumers for whom price was the highest ranked food value were the least likely to have purchased organic food, and stated the lowest willingness to pay. The authors also found interesting relationships between FV – for example, people who placed high importance on fairness place lower importance on self-centered values of price, taste, convenience and appearance. Results from additional applications of the FV tool reinforce these findings (Lusk, 2011; Pappalardo and Lusk, 2016; Lee et al., 2014).

Finally, the Schwartz Human Values tool has been used to demonstrate how an underlying set of stable human values influences individuals' choices, primarily in the public health and psychological literature. Schwartz (2007) proposed that humans across cultures share a core set of relatively stable "value orientations". Schwartz distinguishes these underlying values from their expression as attitudes, norms, opinions, and actions that are commonly measured in social sciences. The underlying values "guide the selection or evaluation of actions, policies, people and events" (Schwartz, 2007, p. 297), and remain stable for individuals throughout their lives.

Ten universal human values are identified by Schwartz: Self-Direction, Stimulation, Hedonism, Achievement, Power, Security, Conformity, Tradition, Universalism and Benevolence. Descriptions of these values are provided in Table 1. Each value relates to the others either appositionally or complementarily. For example, an individual whose values are positively correlated with Tradition would express values that were negatively correlated with Hedonism, but positively correlated with Conformity. As such, Schwartz grouped the ten human values into opposite meta-values, organizing them in a circular-spatial manner. The meta-values and their respective individual values are shown in Figure 1: ***Openness to chang***e (stimulation, self-direction and hedonism) versus ***Conservation*** (security, conformity and tradition); ***Self-transcendence*** (benevolence and universalism) versus ***Self-enhancement*** (hedonism, achievement and power). In the theoretical Schwartz framework, hedonism can either stand-alone or can be a part of ***Openness to change*** or ***Self-enhancement meta-values*** (Caracciolo et al., 2016).

Table 1 Schwartz Values and Defining Goals

VALUES	DEFINING GOALS
SELF-DIRECTION	Independent thought and action-choosing, creating, exploring (creativity, freedom, independent, curious, choosing own goals, self-respect, intelligent, privacy)
STIMULATION	Excitement, novelty, and challenge in life (a varied life, an exciting life, daring)
HEDONISM	Pleasure and sensuous gratification for oneself (pleasure, enjoying life, self-indulgent)
ACHIEVEMENT	Personal success through demonstrating competence according to social standards (successful, capable, ambitious, influential, intelligent, self-respect, social recognition)
POWER	Social status and prestige, control or dominance over people and resources (social power, authority, wealth, preserving my public image, social recognition)
SECURITY	Safety, harmony and stability of society and of relationships (family security, national security, social order, clean, reciprocation of favors, healthy, moderate, sense of belonging)
CONFORMITY	Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms (obedient, self-discipline, politeness, honoring parents and elders, loyal, responsible)
TRADITION	Respect, commitment, and acceptance of the customs and ideas that one's culture or religion provides (respect for tradition, humble, devout, accepting my portion in life, moderate, spiritual life)
BENEVOLENCE	Preserving and enhancing the welfare of those with whom one is in frequent personal contact [the ‘in-group’] (helpful, honest, forgiving, responsible, loyal, true friendship, mature love, sense of belonging, meaning in life, a spiritual life)
UNIVERSALISM	Understanding, appreciation, tolerance and protection for the welfare of all people and for nature (broadminded, social justice, equality, world at peace, world of beauty, unity with nature, wisdom, protecting the environment, inner harmony, a spiritual life)

Source: ***Caracciolo et al., 2016***

How consumers identify themselves in relation to these values is unveiled through the Schwartz 21-item Portrait Value Questionnaire (PVQ). Each of the 21 items in the PVQ addresses one of the ten human values. The survey provides respondents with statements that describe an unknown person's profile, such as "***she thinks it is important that every person in the world be treated equally. She believes everyone should have equal opportunities in life***", and asks respondents to rank the extent to which they identify with this person, using a six-point scale, where one indicates a low level of identification (***not like me at all***) and 6 ranks a high level of identification (***very much like me***).

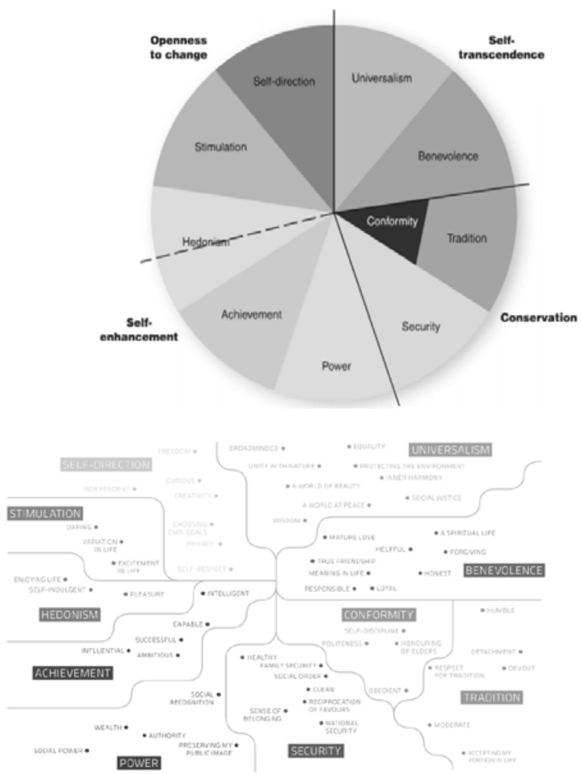

Figure 1 Schwartz Human Values

The Schwartz human values (SHV) tool has been used in a handful of economic studies on consumer food choices. Lombardi and colleagues (2015) use food related lifestyle (FRL) and SHV to identify consumer participation in a Solidarity Purchasing Group (SPG) in Italy, which is a consumer cooperative that works directly with regional farmers to source products for its members with the intention of supporting local economies. Caracciolo et al. (2016) analyzed the relationship between consumers' preferences for sustainable pig farming practices and SHV in five different European countries. This study (n=2437) suggests a strong relationship between consumers who value protection of welfare and nature, and an increased valuation of product attributes that promote environmentally cleaner pork production systems; while consumers who value self-gratification, personal success, and social power demonstrate a decreased valuation for these product attributes.

Our paper extends this research by identifying and measuring human values to explain willingness to pay for credence process attributes for early potatoes. We chose the SHV framework to identify human values and the PVQ tool to measure these values for a number of reasons. The SHV framework is well-established in the choice literature, and has been shown to be valid across cultures, which is particularly valuable as we seek to compare consumers in different countries. The PVQ tool, with only 21 scale questions, places a low burden on respondents, which reduces fatigue and increases the reliability of results. The simplicity of the PVQ also reduces the variability in researcher subjectivity that burdens other approaches, such as means-end laddering. There are, of course, critiques of the SHV framework and PVQ tool that we take into consideration in our analyses. SHV do not include measures that might provide insight into consumers' relative preferences for a credence attribute that signals both social outcomes and fundamentally important product attributes, such as food safety, nutrition, convenience, or appearance (Lusk and Briggeman, 2009) and we are not able to separate consumers' beliefs regarding the meanings of attributes claims and their preferences for those claims (Costanigro and Lusk, 2014). Therefore, we are not able to empirically disaggregate respondents' preferences for social impacts versus their preferences for increased individual welfare. However, we feel comfortable interpreting our results as upper bound preferences for social impacts, as food safety in Italian and German produce markets is likely considered to be adequately addressed by government regulation (Groulleau and Caswell, 2006) and we believe that product nutrition, convenience, and appearance for a potato product would be equivalent across the product attributes that we do vary in our study. We also focus our interpretation on product attributes that are less likely to bundle personal and social benefits.

2.3 Methods

2.3.1 Human Values and Product Attributes Measurement

Our analysis explicitly considers consumers' human values using the framework proposed by Shalom H. Schwartz (1992) and the 21-item Schwartz Portrait Values Questionnaire (Schwartz, 2001). The early potato product was chosen because it conforms with many of the relevant process attributes in which we were interested. The early potato is differentiated, in Italy and Germany by regional and national origin, environmental production, ethical certification, and carbon footprint. In Italy, early potato cultivation is concentrated mainly in the southern regions, especially in pockets that have evolved to resemble informal "territorial districts" that bind their agricultural economy to this crop. Early potatoes grown in these regions are sold on the national market and are exported, mainly to Germany. Early potatoes from other Mediterranean countries are also widely available in Italy and Germany. Unlike storage potatoes, early potatoes are not stored prior to sale, and are considered to be a perishable product with a short window of freshness. Italian producers use conventional, organic or low-input cultivation methods to grow early potatoes. The product may be certified and branded as ethically produced in accordance with the SA8000 certification[1], and it may be certified as being a part of a low-carbon emissions supply chain, featuring a carbon logo. The characteristics of early potato, like its production in specific territorial districts, freshness, the development of more sustainable cultivation methods, the increasing competition with potatoes from other countries, and its ethical and carbon-footprint certifications make it an interesting case to test this relationship in modern markets.

The set of potato attributes and attribute levels we chose to study are specific to the new potato product, and were selected as a result of a multi-step process. We began with a literature review, based on which we conducted in-depth interviews with Italian and German stakeholders in the early potato supply chain. Next, we narrowed down the relative importance of different new potato attributes through focus groups held with consumers, allowing us to identify the most relevant different quality dimensions of early potatoes. This qualitative approach to content validity[2] (Yaghmale, 2009), allowed us to finalize the questionnaire and identify the attributes and levels used to analyze consumers preferences. The attributes that emerged as most important to consumers included local production in specific territorial districts, freshness, sustainable cultivation methods, the

1 SA8000 is an auditable certification standard that encourages organizations to develop, maintain, and apply socially acceptable practices in the workplace (Henkle, 2005)

2 Content validity refers to the degree of coverage as regards the content, which the instrument is supposed to measure (Yaghmale, 2009). Special attention was paid to identify first the attributes and than the levels that define each attribute in order to define the specific quality dimension.

perception of an increase in undocumented migrants among agricultural workers, and competitive pressures from imported new potatoes. The credence attributes that we ultimately selected to model were those that indicated territorial origin, ethical certification, production method and carbon footprint certification.

We expect that consumers who exhibit meta-values that reflect outward looking, pro-social human values will have a higher WTP for credence process attributes that claim positive social impact, and consumers who exhibit meta-vales that reflect inward, self-interested human values will have a lower WTP for these attributes. In particular, we expect that consumers with “self-transcendent” Schwartz meta-values will be willing to pay more for product attributes that indicate social outcomes like environmentalism and equitability. We also expect that these consumers will be WTP more for environmental production methods, but our survey design does not allow us to disaggregate what part of this increased WTP is driven by self-interest for healthful, safe, fresh foods versus what part is driven by preferences for pro-social outcomes. We would expect that consumers who exhibit self-enhancement, conservative, or hedonistic meta-values will have lower WTP for product attributes that indicate social outcomes. Finally, we would expect that consumers who exhibit conservative meta-values would express higher WTP for ethnocentric attributes, like own-country of origin labeling.

2.3.2 Study Participants

Our research compares heterogeneity in preferences and consumers’ human values in Italy and Germany. We use a unique set of cross-sectional survey data from a representative sample of 1,009 German and 1,004 Italian consumers, conducted by a professional marketing company. People interviewed were responsible for household major food purchasing decisions. The sample has been selected and stratified by geographical area, city size, gender and age (Table 2).

Table 2 Socio-Demographic Characteristics of the Sample

	Germany	Italy
Gender (%)		
Male	45.5	13.3
Female	54.5	86.7
Age (years)**:** mean and (st.dev)	42.4 (13.1)	52.5 (14.4)
Children<10 years old (%)		
Yes	20.60	18.30
No	79.40	81.70
Economic situation of the family (%)		
Poor	22.80	25.20
Moderate	39.30	36.90
Good	23.30	36.60
No answer	14.60	1.20
Highest qualification completed (%)		
<High School	11.80	31.30
High School	22.50	40.40
University Degree	28.90	15.00
Sample Size	1,009	1,004

The first section of the questionnaire assessed the perception of the quality of fresh food products from consumers and their level of knowledge about product attributes through a set of exploratory questions. The second section focused on the early potato. Respondents were introduced to the main characteristics of the new potato, and then were asked about past purchases of new potatoes, including frequency of consumption, the country of origin (if known), and the importance attached to the various attributes of early potatoes. In the third section, each respondent was asked to choose a preferred early potato product from a labeled hypothetical choice sets containing four different early potato products, or to ‘opt-out’ and choose “none of these products”. Each early potato product label featured a combination of five different extrinsic attributes and price. Each extrinsic attribute was varied between two or three “levels” of attribute-specific options. Attributes and levels included in the randomized questionnaire design are shown in Table 3. Each individual consumer faced five different choice sets, with four different products and the opt-out alternative. Each of the four products offered featured a different label showing one level of each of the product attributes. The order of choice sets offered was varied between respondents in order to avoid order bias. Choice sets were the result of a randomized CBC (Choice-Based Conjoint) advanced design with complete enumeration. The D-optimal coefficient of the experimental design was equal to 0.99.

Table 3 Choice Experiment Attributes and Levels

Attributes	Levels	Attributes	Levels
Production Method		Country of Origin	
	Organic		Italy/Germany
	Environmental Friendly		Non-Domestic product (but COOL known)
	No information		No information
Carbon Footprint		Price (Euro/kg)	
	Carbon footprint logo		0.60
	No information		0.80
			1.00
			1.40
Ethical certification			
	SA8000 certification		
	No information		

2.4 Model and Analysis

We model previously unobserved heterogeneity in consumers' preferences for product attributes of new potatoes both by explicitly estimating consumers' preferences according to their SHV profiles, and by modeling the distribution of those consumers' preference profiles using a mixed logit, or random parameters logit, model. We first evaluate the reliability of the PVQ results. Upon satisfactory reliability, we conduct a Principal Components Analysis (PCA) with varimax rotation to reduce the number of variables and identify human values principal component weights to create value profiles for respondents. We then use the principal component weights for individual level human values profiles and extrinsic product attributes in a mixed logit model (ML) to determine preference heterogeneity within different Schwartz values profiles. The ML model also allows us to avoid the assumption that observations from a given individual are independent of one another, which is a shortcoming of the standard logit model (Revelt and Train, 1998; McFadden and Train, 2000).

2.4.1 Values Reliability

To determine reliability of the Schwartz Portrait Value results, we compute Cronbach's alpha scores for each of the 10 Schwartz Values. For nine out of the ten Schwartz Values, reliability was a function of responses to two of the PVQ questions; for the Schwartz Value "Universalism," the reliability was calculated as a function of the responses to three questions (Brunso et al., 2004; Schwatz, 2001).

Alpha scores for the Italian and German data sets are reported below in Table 4. According to the literature, alpha scores of above 0.5 are generally considered to indicate moderate/high reliability[3]. All of the Values, except "tradition" in the Italian data set, meet this standard. We retain this value, however, because retention of this variable had negligible impact on subsequent analyses.

[3] "There is much debate among researchers as to where the appropriate cut-off points are for reliability. A good guide is: 0.9 and above shows excellent reliability; 0.7 to 0.9 shows high reliability; 0.5 to 0.7 shows moderate reliability; 0.5 and below shows low reliability " (Hinton et al., 2014, p. 364)

Table 4 Reliability of the Portrait Values Questionnaire scores (Cronbach's alpha)

	German data	Italian Data
Values	C. alpha	C. alpha
Power	0.64	0.63
Achievement	0.76	0.81
Hedonism	0.66	0.61
Stimulation	0.57	0.71
Self-Direction	0.56	0.56
Universalism	0.59	0.68
Benevolence	0.72	0.62
Tradition	0.50	0.35
Conformity	0.59	0.54
Security	0.72	0.57

2.4.2 Principal Component Analysis

To reduce the number of variables and obtain principal components weights to be used as regressors in our ML model, we conducted a PCA of the 21 PVQ scores, using varimax rotation. These components represent the relative weight of each observation on the composition of components. The orthogonality conditions of the varimax rotation are critical in this analysis because of the oppositional tension inherent in the Schwartz value design (Cembalo et al., 2016). Kaiser-Meyer-Olkin tests (KMO) verify the validity of the initial data applied to the model. According to the Schwartz Human Values literature, we would expect the ten human values to be reduced to five principal components corresponding to the meta-values described above. Our analysis identified three explained principal components for the Italian data and four explained components for the German data, a significant reduction from the original 21 questions. The resulting primary components align with the meta-value categories described above, and are consistent with the SHV framework although they fall along slightly different boundaries due to the smaller number of components. We refer to these components as “values profiles”.

The three values profiles identified from the Italian PCA and included as regressors in the mixed logit model below are therefore: “Self-Transcendence/ Openness-to-Change,” “Self-Enhancement/ Openness-to- Change,” and “Conservation”. The component analysis results for Italy are presented below in Tables 5. The four values profiles resulting from the German PCA consist of four meta-values, including “Self-Transcendence / Openness-to-Change,” “Self-Enhancement,” Conservation,” and “Hedonism.” The component analysis results for Germany are presented below in Table 6.

Table 5 Italian Principle Component Analysis Result

Values	**Meta-Values**			***Unexplained***
	Self-Enhancement/ Openness-to -Change	**Self-Transcendence/ Openness-to-Change**	**Conservation**	
Achievement	**0.52**	-0.08	0.03	0.23
Hedonism	**0.44**	0.05	0.05	0.33
Power	**0.51**	-0.15	0.11	0.27
Stimulation	**0.45**	0.17	-0.12	0.27
Benevolence	-0.09	**0.55**	0.11	0.23
Self-direction	0.25	**0.49**	-0.23	0.30
Universalism	-0.09	**0.61**	0.05	0.19
Conformity	0.05	-0.01	**0.60**	0.30
Security	-0.01	0.17	**0.45**	0.37
Tradition	0.01	-0.03	**0.59**	0.38

Variance explained : 71.5%

Table 6 German Principle Components Analysis Results

Values	**Meta-Values**				
	Conservation	**Self-Transcendence/ Openness-to-Change**	**Self Enhancement**	**Hedonism**	***Unexplained***
Conformity	**0.53**	0.05	0.23	-0.14	0.30
Security	**0.53**	-0.16	-0.13	0.40	0.19
Tradition	**0.54**	0.09	0.06	-0.14	0.30
Benevolence	0.24	**0.32**	-0.26	0.23	0.25
Self-direction	-0.15	**0.60**	0.07	0.04	0.30
Stimulation	-0.19	**0.33**	0.20	0.32	0.28
Universalism	0.14	**0.61**	-0.09	-0.17	0.23
Achievement	-0.03	0.06	**0.60**	0.07	0.21
Power	0.08	-0.06	**0.67**	0.00	0.17
Hedonism	-0.02	-0.03	0.03	**0.78**	0.15

Variation explained: 76.47%

2.4.3 Mixed Logit Analysis Results

2.4.3.1 Mixed Logit Model

The values profiles were included in our Mixed Logit model analysis as observable consumer attributes. The mixed logit model is then used to estimate the posterior probability of Italian and German consumers' selection, and their WTP for different credence process attributes of the new potato in both willingness to pay and preference space. The mixed logit discrete choice model addresses two of the most critical concerns associated with the traditional logit model. The model accounts for additional unobserved consumer heterogeneity by allowing parameters to vary randomly (Revelt and Train, 1998). As a result, our model does not suffer from the inappropriate imposition of independence of irrelevant alternatives. In addition, the mixed logit model allows unobserved utility to be correlated over individuals in our panel (Revelt and Train, 1998). The mixed logit model is widely used for food and consumer choice research.

In the discrete choice model, consumers n = 1,…,N maximize utility $U_{njt} = \beta_n' x_{njt} + \varepsilon_{njt}$, where β_n is a vector of individual-specific coefficients, x_{njt} is a vector of observed attributes relating to individual n and alternative j on choice occasion t , and ε_{njt} is a random term that is assumed to be an independently and identically distributed extreme value. The density for β is denoted as $f(\beta \mid \theta)$, where θ are the parameters of the distribution. Conditional on knowing β_n , the probability of respondent n choosing alternative i on choice occasion t is given by the conditional logit formula (McFadden, 1974)

$$L_{njt}(\beta_n) = \frac{\exp(\beta'_n x_{nit})}{\sum_{j=1}^{J} \exp(\beta'_n x_{njt})} \tag{2.0}$$

Where ***j = 1,…, J*** denotes the product alternatives, and ***t = 1,…,T*** denotes the choice sets. The vector of observed variables includes all of the product attributes for the alternative offered to the consumer

$$S_n(\beta_n) = \prod_{t=1}^{T} L_{ni(n,t)t}(\beta_n) \tag{2.1}$$

Where $i(n,t)$ is the alternative chosen by individual n on choice occasion t. The unconditional probability of the sequence of choices that are observed is the conditional probability integrated over the distribution of β :

$$P_n(\theta) = \int S_n(\beta_n) f(\beta \mid \theta) d\beta \tag{2.2}$$

This is a weighted average of a product of logit formulas evaluated at different values of β, with the weights provided by the density f.

The goal is to estimate the mean and covariance of β_n, or the population parameters θ. Since we suggest that there is consumer heterogeneity, the population parameters provide us with the distribution of individual parameters. The probability estimation must be approximated by simulation, as the integral 1.3 does not exist in closed form and cannot be calculated analytically. Details on the simulation procedure are provided by Hole (2007).

2.4.3.2 Model Specifications

We include in the model five product attributes with two or three levels each to represent extrinsic credence attributes for early potatoes. We interacted these attributes variables with values profiles to create variables that capture heterogeneity in preferences for attributes based on human values. The Italian model includes interactions between Self-Transcendence/Openness-to-Change and attribute variables, and Self-Enhancement/Openness-to-Change and attribute variables; the base, or omitted, case is Conservation. The German model includes interactions between Self-Transcendence/ Openness-to-Change and attribute variables, Self-Enhancement and attribute variables; and Conservation and attribute variables; the base, or omitted, case is Hedonism[4].

Following Hole (2007) and Hole (2008) we tested a number of different model specifications to identify which coefficients to vary or to leave as fixed, and which distributions (normal or log normal) these coefficients should follow[5]. As a result, the models estimated for the Italian and German data sets vary slightly, in order to best fit the respective data. In both cases, we find that allowing normal price variables to vary improves model fit (Hole, 2008; Meijer and Rouwendal, 2006). In both data sets, we tested whether coefficients were independently distributed, and finding that they were not we followed Hole (2007) and Train (2003) to estimate the parameters in the covariance matrices[6] and allow for correlated normal coefficients.

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[4] The models were tested with different base cases. These specifications fit the data best.
[5] If we had found that the log-normal distribution fit best, it may not have been the case that coefficients were correlated.
[6] Not estimated directly, but through the lower-triangular matrix L, where covariance matrix is LL’

2.4.3.3 Mixed Logit Model Results

Given the results of the PCA, we expect that Italian and German consumers whose values profiles align principally with Self-Transcendence/ Openness-to-Change will demonstrate a coefficient with positive effects for process attributes that may promote a social outcome, including potatoes that are labeled to indicate ethical labor practices, and low carbon impact. We would also expect these coefficients to be positive for sustainable production methods, such as Organic or Environmental Production, but we are not able to disaggregate these effects from preferences for increased individual welfare. We expect that Italian and German consumers who express the meta-value of Self-Enhancement will demonstrate a decreased willingness to pay for potatoes that do not confer an individual benefit, including ethical certification and carbon logo. Mean coefficient estimates and standard deviations for the ML model are reported in Tables 7 and 8. We will focus our analysis on the statistically significant parameters. We do not have strong priors about the effects of COOL. On one hand, we might expect that a person who exhibits a Self-Enhancement values profile might indicate an ethnocentric perspective, giving Own-Country origin labeling a positive effect, but Other-country Origin labeling a negative effect. On the other hand, a truly self-regarding values profile might indicate a disregard for anyone other than oneself, resulting in a negative effect.

Table 7 Models Estimation (Italy)

			Italian Logit		Italian Mixed Logit			
Attributes		Values	Coefficients		Coefficients		Standard Deviations	
			Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Price			**-1.05**	0.06	**-0.94**	0.10	**1.45**	0.14
	X	Self Enhancement	**0.15**	0.03	**0.15**	0.06	**0.36**	0.13
	X	Self Transcendence	**-0.10**	0.03	0.06	0.08	**0.47**	0.16
Production								
	Environmentally friendly		**0.16**	0.05	**0.32**	0.05		
	X	Self Enhancement	-0.03	0.03	**-0.12**	0.04		
	X	Self Transcendence	0.05	0.03	**0.13**	0.04		
	Organic		0.01	0.05	**0.29**	0.06		
	X	Self Enhancement	0.00	0.03	**-0.13**	0.04		
	X	Self Transcendence	**0.07**	0.03	**0.18**	0.04		
Carbon Logo			**0.40**	0.04	**0.40**	0.04	**0.43**	0.10
	X	Self Enhancement	-0.03	0.02	-0.06	0.03	**0.18**	0.05
	X	Self Transcendence	0.05	0.03	0.07	0.04	**0.21**	0.06
Origin								
	Labeled Italian		**2.25**	0.05	**2.50**	0.11	**1.54**	0.12
	X	Self Enhancement	**-0.18**	0.03	**-0.39**	0.07	**0.42**	0.10
	X	Self Transcendence	**0.11**	0.03	**0.29**	0.08	**0.40**	0.11
	Labeled Not Italian		**0.66**	0.06	**0.66**	0.10	**1.08**	0.11
	X	Self Enhancement	0.01	0.03	-0.11	0.06		
	X	Self Transcendence	-0.06	0.04	0.07	0.07		
SA8000 Certification			**0.32**	0.04	**0.45**	0.05		
	X	Self Enhancement	**-0.07**	0.02	**-0.16**	0.04	**0.24**	0.06
	X	Self Transcendence	0.05	0.03	**0.13**	0.04	**0.21**	0.07
Opt-Out			**-1.07**	0.10	**-4.74**	0.59	**4.26**	0.41
	X	Self Enhancement	**0.16**	0.04	0.23	0.29	**0.87**	0.24
	X	Self Transcendence	**-0.20**	0.04	**0.94**	0.31	**1.77**	0.30
Constant			**-1.81**	0.08				

Table 8 Models estimation (Germany)

			German Logit		German Mixed Logit			
Attributes		Values	Coefficients		Coefficients		Standard Deviations	
			Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Price			**-2.12**	0.06	**-3.07**	0.17	**2.77**	0.21
	X	Self Enhancement	**0.30**	0.04	**0.26**	0.12	**1.25**	0.19
	X	Self Transcendence	0.07	0.04	**0.49**	0.15	**2.02**	0.25
	X	Conservation	-0.06	0.04	-0.15	0.13	**0.77**	0.17
Production								
	Environmentally friendly		**0.18**	0.05	**0.58**	0.07		
	X	Self Enhancement	0.01	0.04	**-0.26**	0.06	**0.62**	0.09
	X	Self Transcendence	**-0.12**	0.03	**0.16**	0.07	**0.56**	0.09
	X	Conservation	**0.06**	0.04	0.09	0.06		
	Organic		**0.25**	0.05	**0.73**	0.07		
	X	Self Enhancement	**-0.09**	0.03	**-0.27**	0.06	**0.60**	0.09
	X	Self Transcendence	0.03	0.04	**0.20**	0.07	**0.54**	0.08
	X	Conservation	0.03	0.04	0.11	0.06		
Carbon Logo			**0.31**	0.04	**0.38**	0.05		
	X	Self Enhancement	**-0.06**	0.03	**-0.13**	0.04	**0.29**	0.07
	X	Self Transcendence	0.02	0.03	**0.11**	0.05	**0.51**	0.08
	X	Conservation	-0.02	0.03	-0.02	0.04		
Origin								
	Labeled German		**1.73**	0.05	**2.00**	0.08		
	X	Self Enhancement	**-0.17**	0.03	**-0.36**	0.06		
	X	Self Transcendence	**-0.14**	0.04	0.07	0.09	**1.44**	0.11
	X	Conservation	**0.14**	0.04	**0.23**	0.06		
	Labeled Not German		**0.53**	0.05	0.16	0.08		
	X	Self Enhancement	0.00	0.04	**-0.17**	0.07	**0.60**	0.09
	X	Self Transcendence	**-0.16**	0.04	0.09	0.08		
	X	Conservation	-0.04	0.04	-0.11	0.07		
SA8000 Certification			**0.49**	0.04	**0.81**	0.06	**0.49**	0.09
	X	Self Enhancement	**-0.17**	0.03	**-0.30**	0.05	**0.53**	0.07
	X	Self Transcendence	**0.07**	0.03	**0.20**	0.06	**0.46**	0.09
	X	Conservation	0.01	0.03	0.08	0.05	**0.18**	0.08
Opt-Out			**-2.16**	0.09	**-6.40**	0.60	**5.20**	0.38
	X	Self Enhancement	**-0.10**	0.05	**-1.02**	0.27	**1.20**	0.32
	X	Self Transcendence	-0.07	0.05	**0.90**	0.31	**2.47**	0.35
	X	Conservation	**-0.15**	0.05	-0.10	0.26		
Constant			**-0.63**	0.07				

We created interaction variables between the values profiles discussed above and product attributes. Several of these interactions were statistically significant, and, additionally, conformed to the hypotheses regarding how human values affect consumer preferences for extrinsic credence attributes. For the Italian model, the interactions between ***Self-Transcendence / Openness to Change*** and the process attributes ***Organic*** and ***Environmental Friendly*** production, ***Italian Origin***, and ***Ethical Certification*** are significant and positive. The interactions between ***Self-Enhancement*** and the process attributes ***Organic*** and ***Environmental Friendly*** production, ***Italian Origin***, and ***Ethical Certification*** are significant and negative. The likelihood ratio for the model indicates a good fit.

Italian and German consumers, as a whole, value process attributes as one would expect, based on prior research. In the ML model, the random coefficients are expected to vary across individuals; this variation is indicated by the estimated standard deviations of the coefficients. The random coefficients in both Italian and German ML models include ***Price, COOL*** (Country of Origin Labeling), ***Italian/ German Origin, Carbon Logo,*** and ***Ethical Certification.*** Each of these is significant. The ***Organic*** and ***Environmentally Friendly*** production methods attributes were also random, significant, and positive in the German model; While they are not random in the Italian model, they are significant and positive. ***Price*** effects and the "***Opt-Out***" are random, significant and negative for both Italian and German consumers, as expected.

Table 9 WTP Estimates for Mixed Logit Italy

Attributes	Values		Coefficients		Standard Deviations	
Production			Coef.	Std. Err.	Coef.	Std. Err.
	Environmentally friendly		**0.36**	0.04		
	X	Self Enhancement	**-0.06**	0.03		
	X	Self Transcendence	**0.11**	0.03		
	Organic		**0.34**	0.04		
	X	Self Enhancement	-0.03	0.03		
	X	Self Transcendence	**0.13**	0.03		
Carbon Logo			**0.31**	0.03		
	X	Self Enhancement	-0.02	0.02	0.06	0.05
	X	Self Transcendence	**0.05**	0.02	0.00	0.06
Origin						
	Labeled Italian		**2.10**	0.14	**0.90**	0.10
	X	Self Enhancement	**-0.23**	0.05	**0.23**	0.05
	X	Self Transcendence	**0.22**	0.06	**0.29**	0.06
	Labeled Not Italian		**0.71**	0.08	**-0.39**	0.09
	X	Self Enhancement	-0.05	0.04		
	X	Self Transcendence	0.07	0.05		
SA8000 Certification			**0.35**	0.04	**0.29**	0.10
	X	Self Enhancement	**-0.08**	0.03	**-0.12**	0.06
	X	Self Transcendence	**0.10**	0.03	**-0.14**	0.05
Opt-Out			**-6.45**	0.88	**4.46**	0.54
	X	Self Enhancement	0.07	0.09	**0.62**	0.12
	X	Self Transcendence	0.15	0.11	**1.99**	0.26

Table 10 WTP Estimate for Mixed Logit Germany

			German Mixed Logit			
Attributes		Values	Coefficients		Standard Deviations	
			Coef.	Std. Err.	Coef.	Std. Err.
Production						
	Environmentally friendly		**0.24**	0.02		
	X	Self Enhancement	**-0.07**	0.01	**-0.06**	0.01
	X	Self Transcendence	**0.06**	0.02	0.00	0.02
	X	Conservation	0.03	0.01		
	Organic		**0.25**	0.02		
	X	Self Enhancement	**-0.07**	0.01	**0.04**	0.01
	X	Self Transcendence	**0.07**	0.02	0.00	0.01
	X	Conservation	0.02	0.01		
Carbon Logo			**0.16**	0.01		
	X	Self Enhancement	-0.01	0.01	**0.05**	0.02
	X	Self Transcendence	0.01	0.01	**-0.05**	0.02
	X	Conservation	-0.01	0.01		
Origin						
	Labeled German		**0.66**	0.03		
	X	Self Enhancement	**-0.08**	0.02		
	X	Self Transcendence	0.01	0.02	**0.30**	0.03
	X	Conservation	0.02	0.02		
	Labeled Not German		**0.18**	0.03		
	X	Self Enhancement	-0.04	0.02	**0.16**	0.02
	X	Self Transcendence	0.01	0.02		
	X	Conservation	-0.03	0.02	-0.03	0.02
SA8000 Certification			**0.20**	0.01		
	X	Self Enhancement	**-0.06**	0.01	**-0.06**	0.02
	X	Self Transcendence	**0.05**	0.01	0.02	0.02
	X	Conservation	0.01	0.01	**0.03**	0.01
Opt-Out			**-3.61**	0.29	**2.10**	0.17
	X	Self Enhancement	**-0.27**	0.05	**0.60**	0.06
	X	Self Transcendence	**-1.33**	0.06	**0.39**	0.05
	X	Conservation	**-0.13**	0.05		

To provide an intuitive interpretation of these coefficients, we calculate WTP estimates in willingness to pay space (Train and Weeks, 2005; Hole, 2007; Hole, 2008), reported in Tables 9 and 10. In contrast to specifying the distributions and then estimating WTP in preference space as the ratio of two coefficients, we specify the distributions for WTP at the estimation stage. We take this approach for three reasons. First, our price attribute coefficients are random, and have a distribution. To estimate WTP in preference space using the Delta Method, we would need to ignore the information presented by the coefficients of the standard deviations estimated in our mixed logit model and assume that our price coefficients are in fact scalar, since both coefficients are normally distributed. Next, our Meta Values are constructed so that individuals fall along a continuum such that the mean is about zero. While we could perform a series of transformations to achieve a defined function, this seems unwieldy. Finally, while there is some ambiguity about the proper approach to estimating WTP from a Mixed Logit model, it appears that, compared to estimation in preference space, coefficients estimated in WTP are less likely to be "inflated" and are therefore more economically realistic than estimates arrived at through the preference space approach Hole and Kolstad (2011). To calculate WTP in WTP space, we use the *mixlogitwtp* procedure (Hole, 2007) in STATA (v.15). We assumed normal distributions and used 500 Halton draws. The *mixlogitwtp* procedure samples the independent Halton draws from the mixing distributions of the coefficients β_k and β_p . In our sample we have $\beta_k \sim N(\mu_k, \sigma_k^2)$, $\beta_p \sim N(\mu_p, \sigma_p^2)$, where $\mu_k, \sigma_k^2, \mu_p, \sigma_p^2$ are estimated in the previous mixed logit model. For each draw, the WTP values are calculated according to the standard WTP formula, $WTP = -\frac{\beta_k}{\beta_p}$ (Rischatsch, 2009).

In general, both Italian and German consumers' mean WTP for product attributes ***COOL*** (Country of Origin Labeling), ***Italian/ German Origin, Organic, Carbon Logo, EC*** (Ethical Certification), and ***Environmentally Friendly*** (German) are positive and significant (WTP estimates are statistically significant at 5% or better if the calculated confidence intervals do not fall over zero).

However, we can see that these increased WTP vary importantly depending upon the values profiles held by the individual consumers. As hypothesized, Italian consumers with values profiles of Self-Transcendence / Openness to Change have a positive and significant WTP for ***Organic*** (€/kg 0.13) and ***EC*** (€/kg 0.10) product attributes. Consumers with value profiles of Self-Enhancement / Openness to change have significant and negative WTP for ***Italian Origin*** (€/kg -0.23) and ***EC*** (€/kg -0.08).

Similarly, German consumers with values profiles of Self-Transcendence / Openness to Change have a positive and significant WTP for ***Organic*** (€/kg 0.07), ***Environmentally Friendly*** (€/kg 0.06) and ***EC*** (€/kg 0.05) product attributes. Consumers with values profiles of Self-Enhancement have significant and negative WTP for ***German Origin*** (€/kg -0.08) and ***EC*** (€/kg -0.06).

2.5 Conclusion

This paper seeks to compare how the human values of consumers in Italy and Germany impact a decision to purchase early potatoes that are differentiated by extrinsic credence attributes. Two online surveys were conducted in the two countries to investigate consumers' human values, their preferences for early potatoes with different extrinsic attributes, and basic demographic information. Several researches have focused in recent years their attention on the relationship between human values and food choice. However, to the best of our knowledge this is one of the first to focus on the role human values have in influencing the willingness to pay for specific extrinsic food attributes. Results from this paper confirm not only the existence of a strong relationship between consumers' human values and food choices, but also show a clear influence of human values on willingness to pay for extrinsic credence attributes.

According to our results, the Schwartz Portrait Values Questionnaire identifies the heterogeneity in consumers' Human Values and plausibly explains how pro-social values relate to consumers' preferences for pro-social credence process attributes. This heterogeneity suggests that different consumers have different preferences for pro-social attributes. On the face of it, this conclusion seems trite – but from a policy perspective the implications are of considerable importance.

While other disciplines exhibit confidence in the external validity of the Schwartz Values framework, there is room to compare the stated preference results with revealed preferences, through scanner data or non-hypothetical experimental auctions. Our two populations were both European, and more robust cross-cultural studies might help interpret the role of equivalency bias.

Values appear to play an important role in consumers' willingness to pay for credence process attributes. Italian and German consumers who express the meta-value of Self-Transcendence / Openness to Change have a higher WTP for product attributes such as Organic and Ethical Certification, demonstrating concern for the wellbeing of others. Consumers who express the meta-value of Conservation have an increased WTP for product attributes such as Italian/ German Origin, and a decreased WTP for new concepts like Ethical Certification, demonstrating order, self-restriction, preservation of the past, and resistance to change.

The results are encouraging, but they also are limited. We are not able to disaggregate preferences for the individual welfare increasing aspects of double duty attributes from the pro social aspects.

CHAPTER 3

FOOD SERVICE AUTHORITIES' MOTIVATIONS TO BUY REGIONAL FOOD

3.1 Introduction

Like consumers in retail environments, food service authorities that purchase foods for cafeterias in institutions like schools, hospitals, nursing homes, and prisons have demonstrated an interest in buying local and regional foods. In this chapter, I combine field research and empirical research to analyze the relationship between institutions' choices to purchase products with pro-social attributes and costs specific to the market structure through which those products are delivered. The first section of this chapter investigates the history of Farm to Institution (FTI) programs in Massachusetts and the relationship between the pro-social motivations of FTI regional food purchasing and market structure. In the second section of the chapter I present work conducted with a co-author, Jeffery O'Hara, in which we use USDA Farm to School Census data to test, among schools participating in farm to school programs, whether the market channel portfolio used to procure local foods impacts school meal costs. We find that schools that exclusively buy from intermediaries are five percentage points less likely to report lower costs from undertaking Farm to School (FTS) initiatives. In contrast, schools that procure local foods from both producers and intermediaries are four percentage points more likely to report lower costs.

3.2 Massachusetts Farm to Institution Programs

3.2.1 Introduction

Farm to Institution programs seek to link institutional food service purchasers to local farmers, and have grown considerably throughout the country and throughout the Commonwealth of Massachusetts in the last decade. Programs are generally operated by non-profits, institutions such as schools or hospitals, or local or regional governments or departments. According to advocacy groups, the first documented “Farm to School” program began in Santa Monica, California in 1996 (Community Food Security Coalition, School Food FOCUS, & National Farm to School Network, 2010). By 2001, there were 6 documented programs in the United States, 400 programs by 2004, and 2,350 programs by 2011 (Community Food Security Coalition, 2012). The National Farm to School Network reports that in 2012 there were 2,571 programs in all 50 states, involving 10,217 schools and 2,470 school districts (2012).

Farm to Institution (FTI) programs have been inspired by a range of motivations including: to provide consumers of institutional meals nutrition education and access to fresher, more appetizing, and more healthful meal options in order to combat nutrition-related illness and disease; to provide a new market for farmers; to spur local economic growth by increasing the scale of locally-grown sales; and to improve the environmental sustainability of the food system (i.e., cutting down on “food miles” or limiting pesticide use). FTI programs may provide support to any of the participants in the supply chain – from the end consumer and the institution where they eat their meal, to the farmer. Nationally, FTI programs began in public elementary and secondary schools, and have subsequently spread to private schools, colleges, universities, pre-schools, hospitals, nursing homes, and group homes.

In 2002, the Massachusetts Department of Agricultural Resources (MDAR) sponsored a farm-to-college event at Tu FTS University, which resulted in an Institutional Sales Task Force under then-Commissioner of Agriculture Jay Healy. The Task Force supported Massachusetts' colleges and private schools to purchase locally grown produce. By the fall of 2003 budget cuts at MDAR eliminated staffing for the Task Force, but the Mass. School Food Service Association (now called Mass. School Nutrition Association) had hired the former MDAR staff person to do a one year grant-funded farm to school pilot project with five public school districts. The former staff person founded the Massachusetts Farm to School Project (M FTSP) in 2004.

M FTSP has been at the forefront of the national FTI trend, and has contributed to a particularly robust landscape of programs in the Commonwealth. M FTSP was the first entity in Massachusetts devoted exclusively to "connect[ing] farms and institutions to improve access to locally grown foods and strengthen our local economy" (M FTSP, 2012). Over the course of the eight subsequent school years, Massachusetts Public School Districts' participation in Farm to School programs increased from 1% in 2004-2005, to 44% in 2011-2012 (Erwin, 2012). This increase in the percent of public school students in Massachusetts who are served local food is shown in Figure 2, along with the concurrent rise in the percent of schools that adopt preferential purchasing of local foods in their school food service budgets (M FTSP, 2012). In 2013, M FTSP became a subsidiary of Project Bread, a non-profit organization that assists those in need of food.

M FTSP also reports increases in programs in hospitals, pre-schools, private schools, colleges and universities in the Commonwealth (Leib, 2012). A list of the entities that joined M FTSP to promote FTI programs in Massachusetts is listed in Figure 3. The list includes agricultural business associations, non-profit “Buy Local” advocacy organizations, childhood health and nutrition organizations, municipal farm to institution programs, economic development and government agencies, school food service staff and farmers, as well as individuals in communities around the Commonwealth.

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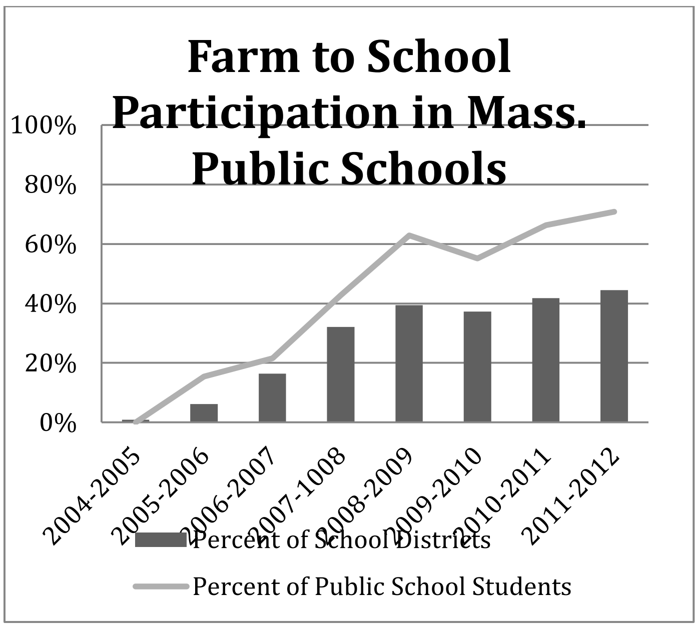

Figure 2 MA Public School District Farm to School Participation 2004-2012 (Erwin, 2012; DOE, 21012)

Despite the increase in number of FTI programs and the volume of product sold, it is not yet clear how or whether these programs necessarily deliver all of the benefits attributed to them. Massachusetts’ diverse and deep offering of FTI programs makes it an ideal environment in which to study how different FTI programs may achieve these benefits. In particular, this paper will provide the research foundation needed to analyze the market structures under which the claims that FTI contributes significantly to increased revenues to regional farmers.

Massachusetts FTI Support Entities	
Agricultural Business Associations	***Farm Bureau Agricultural Preservation Corporation***
	Mass. Fruit Growers Association
	National Association of College and University Food Services
Food Service Associations	***School Nutrition Association of MA***
"Buy Local" Non-Profits	***Berkshire Grown***
	Northeast Harvest
	Southeastern Mass. Agricultural Partnership (SEMAP)
	Community Involved in Sustaining Agriculture (CISA)
Childhood Health & Nutrition	***Mass. Public Health Association***
	Project Bread
	Health Care Without Harm
Economic Development	***MassDevelopment***
	Franklin County Community Development Corporation (FCCDC)
Farm to Institution	***Project Bread***
	Mass. Farm to School Project
	Springfield Farm to Preschool and Families Project
Government	***Mass. Dept. of Agricultural Resources***
	Mass. Dept. of Public Health
	USDA Rural Development

Figure 3 Massachusetts FTI Support Entities

This paper reviews the varied origins and goals of Massachusetts FTI programs, describes the institutional wholesale markets for regionally grown differentiated products, and summarizes the current market and suggests topics for future research, based on currently available data. In addition to the review of relevant published and publicly available literature, the author conducted interviews and reviewed internal organizational documents.

This paper is not intended to be an exhaustive survey of all Farm to Institution programs in Massachusetts, but an outline of the markets that underlie these programs.

3.2.2 Origins and Goals

Farm to Institution programs have been inspired by a wide range of goals and pursued by a variety of organizations. The major proponents of FTI programs in Massachusetts have been:

- Nutritionists, food access and public health advocates,
- Organizations that advocate for regional economic development, and
- Organizations that support farmers

Environmental sustainability does not appear to have been a primary driver of FTI programs in Massachusetts, and this paper will not address environmental goals. This section will offer a brief review of the origins and goals of FTI programs like those in Massachusetts, and the state of current research that seeks to demonstrate the links between them.

3.2.2.1 Nutrition and Access to Healthful Foods

Evidence that nutrition and health are closely linked has motivated nutritionists, public health professionals, and other food access advocates to implement preventative measures that combat nutrition and diet-related illnesses. It is not surprising that institutional food service is seen as an ideal mechanism through which more healthful meals can be offered to at-risk populations in schools, hospitals, nursing homes and other public or quasi- public settings (Briefel et al., 2009; Cohen, et al., 2012; Conner et. al, 2012). Institutional food service providers frequently supply basic sustenance to consumers who are considered to be members of at-risk populations for nutrition-related illness or disease, such as obesity or diabetes, and who may lack access to healthful foods (Briefel et al. 2009, Cohen et al. 2012; Gordon, et al., 2009; Hawkes, 2009). This subsection will outline the proposal that increased regional foods in institutional settings can improve health outcomes.

FTI is not considered to be effective to reduce nutrition-related disease and illness as a stand-alone program; FTI programs are pursued as one component of broad-based health interventions for at-risk populations (Cohen, et al. 2012). Effective programs comprehensively address a number of the economic, psychological and behavioral issues that have been identified as barriers to healthful eating (Cohen, et al. 2012; Just, et al. 2008). For example, a comprehensive approach might offer a meal made with fresh produce from a local farmer with a subsidy to incentivize the purchase of healthful foods, a cooking class to promote the idea that healthful foods are satiating and taste good, a visit to a local farm to teach students where food comes from, and the removal of snack machines in cafeterias to help support new eating habits that include decreased consumption of less healthful foods. The comprehensive approach sources and procures healthful food; trains food service staff in nutrition and preparation of healthful foods; provides consumers with information about health and nutrition; offers healthful foods in a manner that encourages the selection of more healthful over less healthful foods;

reduces the availability of less healthful foods; and tracks the actual consumption of healthful foods (Just, et al. 2008; Briefel, et al., 2009).

The multi-faceted nature of the comprehensive approach, in addition to the recent introduction of these programs, makes it difficult to isolate the importance of the role of FTI, in and of itself, in achieving these health and nutrition related goals. Health and nutrition-related studies that seek to verify the value of FTI programs in addressing these issues appear to be focused on Farm to School programs, as opposed to Farm to Hospital, or more general Farm to Cafeteria programs.

To demonstrate the value of FTI as a component of a comprehensive approach to improve health outcomes, one would need to demonstrate that regional foods are nutritionally superior or are more likely to be consumed than non-regional foods; that education about and increased access to regional foods is directly linked to the increased purchase and consumption of these foods; and that the increased consumption leads to a decrease in nutrition related diseases. This is obviously a high bar, and these links have not yet been conclusively demonstrated (Cohen, et al. 2012). The rest of the section will focus on the pieces of evidence that FTI programs can impact health and nutrition outcomes.

Farm to School programs operate under a specific set of constraints. These constraints bind school food service providers to work within very tight budgets, and adhere to an evolving landscape of nutritional requirements (Izumi, et al., 2010; Gordon, et al., 2009). Public and non-profit private schools frequently participate in the National School Lunch Program (NSLP) and School Breakfast Program (SBP), which subsidize and provide USDA food for schools which offer free and reduced cost meals that meet the USDA's dietary guidelines to eligible children (FNS, 2011). In addition, these schools may have access to Department of Defense (DOD) commodity foods (FNS, 2011). Meals subsidized under NSLP and SBP are available to students whose families are at or below 130 percent of the federal poverty level (free meals) and to students whose families are between 130 and 185 percent of the federal poverty level (reduced-price meals) (Fox et al., 2012). Many schools supplement meals offered via USDA and DOD programs with "competitive foods" - à la carte menu items, vending machines, school stores, snack bars, and fundraisers, which students pay for in cash (Gordon et al., 2009). These competitive foods are not required by the USDA to meet specific dietary guidelines, although in 2010 the Commonwealth of Massachusetts Legislature revised Chapter 197 to regulate competitive foods (Erwin, 2012).

The USDA's dietary guidelines for NSLP and SBP have changed over the years as the understanding of the roles of different nutrients in a healthful childhood diet has improved (Fox et al., 2012). The most recent guidelines limit the intake of total fats, saturated fats, and sodium as well as recommended Dietary Allowances (RDA) or Dietary Reference Intakes (DRI) for vitamins and minerals. Meals offered in schools generally meet the dietary guidelines and NSLP nutritional requirements, but these requirements have not historically limited or specified guidelines regarding sodium, whole grains or fiber content, much less taste or palatability (Cho, et al., 2004; Clark, et al., 2009). The USDA's Food and Nutrition Service (FNS) periodically conducts the School Nutrition Dietary Assessment (SNDA) to determine student nutrient intake, including both NSLP and SBP participants and non-participants. The most recent SNDA, which used a 24 hour student dietary recall along with 2004-2005 school menu reports, found that while the number of schools that offer more healthful meals has increased, "…Fewer than one-third of public schools offered and served school lunches that met the USDA standards for total fat (no more than 30 percent of calories) or saturated fat (less than 10 percent of calories)…" (Gordon et al., 2007). Because many of these food service providers work on tight margins, often with significant public funding, school food service providers have prioritized meeting the NSLP nutritional requirements, at times by relying on low-cost inputs (Gordon, et al., 2009; Just, et al., 2008). The nutritional quality and palatability of meals prepared with these low-cost inputs has been questioned, and has fed the notion that more healthful meals would actually be consumed if better quality products were offered (Cho, et al., 2004).

Research that validates the role of regionally sourced fresh fruits and vegetables to achieve nutrition and public health goals is in its infancy, and reports that substantiate this role often rely on program-level case studies and survey data (Graham, et al., 2004; King, et al., 2010). Many non-peer reviewed studies indicate that consumption of fruits and vegetables may increase when local or regional foods are offered through farmer's market salad bars or other farm to institution programs (Graham, et al., 2004). In 2007, Faith, Monatine, Allison and Baskin reviewed different ways that institutions can address the problems of food consumption and obesity by changing the food environment. Few of the reviewed studies presented sound evidence that increased access to healthful food had a direct impact on consumption or changes in consumption, though they found evidence that indicated that subsidies for healthful food products did increase the purchase of more healthful foods (Faith, et al. 2007). In some non-peer reviewed reports, the Faith et al.

study is used to substantiate the link between increased access to -- and increased consumption of -- more healthful foods. The validity of this link begs further analysis that allows proper inference.

However, a recent study, published in 2012 in the Journal of the Academy of Nutrition and Dietetics, analyzed the nutritional content of school meals offered through the Boston Chef Initiative compared with the nutritional content of traditional meals in control group schools that did not participate in the Chef Initiative program (Cohen, et al.). The Chef Initiative program funded four trained professional chefs to work in two public middle school cafeterias in Boston. The chefs worked with cafeteria staff to revise the school lunch menu in selected schools to offer more flavorful lunches while increasing whole grains, fruits and vegetables, and reducing sugar, salt, saturated fats, and trans fats, and to plan and train kitchen staff to prepare more nutritionally healthful meals. Meanwhile, two demographically comparable Boston public middle schools continued to offer the “traditional” school lunches as a control. Pre- and post-consumption weights of plates from these schools were compared to determine whether there was a difference in the quantity of the meal consumed. The results of this two-year plate-weight pilot study indicated that, compared to the control group that offered less healthful meals, when more healthful meals were offered to middle school students, a similar percentage of school meals were consumed, which resulted in higher overall consumption of more healthful foods (Cohen, et al. 2012). They hypothesizes that a broad-based program designed to incorporate more healthful foods and improve palatability of school meals would not negatively impact the amount of food consumed was validated in this study. The study results supported this hypothesis, and Cohen et al.

found no support for the contrary argument that students would eat less and waste more when healthy foods were served to them via this program.

The Chef Initiative study did not use regionally grown food explicitly. No study has demonstrated conclusively that regionally grown food is healthier. One frequently cited and cautiously presented article, published in the Journal of the American College of Nutrition in 2004, did conclude that there were real declines in certain nutrients (protein, calcium, phosphorus, iron, riboflavin and ascorbic acid) in garden crops between 1950 and 1999 (Davis, et al., 2004). The authors attribute these declines to the increased cultivation of high-yield varieties (Davis, et al., 2004). To the author's knowledge, no comparable study of farm crops has been conducted, and no study has demonstrated that "local" or "regional" foods have higher nutritional value than other foods.

The Cohen et al. and Davis et al. studies are examples of the research currently being undertaken to identify how to fit the causal links proposed by those who advocate FTI programs to actual health outcomes. While these studies do not explicitly connect regionally grown food with health outcomes, they offer pieces of the puzzle. Understanding how, or whether, the pieces of a comprehensive campaign to prevent diet and nutrition related illness fit together, and the role that FTI plays in that campaign, will likely take many years. In the interim, public health professionals, nutritionists, and food access advocates continue to incorporate FTI programs as components of campaigns that introduce new, more healthful ways of eating to at-risk populations

3.2.2.2 High Revenue Diversified Markets for Farmers

Supporters of local and regional agriculture, including regional interest groups, non-profits and state departments of agriculture, advocate for FTI programs as a consistent high-revenue market for nearby farmers (Anderson, 2007; Conner et. al. 2012; Izumi et. al, 2010). Some supporters purport that the large scale of institutional food service providers offers access to a large market for direct sales of locally or regionally -based differentiated products with relatively small transaction costs, compared to direct retail sales to consumers or smaller wholesale purchasers such as grocery stores and restaurants (Conner et. al, 2012; King, et al., 2010; Izumi, et al., 2010). The economic justification for the capacity of regional foods in the wholesale institutional market to deliver higher revenues to farmers thus depends upon:

- whether the "short" supply chain is able to minimize transaction costs and deliver increased marginal revenues to farmers, similar to those resulting from regional direct sales, and
- whether the price premium for a regionally differentiated product is able to capture a large enough premium over traditional wholesale products to deliver a higher net revenue to farmers than other available markets (Brown et al., 2012; Feenstra, et al., 2011; Low et al., 2010; Sexton, 2012).

This subsection will outline the proposal that farmers can increase revenues by selling to the institutional market.

Early FTI sales linked farmers to occasional wholesale direct sales at schools, often to prevent waste due to a bumper crop or a saturated market, or in a region where an export crop was already in abundance (King, et al., 2010; Izumi, et al., 2010). More consistent direct wholesale sales relationships followed, often coordinated by entities "outside" of the supply chain, including non-profits or state departments of agriculture

(King, et al., 2010). As volume and regularity of sales increased, operational discrepancies between schools' food procurement systems and farmers' capacities became more problematic (Brayley, et al., 2012; Conner, et al., 2011; Feenstra, et al., 2011; Fitzsimmons, 2011; Leib 2012). Farmers do not always have the capacity to produce large enough quantities of a particular product for delivery at a particular time, the capacity to coordinate with other farmers to aggregate, the ability to lightly process or wash produce to meet food service expectations, the ability to offer online purchasing or become an approved vendor for school districts, or the ability to meet the rising bar for on-farm food safety precautions, for example. For farmers who do have the capacity to participate in direct sales to institutions, there is the potential to receive almost 100% of the sale price. However, transaction costs absorbed by farmers associated with direct sales are estimated in case studies to be between 13-62% (King, et. al, 2010). As a result, FTI advocates have explored the addition of market intermediaries, such as wholesale aggregators, broadline or regional food distribution companies, to the supply chain, as these intermediaries' capacities could fill the market gaps (Brayley, et al., 2012; Lieb, 2012).

Intermediaries can offer farmers and institutions with market services like orders, purchases, packaging, sanitation guarantees, delivery, and billing, which are more in line with a food service provider's needs. The cost of these services must be absorbed by farmers and institutions. In addition to an estimated 15-25% purchase price markup to cover the transaction costs mentioned above, farmers can be required by intermediaries to meet stringent and expensive food safety liability insurance (FSLI) and on-farm sanitation guidelines like Good Agricultural Practices (GAP) that do not necessarily reflect the nature or scale of the farm (Feenstra, et al., 2011; King et.al. 2010; Erwin, 2012). In addition, the costs associated with transferring product information like the characteristics of the differentiated product -- farm's identity, growing conditions, and sometimes the "local" quality of the product -- may be too high to be consistently communicated to the purchaser, and thus to the consumer (Feenstra, et al., 2011; King et al. 2010; Erwin, 2012). The exercise of market restraints, like FSLI, GAP, purchase minimums, and the capture of margins associated with them, is common in agricultural markets where downstream firms typically set contracts to protect food quality and safety (Sexton, 2012).

In the recent paper, "Market Power, Misconceptions, And Modern Agricultural Markets," Richard Sexton writes that:

> *Market intermediaries, with even rather modest amounts of market power, can capture large shares of the benefits from policies intended to benefit farmers (2012).*

While there is evidence that farmers who participate in direct-to-consumer sales are able to capture a higher share of the food dollar, whether farmers who participate in intermediated regional markets are able to capture a similarly high portion of the food dollar is in question (Low & Vogel, et al., 2010). These realities challenge both the notion that FTI programs necessarily generate net revenues to farmers comparable to those seen in direct markets, as well as the idea that "regional" product differentiation necessarily generates a price premium to farmers (Izumi, et al., 2010; King, et al., 2010).

These challenges, however, do not preclude the possibility that there are other aspects to this market that do serve to increase revenues to farmers. To the extent that off-grade or surplus produce (smaller apples, peppers harvested at peak-season) are preferred by institutional buyers, these markets could be seen to offer farmers a premium price for their marginal (but still regionally differentiated) products (Fitzsimmons, 2011; King, et al., 2010). The willingness and capacity of institutional buyers to absorb transaction costs or otherwise augment benefits to farmers (such as promoting the farmer through school events) may bolster farmers' revenues. In addition, participating in these markets clearly is a way that farmers can diversify their businesses, and revenues are not thought to be lower than in mainstream wholesale channels (King, et al., 2010). More relevant to an analysis of market structure, some studies suggest that there is in fact a premium available for regionally differentiated produce, and that some market structures are more likely than others to preserve this premium for pass through to farmers (Brown, et al., 2012; Feenstra, et al., 2011; King, et al., 2010). These concepts are explored in more depth in the sections below.

There has been some indication that institutional sales in Massachusetts can be profitable to farmers. The Massachusetts Farm to School Project commissioned telephone surveys with farmers who sold institutions in 2008 and 2010 to inquire about the impact of FTI sales on farmers' profits (Adams, 2011). The survey results describe Massachusetts farmers' understanding of the profitability and role of FTI sales. The 2010 survey asked farmers who sold to institutions about:

- Gross income from institutional sales
- Whether the sales to institutions were profitable (Yes, No, Somewhat)
- What percent of total annual product sales were institutional sales, if known
- Whether the farmer sold to a distributor that sells to institutions

The survey had a 68% response rate; 73 farmers completed the survey. Of these 73, 56% sold exclusively through direct sales to institutions, 14% sold both directly to institutions and through distributors to institutions, and 3% sold exclusively through distributors to institutions. About 27% of the respondents did not sell to institutions in 2010.

Figure 4, Profitability of Actual Massachusetts FTI Sales, shows farmers' perceptions of profitability from FTI sales. Of those farmers who sold directly to institutions, 55% indicated that FTI sales were profitable, 27% indicated that FTI sales were somewhat profitable, 14% indicated that FTI sales were not profitable, and 4% did not know whether FTI sales were profitable. Profitability responses from farmers who sold exclusively to distributors were not reported, and the profitability for farmers who sold both through distributors and directly to institutions did not indicate whether one supply chain contributed more or less to profitability than the other.

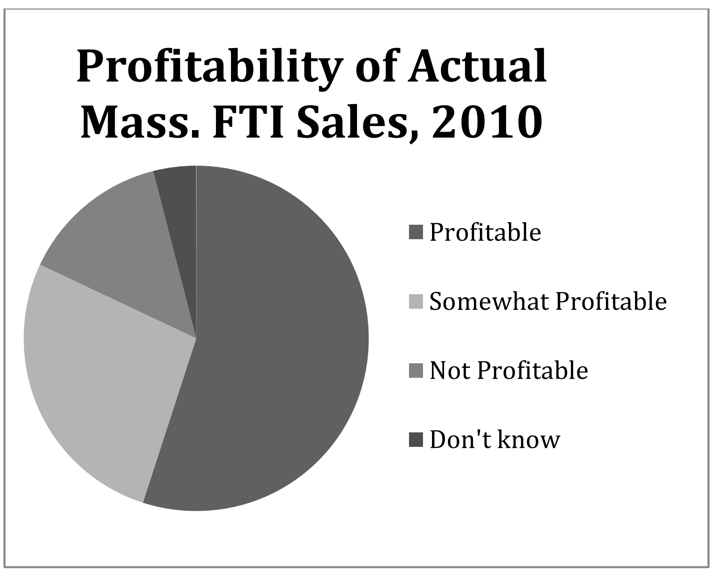

Figure 3 Profitability of Actual MA FTI Sales, 2010 (Adams, 2011)

About 91% of respondents who sold to institutions estimated gross income and the percentage of gross income from FTI sales. All of these respondents indicated that less than 50% of gross sales were institutional sales, about 19% indicated that FTI sales accounted for 10-50% of gross sales, and 81% indicated less than 10% of gross sales were FTI sales, as shown in Figure 5. Farmers' Percent of Gross Income from FTI sales in Massachusetts. Dollar amounts for income from sales to institutions were provided by 79% of respondents and totaled $1.32 million for the 2009-2010 school year. While the average income from FTI sales, based on these results, is about $31,474 per farm, the author of the report notes that correcting for a few outlying farms with large reported FTI sales puts the per farm average sales at $5,753 per farm.

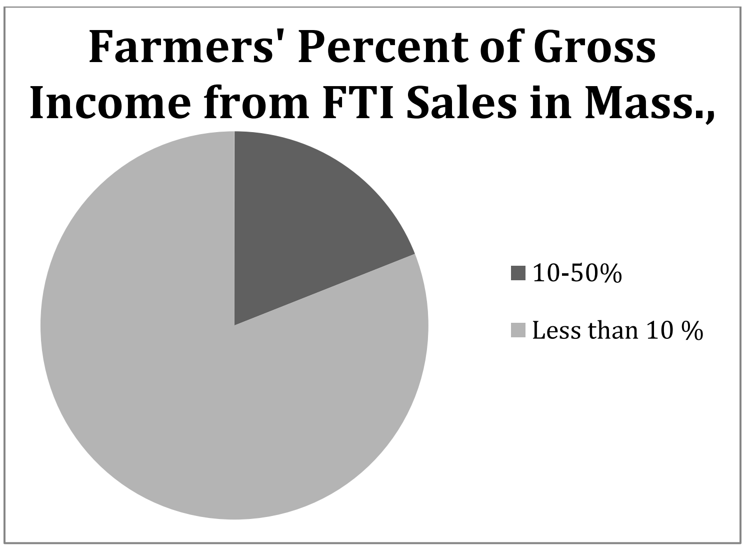

Figure 4 Farmer's Percent of Gross Income from FTI Sales in MA, 2010 (Adams, 2011)

The report also noted some farmers' comments. Farmers noted the trade-offs between costs associated with FTI sales and the profitability of these sales, the non-economic benefits of FTI sales such as community "exposure", the role of FTI sales in stabilizing seasonal income streams, the personal value of helping feed schoolchildren, and the "premium" nature of the product sold.

In the language of economics and market structure, these comments and the survey results identify a need to understand the relationships between profitability of direct sales and intermediated sales, the trade-offs associated with added transaction costs, the market value of the differentiated product, and the motivations beyond profit for farmers who sell to institutions.

3.2.2.3 Local Food as Economic Development

Recently, public officials and economic development organizations joined regional and local FTI advocates, who emphasize the role of agriculture in local and regional economic development (Izumi, et al., 2010). The idea that there are multiplier effects created from the purchase of local products flows from the idea that money is kept in circulation within a region, as opposed to flowing out of the region (King, et al., 2010). This would occur, as O'Hara and Pirog point out, if farmers subsequently purchase inputs, hire labor, and access capital within the region in question (Hilchey, 2013). This subsection will outline the proposal that increased sales of regionally grown foods to institutions can have a net positive effect on the regional economy.

Studies that attempt to quantify the general or broad "impact" of local and regional agriculture on a regional economy generally estimate the potential economic value of a large increase in fruit and vegetable production and purchasing in a given region, often based on a "what-if" scenario. For example, "What if all of the end consumers for institutional food in a region consumed the USDA recommended quantities of fruits and vegetables, and these fruits and vegetables were all grown within the region?" Input-output models and tools (e.g., IMPLAN) used to calculate the direct, indirect, and induced effects of these "what-if" scenarios can be illuminating, but require a series of assumptions that may or may not reflect the actual regional economy being modeled. Such assumptions include both the parameters that are assigned to different events within the economy, as well as the nature of the regional economy itself.

A handful of recent studies that aim to quantify economic impact from regional or local food modify the parameters in standard input-output models to obtain more accurate results – these studies, along with the recent article "Economic Impacts of Local Food Systems: Future Research Priorities" offer a review of the challenges associated with conducting and drawing inferences from a rigorous input-output study (Gunter, 2011; Hilchey, 2013; Otto et al., 2005; Swenson, 2011; Tuck, et al., 2010).

O'Hara and Pirog note four potential challenges associated with the parameters values of input-output models. The values may:

- Be out of date
- Be "at a coarser resolution than the researcher's specified area of study"
- Represent "average conditions", while the researchers may be attempting to model specific conditions
- May not be "based on statistical analysis"

They further recommend that researchers who use these models customize the parameters in question, and document these modifications for future comparison (Hilchey, 2013).

While regional economic "impact" studies of increased local production and consumption can include institutional purchases, most studies do not specifically address the role of FTI programs on economic development outcomes. An input-output study that pursues this line of questioning for Massachusetts would likely need to ask "What if Massachusetts producers grew enough fruit and vegetables to supply all of the wholesale institutional purchasers in Massachusetts, and these purchasers restricted their purchases of these products to only those products grown in Massachusetts?" Two studies, which use FTI programs in Colorado and Minnesota, have made some progress towards answering similar questions on smaller scales.

The Minnesota study proposed to answer the question “what is the potential economic impact of farm-to-school programs in Central Minnesota,” and to model impact that explicitly “accounted for decreased expenditures in the current supply chain and the potential for increased costs to the community in the form of higher lunch prices” (Tuck et al., 2010). Tuck et al. both conducted interviews with food service providers and farmers, and used pre-existing Minnesota food service survey demand data to frame IMPLAN scenarios. The study created scenarios under which schools serve all meals, some meals, or only special monthly meals, to model the “what if” shift in demand, and used three different prices – one price that reflects a “farm price” near to the farmer’s current market price, another “school price” that reflects the lower price that schools currently pay for equivalent product, and a third “intermediate price” that is halfway between the “farm price” and “school price.” The study finds that the largest multiplier effects result from the scenarios under which all of the products that are available locally are purchased, and where the farm price is used. However, the greatest positive regional economic effect occurs when the “school price” is used, as any higher price increases the costs to the public, which must pay for the increased cost of school meals. This result suggests that there may be a tension between achieving all FTI goals – an increase in the quantity of local foods served may not always be compatible with offering a price premium to the farmer.

The Colorado study also uses IMPLAN to “quantify the direct impact of the Weld 6 [School District] Farm to School program on the local economy” (Gunter, 2011). The

Colorado study, however, goes to greater lengths to customize IMPLAN to more accurately represent the direct marketing sector (Gunter, 2011). Gunter relied more heavily on survey and secondary data than did Tuck et al. to modify farmer decision making parameter values and the relative importance of key economic decisions by all supply chain actors. The study estimated demand for the school district in question as 10% of all direct sales in Colorado for both fruits and vegetables, calculated with 2007 Census data, and further assumes an allocation of sales between fruit and vegetables based on the school district's purchase data. Gunter models four scenarios, but suggests that the most accurate scenario is that under which demand is not "new", but shi FTS from already existing wholesale demand, and the above mentioned modifications to IMPLAN are incorporated. In this scenario, the increased local food purchases resulted in a modest positive net effect on the regional economy.

An additional challenge for economic impact assessments is to appropriately factor in the opportunity costs of transferring land, labor and technology from one area of production to another (Swenson, 2010). Regions are distinct in both the existing areas of production that would be reduced and the potential area that could be increased. Each region is distinct in productivity of its farmland - the yields from an acre of land devoted to carrot production in Iowa may not be comparable to that of an acre of land in Massachusetts. Further, each region is distinct in the availability of productive farmland – "what if" scenarios do not generally restrict the potential supply of production.

These caveats, along with others outlined in the reports mentioned in this section, suggest that "economic impact" studies conducted with input-output models warrant a cautious reading, and that it is nearly impossible to extrapolate the findings of a particular study to predict the nature of effects in other regions.

For example, Swenson's 2010 report sought to quantify the economic value of increasing fruit and vegetable production and consumption within each of the Upper Midwest states, and again with selected sub-regions within that region. In this report, the cost of taking agricultural land out of corn and soybean production, including subtracting income from farm workers and revenues to local seed and supply firms, e.g., was weighed against the increase in employment and revenues from new fruit and vegetable production. Similar reports in other regions likewise used input-output models and found potential positive economic effects to increased regional fruit and vegetable production and consumption, but to date these studies appear to focus on regions that would swap one agricultural use of land for another (Conner, et al., 2008; Otto & Varner, et al., 2005; VSJF, 2011).

To date, no comparable study has been conducted for Massachusetts, and it is therefore difficult to state with any confidence that increased production and consumption of Massachusetts produced food could be a net driver of economic development in the manner often suggested. In addition to the concerns above, a key component of these studies – i.e., the switch between agricultural uses of land - does not accurately represent the trade-offs that would need to be taken into consideration in Massachusetts. The value of land in Massachusetts is relatively high and alternative uses of land are likely to return higher economic values to non-agricultural uses, and perhaps non-FTI agricultural uses. For example, Figure 6 shows the Farm Real Estate Value of Land, which the USDA defines as an average of "the value at which all land and buildings used for agricultural production, including dwellings, could be sold under current market conditions, if allowed to remain on the market for a reasonable amount of time” for Massachusetts was $10,500 per acre in 2012 (USDA, Land Values, 2012). The 2012 farm real estate value per acre of land in Iowa, which had the highest average land value of the states used in Swenson’s report, was $7,000. Average land value in Vermont, which was studied in the Vermont Sustainable Jobs Fund report was $2,750 per acre, and the value per acre in Michigan, which was studied in the Conner et al. report, was $4,250. Swenson’s report used 2007 Agricultural Census and purchased IMPLAN data; the difference between Iowa and Massachusetts farm land values in 2007 was even greater - $3,958 per acre in Iowa versus $14,276 in Massachusetts (USDA, Agricultural Census, 2007).

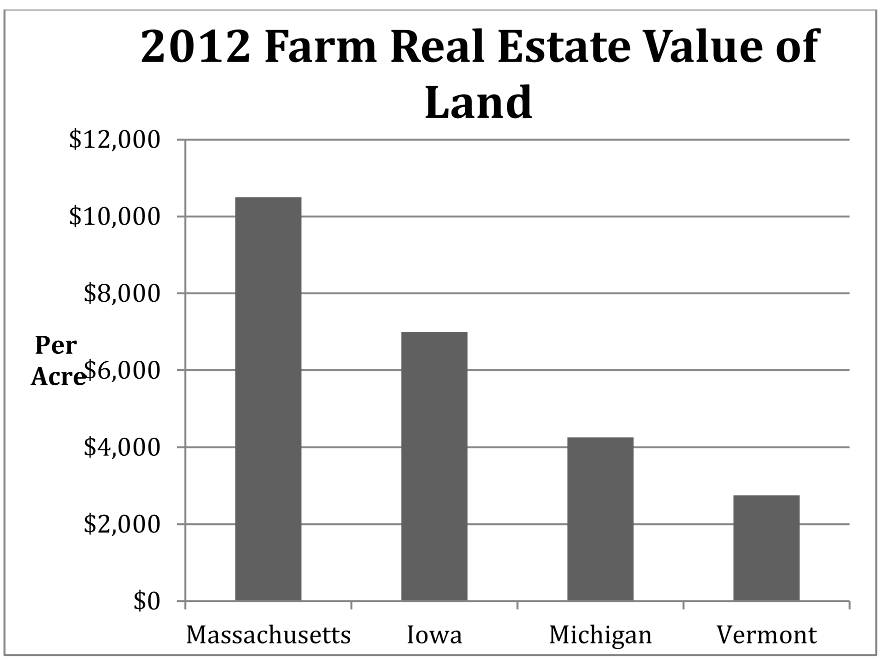

Figure 5 2012 Farm Real Estate Value of Land (USDA, 2013)

Another important difference between the scenarios offered above and the intermediated market of interest in Massachusetts is the relationship between prices, transaction costs and the availability of supply chain infrastructure. While the Swenson study assumes that the infrastructure required for “scaling up” is available, both the Tuck and Gunter studies assume that FTI sales are direct sales, and that farmers in these scenarios absorb the additional transaction costs associated with Farm to Institution sales and earn any associated increase in the share of food dollars.

Finally, it is not entirely clear that agricultural markets for regionally differentiated goods are perfectly competitive markets. Input-output models are based on the economic assumption that the markets modeled are perfectly competitive and in equilibrium. If these markets are not, in fact, perfectly competitive, then input-output models may not have the power to illuminate economic effects of changes in the market inputs or parameters.

The diversity of the origins and goals of these programs in Massachusetts has resulted in a number of innovative FTI programs. While increasing the amount of locally or regionally produced food in institutional settings is the common short-term strategy among the programs, the end goals diverge and are often more in line with the provenance of the group that has promoted or implemented the program. However, it is generally agreed among these groups that each of the goals contribute to a larger shared vision of a more equitable and just food system. Ultimately, health goals, economic development goals, and environmental goals of FTI all depend on whether the farmer can profitably sell to the institutional market.

3.2.3 Massachusetts Grown Wholesale FTI Market

Whether the farmer can profitably sell to the institutional market depends on whether the product can command a price premium, or whether the costs associated with production and marketing preserve enough of the sale price for farmers. The structure of the market influences these conditions. This section introduces the language and structure of the microeconomic theories of industrial organization and information to the existing market in Massachusetts, as described by market participants in interviews, and internal organizational documents, such as annual surveys, intake sheets, and meeting notes.

This section first describes the differentiated local or regional product and how the product attributes relate to unique characteristics of the market. The context and institutions under which this market may exist are explored, including market channels, supply and demand for these products, supply chain actors, and characteristics of the supply chain with respect to contracts, information and regulation. This section will then offer five different models of operational FTI supply chains within this market in Massachusetts. Three recent USDA reports, the 2010 report "Local Food Systems: Concepts, Impacts, and Issues" and "Comparing the Structure, Size, and Performance of Local and Mainstream Food Supply Chains," and the 2011 "Direct and Intermediated Marketing of Local Foods in the United States," offer helpful compilations of similar regionally-grown market studies from around the country, as well as useful common sets of terms, which we employ throughout this report (King, et al., 2010; Martinez, et.al., 2010; Low & Vogel, 2011).

The scope of this section will be limited to fresh fruits and vegetables, as they represent the most common products delivered through FTI supply chains, and existing research and policy tends to be centered on these products. Massachusetts FTI programs also encompass beef, poultry, fish, and dairy supply chains (Erwin, 2012).

3.2.3.1 “Locally” or “Regionally” Differentiated Product

There is currently no concise, universal definition for what constitutes a “local” or “regional” product. The most widely referred-to guidelines are defined by Martinez et al., and rely on a spatial definition that links the products’ origins to their points of consumption, usually in terms of miles, but also in terms of the state or region (2010). Reports and studies that use USDA data tend to employ the NASS Census agricultural product designation “Direct Sales for Human Consumption” as the best proxy for “Local”, but acknowledge that this category is imperfect, as it omits products that are sold through intermediated channels, such as wholesale institutional sales through regional distributors.

However, case studies and experiments indicate that the terms “local” and “regional” may imply more than the distance between producer and consumer (Conner et al., 2012; Darby et al., 2008; Dentoni, et al., 2009; Feenstra, et al., 2011; Thilmany, et al., 2008). For consumers, these terms may carry connotations of quality and freshness, the impact that the growing practices may have on the consumers’ community and environment, and an idea that their purchase has a positive net effect on the local or regional economy (Cembalo, et al., 2012; Darby, et al., 2008; Dentoni, et al., 2012; Wirth, et al., 2012; Lusk, et al., 2006; Thilmany, et al., 2008).

These connotations are quality attributes, or characteristics of the product which indicate that consumers may be willing to pay a premium for the product, compared to a similar product without the “local” or “regional” designation. In this sense, these products are differentiated from other available products, which may look and taste the same, but do not carry additional information about the perceived impact of the consumers purchase. These quality attributes are “credence attributes,” or attributes that some consumers may believe to be true, but do not have means to verify (Dentoni, et al., 2009; Sexton, 2012). Such information about specific qualities of regionally differentiated products – and therefore traceability and food safety attributes – is considered to be more accessible in shorter supply chains.

This implicit product differentiation is thought to create market value (Feenstra, et al., 2011, Izumi, et al., 2010; King et al., 2010; Thilmany, et al., 2008). In the case of regionally differentiated products in institutional wholesale markets, it can be difficult for an end consumer to know with certainty whether the product available for purchase meets the standards that the individual consumer has in mind. This certainty should arise from the consumers’ belief that each of the intermediaries, who prepared, purchased, sourced, transported, and grew the product, both shared these standards and verified the standards at each step along the way.

For this reason, the institutional market for regionally differentiated products is unique from both the traditional wholesale institutional market and the direct to consumer market for regionally differentiated products. Market interactions carry an additional burden of information verification. This burden can be interpreted as one of traceability and labeling, which begs the question of enforceability, or as a burden of trust and relationships, which similarly begs the question of the dependence of the market on the non-market entities that foster and monitor these relationships (Feenstra, et al., 2011).

For the purposes of this paper, we will simply allow that participants in these markets share mutually agreeable definitions of “regional” or “local”. We will use the terms “local” and “regional” interchangeably. Further discussion of the role these product attributes play in the FTI market will be addressed in the Information, Regulation, and Contracts section below.

3.2.3.2 Value Added vs. Not Value Added Product

A raw product that has undergone some physical change of state prior to its purchase by the food service institution, such as primary and secondary processing, is considered a value-added product. Some examples include coined carrots or washed salad greens.

The USDA's definition of "value added" calls for the incremental market value added to the product by its change of state to accrue to the farmer, which can occur only if the product underwent this change of state prior to its purchase by the food service providers (USDA, Value Added Producer Grant, 2012). Primary Processing in these market channels is conducted on-farm. If the same kind of processing, for example, coin-cutting carrots, is conducted in the food service kitchen by the food service management company, it is referred to as On-Site Processing, and the product is not considered to be value-added. Secondary Processing in this supply chain is assumed to be value-added because the secondary processor in Massachusetts is a non-profit organization that passes the added value on to the farmer.

3.2.3.3 Fresh vs. Frozen or Canned Product

Fresh marketing channels, as opposed to extended-season marketing channels, appear to account for the highest volume of "regional" sales in the country, and can be divided into intermediated supply chains and fresh direct-to-consumer supply chains

(Low & Vogel, 2011). Fresh marketing channels are characterized by their short supply chains, which allow farmers to capture a larger percentage of the sales price (Low & Vogel, 2011). Farms must perform additional tasks in this supply chain, such as marketing, storage, distribution, pricing, and sales that may increase farmers' transaction costs. Generally, small and mid-sized farms selling fresh direct ("annual sales of agricultural products are less than $250,000 for small farms and $500,000 for mid-size farms - hereafter referred to as small farms") can absorb these additional tasks given their smaller volumes (USDA, Small and Mid- Sized Farms, 2012; Martinez, et al., 2010).

However, larger farms (over $500,000 in annual sales) either need to invest in on-farm capacity, or participate in an intermediated marketing channel (Martinez, et al, 2010; Low & Vogel, 2011). FTI advocates maintain that a consistent fresh wholesale sales relationship with an end purchaser in the form of a large institution allows farmers to minimize transaction costs, while capturing a high percentage of the sales price. Sales to a fresh wholesale distributor or aggregator transfer these transaction costs to the intermediaries, but reduce the percentage of the sales price that flows directly to the farmer.

The fresh marketing channel in New England is restricted by seasonality. In response, a small "extended season" intermediated wholesale marketing channel has developed in Massachusetts. This intermediated marketing channel resembles the fresh intermediated marketing channel, with the addition of a secondary processor which purchases fresh product directly from the farmer, and freezes or cans the product for sale to institutions during the winter season. Frozen or canned products undergo a series of physical changes in state that allows the product to be consumed in the off—season.

Some examples include frozen broccoli or canned tomatoes. Extended-season marketing channels are those channels in which Secondary Processing has occurred.

This addition incurs additional transaction costs, and likely reduces the net income to the farmer. However, in this case the processor is also non-profit market support entity with capital costs that are already invested, and the processor uses the regional produce market wholesale price index as a benchmark price. Thus, the processor does not extract economic profits and farmers receive prices for their products that represent their best alternative prices, which are current wholesale prices.

3.2.3.4 Supply and Demand

It is a challenge to estimate the supply and demand for local or regional fruits and vegetables, particularly with respect to intermediated markets (King, et al., 2010; Low & Vogel, 2011; Timmons, 2008). While publicly available data can describe who grew what, nationally gathered data has not historically identified product channels – it is difficult to say to whom products were sold. In addition, aggregated consumer purchases of fruits and vegetables are not publicly available, so it is difficult to describe the actual demand for fruits and vegetables in general, much less for fruits and vegetables that come from a specified area and are sold to consumers within that area. Practitioners and researchers do not generally have access to food distributors' private data, which can track where product is purchased and where it is sold. It is a challenge to track sales of a product grown in a specified area, particularly in New England, with relatively small states and distribution networks centered in multi-state regions.

It is clearly a challenge, then, to further isolate the relationship between Massachusetts farmers and Massachusetts institutions using publicly available data. The supply of, and demand for, fruit and vegetable products for FTI programs in Massachusetts overlaps with FTI programs in other New England states. This paper will not attempt to quantify either supply or demand in this market. Instead, this section will mention some of the methods used to estimate supply and demand of local or regional products, and offer data that describes the overall agricultural trends in Massachusetts. Placed alongside national characteristics of direct-to-consumer and the intermediated markets described in the Massachusetts Grown Wholesale Market section above, this section sketches the supply and demand in the FTI intermediated wholesale market in the state.

The USDA's National Agriculture Statistical Service (NASS) takes a census of agriculture every five years, and conducts annual surveys. However, past data collection has primarily emphasized producer and product characteristics, and has not requested detailed information about the various supply chains through which agricultural products flow. Data that track the number of farms participating in direct-to-consumer supply chains (a farmer who sells directly to the end consumer, e.g., at a farmers' market, roadside stand, or through a CSA) and the value of these sales has been collected since 1978. However, survey questions that elicit information about intermediated supply chains were introduced in the 2008 Agricultural Resource Management Survey (ARMS) survey conducted by the Economic Research Service (ERS), and only the 2011 ARMS separated questions on direct-to-consumer sales from intermediated sales and requested information that could allow researchers to quantify the role of institutional markets in intermediated marketing channels (Low & Vogel, 2011).

National 2008 ARMS data suggests that including locally marketed food that flows through intermediated market channels (farmers' sales to local retail, restaurants, and regional distributors) increases the estimated volume of "local food" about four-fold, compared to the volume suggested by the NASS census that tracks direct-to-consumer sales (Low & Vogel, 2011). The value of the food that flows through intermediated channels is three times that marketed through direct-to-consumer channels. While farms of all sizes sell through each of these marketing channels, more large farms sell through intermediated market channels with more supply chain steps, and more small farms sell through market channels with fewer supply chain steps (Low & Vogel, 2011). Nationally, USDA researchers estimate that for farms of all sizes who market local foods, 61% of gross farm sales are local foods (Low & Vogel, 2011). Low and Vogel further suggest that the high share of local food sales demonstrates integration of these farms into existing direct-to-consumer and intermediated supply chains (2011).

While the number of farms in Massachusetts has increased in the last 5 years, these farms decreased in size (USDA, 2012). At the same time, the number of farms engaged in direct-to-consumer sales has increased, as has the per farm sales of direct-to-consumer marketed products (USDA, 2012). "The value of sales directly to consumers on a per farm basis" in 2007 was $25,356 in Massachusetts, which places the Commonwealth at the second highest per farm value of direct to consumer sales in the nation (USDA, 2011).

Studies do quantify the existing overall production of fresh fruits and vegetables in Massachusetts, and attempt to quantify the amount of production consumed locally, with varying degrees of success. Fruit and nut tree farms and vegetable and melon farms in Massachusetts reported the market value of products grown in Massachusetts in 2007 at $58,995,669, or about 32% of the total market value of all farm products grown in the state; however, it is unclear what proportion of these sales were in-state, much less whether they were sold directly or through distributors to institutions, restaurants, processors, or retail operations (USDA, 2012). Timmons et al. used 2002 NASS data to estimate that a maximum of 5.6% of all foods grown in Massachusetts were sold as direct-to- consumer "local" foods (2008). For this to increase, some combination of increased farm productivity and the amount of land in production would need to increase. Increasing these factors may be a challenge in Massachusetts: "While Massachusetts has 519,000 acres of land in farms, only 119,000 acres of that land is cropland with prime agricultural soils—the best land for food production" (Bowell, et al., 2008).

It is not known how the increase in the percentage of Massachusetts schools that participate in FTI, described in the introduction above, translates into the dollar value or quantity of product sold. While some schools are committed to increasing the volume of product they purchase, others only buy occasionally. The University of Massachusetts Amherst, for example, now purchases about 25% of its produce regionally, while some schools purchase one delivery of apples each year (Toong, 2010). The consensus at this time seems to be that there are very few scenarios under which the supply of Massachusetts grown products could keep up with the institutional demand for these regionally grown products (Erwin, 2012). In 2013, the USDA's Food and Nutrition

Service conducted the first-ever National Farm to School Census, which asked public school districts about their participation in Farm to School programs. The results, when available, may be able to help quantify the current dollar value of demand for Farm to School purchases in public school districts.

3.2.3.5 Market Channels

The wholesale farm to institution market in Massachusetts is an intermediated market for locally-based differentiated products, comprised of five different marketing channels that are characterized by:

- How many times the product changes hands, or the potential "degree of markup", explained in detail below.
- Whether the product has "undergone a change in physical state" –referred to as value-added or not value-added (i.e., washed, peeled, or chopped), and
- Whether the product is fresh, or frozen / canned (USDA Value-Added Producer Grant, 2012; Low & Vogel, 2011).

The use of the term "direct sales" poses a challenge in this scheme. According to Low and Vogel, literature on FTI frequently describes sales between a farm and an institution as "direct", although it is understood that there is an additional sale from the institution to the end consumer – the student, patient, etc. "Generally, marketing channels are classified as intermediated when local food products pass through one or more intermediate steps in the local food supply chain before reaching the consumer" (King, et al., 2010). The rest of this document will abandon the term "direct," and instead refer to the degree of markup.

The market channels, in turn, are comprised of supply chains. The supply chains are models of relationships between different "supply chain actors" -- the farm businesses, aggregators, processors, distributors, food service providers, and other organizational entities that support markets. In this paper, end consumers, such as students and patients, are also referred to as supply chain actors. The life-cycle of the supply chain is modeled linearly, and actors are defined relative to other actors. “Upstream actors” refers to those firms whose actions are nearer the beginning of the chain, and “downstream actors” refers to those firms and consumers whose actions are nearer the end of the chain (Waldmen et al., 2007). For example, a food service provider is upstream of the consumer, but downstream of the farmer.

3.2.3.6 Markup

Potential “degrees of mark-up” refers to the minimum numbers of transactions through which the product has changed hands. Each time the product changes hands, a transaction cost is incurred, and there is potential to add a “markup.” The concept of markup arises from the ability of the supply chain actor to add an economic profit margin to a product, above the transaction cost to perform the supply chain step (Carlton & Perloff, 2005). Economic profit refers to profit that is extracted above and beyond the transaction costs incurred, including the cost of foregoing all other opportunities. Markup occurs when the supply chain actor possesses some degree of market power. In a perfectly competitive economy, like those modeled in the “Local Foods as Economic Development” section above, it is assumed that sellers do not make an economic profit from sales. It is difficult to say, at this stage, whether or how much market power any of the supply chain actors in the FTI supply chain actually have, and therefore whether any markup charged by a supply chain actor accrues as profit to that actor or is simply a reflection of the transaction costs incurred by that actor. However, this concept is included because it provides terminology to differentiate between gradations of long or short supply chains and highlights a major question that must be asked in future research in order to determine the long term viability of FTI supply chains.

It is also important to note that in FTI supply chains, market power could be exercised to achieve non-economic, values-based outcomes (Izumi, et al., 2010).

A low degree of markup, or “3rd degree marginalization”, indicates that the product has changed hands at least twice – once from the farmer to the food service provider, and once from the food service provider to the final consumer (what is referred to as “direct sales” in much of the literature). A medium degree of markup, or “4th degree marginalization”, indicates that the product has changed hands three times – from the farmer to a distributor, and from the distributor to the food service provider, and then from the food service provider to the consumer. A high degree of markup, or “5th degree marginalization” indicates that the product has changed hands at least four times – from the farmer to a processor, from the processor to a distributor, from the distributor to the food service provider, and then from the food service provider to the consumer. Note that in each of these cases, an additional transaction may occur when an upstream farmer-aggregator aggregates product from a number of different farmers prior to selling it downstream. This happens more frequently as the volume of product required by a downstream purchaser increases.

The products that move through the 3rd and 4th degree marginalization marketing channels may either be completely unprocessed, fresh produce when they are delivered to the food service provider, or they may be products that undergo some primary processing. For example, whole, unpeeled carrots without the greens are considered non-value added products, while peeled, coin-cut carrots are considered to have gone through some primary processing. In Massachusetts, some farms have primary processing equipment on site; often these farmers will act as aggregators and purchase unprocessed produce from other farmers, perform some primary processing on the product, and then sell the product to the downstream actor.

Unique to Massachusetts, at the time of this writing, is an operational extended-season processing facility that has the capacity to freeze or can large quantities of product for sales in the off-season. This marketing channel is 5th degree marginalized.

Direct-to-consumer sales referred to in much of the literature would be characterized as 2nd degree marginalization, from the farmer directly to the consumer. This is clearly not likely in the institutional wholesale supply chain.

3.2.3.7 Supply Chain Actors

This section defines and describes the people, businesses, and organizations that move food between farmers and institutions in Massachusetts.

Farms that participate in FTI are generally small to mid - sized farms, with revenues between $50,000 and $250,000 (Low & Vogel, 2011). Some of these farmers play the role of aggregator. They aggregate product from other farmers to sell downstream (Diamond & Barham, 2012). Some of these farmers conduct Primary Processing.

Aggregators need not be farmers – they can also be private firms or co-operatives of farmers who operate an aggregation business collectively. Aggregators source product from a number of different farmers for sale downstream, often in order to meet the volume required by the downstream producer. Farmers may aggregate and then conduct Primary Processing.

Secondary Processors, as described in this supply chain, transform freshly harvested product from a farmer or aggregator into a value-added product by changing its physical state (USDA, Value Added Producer Grant, 2012). Processors may include farm operations, aggregators, and processing facilities. Primary processing refers to the first (and often only) round of processing, peeling or chopping freshly harvested vegetables, for example. In some supply chains, primary processing is performed by food service providers, which we will refer to as on-site processing. Depending on the supply chain actor and their institutional capacities, this processing may be performed manually or by large, specialized machinery. Secondary processing preserves the product and allows it to be served in institutions out of season – for example, freezing or canning. Specialized facilities with large capacities are generally required to perform secondary processing efficiently and according to food safety requirements. These products are referred to as extended season products.

Broadline Distribution Companies source and stock a wide range of food and food service products, and offer these products to institutional purchasers. Distributors purchase product from the farmer or processor, at times process the product, and then sell the product to institutions. Distributors source and provide access to a wide variety of perishable and non-perishable goods, and perform a number of services in institutional food service markets (Izumi, et al., 2006). Broadline distribution companies may require food businesses to meet packaging and labeling requirements, which provide important information for tracking and rotating stock (Audile et al., 2012).

Regional Produce Distribution companies source, store, and deliver usually fresh produce to institutional purchasers. These companies may offer a more limited range of specialized products. Some regional distributors adopt a “we don’t own it” policy, where the services contracted may include brokerage and transportation, but the distributor never takes ownership over the product, even when the product is in physical possession of the distributor.

Food Service Providers may receive freshly harvested product (not value-added), value-added product, or extended season product. If they receive non-value added products they may need to process the product in some way (peel or chop carrots, e.g.). Food service providers prepare meals and sell these meals to consumers, which in this example are students. To sell the product to students, food service providers engage in a number of supply chain activities. They also plan meals, source product, meet federal and state nutrition guidelines, hire and train food service staff, receive, bill and invoice suppliers, etc.

Institutions such as schools, hospitals, group homes, and nursing homes either have in-house food service staff, or contract with a food service management company. Many of these institutions are funded from government sources, operate as bidders on publicly funded contracts, or receive remittances from government sources. This funding goes hand in hand with requirements to provide meals that meet nutritional standards. In addition, certain kinds of funds (notably for schools with students who qualify for free and reduced meals) correspond with the availability of very low cost food from the USDA.

Food service companies that pursue procurement of locally grown foods will likely have more market power than individual in-house food service operations, because they may be able to aggregate demand from many different institutions. A very large institution, such as a university or urban school district that operates without a food service management company may also wield market power because of the ability to aggregate demand. The mix of public funds and à la carte payments for meals can impact an institution's ability to purchase specialty items, such as regionally or locally produced food. Paradoxically, schools with lower à la carte sales and higher free and reduced lunch percentages receive larger and more regular quantities of USDA foods, which allow them more flexibility in their procurement budgets. This counterintuitive result arises because the comparatively low cost of USDA foods frees up purchasing dollars in the food budget for other purchases.

Smaller institutions, institutions in agricultural regions and/or in communities that advocate for regional procurement, may have additional flexibility in their procurement options (King, et al., 2010). Some states or localities have passed ordinances that allow schools to bypass low-bid offers for a certain percentage of regional purchases. In some cases, the proximity of regional farms and community-based relationships pave the way for regional procurement (King, et al., 2010). Some of the incompatibilities between a farm operation and an institution can be mitigated by institutional infrastructure that has not been "updated" and therefore de-equipped, i.e., for institutional kitchens that still have ovens, stovetops, blenders and choppers, instead of only microwaves and steam heat trays.

Support Entities include a wide range of organizations that provide some level of market support to any of the supply chain actors in FTI programs. Often these entities are considered to be outside of the market, and are not modeled as supply chain actors, but as they have historically served and continue to serve certain key market roles, we include them in the model. The Massachusetts Department of Agricultural Resources funds assistance to introduce the market to both farmers and institutions. Non-profit organizations such as M FTSP and SEMAP act as modified brokers, in the sense that they collect information regarding different supply chain actors' preferences and capacities, and link and encourage relationships between these actors. These organizations, along with others such as Community Involved in Sustaining Agriculture (CISA) and national organizations like the National Farm to School Network offer tools for both farmers and institutions to use as they navigate these new markets, including how-to's, sample procurement forms, best practices, and workshops. In the extended season supply chain, the Franklin County Community Development Corporation (FCCDC) has a pure market role as processor, including negotiating prices and contracts and taking ownership of product. Non-profits also provide marketing services, and develop marketing tools to communicate the value of the differentiated product (i.e., "local food") – some examples include posters, calendars, trading cards, and events, such as the Massachusetts Harvest for Schools Week, which takes place each September. These entities have worked to change the political and regulatory landscape regarding local, state, and federal levels with successes that range from new nutrition guidelines to new preferential purchasing agreements. Finally, the continued involvement of these entities has served the critical role of verifying the characteristics of the regionally differentiated product, and communicating that the product meets the requirement of credibility to both upstream and downstream actors.

Consumers in the supply chain examples are students who purchase meals from food service providers and, in some cases, their parents.

3.2.3.8 Information, Regulation, and Contracts

End consumers and institutional purchasers may find it challenging to confirm information about a “local” product. As discussed above, a “local” product implies a number of product attributes. Some of these attributes relate to the product itself – it is presumed to be fresher, and therefore have better taste and texture, and perhaps an improved nutrient profile. Some of the attributes relate to the process that has produced the product; for example, consumers presume that the product was grown with fewer chemical inputs, it traveled fewer food miles than comparable products, it was grown within a certain distance from its purchase, or farmers and farm workers earned a living wage in its production. Process attributes may also relate to the food safety associated with the product – because it is grown locally, farmers may be compelled to ensure that the product is not spoiled or contaminated. Finally, some of these attributes relate to the presumed implications of purchasing the product: that purchasing the product keeps productive farmland in use; that money earned is used in the community and has a multiplier effect that benefits the entire community and that is greater than the multiplier for non-“local” food. Some of the attempts to verify whether these presumed attributes are accurate are addressed above. To reiterate, there is no industry-accepted standard to date that offers, labels, or enforces whether the “local” product does exhibit any of these product attributes.

The supply chain modeled in Figure 5 shows where the ownership of the product and/or the physical possession of the product are transferred. But each of these points also shows where product information is transferred, as well as where market supports may be offered, transaction costs may be incurred, or economic profits may be captured. Product attribute information may be explicitly communicated – a farmer may tell an institutional buyer that the product was grown without pesticides and harvested that morning, or a farmer may label a box of peppers with the farm name and address. The product attribute information may also be implicitly communicated – the product is labeled as “local” on a distributor’s price list, or a market support entity has recommended a farmer to a purchaser, but they do not exchange specific product information outside of price and quantity ordered.

Contracts in this market can range from a “handshake” agreement, to standard arms-length contracts, to extensive site visits and requirements to become an “approved vendor,” to contract farming. The nature of specific contracts and the transfer of product information will be described below for each supply chain example.

While the contractual arrangements vary, food service management companies that pursue local food increasingly require certification that the food purchased meets stringent food safety requirements. Farmers can be required to obtain Good Agricultural Practices (GAP) certification and purchase additional Food Safety Liability Insurance (FSLI). Processors are required to create and follow Hazard and Critical Control Point

(HACCP) plans and Good Manufacturing Plans (GMP), as well as meet local, state, and federal requirements for sanitation of processing equipment and facilities, and train employees in food safety. Each of these food safety regulations, while indispensable for ensuring the safety of the food supply, can add considerable fixed costs to a farm operation that sells to institutions.

In addition to regulating food safety, some laws serve to advance the purchase of local foods, under the same presumptions about the social and economic impacts of product attributes mentioned above. Massachusetts General Laws, Chapter 7, Sections 23B contains a preferential purchasing policy for state agencies to “give preference to food products grown or produced in Massachusetts” (Leib, 2012). This law “requires state agencies to purchase food products grown in Massachusetts, unless the price is more than 10% higher than the price of out-of-state products” (Leib, 2012). While the regulations are “required,” they do not appear to be legally binding (Leib, 2012). An additional regulation, Chapter 30B, Section 20, however, does allow state agencies some latitude to justify and make individual in-state purchases up to $25,000 without seeking quotes (Leib, 2012). This regulation applies to all public schools.

The roles of information, contracts, and regulations carry a heavier burden, and are significantly less codified in the regional wholesale FTI market than in other wholesale markets. Because the product does not pass directly from farmer to consumer, the “relationship-based” verification of product information relies upon not one, but a series of relationships. Individual consumers prefer certain “local” product attributes over others, and without either a total convergence of every intermediary buyer and sellers’ preferences for “local” or a clear line of explicit information, it is unlikely that each consumers’ presumed menu of “local” product attributes is achieved in this market.

3.2.9 Supply Chain Examples

Figure 5 models five different supply chain examples for Massachusetts FTI markets. These five chains illustrate the variety of supply chains within the marketing channels observed in Massachusetts. This section describes each individual supply chain, and identifies which supply chain actors absorb transaction costs, which supply chain actors make transaction costs explicit, how information flows, and what kinds of contracts are common.

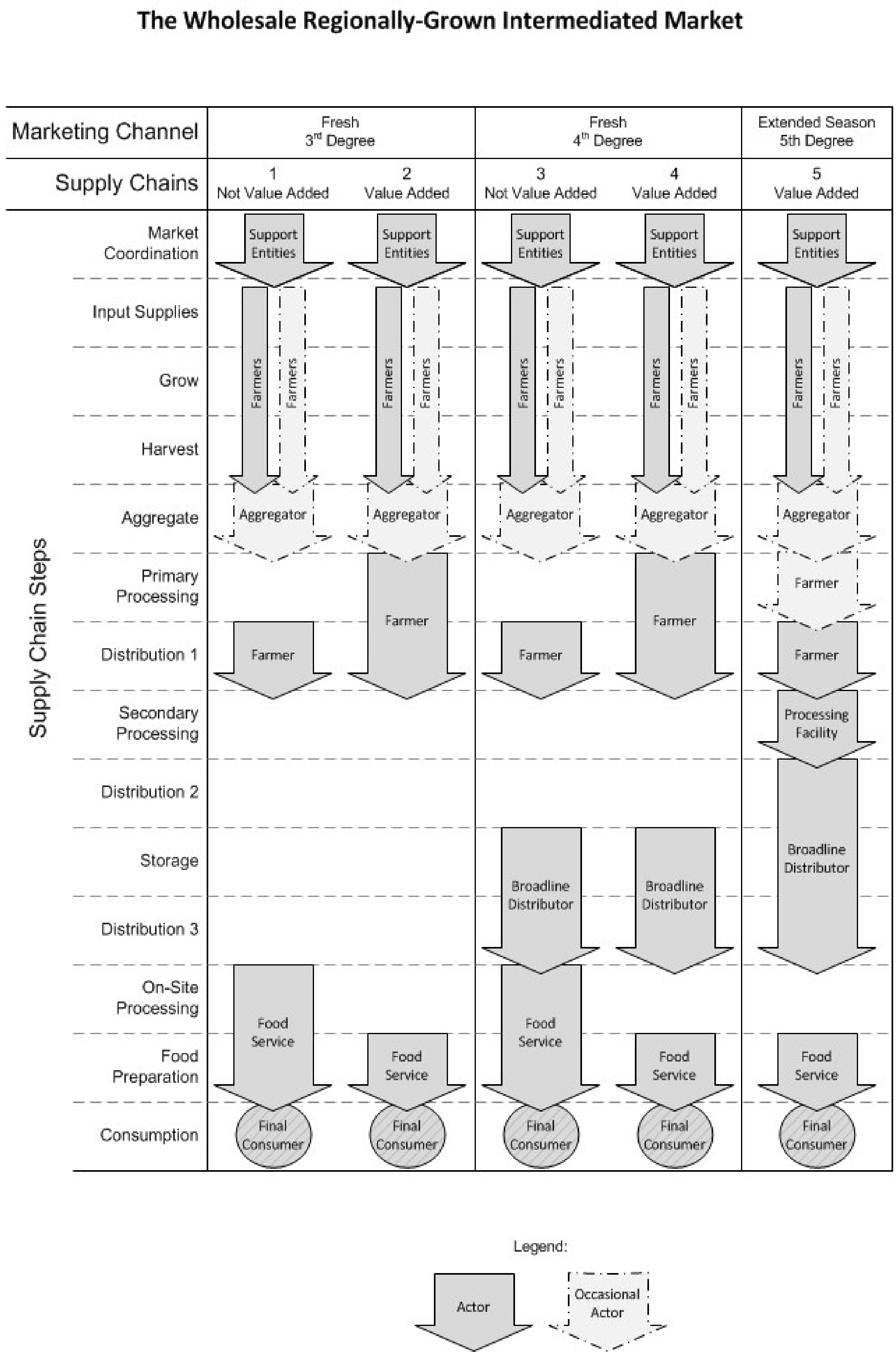

Figure 6 Wholesale Regionally-Grown Intermediated FTS Market

3.2.3.9.1 Supply Chain #1

Support entities introduce the market relationship concept of FTI to both farmers and schools. The support entities may assist or provide tools for farmers and schools to use to begin a market relationship, including sets of questions and expectations for each supply chain actor to consider. Questions and expectations might address choice of crops, seasonality, price, quantity, quality and specifications, ordering, packaging, delivery, billing, and marketing (M FTSP, 2012). Some support entities work with farmers to determine how entering this market might impact their farm business, and some entities work with institutions to determine how to best incorporate FTI purchases into their menus and school wellness plans, including how to train food service staff. This work is sometimes referred to as "building relationships." Relationships or networks resulting from relationships can also be framed in terms of market interactions: providing assistance in market development and establishing the veracity of information and product attributes. Despite this initial assistance, after a market relationship between farmers and purchasers is established, contracts are generally standard arms – length transactions.

The farmer plans the crop, purchases inputs such as seed and fertilizer, grows and harvests the product. The farmer contacts the food service provider to schedule delivery, delivers the product, usually along with a hand-written invoice. The food service company receives and inspects the product, and upon approval submits the invoice to the billing department for payment. The food service provider plans meals and menus that include the product. The food service company performs any needed on-site processing, prepares the meal, sells, and serves the product to the consumer.

In this supply chain, the institution conducts the On-Site primary processing. The institution absorbs nearly all of the transaction costs associated with this market – from the added cost of time spent planning with the farmer, to developing and implementing non-standard food procurement and payment protocols, to cleaning and chopping produce that staff would not otherwise need to process, and to marketing and selling the product to the end consumer.

The farmer also absorbs transaction costs, but these are few compared to other FTI supply chains. This supply chain offers the fewest supply chain steps and the fewest intermediaries, and as a result should come the nearest to generating a relatively high margin for the farmer with relatively few external transaction costs.

Over time, the food service provider's role may evolve to help the farmer plan which and how many crops to plant, quality control, food safety, marketing, and additional value-added activities such as farm tours, or including farmers in institutional activities. These overlaps have some characteristics that are similar to vertically restricted supply chains present in contract farming, where the downstream purchaser begins to have more control over upstream activities (Carmeli, et.al, 2007).

3.2.3.9.2 Supply Chain #2

This supply chain is nearly identical to Supply Chain #1 described in detail above. Information transfer, contracting, and most transaction cost responsibility remain the same.

The distinction between Supply Chains #1 and #2 is that the Primary Processing supply chain step is moved from the food service company's role to the farmer's role. The farmer has primary processing capacities on-farm, and creates a value-added product to sell to the institution. The food service providers no longer need to perform primary processing on-site.

While some institutions may be willing and able to pay a premium for this product, as intended by the characterization of "value-added," this product will generally transfer some, if not most, of the transaction costs described above as accruing to the institution, to the farmer, instead.

3.2.3.9.3 Supply Chain #3

This supply chain builds on Supply Chain #1, and adds the supply chain steps of Distribution and Storage, undertaken by a broadline or regional distributor downstream of the farmer or aggregator. The distributor picks up fresh produce that is not value-added from the farmer. In some cases, a distributor may deliver the product directly to the institution, but usually the product is brought to a centralized storage facility and either aggregated or divided for delivery to an institution.

As FTI programs have become more prevalent, the lack of operational compatibility between farmers and institutions has increasingly become a barrier to the success of many programs, particularly when the institutions are relatively large, or are far away from the farmers. Supply chains that include distributors which aggregate product and provide delivery and billing services removes these barriers by transferring the transaction costs to the intermediary, but may correspondingly lower the price paid to the farmer.

Most distributors take ownership of the product when they pick it up from a farmer. Distributors, therefore, are cautious about the quality and safety of the product that they distribute. Distributors can require farmers to purchase FSLI, get GAP certification, to use particular kinds of containers or on-farm storage facilities to control for heat and humidity. Farmers who work with a distributor may have to make up-front investments (and incur explicit transaction costs) in order to be in compliance with distributors' requirements.

Contracts in these supply chains can vary, but many of these transactions are conducted as arms-length transactions. The transfer of farm- and product-specific information can vary widely with the distribution company.

3.2.3.9.4 Supply Chain #4

This supply chain is like Supply Chain #2 in that the farmer conducts primary processing. It is like Supply Chain #3 in that it includes distribution. In this supply chain, the farmer adds value to the product, but then relies on distribution. Like Supply Chain #3, distribution can resolve operational incompatibilities between farmers and institutions through aggregation, billing services and distribution, but can add up front transaction costs for farmers and can compromise the transfer of farm- and product-specific information.

3.2.3.9.5 Supply Chain #5

This supply chain builds upon #4 above, but adds a supply chain step downstream of the farmer and upstream of the distributor. This step, Secondary Processing, creates another change in physical state, where the product is frozen or canned for sale in the off season. This extended season product is then picked up by a distributor and delivered to a storage facility before it is delivered to the food service provider. Secondary Processing allows Massachusetts farm products that are locally grown to satisfy markets that were previously inaccessible due to seasonality. In this value chain, the processing facility conducts primary processing.

Transactions costs in this supply chain are primarily absorbed by the processor. Federal, state and local regulations require the processor to maintain strict facility and employee food safety certifications and protocols. In some cases, distributors or large food service management companies may impose additional food safety requirements, and contracts between food service companies, distributors, and processors will provide for these requirements. Transaction costs for the farmer in this supply chain can vary. For the most part, these costs are similar to those in Supply Chain #4, although the processor's need for a large delivery at a particular time and day adds labor, transportation, and storage costs.

3.2.4 Summary and Future Research

Massachusetts' farm to institution programs have steadily increased in number and volume of product bought and sold over the last fifteen years. There are many inherently attractive aspects to Farm to Institution projects – it is uncommon that a relatively simple idea has the power to link such a wide variety of social problems with an enterprise-based and culturally inspiring solution. Can this simple idea actually deliver the hoped-for benefits to all actors in a way that satisfies all of the constraints? Can the large scale of institutional purchasing of Massachusetts grown food by Massachusetts institutions improve health outcomes, provide farmers with improved farm viability and contribute to economic development? If FTI sales do not contribute to farm viability, is it possible to achieve the nutrition, environmental, and economic development related goals?

The answers to these questions are unclear. While a significant amount of work and thought has been devoted to the promotion and assessment of individual programs, there is very little evidence available to show whether or not these goals are being, or can be, met on a regional scale. This paper has offered a framework by which farmer viability in FTI markets can be analyzed.

The FTI market is an interesting subset of the "local foods" trend. The product itself is differentiated by process and product attributes, most of which are credence attributes. Some of these attributes relate to the product itself, but some relate to the perceived impact of the product. Additionally, product attributes are impacted by process attributes that depend on the marketing channel and supply chains through which the product flows. Because of this, the market for regionally produced goods and its ability to preserve a premium price that passes through to a farmer may depend on market structure, the market power of the supply chain actors, and by whom the transaction costs are absorbed.

The market for the differentiated product may flow through different market channels. These market channels can have different opportunities for markup.

The supply of and demand for these products is difficult to quantify, other than to say that both appear to be growing. That supply and demand are growing implies that the market will continue to grow, though it will have boundaries in the natural capacity of productive farmland in the area.

The role of information in much of this market is currently very informal, and this lack of formality is reflected in the preponderance of arms—length contracts between supply chain actors. Regulation in this market is generally pursued by private companies which aim to ensure food safety in supply chains with higher degrees of marginalization. These companies do not emphasize the role of explicit product information; larger distribution and food service companies appear to be slow to decide that detailed product information beyond the label “local” may be valuable.

If demand for this product continues to grow, there are a number of factors that will need to be considered to determine whether the purported goals are being, or can be, achieved. These considerations are offered as possible future research areas.

The first consideration, particularly given the relative scarcity and high opportunity cost of productive farmland in the Commonwealth, is whether FTI programs should focus on state-specific procurement or on regional procurement. Massachusetts has the highest population density in New England. New England, as a relatively small region, shares existing food system infrastructure between Connecticut, Maine, Massachusetts, New Hampshire, Vermont and Rhode Island. The New England states’ productive farmland is much greater than Massachusetts’ alone. To connect potential supply to potential demand, many FTI programs in New England, including Massachusetts, are pursuing regional markets. The second consideration is whether the end consumers of institutional food prefer “local” enough to pay a premium price for it. If so, will that premium be enough to cover the additional transaction costs associated with the relative supply chain? Will that premium price generate a return to the farmer comparable to that returned through direct marketing, or through wholesale marketing?

Finally, is this market perfectly competitive or do some supply chain actors exert market power? Are all of the supply chain actors price-takers, or do some supply chain actors, in particular distribution and food service companies, have enough market power to extract economic profit, in addition to covering their transaction costs?

CHAPTER 4

MARKET CHANNEL AND SCHOOL MEAL COSTS IN FARM TO SCHOOL PROGRAMS

Authors: Jill Fitzsimmons and Jeffrey O'Hara

4.1 Introduction

Schools in the United States participate in "farm to school" (FTS) programs to promote the health and well-being of students by engaging them in a variety of food and nutrition related activities. One important component of many FTS programs is to teach students about agriculture by procuring and serving locally produced foods in school meals and snacks. Local food procurement may add costs to school food programs since buying local may require additional staff effort and command a premium price (Boys and Fraser 2017). Among the subset of schools that buy local foods, if the costs of locally procured foods are higher than those of alternative products, we would expect to see constraints on local foods procurement in the absence of continued policy interventions to mitigate costs. If, however, certain local food procurement strategies are more effective at reducing school meal costs relative to others, we might expect to see school food authorities (SFA) purchase local foods in greater quantities.

In this paper we supplement school-level data from the 2013 and 2015 USDA Food and Nutrition Service (FNS) Farm to School Censuses with data from the Census of Agriculture and Food Environment Atlas to investigate, among schools with FTS programs, whether the market channels from which they procure local foods reduces perceived school meal costs. Specifically, the procurement strategies that we use as independent variables include whether an SFA purchases local foods directly from producers exclusively, from intermediaries exclusively, or from both producers and intermediaries. We control for observable factors that may impact school meal costs, including SFA characteristics, regional characteristics, and transaction characteristics. We use lagged values of these variables to control for the types of local food products purchased and educational motivations behind local procurement to mitigate the possibility of simultaneity. Regional characteristics include dummy variables for regions of the country and whether the SFA is located in or adjacent to a metropolitan county. We test whether our results are sensitive to specific types of transaction characteristics that may influence local food procurement costs, identified by responses to questions regarding procurement challenges that SFAs experience when they source local products.

The marginal effects of our probit regressions indicate that SFAs that buy local foods exclusively from intermediaries (relative to SFAs that procure at least some local foods directly from producers) are five percentage points less likely to report lower school meal costs from FTS. SFAs that procure local foods from both producers and intermediaries are four percentage points more likely to report lower school meal costs. We did not find a relationship between SFAs that procure local foods exclusively from producers and school meal costs, likely because this procurement method was uncommon. These results contradict the hypothesis that intermediated FTS market channels, in contrast to direct market channels, are more likely to support the long term viability of FTS procurement as a result of efficiencies and economies of scale. While our data don't reveal the specific mechanism(s) by which SFAs experienced reduced costs due to local purchases from producers, we document that our results may occur for any combination of the following reasons: producers may supply foods to fulfill social goals while intermediaries may supply foods to maximize profits; intermediaries may not efficiently source local foods; and intermediaries may efficiently source local foods, but do not pass savings that result from these efficiencies along to SFAs.

To address concerns that reduced school meal costs and the choice of market channel are determined simultaneously, we test whether market channel choice is endogenous. We consider two instruments that characterize local food activity proximate to SFAs: county-level farmers markets per capita and county-level number of direct-to-consumer farmers that sell to retail outlets per capita. We show that proximate local food market activity is correlated with market channel choice, since the market channels SFAs use are influenced by the types of suppliers available. We argue that these variables are otherwise uncorrelated with SFA decisions to reduce school meal costs through FTS program participation.

Prior to the development of the FTS Census, research into the economic motivations of actors who participate in FTS programming consisted of case-studies of a small number of producers in a narrow geographic region, like a state (Izumi, Wright, Hamm, 2010). For instance, Conner et al. (2014) found that producers sell to schools at lower price points (provided their costs are covered) for non-pecuniary objectives, such as portfolio diversification and social preferences, and that broadline distributors that supply local foods for profitability objectives may not have the same motivations to supply foods to schools at lower prices. Our results provide the first national-level empirical findings into factors that influence how market channel choice of local food procurement impacts perceived school meal costs.

While the FTS Census has increased the rigor of research on FTS implementation, most of the applications of this dataset to-date have examined which socio-demographic factors predict the adoption of FTS programming, such as Botkins and Roe (2018). One exception is Christensen, Jablonski, and O'Hara (2017), who use FTS Census data to find a negative correlation between per-student local food expenditures and purchases of local foods directly from producers and from other non-traditional suppliers. We introduce a structural model and test for a causal relationship between market channel portfolio choice and costs. This advances the literature on FTS procurement programs and provides new insight that informs the financial sustainability of local foods procurement from the perspective of SFAs and policy intended to support FTS programming.

4.2 Background

4.2.1 School Meal Costs

Schools are a strategic venue to promote healthier food consumption due to the long duration of time that most children in the United States (U.S.) are at school (CDC 2018). However, SFAs must keep meal costs low without compromising participation rates among students and the nutritional content of the food. While SFAs that provide government-funded school meals are intended to operate on a cost-recovery basis to maintain a balanced budget, some programs operate at a loss in practice (Ralston and Newman 2015).

Standard school food program costs include the cost of food purchasing, preparation, and program management. Food service operations can be self-operated or contracted out to a food service management company, but regardless are nested within a SFA's administrative management structure, which is ultimately responsible for food services. An average SFA reports that food purchases account for 46% of reported meal costs, while labor for food preparation and food service portion of management comprise 45% of reported costs (Bartlett, Glantz, and Logan 2008). Program management costs at the administrative level are generally unreported, as they are incurred by the SFA's administrative offices, not the food service operation. However, Bartlett, Glantz, and Logan (2008) estimate that on average, unreported costs account for 19% total costs, about 61% of which is labor. Average school per-meal costs vary depending on the region of the country; whether the school is in an urban, suburban, or rural area; and school size (Ollinger, Ralston, and Guthrie 2011, Ollinger and Guthrie 2015).

In addition to the standard costs of school food programs, FTS programs are associated with increased transaction costs resulting from the additional effort needed to gather information, negotiate costs, and monitor costs (Motts and Sharma, 2016). The effort required to deal with additional transaction costs generally enters as labor costs, and might manifest as additional staff hours dedicated to FTS procurement (Fitzsimmons and Lass, 2015). Other FTS specific costs may arise from the additional effort associated with training food service staff how to cook with local foods (labor costs), or purchasing new kitchen equipment to more effectively cook local foods (capital expenses) (Colasanti, Matts, and Hamm, 2012). Finally, an obvious source of increased costs from local may be a price premium associated with purchasing the higher-quality local product (Sharma, 2012; Ortiz, 2010).

The transaction costs associated with FTS program adoption are well-documented[7]. For instance, the 2013-2014 Farm to School Census asked SFAs what kinds of problems they experienced when they procure local foods (Appendix A). Product availability was the most widely reported problem (57%). High prices were a problem for 38% of respondents, and procurement coordination problems, alongside regular procurement were a problem for 26% of respondents. Overall, 25% of SFAs reported no problems with procurement.

4.2.1.1 Farm to School Programs

FAs that implement FTS programs in the United States undertake at least one of following three activities: locally sourced food products, establish school gardens, or implement nutritional educational curriculum. Schools undertake FTS programs to improve the nutritional content of school foods, support local farmers, and/or create interactive educational opportunities about culinary and agricultural topics (Benson 2014). In 1997, just six FTS programs were reported in the United States, but by 2014 5,254 school districts reported FTS programs (NFSN 2016, USDA FNS 2017).

FTS Census data reveal that SFAs procure local foods from a wide variety of sources (Appendix B). SFAs undertake direct purchases from individual producers (40%) more frequently than direct purchases from producer cooperatives (17%), farmers markets (8%), or CSAs (3%). SFAs source local foods most frequently from distributors (63%). SFAs also commonly make local food purchases from food

[7] For instance, see Izumi, Wright, and Hamm (2010); Colasanti, Matts, and Hamm (2012); Bateman, Engel, and Meinen (2014); Fitzsimmons and Lass (2015); Motta and Sharma (2016); and O'Hara and Benson (2017).

processors/manufacturers (38%), USDA Food Distribution Programs (31%), Department of Defense Fresh Program vendors (29%), and food buying cooperatives (14%).

Numerous studies examine which factors are important in predicting institutional purchases of local foods. Prior to the FTS Census, state-level FTS studies were undertaken by Vo and Holcomb (2011) and Dimitri, Hanson, and Oberholtzer (2012) in Oklahoma and Maryland, respectively. Similar studies examining institutional purchases of local foods in non-school contexts include Smith, Kaiser, and Gomez (2013) and Oberholtzer, Dimitri, and Jaenicke (2014) with regard to hospitals and retailers, respectively. National-level studies of the determinants of FTS programs using 2013 FTS Census data include Lyson (2016); Ralston et al. (2017); McCarthy, Steiner, and Houser (2017); and Botkins and Roe (2018), whereas O’Hara and Benson (2017) use 2015 FTS Census data. While the specifications, and in some instances datasets, have varied between the FTS studies, collectively they have found that school characteristics, state FTS policies, local agricultural conditions, and spillover effects are all important in predicting the FTS engagement levels of SFAs. Examining whether the market channels used by SFAs impacted the cost-effectiveness of school meal programs has not been closely scrutinized in these studies.

Using 2015 FTS Census data, Christensen, Jablonski, and O’Hara (2017) found a negative correlation between a SFAs per-student non-milk local food expenditures and whether they purchased local foods directly from either producers or from other non-traditional suppliers (food hubs, cooperatives, and state FTS program offices). However, their findings represent correlations since they did not develop a causal model. While Christensen, Jablonski, and O’Hara (2017) examine the relationship between market channel and food expenditures, they do not focus on outcome changes that schools may have experienced from FTS participation. Our results suggest that SFAs may reduce costs by taking a portfolio approach to local foods procurement, rather than relying exclusively on intermediated procurement.

While farmers selling directly to local schools seek to receive a price that compensates them for their costs, receiving a high price may not be the primary factor motivating their participation in the transaction (Conner et al. 2014, Fitzsimmons and Lass 2015, Barrowclaw et al. 2017, Lehnerd et al. 2018). Thus, they may be willing to sell to schools at a relatively low price point in order to achieve other objectives. First, farmers may sell to local schools in order to satisfy their own social values, such as supplying healthy food locally (Batemen, Engel, and Meinen 2014, Conner et al. 2014, Matts et al. 2016, Lehnerd et al. 2018). Farmers with such motivations may sell food to schools in such small volumes that it does not affect farm profitability, and they are more likely to donate food, visit a classroom, and/or host a field trip (Conner et al. 2012). If there is a high degree of trust in the relationship between the farmer and SFA, non-traditional procurement methods may be undertaken (like delivering the food in a personal vehicle) in order to keep costs low (Izumi, Wright, Hamm 2010). A second motivation is that selling to schools offers farmers a form of market diversification and/or an opportunity to sell surplus produce (Izumi, Wright, Hamm 2010, Batement, Engel, and Meinen 2014). School sales for farmers motivated by this objective are larger, account for a relatively larger percentage of total sales, and are undertaken to increase their profitability (Conner et al. 2012).

There is similarly variation in the motivations of distributors in participating in farm to institution programs. Larger-scale distributors principally engage in farm-to-institution markets for profitability considerations, while distributors that may be a non-profit or have a regional focus may be more motivated by social considerations (Cleveland et al. 2014, Conner et al. 2014). This suggests that there may be a relationship between the scale and priorities of distributors and whether they pass cost savings from economies of scale through to SFAs.

4.2.3 Market Channel Structure and Costs

It is suggested that intermediaries may reduce supply costs for local food products relative to producers through economies of scale. Supply costs that may be reduced include those incurred both by farmers and by SFAs in the form of additional transaction costs (gathering information, negotiating terms, and enforcing terms) and marketing costs (packaging and distribution). If intermediaries reduce these costs and pass the cost savings on to SFAs, then school meal costs of local procurement should be lower when procured through intermediated markets than procured directly from producers. On the other hand, procurement from intermediaries might increase costs to SFAs. This might be the case if intermediaries do not pass cost savings through to SFAs, if the economies of scale are not significant enough, or if there are fixed adjustments costs that confront intermediaries in procuring local products.

SFAs may bear additional costs from procuring local foods from two sources: the additional effort that schools must engage in to source, purchase, and prepare local foods, as well as the price of the food itself (Boys and Fraser 2015). SFAs have limited budgets and ability to cover additional costs associated with procuring local foods, so local food procurement must be cost-effective for SFAs to commit to buying local foods in significant quantities in the long-term. In the last decade there has been significant investment in developing intermediated channels through which schools can access local foods (Low, et al., 2015). Such intermediated channels are hypothesized to provide economies of scale to the market to reduce overall costs for SFAs, as well as to provide a supply chain capable of aggregating product from small and medium sized farms that could not individually meet volume requirements of institutional buyers (Low et al. 2015).

Intermediaries may be able to exercise market power, limiting the ability of SFAs to negotiate prices and procurement terms, and resulting in overall higher costs of procurement (Nocke and White 2007). Economic theories rooted in industrial organization suggest that there is considerable ambiguity in the predicted outcome from market consolidation, such as from vertical integration and mergers (Ashenfelter et al. 2015)[8]. In the case of vertical integration of markets, where upstream and downstream supply chain actors are combined, there may be efficiencies of scale that lower overall costs along the supply chain (Hortascu and Syverson, 2007). Similarly, mergers may create efficiencies by eliminating redundancies and accessing efficiencies of scale (Ashenfelter et al. 2015). However, both theoretical and empirical research suggests that cost reductions realized from these efficiencies must be measured against the effects of increased market concentration (Ashenfelter et al. 2015, Belleflame and Peitz 2010,

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[8] It is unusual in the literature for consumers to advocate for a consolidation of suppliers in a market, as is the case where SFAs advocate for more opportunities to buy from intermediated sources instead of individually from farmers. The relevant theory comes from the perspective of suppliers that are interested in consolidation and the subsequent conversation about the potential welfare effects of consolidation.

Hortascu and Syverson 2007). Both vertical integration and mergers result in fewer firms in the market, which might provide remaining firms with the ability to exercise market power and charge the end consumer higher prices (Belleflame and Peitz 2010).

Market concentration upstream of SFAs validates the possibility that market power may be a factor. School food authorities may contract with food service management companies, who hire management staff and arrange procurement, or they may be self-operated by the authority. School food service management companies comprise about 25% of the food service contracting industry, in which 66% of revenues are accrued by the top four companies in the industry nationwide, indicating the potential for upstream market power (Hyland 2018). While the national concentration of wholesale food distribution companies is lower in general, the broadline food distribution companies that often supply school food services are also concentrated, with the top three companies earning 60% of revenues, suggesting that even self-operated food service management may be subject to upstream market power (Technomics 2017). We do not have data that indicate whether SFAs in our sample are self-operated or are operated through contracted food service management companies. Regardless, upstream market concentration is a reasonable proposition in either case.

4.3 Data and Methods

4.3.1 Farm to School Census

The USDA's Food and Nutrition Service (FNS) developed a national-level FTS Census to comply with a directive in the Healthy Hunger Free Kids Act of 2010 to "disseminate research and data on existing farm to school programs". The first FTS

Census solicited data in 2013 about FTS activities during the 2011-12 academic year from U.S. public school districts participating in the National School Lunch Program. USDA FNS revised questions in the 2015 FTS Census and administered it to private schools and charter schools as well. In the 2015 FTS Census, 12,585 SFAs completed the survey, a response rate of 70%. The FTS Census did not impose a definition of "local" foods for SFAs. Instead, it instructed SFAs to self-define local from among several common options. Of SFAs that provided a definition in the 2015 FTS Census, 45% considered local to be within the same city/county, within 50 miles, or within 100 miles (O'Hara and Benson 2017).

Whereas previous studies using the FTS Census only used variables from one of the surveys, we use variables from both datasets. To merge the 2013 and 2015 FTS Census datasets, we first eliminate SFAs in the 2015 Census that did not have a Common Core of Data (CCD) identification number, since these numbers served as the basis for linking FTS responses with school district data from other sources. Because in some instances the CCD number was not uniquely assigned in the 2015 Census, we merge respondents in the two datasets by matching on CCD number, SFA zip code, and the first eight letters of the school name[9]. The resulting dataset includes 2,373 observed SFAs that participated in both the 2013 and 2015 Census. Of these observations, however, 161 did not specify which market channel they used to source local food

[9] Before doing this, we deleted ten observations from the 2015 Census in which two schools had the same CCD number, zipcode, and first eight letters of the school name in common.

products. Our resulting dataset thus has 2,122 observations[10]. We merge these FTS data with county-level rural-urban continuum codes in order to control for the metropolitan status of the county (USDA ERS 2013). We merge in county-level data from the Census of Agriculture (USDA 2017) and Food Environment Atlas (USDA ERS 2017).

Twenty-two percent of SFAs reported lower school meal costs from participating in FTS programs (Table 1). Ten percent of SFAs purchased local food exclusively from a producer, while 47% made such purchases both directly from producers and intermediaries. Fruits and vegetables were the most frequently purchased local food products. The average student size of an SFA was 5,600, and an average 48% of students were eligible for free or reduced-price lunch. The corresponding median values for these two variables are 2,247 students and 47%, respectively. SFAs were distributed evenly among the six geographical regions established by FNS, and 86% of the SFAs were either located in a metropolitan county or adjacent to a metropolitan county. While the FTS Census was administered to all SFAs, it is possible that SFAs undertaking FTS programming are more likely to respond to the survey than non- FTS SFAs. However, this is not a concern for our study since we are exclusively examining SFAs with FTS programs, and of this subset it isn't clear that there would be different response rates among SFAs conditional on the market channels that they use for local procurement

[10] A select number observations had either negative or zero values recorded for the number of students in the school district and/or the number of schools in the school district. In such instances, we changed the value to missing.

Table 11 Descriptive Statistics for Market Channel and School Meal Costs

Variable	N	Mean	Std. Dev.	Min.	Max.
Lower Cost from FTS Programming	2,212	0.22	0.42	0	1
Purchased Direct Exclusive	2,212	0.10	0.31	0	1
Purchased Intermediate Exclusive	2,212	0.42	0.49	0	1
Purchased Both Direct and Intermediate	2,212	0.47	0.50	0	1
County-level Farmers Markets Per 10,000	2,194	0.50	0.59	0	6.36
County-level Direct Retail Producers Per 10,000	2,167	3.89	5.17	0	75.52
Student size of SFA / 10,000	2,195	0.56	1.37	0.0007	32.0532
% of Students Free/Reduced Price Lunch	2,187	0.48	0.22	0.00	1.00
SFA in Metropolitan County	2,212	0.61	0.49	0	1
SFA in Non-Metro Adjacent County	2,212	0.25	0.43	0	1
Fruits / Veg. Local (2011-12)	2,212	0.62	0.49	0	1
Fluid Milk Local (2011-12)	2,212	0.28	0.45	0	1
Meat / Eggs Local (2011-12)	2,212	0.15	0.36	0	1
Farm Visit / Trip (2011-12)	2,212	0.26	0.44	0	1
Transaction Procurement Problem	2,212	0.53	0.50	0	1
Product Procurement Problem	2,212	0.74	0.44	0	1
Distribution Procurement Problem	2,212	0.29	0.45	0	1
On-Site Procurement Problem	2,212	0.29	0.45	0	1
Pricing Procurement Problem	2,212	0.48	0.50	0	1
Northeast	2,212	0.16	0.37	0	1
Midatlantic	2,212	0.10	0.30	0	1
Southeast	2,212	0.13	0.34	0	1
Midwest	2,212	0.23	0.42	0	1
Mountain	2,212	0.13	0.33	0	1
Southwest	2,212	0.08	0.27	0	1

4.3.2 Empirical Model

We estimate equation (1) using a probit model.

$$P(y = 0|\boldsymbol{x}) = 1 - \Phi(\boldsymbol{x}\gamma) \qquad (4.0)$$

The independent variable, y, is a binary indicator that equals one if an SFA reported lower school meal costs from FTS participation in 2013-14 and zero otherwise. In (1), Φ is the standard normal cumulative distribution function and $\boldsymbol{x}$ is a matrix of explanatory variables. Since the parameter estimates of probit regressions are challenging to interpret, we report the marginal effects of each coefficient in which the other covariates are evaluated at their sample means.

The main independent variable of interest is the market channels that SFAs use to procure local products. We estimate three separate regressions in which the main independent variable is, respectively, whether the SFA procured local foods exclusively directly from producers; whether the SFA procured local foods exclusively from intermediaries; and whether the SFA procured local foods from both producers and intermediaries. We estimate the regressions including just one of these independent variables so that we can implement the endogeneity tests discussed below. In addition, we report regression results in which we include two binary variables indicating if the SFA purchased directly from producers exclusively and directly from intermediaries exclusively, which we report as specification "D" in the results. The results from specification D inform whether omitting one of the market channel classifications from the results would bias the results.

We define SFAs that purchased directly from producers as those that answered affirmatively to any of the following four market channel classifications regarding where they obtained local foods: directly from an individual food producer (farmer/fisher/rancher), at a farmers market, via a community supported agriculture (CSA) program, or from a producer cooperative[11]. We define SFAs that purchased local foods from intermediaries as those making such purchases from food

[11] While purchases from a producer cooperative can be considered "direct" from a producer, they could exert market power. Nonetheless, our main results are robust to whether we classify producer cooperatives as "direct" purchases or purchases that occur from an "intermediary".

processors/manufacturers, distributors, food buying cooperatives, food hubs, food service management companies, Department of Defense Fresh Program vendors, USDA Foods, or state FTS program offices.

To mitigate the possibility of omitted variable bias, we control for region-specific and SFA-specific characteristics. Regional variations influence the adoption of FTS programs and the ways they are implemented (Lyson 2016, McCarthy, Steiner, and Houser 2017), so we include indicator variables to control for the region in which the SFA resides. We use rural-urban continuum codes to control for whether the SFA resides in a metropolitan county or non-metropolitan county that is adjacent to a metropolitan county (USDA ERS 2013). We control for the number of students in the SFA since there could be economies of scale that could influence the use of particular market channels. We control for the percentage of students eligible for free or reduced-price meals since the socioeconomic status of the school may influence which market channels they use. For instance, schools in less affluent districts may be more motivated to participate in FTS programs for cost saving purposes than wealthier schools.

The type of local food products that SFAs purchase might influence the market channels that SFAs use to procure these products. To control for this variation, we use three food product classifications for whether the SFA purchased a) fruits or vegetables locally, b) fluid milk locally, and c) meat or eggs locally. For example, it may be easier to procure fruits and vegetables directly from a farmer than fluid milk. We control for educational motives that SFAs may have for purchasing directly from a producer by constructing a binary variable equal to one if the SFA conducted a student field trip to a farm or had a farmer visit a classroom. Including this control is important if such educational activities result in reduced school meal costs. We use responses from the 2013 Census to construct the food product and educational variables as otherwise these control variables could be endogenous due to simultaneity.

We examine whether particular problems with procuring local food are correlated with market channel choice. To do so, we combine FTS Census responses in which SFAs are asked to indicate procurement challenges because responses to these questions are highly correlated with each other. The five variables that we create are whether the SFA experienced local food procurement challenges pertaining to executing the transaction, the product, distribution, on-site preparation, or product prices (Appendix A).

Even though our new categories reduce the redundancy of some of the problem categories, the new procurement variables that we create are nonetheless positively correlated with each other (Table 2). SFAs that experience challenges with procuring particular types of products are less likely to buy local foods exclusively from intermediaries, and more likely to make local purchases both directly and intermediaries. However, other types of procurement challenges are uncorrelated with whether a SFA purchased exclusively from an intermediary. Instead, SFAs with transaction, distribution, on-site, and pricing procurement problems are less likely to purchase local foods directly from producers exclusively, and have a greater probability of purchasing local foods from both producers and intermediaries. The procurement problem variables are negative correlated with SFAs that experienced lower school meal costs, as expected. Thus, the correlations between procurement challenges that SFAs confront and market channel choice provide justification in testing whether our results are sensitive to the inclusion of the procurement problem variables in our regressions.

Table 12 Market Channel Choice and Procurement Variables Correlations

	Lower Cost from FTS	Direct Excl.	Interm. Excl.	Both Direct & Interm.	Trans. Prob.	Product Prob.	Distr. Prob.	On-Site Prob.	Pricing Prob.
Lower Cost from FTS	1.00	0.01	-0.05**	0.05**	-0.05**	-0.01	-0.07***	-0.08***	-0.19***
Direct Excl.		1.00	-0.29***	-0.32***	-0.04*	0.01	-0.04*	-0.08***	-0.07***
Interm. Excl.			1.00	-0.81***	-0.02	-0.08***	-0.03	0.00	-0.04*
Both Direct & Interm.				1.00	0.04*	0.07***	0.06***	0.05**	0.08***
Transaction Prob.					1.00	0.42***	0.33***	0.29***	0.30***
Product Prob.						1.00	0.28***	0.22***	0.37***
Distribution Prob.							1.00	0.25***	0.30***
On-Site Prob.								1.00	0.27***
Pricing Prob.									1.00

*** -- Significant at 0.01 level. ** -- Significant at 0.05 level. * -- Significant at 0.1 level.

4.3.3 Instrumental Variable Regressions

An SFA may make the decision of which market channels to use and school meal costs simultaneously. We use two instruments to test for the possibility that market channel choice is endogenous: the county-level number of farmers markets in 2016 per 10,000 residents and the county-level number of farmers selling directly to retail outlets in 2012 per 10,000 residents (USDA ERS 2017, USDA 2017). Both measures are indicative of the opportunities available to SFA to procure foods directly from producers. We use two variables because while the number of producers selling directly to retailers in a county is a more accurate representation of producers within close proximity, some of those producers may not be marketing products within the county in which they reside. Alternatively, the number of farmers markets is more representative of the vibrancy of local food markets within closer proximity to the school, which could include the participation of producers from outside of the county. The county-level density of farmers markets is a variable that has been used in other FTS studies, although in different contexts (Ralston et al. 2017, Botkins and Roe 2018).

We hypothesize that both of these instruments are positively correlated with the probability that a SFA within that county has procured local foods directly from a producer. This is because a greater number of DTC markets and/or farmers selling to retail outlets within close proximity to the school could increase the probability that schools can identify producers from which to procure food products directly. We claim that these variables are exogenous with regard to whether a FTS program reduced school meal costs at the school district level in 2013-14 outside of its influence on market channel choice. This is because these variables represent average county-level conditions, which we claim are exogenous with regard to decisions made at the SFA-level.

Since both the dependent variable and independent variable of interest are binary, we estimate a linear probability model (LPM) using instrumental variables following the rationale in Angrist and Pischke (2009). We estimate the coefficients from which derive the Hausman p-values that we present for the linear probability model according to the methodology in Wooldridge (2002). For robustness, we estimate instrumental variable probit regressions by maximizing the likelihood function of the joint density of lower school meal costs and market channel choice following Wooldridge (2002). We estimate both types of instrumental variable regressions to assess whether the distributional and functional forms associated with either of these regressions influences the results. However, for brevity, we only present the LPM instrumental variable regression results.

4.4 Results

4.4.1 Probit Regressions

We present the probit regression results in Table 3[12]. In model A, there is no statistically significant association between SFAs that purchase local foods directly from producers exclusively and lower school meal costs. SFAs that purchase local foods exclusively from intermediaries (relative to those that do not) are less likely to have reduced school meal costs in model B ($P<0.05$). SFAs that purchase local foods from both producers and intermediaries have a greater probability of reducing school meal

[12] We find similar results when we estimate linear probability models or logit models instead of probit specifications.

costs in model C relative to those that do not (P<0.05). In model D, the coefficient on whether a SFA purchases exclusively from intermediaries is statistically significant with a similar coefficient magnitude as in model B. Thus, our results are robust to whether we include more than one market channel designation as an independent variable.

Table 13 Probit Regression Result

	A	B	C	D
Intercept	-0.44***	-0.38**	-0.51***	-0.37**
	(0.15)	(0.15)	(0.15)	(0.15)
Purchased Direct Exclusive	0.02			-0.05
	(0.10)			(0.10)
Purchased Intermediate Exclusive		-0.16**		-0.17**
		(0.07)		(0.07)
Purchased Both Direct and Intermediate			0.14**	
			(0.06)	
Student size of SFA / 10,000	-0.03	-0.03	-0.03	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)
% of Students Free/Reduced Price Lunch	-0.09	-0.09	-0.09	-0.09
	(0.16)	(0.16)	(0.16)	(0.16)
Fruits / Veg. Local (2011-12)	0.06	0.03	0.04	0.03
	(0.08)	(0.07)	(0.07)	(0.07)
Fluid Milk Local (2011-12)	0.03	0.04	0.03	0.03
	(0.08)	(0.08)	(0.08)	(0.08)
Meat / Eggs Local (2011-12)	-0.07	-0.08	-0.07	-0.08
	(0.09)	(0.09)	(0.09)	(0.09)
Farm Visit / Trip (2011-12)	0.006	0.002	0.001	0.002
	(0.074)	(0.074)	(0.074)	(0.074)
SFA in Metropolitan County	-0.33***	-0.30***	-0.31***	-0.30***
	(0.09)	(0.09)	(0.09)	(0.09)
SFA in Non-Metro Adjacent County	-0.15	-0.14	-0.15	-0.14
	(0.10)	(0.10)	(0.10)	(0.10)
Northeast	-0.08	-0.08	-0.08	-0.08
	(0.11)	(0.11)	(0.11)	(0.11)
Midatlantic	0.02	0.01	0.02	0.02
	(0.12)	(0.12)	(0.12)	(0.12)
Southeast	-0.15	-0.13	-0.13	-0.13
	(0.11)	(0.11)	(0.11)	(0.11)
Midwest	-0.22**	-0.21**	-0.21**	-0.21**
	(0.10)	(0.10)	(0.10)	(0.10)
Mountain	-0.18	-0.19	-0.17	-0.18
	(0.12)	(0.12)	(0.12)	(0.12)
Southwest	0.34***	0.39***	0.38***	0.39***
	(0.12)	(0.13)	(0.12)	(0.13)
Observations	2,186	2,186	2,186	2,186
-2 * Log Likelihood	2,276	2,270	2,271	2,269
Percent Correctly Predicted	78%	78%	78%	78%

Parameter estimate (standard error)

*** -- Significant at 0.01 level. ** -- Significant at 0.05 level. * -- Significant at 0.1 level.

In models A, B, C, and D, SFAs in metropolitan counties and in the Midwest have a lower probability of reduced school meal costs, while SFAs in the Southwest are more likely to have reduced them. None of the other control variables influence the probability of whether a SFA reduced school meal costs via FTS program participation.

In model B, the marginal effect of a coefficient magnitude of -0.16 implies that purchasing from intermediaries exclusively decreases the predicted probability that a SFA reduces school meal costs from FTS participation by 0.05 (Table 4). The marginal effect for this coefficient in model D is similarly equal to -0.05. In model C, the marginal effect of a coefficient magnitude of 0.14 implies that purchasing local food from both producers and intermediaries increases the probability that the SFA reduces school meal costs by 0.04. The marginal effect of a SFA residing in a metropolitan county reduces the predicted probability of a SFA reducing school meal costs by 0.09. SFAs residing in the Midwest decrease the probability of reducing school meal costs by 0.06, while SFAs in the Southwest increase the probability by 0.1.

Table 14 Marginal Effects

Specification	A	B	C	D
Purchased Direct Exclusive	0.006			-0.015
	(0.029)			(0.030)
Purchased Intermediate Exclusive		-0.048**		-0.050**
		(0.019)		(0.020)
Purchased Both Direct and Intermediate			0.042**	
			(0.018)	
Student size of SFA / 10,000	-0.010	-0.009	-0.010	-0.009
	(0.007)	(0.007)	(0.007)	(0.007)
% of Students Free/Reduced Price Lunch	-0.026	-0.028	-0.027	-0.027
	(0.048)	(0.048)	(0.048)	(0.048)
Fruits / Veg. Local (2011-12)	0.017	0.009	0.011	0.009
	(0.022)	(0.022)	(0.022)	(0.022)
Fluid Milk Local (2011-12)	0.008	0.011	0.008	0.010
	(0.024)	(0.024)	(0.024)	(0.024)
Meat / Eggs Local (2011-12)	-0.019	-0.022	-0.021	-0.022
	(0.027)	(0.027)	(0.027)	(0.027)
Farm Visit / Trip (2011-12)	0.002	0.001	0.000	0.000
	(0.022)	(0.022)	(0.022)	(0.022)
SFA in Metropolitan County	-0.097***	-0.088***	-0.092***	-0.089***
	(0.027)	(0.028)	(0.028)	(0.028)
SFA in Non-Metro Adjacent County	-0.045	-0.042	-0.043	-0.042
	(0.029)	(0.029)	(0.029)	(0.029)
Northeast	-0.022	-0.024	-0.024	-0.024
	(0.033)	(0.033)	(0.033)	(0.033)
Midatlantic	0.005	0.004	0.007	0.005
	(0.036)	(0.036)	(0.036)	(0.036)
Southeast	-0.044	-0.038	-0.038	-0.038
	(0.034)	(0.034)	(0.034)	(0.034)
Midwest	-0.064**	-0.062**	-0.062**	-0.062**
	(0.030)	(0.030)	(0.030)	(0.030)
Mountain	-0.054	-0.055	-0.050	-0.054
	(0.034)	(0.034)	(0.034)	(0.034)
Southwest	0.100***	0.114***	0.111***	0.114***
	(0.036)	(0.037)	(0.037)	(0.037)

Parameter estimate (standard error)

*** -- Significant at 0.01 level. ** -- Significant at 0.05 level. * -- Significant at 0.1 level.

Our results are robust to the inclusion of control variables that represent challenges that schools experience with procuring local products (Table 5). The coefficient magnitudes on the independent variables that do not represent procurement problems are of a similar magnitude to the parameter estimates of the regressions in which the procurement problem variables are not included. SFAs that experience pricing challenges with procuring local foods are less likely to experience reduced school meal costs from implementing FTS programs, while SFAs with product challenges are more likely to do so. The other procurement problem parameter estimates are statistically insignificant.

Table 15 Probit Regressions with Controls for Procurement Challenges

Specification	A	B	C	D
Purchased Direct Exclusive	-0.05			-0.13
	(0.10)			(0.11)
Purchased Intermediate Exclusive		-0.17**		-0.19***
		(0.07)		(0.07)
Purchased Both Direct and Intermediate			0.18***	
			(0.06)	
Transaction Procurement Problem	-0.05	-0.05	-0.05	-0.05
	(0.07)	(0.07)	(0.07)	(0.07)
Product Procurement Problem	0.25***	0.23***	0.24***	0.24***
	(0.08)	(0.08)	(0.08)	(0.08)
Distribution Procurement Problem	-0.06	-0.06	-0.06	-0.06
	(0.08)	(0.08)	(0.08)	(0.08)
On-Site Procurement Problem	-0.09	-0.08	-0.09	-0.08
	-0.08	-0.08	-0.08	(0.08)
Pricing Procurement Problem	-0.56***	-0.56***	-0.57***	-0.56***
	(0.07)	(0.07)	(0.07)	(0.07)
OTHER INDEPENDENT VARIABLES INCLUDED	YES	YES	YES	YES
Observations	2,186	2,186	2,186	2,186
-2 * Log Likelihood	2,192	2,185	2,184	2,184
Percent Correctly Predicted	78%	78%	78%	78%

Parameter estimate (standard error).

*** -- Significant at 0.01 level. ** -- Significant at 0.05 level. * -- Significant at 0.1 level.

Notes: We do not report the coefficients from the other independent variables for brevity.

4.4.2 Endogeneity Diagnostics

We present endogeneity diagnostics in Table 6. For the linear probability model, both the county-level density of farmers markets and number of producers selling to retail institutions have positive and statistically significant coefficients on whether a SFA purchases local foods both directly from producers and intermediaries, and a negative and statistically coefficients on whether a SFA purchases local foods exclusively from intermediaries. These coefficients are statistically significant irrespective of whether we estimate the regressions with just one of the instruments or if both instruments are included. The F statistics from the first-stage regression are greater than ten in magnitude. The statistically insignificant F value from the over-identification test results provide evidence of the validity of using two instruments. Collectively, the first-stage regression results and over-identification test results imply that we do not have weak instruments.

The market channel choice variable has a statistically insignificant impact on reduced school meal costs in each of the second-stage regressions. However, we find in our Hausman tests that we cannot reject the null hypothesis that market channel choice is exogenous. Thus, due the robustness of the finding across different instruments and market channel combinations, we believe it is reasonable to conclude that market channel choice is exogenous with regard to reducing school meal costs.

Table 16 Endogeneity Diagnostics

Potentially Endogenous Market Channel Variable:	Interm. Excl.	Interm. Excl.	Interm. Excl.	Both Direct & Interm.	Both Direct & Interm.	Both Direct & Interm.
First Stage Regression Results (Linear Probability Model)						
Density of Farmers Markets	-0.04*	-0.06***	-	0.05**	0.06***	-
Density of Direct Retail Producers	-0.01***	-	-0.01***	0.01**	-	0.01***
Regression F Statistic	17.05***	17.18***	17.91***	10.66***	10.88***	10.93***
Pertinent IV Statistics (Linear Probability Model)						
Hausman Exogeneity P-Value	0.19	0.49	0.25	0.22	0.50	0.29
Overidentifying Restrictions F-Value	0.02	-	-	0.01	-	-
Overidentifying Restrictions P-Value	0.88	-	-	0.91	-	-
IV Regression Results (Linear Probability Model)						
2nd Stage Market Channel Coefficient	0.17	0.15	0.16	-0.22	-0.14	-0.23
Regression F Statistic	2.31***	2.63***	2.30***	2.25***	2.63***	2.20***

*** -- Significant at 0.01 level. ** -- Significant at 0.05 level. * -- Significant at 0.1 level.

In the instrumental variable probit regressions (which we do not present in Table 6), the instruments are statistically significant when both instruments are used. However, the statistical significance is attenuated when only one instrument is used. While the market channel choice variable is statistically insignificant in the second-stage regressions when we use both instruments, it is statistically significant in three of the four second-stage regressions when we use one instrument.

4.5 Discussion

We find that exclusively purchasing local foods from intermediaries reduces the probability that an SFA perceives reduced school meal costs, and that purchasing from both intermediaries and producers increases the probability that an SFA perceives reduced school meal costs. While we are not able to identify the mechanism underlying these results with these data, there are a number of possible explanations for why this may be the case. One explanation for these results is that producers may have non-pecuniary objectives for selling directly to schools, and they may be more willing to sell foods at affordable prices in order to facilitate the transaction (Conner et al. 2014). Intermediaries either may not achieve cost savings when aggregating from local producers, or if they do achieve cost savings, they do not pass those cost-savings along to SFAs.

We do not find that purchasing local foods directly from producers exclusively has a statistically significant impact on reducing school meal costs. One reason why this effect is statistically insignificant is because a proportionally small number of SFAs procure local foods in this way, so we may not have a large enough sample to estimate an effect. Another explanation is that SFAs that procure local foods from a variety of market channels may be able to negotiate or identify the most cost-effective locally priced foods. For example, a farmer may sell food at a lower price to a SFA that is also procuring local foods from intermediaries vis-a-vis those that are not.

Our results are consistent with other case studies that found that non-pecuniary factors can be important in a farmer's decision to sell to schools. While previous studies occurred with a small number of farmers within a narrow geographic region, we establish that this result holds at a national-level. Our results are also consistent with Christensen, Jablonski, and O'Hara (2017), who found that per-capita local expenditures were negatively correlated with SFAs that procured local foods directly from producers. The new insight that our model provides is establishing a causal relationship between market channel choice and school meal costs. We demonstrate that market channel choice by SFAs is highly influenced by characteristics of the surrounding food distribution system, and the results from our instrumental variable regressions indicate that market channel choice is exogenous. Nonetheless, we did not obtain consistent results on the second-stage market channel choice coefficients, since they were statistically insignificant in the LPM IV regressions but significant in some of the IV probit regressions. So, our conclusions would be attenuated if market channel choice was endogenous.

The negative coefficient on metropolitan counties in reducing school meal costs could arise if input costs for local farmers (irrespective of the market channels that they use) selling to SFAs in metropolitan counties is high, such as land prices or transaction costs. These higher input costs could raise their production costs, and reduce potential cost-savings to SFAs from local procurement. Or, these farmers may have greater opportunity costs, such as other local marketing opportunities (like selling at farmers markets and/or to restaurants, for example) that may reduce their incentives to market products to schools (Fitzsimmons and Lass, 2015).

The procurement problem variables were positively correlated with sourcing from both producers and intermediaries, which suggests SFAs may adapt to procurement challenges by sourcing from multiple types of suppliers. Of the five distinct procurement problems, lower school meal costs has highest negative correlation with pricing challenges (Table 2). This correlation may explain why pricing procurement challenges is statistically significant at the 0.01 level in the probit regressions (Table 5). While product procurement challenges have a positive coefficient in the regressions, it is statistically insignificant when we estimate the regression without including pricing challenges as an independent variable. On-site procurement problems and distribution procurement problems are statistically insignificant in Table 4, but are both negative with statistical significance when pricing challenges is not included as an independent variable. We caution against drawing definitive conclusions about how particular procurement challenges impact school meal costs because the procurement challenges are highly correlated with each other (Table 2). Our principle purpose in including these controls is to test whether procurement challenges that could influence school meal costs were correlated with market channel choice, and we find that the statistical significance our market channel coefficients are robust to the inclusion of these variables.

4.6 Conclusion

Whether and by what means SFAs may be reducing school meal costs via participation in FTS programs has not received extensive attention. Transactions costs and impediments to local food procurement by SFAs is well-documented, and our results suggest that market channel portfolio choice can contribute to reduced school meal costs. These findings suggest the conditions under which FTS program implementation may be more self-sustaining in the long-run, perhaps in the absence of policy support. Our results contradict the hypothesis that intermediated channels both realize cost reductions and pass those savings long the supply chain. However, since we do not observe actual costs, we are not able to determine the relevant mechanism. In particular, do intermediated channels not create significant efficiencies, or do they create efficiencies but do not pass them through the supply chain?

One limitation of the dataset is that the question about school meal costs reflects the perception of SFAs regarding whether their school meal costs were reduced through participation in FTS programs. They were not asked to undertake any calculations to arrive at their conclusion or to elaborate on how their school meal costs declined. The FTS Census does not ask FTS SFAs if their school meal costs increased, and does not ask non- FTS SFAs questions about trends in school meal costs. More detailed data collection efforts into the components of school meal budgets would be valuable in being able to identify how school procurement strategies can be most effectively deployed given budgetary constraints.

CHAPTER 5

PRODUCER COSTS AND RETURNS FROM NEW ENGLAND FARM TO INSTITUTION SALES

5.1 Introduction

Diversified specialty crop producers take into consideration a number of factors when they choose how to market their products. In this chapter, I present the result of field research that informs the development of a theoretical model of utility maximizing producer choice of markets. We interviewed producers in six New England states who market at least some product to Farm to Institution markets. The field research results from a small scale study (N=11) of costs and returns to producer sales to local foods markets in New England, with particular focus on how sales to institutions fit into producers' overall marketing plans.

We conducted in-depth interviews with eleven producers about their costs and returns in selling to farm to institution markets and two interviews with producers about their farm to institution markets more generally. Interviewees represented diversified fruit and vegetable growers in each of the six New England states, and a broad range of farm operations sizes and farm marketing strategies. Farm to Institution marketing ranged from less than 1% of total sales to about 11% of total sales of the farm operations interviewed. Notably, while very few farm operations specifically track costs and returns to farm to institution marketing, only two producers target this market for future growth. The barriers cited to increased participation include low prices, volume requirements, and logistical challenges.

We asked New England producers to identify the transaction characteristics associated with sales to the institutional market in direct and traditional-intermediated supply chain structures. Research results contribute to a growing body of literature on costs and returns to local foods markets and FTI specific transaction costs. This research further contributes to a new theoretical model of producer market channel choice that explicitly accounts for transaction characteristics that impact producers' decision to supply to FTI markets in the Chapter 6.

In addition, we identify three important emerging topics that impact producers' profitability in the farm to institution market and conduct additional research to develop materials to inform producers about these topics. These topics include the emergence of online brokerage platforms to reduce transaction costs, the increased risk of violating Federal Department of Labor Wages and Hours violations as a result of engaging in some farm to institution activities, and the role of a value-added product in farm to institution sales.

5.2 Background

There are many ways for researchers to model producer marketing choices like what to produce and where to sell the products, but each model of producer choice comes with a trade-off. Extension economists, for example, might be interested in the practical choice that producers face on a regular basis: "This is what I can grow, where do I sell it?" To help producers answer this question, researchers can model costs and returns in different markets (Hardesty and Leff, 2010; LeRoux, 2010). It is often expensive and difficult to obtain this kind of information for diversified specialty crop producers. It is not usually possible, for this population, to obtain cost and returns data in the volume that would allow statistical inference, so results are often of limited applicability.

National data sets might allow researchers to observe which markets producers have sold to in the past, but do not usually provide both cost and returns information, such as sales prices, costs of production, marketing costs, transaction costs, and the costs and returns of the alternative markets to which the producers may have otherwise sold product. Producer choices are explained by producer demographic information, regional consumer demographic information, county, region, or state level market information that can be merged with other national level data (Park, Mishra, and Wozniak, 2011). While this research can provide a national view with broad applicability, it models producer choice as utility maximizing where equilibrium prices and quantities are exogenous, if they enter the model at all. This limitation prevents researchers from performing welfare analysis and inhibits the ability to model the potential effects of policy changes on market equilibria.

Another approach is to model producer choice to differentiate product as local, instead of the choice of how to market the product. Producer product differentiation models are based on a well-developed literature (Muss and Rosen, 1978) with application across agricultural and non-agricultural sectors. This approach has the strength of allowing endogenously determined equilibria but does not account for the practical menu of choices that producers face regarding where to market their product. Two recent applications of this mode l use simulation methods (Winfree and Watson, 2017) and regional proprietary data from retailers (Richards et al., 20I 8) to identify equilibria and conduct welfare analysis.

As Farm to Institution (FTI) programs in New England expand, new supply chains are being developed to handle the increased flow of regionally-produced goods to regional institutions (Ralston, et al., 2017). While some supply chains deliver product directly to institutions, using no aggregators, distributors, or processors, other supply chains rely upon these additional supply chain actors. These are referred to as "direct" and "intermediated" supply chains, respectively. Each time an additional supply chain actor is added, the costs incurred to perform the supply chain task for which the actor is responsible must be covered. The actor may also charge an additional fee. On the other hand, in the absence of these additional supply chain actors, producers must absorb the costs associated with performing the supply chain tasks.

It is not clear whether FTI markets are profitable to producers, and if not, what motivates producers to sell to FTI markets. Adams (2010) found evidence that institutional sales in New England may be profitable to producers. The Massachusetts Farm to School Project commissioned telephone surveys with producers to identify the impact of FTI sales on producers' profits. Results provide a description of Massachusetts producers' understanding of the profitability/ role of FTI sales. In written comments, producers noted trade-offs between costs associated with FTI sales and the profitability of these sales, non-economic benefits of FTI sales such as community "exposure", role of FTI sales in stabilizing seasonal income streams, personal value of helping feed schoolchildren, and the "premium" nature of the product sold. Sitaker et al. (2014) conducted a comprehensive literature review to determine whether different local food marketing options:

- enable producers to make a living;

- improve local economies;
- provide local residents with greater access to affordable, healthy food; and
- contribute to greater consumption of healthy food among local residents.

They found positive support to claim that producers marketing to farmers markets, retailers, CSAs, and food hubs may contribute to achieving these goals. In the case of FTI, however, the available research was insufficient to determine whether or not FTI is profitable, provides community economic benefit, or improves access and diet quality.

Conner et al.'s (2012) work "Sustainable School Food Procurement in Large K-12 Districts" offers a qualitative value-chain analysis of two pilot Farm to School projects. This study interviews producers, schools, and mid-chain vendors and uses Stevenson and Pirog (2008) definition of value-chains to further define the specific attributes of value chains as related to Farm to Institution programs. According to Stevenson and Pirog, value chains are characterized by:

- product differentiation and value-added products
- strategic partnerships across supply chain actors
- information-sharing
- trust
- commitment to welfare of all participants through
- fair pricing
- fair governance.

Conner et al. find that actors in the farm to school supply chain in their study display evidence of cultivating value-chains, particularly with regards to Business Relationships and Values, Information and Learning, and Equity and Pricing. Actors' business interests and decisions are informed by the potential contribution they could make to the school districts' goals to improve local producer viability and child nutrition. Actors exchange information and develop opportunities to learn from one another to improve supply chain responsiveness. Finally, actors recognize that support for their shared goals of supporting local producers and child nutrition are constrained by tight price margins and economic bottom lines, and made efforts to offer products at "competitive prices," although the practice is dominated at times by the "desire to extract maximum economic surplus from upstream or downstream supply chain links" (2012).

Low and Vogel (2012) use national data to determine how "local" foods are marketed, finding that "a large portion" of local foods move through intermediated markets, although small and medium sized farm sales in the northeast are dominated by direct markets. They also find that while there is evidence that producers participating in direct to consumer sales are able to capture a higher share of the food dollar, whether producers who participate in intermediated markets are able to capture a similarly high portion of the food dollar is in question.

King et al. (2010) conducted case studies to compare "structure, size, and performance of local food supply chains with those of mainstream supply chains," including a FTI supply chain. The case studies focused on descriptions of structure, size, and performance of local food supply chains. Five key findings emerged from their research. First, they found that while local foods can move through different types of supply chains, intermediated supply chains make it difficult to establish and maintain consumers' connection to the "local" attributes of the product. Second, they found that local food supply chains account for a very small percentage of overall consumer demand for the five products and places studied. Third, they found that there is no single "cookie cutter" business model for a successful local food business enterprise. Fourth, they found that farmers that market directly generally count direct marketing as one component of a diversified marketing portfolio. Finally, they found that product aggregation to reduce per unit costs can be more important than how nearby the producer is to the consumer.

Sexton (2012) suggests that “Market intermediaries, with even rather modest amounts of market power, can capture large shares of the benefits from policies intended to benefit producers." The exercise of market restraints, like liability insurance, sanitation guidelines, purchase minimums in FTI markets, and the capture of associated margins is common in intermediated agricultural markets where downstream firms typically set contracts to protect food quality and safety.

5.3 Methods and Participants

The goal of the research was to identify producers' costs and returns from broad range of FTI sales experiences. In coordination with Farm to Institution New England (FINE), we worked with farm to institution practitioners in New England to identify a judgement sample (Marshall 1996) of producers in six New England states who had experience selling to institutional buyers either directly or through intermediated channels. The criteria for inclusion on the list were broad: we requested that practitioners identify producers that were representative of their states' farm size, product offerings, access to marketing infrastructure, and marketing channels used. From this list, we prioritized interviewees that provided geographical, farm size, and market channel diversity. Fourteen producers agreed to be interviewed, although not all were willing to provide the full range of data requested. The sample size is appropriate for in depth qualitative research on FTI market costs and returns (Sandelowksi, 1995) for the purpose of informing future research, but not large enough to be used to draw inferences.

5.4 Survey Instrument

We developed a survey tool and used the tool to conduct semi structured, in person interviews. We designed the survey to meet many goals. The survey instrument is intended to be compatible with existing USDA surveys and reports (King et a., 2012; USDA NASS 2012 Census of Agriculture; USDA ERS 2011 Agricultural Resource Management Survey), and IRS forms (1040 Schedule F), and additionally include questions that address costs and returns not currently gathered in these instruments (Lass, 2012). There were multiple purposes for this intention. Primarily, we hoped to make straightforward comparisons to existing data for those fields that are included in both existing instruments and our instrument. Producers were able to refer to forms that they have already completed in order to answer many of our questions, which streamlined the process and helped the interviews go more quickly. Finally, the questions are designed to complement the existing instruments so that they may be easily inserted into future federal instruments and/ or may serve as a pilot for potential questions, should USDA decide to begin soliciting farm to institution data in future surveys. The list of documents prducers were requested to have on hand during interviews is provided in Figure 5.1, List of Farm Operation Documents.

2014 IRS Schedule F
2014 Harvest data
Documentation of any grants received (contracts, etc.)
Payroll
Insurance paperwork
Federal Crop Insurance
Food Safety Liability Insurance
Farm Property Insurance
Employee Liability Insurance
Mortgage statement/ Leases
Town tax documents
A copy of your 2012 USDA Farm Census form

Figure 7 List of Farm Operation Documents

The survey was also designed to be compatible with existing measures of social preferences. We designed the social preferences section with the intent of using the results to inform a future field experiment design. To achieve this, we reviewed the literature on field experiments, and developed a survey intended to identify a robust Dictator Game to identify producer social preferences for three social outcomes. As identified in the literature. In the process of making this design decision, we reviewed and rejected a number of other social preference frameworks.

The final instrument design was built on the literature review and previous producer costs and returns surveys, including federal farm financial reporting and survey instruments, and questions intended to elicit producers' preferences for the social outcomes attributed to Farm to Institution programs (King et al., 2014; Lass, 2012). Section I, Social Preferences, included a section eliciting producers' agreement with common beliefs about the impact of FTI programs and the effectiveness of organizations with goals and principles that align with those impacts, using 5 point Likert scales ranging from Strongly Agree to Strongly Disagree, with a "Can't Choose" option. Identify other causal factors that relate to supply chain transactions, including producer preferences, producer socio-demographic characteristics and farm characteristics.

Sections 2 through 6 requested farm operation and financial information for the 2014 growing year. Section 2 asked producers which market channels they sold to and whether and how they contracted with buyers in these market channels. In Section 3 we requested farm operation information regarding total acreage, production and marketing income from specific crops. In Section 4 we asked the producer about any other farm related income, and in Section 5 we asked detailed information about farm labor and wages. In Section 6 we solicited detailed information regarding farm operating expenses. Finally, Section 7 requested demographic information from the interviewee. A sample of interview questions is provided in Figure 5.2. The full instrument is attached in Appendix C.

Section 1. Social Preferences

Beliefs

Do you Strongly Agree, Agree, Neither Agree or Disagree, Disagree, Strongly Disagree or Can't Choose with the following statements:

- Increasing the sales of New England food to New England consumers benefits the environment.
- Increasing the sales of New England food to New England consumers helps preserve the region's working landscape.
- Increasing the sales of New England food to New England consumers decreases the environmental impact of large-scale agriculture.
- Increasing the sales of local and regional foods is a driver of local economic development.
- Increasing the sales of local and regional foods is a driver of regional economic development.
- Increasing the sales of local and regional foods to consumers in New England could improve health and nutrition outcomes.
- Increasing the sales of local and regional foods could improve health and nutrition outcomes for students k-12.
- Increasing the sales of local and regional foods could improve health and nutrition outcomes for the elderly.
- Increasing the sales of local and regional foods could improve health and nutrition outcomes for incarcerated individuals.
- Increasing the sales of local and regional foods could improve health and nutrition outcomes for hospital patients.
- Small and medium sized farms are important drivers of rural economies.

Section 2. Markets and Marketing Contracts

Direct to consumer (fresh or processed)

- Farm stand
- CSA
- Farmers' market
- PYO

Wholesaler
End buyer known? Y N
if "yes":

- institution
- retail
- restaurant
- buying club
- processor
- other

Intermediated (fresh or processed)

- Direct to restaurant
- Direct to retail
- Direct to buying club
- Direct to aggregator

Direct to processor

Direct to institution

- public k-12
- pre-school private k-12
- private college
- public college/univ
- hospital
- other

Figure 8 Selected Interview Questions

5.5 Procedures

We identified and interviewed 11 producers who shared extensive financial information about their farm operations, and two additional producers who were interested in discussing their experiences with costs and returns in farm to institution markets but were not willing to share financial information. The FINE practitioners identified potential producers to interview and the appropriate means of conducting those interviews. Several unanticipated questions came up during the process of identifying potential producer interviewees; particularly the issue of how FINE could be included in collecting producer information in a way that satisfies University Internal Review Board (IRB) requirements for confidentiality.

The interviews were conducted on site, as producers were asked to share financial documents that would be difficult to transport. We requested in depth farm financial information, and a brief survey of producers pro-social motivations. We provided producers with hard copies of the interview instrument three weeks prior to the scheduled interview, along with a list of Farm Operation Documents that could furnish the information requested in the interview, provided in Table XX, and a guide to indicate which Farm Operation Documents were needed to respond to each interview question.

Interviews times were targeted to be about two hours, and actual interview time ranged between two and four hours, with interviews taking over two hours being extended with the continuing consent of the respondent. Surveyed producers were compensated $100 each.

Respondents were informed that their responses were voluntary and that they could withdraw from the interview process at any time without forgoing compensation. Respondents were further informed that information received would only be reported in aggregate and that they would not be identifiable, and that they would remain anonymous. After each interview, the interview notes were typed and emailed to producers. Producers were given a (flexible) deadline, and asked to review the notes for accuracy, and to edit or redact any information that they consider to be identifying or proprietary.

5.6 Results

We use USDA's classification of farms according to gross income. 45.45% of interviewed farm operations were "small family farms" with less than $350,000 in gross cash farm income (GCFI) (USDA, 2013). Four of these farms are considered "low-sales small family farms" with GCFI of less than $150,000, and one is considered "moderate sales small family farms" with CGFI between $150,000 and $349,999. Interestingly, only one interviewed farm (9.09%) is classified as a "mid-sized farm," or a family farm with a gross income between $350,000 and $499,999 a year. The remaining 45.45% of farms all are considered "large-scale family farms" with CGFI of between $1,000,000 and $4,999,999.

5.6.1 Social Preferences

We asked eleven questions intended to elicit whether interviewed producers believed that farm to school programs contributed to the achievement of pro-social goals.

Producers ranked their responses on a Likert scale from 1 to 5, where" 1" indicated strong agreement and "5" indicated strong disagreement. The producers were also allowed to opt out of stating a level of agreement, although none did for any question. In the case where a farm operation had more than one primary farm operator, we asked each farm operator with equal decision-making roles to fill out this portion of the survey; however, responses are not weighted to reflect the number of responses per farm operation.

All producers interviewed "Strongly Agreed" or "Agreed" with the statements that: Small and medium sized farms are important drivers of rural economies; Increasing the sales of New England food to New England consumers helps preserve the region's working landscape; Increasing the sales of local and regional foods is a driver of regional economic development.

Almost 92% of producers "Strongly Agreed" or "Agreed" with the following statements: Increasing the sales of New England food to New England consumers benefits the environment; Increasing the sales of local and regional foods is a driver of local economic development; Increasing the sales of local and regional foods to consumers in New England could improve health and nutrition outcomes; Increasing the sales of local and regional foods could improve health and nutrition outcomes for hospital patients.

Over 81% of producers "Strongly Agreed" or "Agreed" that: Increasing the sales of New England food to New England consumers decreases the environmental impact of large-scale agriculture; Increasing the sales of local and regional foods could improve health and nutrition outcomes for the elderly; Increasing the sales of local and regional foods could improve health and nutrition outcomes for incarcerated individuals. And 75%

of producers of producers "Strongly Agreed" or "Agreed" that increasing the sales of local and regional foods could improve health and nutrition outcomes for k-12 students.

Table 17 Producer Social Preference

	Strongly Agree/ Agree	Neither	Strongly Disagree/ Disagree	Can't Choose
Increasing the sales of New England food to New England consumers …				
benefits the environment	91.7%	8.3%	0.0%	0.0%
helps preserve the region's working landscape	100.0%	0.0%	0.0%	0.0%
decreases the environmental impact of large-scale agriculture	83.3%	16.7%	0.0%	0.0%
Increasing the sales of local and regional foods is a driver of …				
local economic development	91.7%	0.0%	8.3%	0.0%
regional economic development	100.0%	0.0%	0.0%	0.0%
Increasing the sales of local and regional foods to consumers in New England could improve health and nutrition outcomes.	91.7%	8.3%	0.0%	0.0%
Increasing the sales of local and regional foods could improve health and nutrition outcomes for …				
for students k-12	75.0%	16.7%	0.0%	0.0%
the elderly	83.3%	8.3%	8.3%	0.0%
incarcerated individuals	83.3%	16.7%	0.0%	0.0%
hospital patients	91.7%	8.3%	0.0%	0.0%
Small and medium sized farms are important drivers of rural economies.	100.0%	0.0%	0.0%	0.0%

N=12

5.6.2 Supply Chain Structure

We asked producers to identify how they marketed all products sold by the farm operation, and in particular, to identify the structure of the supply chains through which products flowed to end consumers in institutions. We provided producers with the following definition:

"**Direct Marketing**" is defined as sales from the producer directly to the end consumer of the product.

"**Intermediated Marketing**” is defined as any sales where an additional business or organization owns the product before it reaches the end consumer.

5.6.2.1 Direct Sales

Seventy three percent of producers interviewed sold directly through a farm stand or farmers market, while 82% sold directly through a CSA, and 45% sold directly through pick-your-own. This suggests that our producer sample is not solely comprised of large producers that exclusively market to large wholesale buyers.

5.6.2.2 Intermediated Sales

We look at intermediated sales, in which producers sold product to outlets that prepared or sold product in turn to end consumers. Given our research goal to identify the costs and returns in the FTI market, we distinguish between intermediated sales to institutions versus those outlets that are not institutions. For Non-Institution Intermediated Sales, we find that 100% of producers interviewed sold product to a retail outlet, like a grocery store or co-op; 91% of producers interviewed sold to restaurants; 55% sold to processors, 36% sold to aggregators, and 27% sold to buying clubs. This indicates that our sample was "wholesale ready", meaning that while producers in our sample may include sales directly to consumers in their portfolio of marketing options, they have the capacity to work with wholesale buyers. If our sample was comprised of producers that were not already "wholesale ready," we would be concerned that FTI specific costs could not be separated from the costs of learning or from up front fixed costs associated with entering a new wholesale market, rather than the costs that are specific to the FTI market itself.

Next we asked about FTI Intermediated Sales. Since our sample was selected from producers that were known to have sold to the FTI market in 2014, we asked producers to identify which FTI markets they sold to without using a wholesaler, such as an aggregator, processor, or distributor. Fifty four percent of producers interviewed sold to a public pre-k through 12th grade institution; 36% sold to private pre-k through 12th grade private schools or hospitals; 28% sold to a public college, or a private college, or a jail; and 9% sold to a pre-school.

When producers sell products to a wholesaler, they do not always know who buys their product from the wholesaler. On the other hand, there are occasions where producers negotiate sales with a buyer and then contract a wholesaler to deliver the product. One important contribution of this study is that we ask producers who sell to wholesalers whether they have information about buyers further down the supply chain. This information is important because it provides insight into whether the intermediated supply chain is a "value-chain", in the sense that information flows "backwards" to the producer, whose marketing decision may be influenced by knowledge that the end consumer; are students, for example. To obtain this information, we asked producers about Intermediated Sales, when producers sell to wholesalers where the end buyer is known. Of the producers interviewed, 64% sold to a wholesaler. Of the producers interviewed, 27% (three total producers) sold to a wholesaler and know who buys their product from the wholesaler. All of these three producers know that the buyer who bought their product from the wholesaler was an institution. Of the producers interviewed, 36% used a non-profit online broker as a wholesale distributor to institutions. Additional Market results are presented in Table Markets and Marketing Contracts.

Table 18 Producer Choice of Market Channel

Markets	No	Yes		No	Yes
Direct to consumer			**Intermediated**		
Farm stand	27%	73%	Direct to restaurant	9%	91%
CSA	18%	82%	Direct to retail	0%	100%
Farmers' market	27%	73%	Direct to buying club	73%	27%
PYO	55%	45%	Direct to aggregator	64%	36%
Intermediated			Direct to processor	45%	55%
Wholesaler	36%	64%	Direct to institution		
End buyer known?	73%	27%	Public k-12	45%	55%
Institution	73%	27%	Pre-school	91%	9%
Retail	82%	18%	Private k-12	64%	36%
Restaurant	82%	18%	Private Higher Ed	73%	27%
Buying club	91%	9%	Public Higher Ed	73%	27%
Processor	100%	0%	Hospital	64%	36%
Other	82%	18%	Other	73%	27%
***If** End Buyer Known*					
Institution	0%	100%			
Retail	33%	67%			
Restaurant	33%	67%			
Buying club	67%	33%			
Processor	100%	0%			
Other	33%	67%			

N=11

5.6.3 Transaction Costs - the Costs of Gathering Information, Negotiation, and Monitoring.

We asked a number of questions intended to uncover the transaction costs associated with farm to institution sales, but only one producer kept records that allowed us to calculate a dollar value of those costs as distinct from costs associated with other marketing. In this particular case, the dollar value is estimated as a portion of the salary of an employee whose job includes wholesale marketing, plus additional labor costs required for packing product for sales to these markets. This farm operation's business planning is perhaps the most sophisticated of all farms interviewed, and may offer a window into how other farms will approach farm to institution marketing in the future, so we will share as much as we can about the costs without providing identifying information about the farm operation.

This farm operation only used a non-profit online farm brokerage platform to coordinate and deliver farm to institution sales. Like many farms interviewed, the farm does not distribute to institutional buyers because the uncertainty associated with these deliveries is too high, and the revenue too low. The broker adds a 20% charge above what farm price. The 20% shi FTS the cost of the non-profits brokerage services and delivery to the buyer, so that the producer is not bearing these costs. In terms of transaction costs, the brokerage service is bearing the costs of gathering information about potential buyers and making a match among buyers and sellers; negotiating terms, including contracts, product quality and packaging, prices and quantities; and monitoring the value and quality of the sale. The farm does not process the product beyond what they would for any other wholesale buyer, but the FTI product needs to be packed differently than product for other wholesale buyers. The employee spends about 2% of their paid time on FTI sales, which constitute about 0.004% of the farm's total sales, and has volunteered about 200 hours of additional unpaid time to developing the farm to institution market for the farm.

While other farm operations do not track information about transaction costs in a way that allows for this comparison, it is perhaps not difficult to see why 81% of the experienced farm business decision makers interviewed do not see Farm to Institution marketing as a growth area for the farm business operation. When we asked these producers why they did not see this market as an area for growth, the answers all alluded to the transaction costs in the market.

We provide a number of producer comments from our semi-structured interviews that indicate that transaction costs are a barrier to increased sales to institutions:

> -*The wholesale learning curve is way more transparent than the FTI learning curve. Also, the rules for FTI are evolving more quickly, so it isn't like you invest in learning something and then you've invested that time and you move on - instead the needs and rules change as you go. Not sure if it will each some kind of stasis.*
>
> -*In wholesale marketing, the organizational relationship is much stronger than the institutional relationship, but in the institutional market, the relationship with the individual is paramount to getting anything done, even though it is dynamic - if a person [who you are working with at an institution] moves jobs, that may be the end. With institutions, you have to actually go and meet with them.*
>
> -*Won't do [delivery to institutions], or will avoid it if at all possible. Probably less than 1% was direct. For example, one local school wanted deliveries, but we said they need to go through the distributor because it just isn't worth all of the coordination for the volume that they want.*
>
> -*Quantities are too small to make it worth running a truck. Makes no economic sense.*
>
> -*Sold through [online broker to schools] for about 4-5 years, But 2014 was the last year - then they didn't want to work with us because we were too small. [online broker] has decided to focus on working with larger scale wholesale farms.*

-We could have sold through [national distributor who works with food service companies in institutions] but we would have had to increase our Food Safety Liability Insurance to $10 million umbrella. That would have cost $3000 a year, so we avoided it.

-[To increase sales to institutions] you need to incentivize the people who buy. Buyers at schools need to get some kind of incentive - maybe 1% of local foods or something, as a bonus at the end of the year.

-For us to move more of our sales from wholesale to institutions, they would need to increase their prices.

-People who do food service are not accustomed to using whole vegetables, and they have to be willing to deal with the product we sell, to cook it, etc. We haven't made efforts to lightly process product in the way that institutions would need. At the moment we wouldn't take on that kind of processing. It is conceivable that we could sell to a middle man who would then process and move the product to schools. But they would have to make a commitment to organic, or the investment we've made in that wouldn't earn the returns to make it worthwhile.

-What we need is a processor that can make the product into the kind of thing that cafeteria workers like.

In addition, these farms may have better options for growth areas for their businesses. Farms that are near metropolitan areas are investing in farm stands and other direct marketing, like CSAs. Farms farther away from metropolitan areas are interested in moving into wholesale restaurant and retail markets, particularly those that have access to online brokerage platforms. These marketing options have much more clearly defined transaction costs.

With these comments however, it is important to distinguish the uncertainty about the transaction costs in the FTI market and the actual costs themselves. Perhaps with the emergence of online non-profit and for profit brokerages, the uncertainty will be gradually eliminated, and producers will sort themselves into markets with clearly defined costs, including farm to institution markets.

Only two of the thirteen producers interviewed see farm to institution marketing as a growing market for their farm operation. These farm operations had a few characteristics in common - they did not perceive direct marketing as a growing market for their operations, either because they were geographically isolated from densely populated areas or because they felt that the direct to consumer market was saturated where they were located. Unlike most of the producers interviewed, who identified as diversified farm operations, each of these two operations focused on growing a smaller number of crops. Both operations had made large investments in on-farm processing facilities in the last two years, and both farms aggregate and process products from nearby growers to sell to institutions. While the other eleven interviewed producers engaged in on-farm processing, only these two farms served as aggregators, suggesting that the growth opportunity may be in aggregation, rather than a reallocation of product grown on-site from more general wholesale sales or direct sales to farm to institution sales.

These producers, however, had far more differences than similarities. The operation sizes in terms of total dollars sales were on the opposite ends of the ranges of those interviewed. Farm labor expenditures were relatively low for one producer, and relatively high for the other. The farms' locations were very different in terms of access to markets and infrastructure. One farm had significant on-farm infrastructure and the other did not. The producers had very different ratios of expenditures for distribution costs, utilities, insurance costs and other standard farm operation costs.

5.7 Emerging Issues

In addition to addressing social preferences and costs and returns in the FTI market, our semi-structured interviews uncovered some important emerging topics in FTI markets. The first topic is the development of a number of non-profit and for-profit organizations that have developed online ordering platforms that minimize many of the transaction costs associated with producers and buyers interacting in this market. The second topic is the increased chance that producers will be in violation of Federal Department of Labor Wages and Hours regulations as a direct result of new farm activities that producers may engage in to sell to institutional markets, including aggregating product from other producers and processing product. The final topic is the role of engaging in value-added processing for the farm to institution market. Appendices include extension and outreach materials developed as a result of this research to guide producers in their choices regarding two of these issues, and a Case Study to explore the third. To provide useful information to producers and practitioners about the emerging issues uncovered in the interviews with producers, we extended our research.

5.7.1 Online Brokerages

We determined the important characteristics of online brokerage platforms, identified the non-profits that offer these services to producers, constructed an online survey using SurveyMonkey to elicit the relevant information and asked non-profits to fill out the survey. We identified five non -profits in New England that operate as brokers. The role that the brokers played varied. Most brokers required that producers deliver their product to a centralized location, although some would pick product up if the farm was on an established delivery route. Farmers usually set the price they charged brokers for each delivery of product, although it was often noted that the process was generally give and take, and at times prices were set for a portion of a season. The cost structure varied among brokers, with some brokers passing transaction, storage, and delivery costs directly on to buyers, and others charging a flat rate of 10-18%. Notably, most brokers paid producers in full within two weeks, which is an important improvement over the payment terms offered when by institutional purchasers, which can take months to fulfill payment. Finally, the brokers often provided a range of additional services, including:

- Process raw product;
- Refrigerated & Frozen storage;
- Refrigerated trucks;
- Legally own product once it is in possession;
- Label, or require farmers to label, product origin;
- Require farmers to participate in or carry any additional food safety certification s or processes
- Online platform for sales.

5.7.2 Labor Laws and Farm to Institution Innovations

In recent years, a number of producers in New England have been the subjects of Department of Labor Wages and Hours violation investigations for activities like aggregation and on farm processing that are encouraged by FTI advocates, but that result in farm workers' exemption from Fair Labor Standards Act (FLSA). We interviewed three farmers who had been found in violation of labor law, reviewed FLSA and relevant case law, and interviewed a number of labor lawyers with expertise in agricultural labor law. We found that FTI sales may be different than other wholesale sales because institutions may want product that is lightly processed, they may need a volume delivered that is too large for any one farm to fill so that producers work together to aggregate deliveries, or they may be interested in buying from a farm in a neighboring state. Producers that are relatively large and are engaged in any of those activities to satisfy orders from institutional buyers may not be employing workers in "agricultural work" as defined by labor law. If workers are not engaged in agricultural work according to this definition in any given week, then they are not exempt from overtime pay for that week, and failure to pay overtime could result in expensive fines, in addition to providing the affected workers back pay.

More research is needed to understand the scope of impact of labor regulations on the agricultural activities that producers engage in to meet the demands of institutional buyers, as well as on the activities that producers in New England engage in for other markets. A number of producers in New England have been found in violation of labor laws in the last few years, and engaging these producers to research this issue in depth and develop materials to prevent non-compliance is a growing need. Online brokerage platforms, both those run by non-profits and those run by for- profit companies, are a growing trend across the country. In what circumstances might these platforms support producer profitability and in what circumstances they may contribute to a downward pressure on the prices charged by producers who use the platforms? More research is needed into the prices and quantities of products sold by producers and costs and returns to different farm to institution food processing options. Without this information, it will continue to be difficult to determine the profitability of this market for producers.

5.7.3 Value-Added Product Line

We conducted an in-depth interview with a farm that developed a value-added product line for institutional consumers. Reviewing internal production, processing, and sales documents detailing the costs and returns for that product and its role in the farm operation's long term viability, we investigated the convergence of stakeholders and resources that allowed the producer to explore a value-added soup product line. Despite significant community support for the value-added venture, the pilot value -added soup project was not cost-effective, and was not likely to be without significant changes in production costs.

5.8 Conclusions

The project identified a number of critical potential costs and returns for producers in farm to institution marketing in New England, and important new approaches to mitigate those costs. One approach is to leverage new technological resources like online brokerage systems to reduce transaction costs.

Results are also important for practitioners and researchers who have struggled to clearly understand the roll of farm to institution marketing in a sustainable farm business plan. In addition to the valuable responses to questions we asked about marketing, we have identified a number of questions that must be asked in the future, including the role of different market intermediaries and market structures, the role of labor and farm to institution activities, the role of processing, and the role of social preferences in producers choices to sell to these markets.

CHAPTER 6

EQUILIBRIA AND WELFARE IN MARKETS WITH SOCIAL PREFERENCES

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6.1 Introduction

In this paper we introduce a theoretical model of markets for local foods that demonstrates how microeconomic theory can support sound policy decisions when both firm and consumer choices are determined by social preferences, and we apply the model to examine the effectiveness of different policy tools to enhance local food markets in which there may be a trade-off between achieving different local foods systems goals. Supply chains in markets for local foods are commonly referred to as “value chains” (Stevenson and Pirog, 2008). Value chains, in this definition, are supply chains in which both the product and information regarding the product’s pro-social attributes are communicated upstream and downstream along the supply chain, and supply chain actors’ choices in the market are influenced by preferences for pro-social attributes. There are three major challenges to modeling equilibria and welfare in markets comprised of value chains, like local foods: 1) The classical approach to modeling agricultural producer choice in markets for local foods is to treat the producer’s choice as a profit maximizing decision to differentiate product to meet consumer demand for local product attributes, but this objective function ignores the literature on producer profit maximizing market channel choice in local food markets, as well as the literature on producer utility maximizing market channel choice; 2) Either firm or consumer choices can independently be explained by incorporating determinants of social preferences into the relevant objective functions, but prices and quantities are treated as exogenous, so that aggregate supply and demand cannot be derived and used to determine the market price and quantity; 3) Markets for local foods have, until recently, been characterized as "direct" markets in which there are no market intermediaries, but as the market matures, the effect of intermediary supply chain actors that may not be motivated by social preferences must be taken into account.

This paper makes two types of contributions. First, we demonstrate the impact of modeling assumptions on welfare measures in markets that include value chains. To do this, we develop a partial equilibrium model that allows endogenous price and quantity in markets for local foods and that unifies the different perspectives of firms and consumers in markets for local foods. Our model allows identical producers to choose markets while heterogeneous consumers choose products. We then develop a model in which both firm and consumer are heterogeneous in their preferences for pro-social value chain outcomes, expanding the application of social preferences in decision making to firm decision making. Finally, we include the potential for intermediary market power to conduct welfare analysis. The second contribution is to apply this model to test the effectiveness of different policy measures in the specific case of farm to school markets, though the approaches we suggest can be used to model other agricultural markets, as well as non-agricultural markets.

Farm to School (FTS) markets are particularly interesting because both case studies and empirical evidence raise questions regarding the long term viability of the markets, but policy makers continue to support them to achieve childhood health and nutrition objectives. While demand in these markets is growing, it is price constrained (Ralston et al., 2017; Technomics, 2017), and supply to this market is relatively low compared to that of other markets for local food products (NASS, 2016). It is not clear that marketing to FTS channels is a profitable strategy for producers who market local food (Boys and Fraser, 2018; Fitzsimmons and Lass, 2015; Sitaker, et al., 2011), yet empirical evidence suggests that physical proximity to producers who market directly is both statistically and economically important to FTS program implementation (Botkins and Roe, 2018). Finally, while the local foods in general and the FTS market in particular are moving toward more intermediated sales (Richards, et al., 2017; Bloom and Hinrichs, 2011) producer motivation to supply to the market may be driven by non-pecuniary factors (Lehnerd, et al., 2018; Matts et al., 2011) that may not be discoverable or supported in intermediated markets where intermediaries do not transmit market information upstream.

Policy makers have invested in creating demand for Farm to School Programs in which schools purchase “local” foods from producers, but have not made similar investments to ensure producer supply to these programs. This is understandable, considering that previous research does not provide a clear explanation for how producers choose marketing channels for locally differentiated products in intermediated markets. If policy makers want to support FTS programs but do not understand how producers make the choice to sell to this market, it is difficult to design policy intended to encourage participation.

The FTS market for locally differentiated products to schools highlights a number of potential trade-offs that often go unexplored in local foods research but that can be addressed through our approach. In FTS markets, there may be economic trade-offs between increasing the quantity of local foods supplied to schools and total welfare in the partial equilibrium model. As the quantity supplied to the FTS market increases as a result of policy intervention, total economic welfare can decrease due to welfare decreases in the non FTS market. As the FTS market grows, producers and schools increasingly rely on market intermediaries to distribute product. The role of intermediaries in the market, however, is generally overlooked, resulting in the potential to under-estimate the price paid by schools for local product and over-estimate the equilibrium quantity allocated to the market. In addition, subsidies intended to increase the quantity of local foods in FTS programs may improve success if used to support producer supply rather than school demand. The Farm to School case highlights that policy interventions to support social outcomes of local foods systems are sensitive to market factors that are not currently considered by policy makers and FTS advocates, and highlights the need for more rigorous economic theories that can incorporate different dimensions of local foods systems.

6.2 Economic Analysis of Local Food

Economic analysis of “local” food systems has been challenging, in part, because the market definition differs between the demand side and the supply side. While consumers purchase “locally differentiated” products, producers sell “through direct markets”. To the extent that local foods markets have been defined by the direct marketing channel through which they were bought and sold, and the product attributes have been considered verifiable as a result of "knowing" the producer, the modeling distinction has been insignificant. As markets for local food grow, however, and diversify beyond direct-to-consumer channels to include marketing locally differentiated foods through intermediated market channels, the distinction becomes relevant and necessary to effectively analyze market equilibria, policy impacts, and economic welfare.

6.2.1 Consumer Demand for Local Food

The idea that consumers can make purchasing choices to support social causes is not new, and has been applied to consumer choices for food and agricultural products for many decades. Examples include Victory Gardens, health foods, sustainable foods, organic foods, and most recently, local foods (Brown & Jameton, 2000; Pothukuchi & Kaufman, 1999). Economic analysis of consumer demand in markets for these foods generally focuses on understanding the specific food product attributes that consumers bundle into their definitions of these foods (Connolly & Klaiber, 2014; Darby et al., 2008; Lusk and Briggeman, 2009). Economists ask what product attributes, such as food quality, environmental outcomes, health, *et cetera*, motivate consumers to choose and pay a premium for these products over otherwise indistinguishable commodity alternatives. Consumers consistently demonstrate an increased willingness-to-pay for products that are labeled as "local" or are labeled with a specific local or regional brand ("Colorado Grown") and the attributes that are bundled into the implicit concept of local (Darby et al., 2008; Feldmann & Hamm 2015; Fitzsimmons and Cicia, 2018; Loureiro et al., 2002; Martinez, 2010). More recently, economic models of consumer demand have included other-regarding consumer preferences to support local producers (Toler et al.,

2009) or to value local economic impacts and other potential externalities (Winfree and Watson, 2017). The presumption is that producers may then use this information to differentiate their product to meet consumer demand, and capture the relevant premium.

The demand for local foods has extended beyond household consumption, and has a growing presence in public and private institutions like schools, colleges, hospitals and nursing homes (Ralston et al., 2017). We apply the model developed in this paper to the case of Farm to School (FTS) programs, where public K-12 schools procure local foods for sales in cafeterias, so we will explore the demand in the K-12 FTS market in particular.

Like consumers' household demand for local in general, FTS advocates argue that FTS programs create new markets for producers that may bring better profit margins, improve nutrition and health for end consumers, improve connections between producers and community, generate local economic growth, and improve environmental sustainability of the food system (USDA, Food and Nutrition Service, 2016; National Farm to School Network 2016). Demand for local product by FTS programs is intended to support systems change, incorporating different actors with different goals, which the National Farm to School Network summarizes:

> *Farm to school enriches the connection communities have with fresh, healthy food and local food producers by changing food purchasing and education practices at schools and early care and education settings (2018).*

Programs incorporate education around nutrition, food preparation, and production with procurement to support this goal. Agencies, funders, and policies that aim to support FTS goals are generally oriented towards the institutional buyer, not the agricultural producer, and the resulting interventions tend to focus on education and procurement strategies. Nutrition and public health agencies tend to promote education interventions that benefit students' health outcomes (Berezowitz et al., 2015; Lyson, 2016), while producer-oriented organizations and agencies like USDA tend promote interventions that support schools procurement of local foods (Ralston et al., 2017). In general, FTS programs are perceived to be mutually beneficial to both consumers and producers, and, like household consumers of local foods, the potential benefits to local producers, local economic development, and the environment are valued in addition to the perceived benefits from more healthful products and the opportunity to educate youth about food and health (Izumi et al., 2010).

Unlike consumers' household demand for local, however, there are a number of barriers that school food authorities (SFAs) face to procure local food products. SFAs struggle with local food availability, distribution logistics, operating costs, lack of staff training and kitchen equipment to prepare unprocessed products, and ordering and managing financial transactions (Bloom and Hinrichs, 2010; Boys and Fraser, 2017; Fitzsimmons, 2011; Vo and Holcomb, 2011). In the 2015 Farm to School Census, conducted by USDA's Food and Nutrition Service, 75% of respondents that participated in FTS programs reported problems with procurement. In Table 19. "Perceived Local Food Procurement Problems, 2013-2014", we divide the twenty procurement problems identified by Census respondents into five problem categories: Transaction, On-Site, Delivery, Product Availability, and Price. SFAs that participated in FTS were asked what problems they experienced with FTS procurement. The most frequently noted problems include Product Availability and Transaction costs. For example, 66% of respondents that participated in FTS programming reported at least one problem with product availability, and 53% reported at least one transaction problem related to obtaining information, negotiating terms, and monitoring compliance. Of the SFAs that did procure product for FTS programs, 53% that reported at least on transaction problem, and 26% reported that it was “Hard to coordinate procurement of local with regular procurement.”

Policy makers and funders have long recognized that the problems SFAs face in procuring local product are barriers to program implementation, and have increased funding for FTS programs and implemented policies to encourage schools to source regional farm products to help SFAs overcome the barriers (Lyson, 2016). For example, USDA began a $5 million annual FTS grant program in 2012 “to increase local food procurement for school meal programs and expand educational agriculture and gardening activities.” The program was established by the 2010 Healthy, Hunger Free Kids Act (Lyson, 2016; Community Food Systems, 2017). The USDA’s FTS programs are intended to increase procurement of local foods by local schools, primarily by addressing the barriers to participation faced by schools (Ralston, et al., 2017). The grants are limited to “training and technical assistance, planning, purchasing equipment, developing school gardens, developing partnerships, and implementing FTS programs” (USDA, 2016).

Table 19 Perceived Local Food Procurement Problems for FTS Participants

	Specific Problem	*One or more problems*
On-Site		**23%**
Lack of kitchen equipment to process/prepare local foods.	12%	
GAP/ other food safety requirements	12%	
Lack of compliance with your institution's purchasing policies	6%	
Delivery		**24%**
Lack of reliability in delivering ordered items	19%	
Getting on time deliveries	8%	
Quantity delivered equals quantity ordered	8%	
Price		**42%**
Higher prices	38%	
Unstable product prices	15%	
Product Availability		**66%**
Hard to find year-round availability of key items	57%	
Local items not available from primary vendors	27%	
Vendors for local items don't offer a broad range of products	22%	
Lack of availability of processed/precut products	15%	
Getting product delivered that meets your quality requirements & other specs (i.e., size)	15%	
Transaction		**53%**
Local producers aren't bidding	16%	
Hard to coordinate procurement of local with regular procurement	26%	
Hard to find new suppliers/growers or distributors	19%	
Hard to get information about product availability	16%	
Hard to place orders with vendors	6%	
Resolving problem deliveries	4%	
Inability to pay farmers according to farmers' needs due to school district payment procedures	8%	

Number of SFA Respondents that participated in FTS programming, N=4718.
75% of SFAs Reported One or More Problems.

While agricultural producers and producer groups are eligible for funding, less than $300,000 out of the $15 million has been awarded to producers to increase supply during the first three years of the grant's existence (NSAC, 2016), and fewer than 9% of grant applicants and 1% of recipients between 2013 and 2017 were agricultural producers (Food and Nutrition Service, 2017). The USDA FTS grant program is focused on procurement; between 2013 and 2017, 50% of funded projects were awarded directly to schools and school districts, 49% to non-profits, state and local agencies, Indian tribal organizations, and universities and colleges, while 0.008% has been awarded to producers. Thus, it is not surprising that funded proposals supported school food authorities in local food procurement, processing, and preparation activities, as well as agriculture, food, and nutrition-based education and school garden activities, and did not provide significant assistance to producer supply (Food and Nutrition Service, USDA, 2017).

The National Farm to School Network also tracks state-level FTS policy proposals. Similar to the priorities of the USDA grant program, all of the three NFSN legislative categories support demand by increasing 1) education related to food, agriculture, health and nutrition; 2) school gardens; and 3) procurement, or school purchasing, serving and promoting of local foods. An analysis of laws that provided direct financial or program support to serve local foods found that such legislation was associated with higher rates of FTS participation and frequency of serving local food at the state level (McCarthy et al., 2017).[13] The category of procurement includes two

[13] Categories included: Project or pilot program implementation, budget appropriations, grant money allocation, local preference, FTS coordinator, and database (McCarthy et al., 2017).

legislative topics that may indirectly increase market prices, benefiting producers, despite being aimed at schools: 1) increasing reimbursements for local food purchasing (19 proposed bills); and 2) establishing preferential purchasing policies for local food (57 proposed bills) (NFSN, 2016). To our knowledge, no legislation and no federal funding has been proposed to directly support producer participation in FTS markets, although producers have access to many non- FTS specific funding and financing opportunities.

In addition to funding SFAs to mitigate procurement costs at the school level, a proposed solution to reduce the barriers to local foods procurement for FTS programs is to leverage economies of scale in existing "conventional" food distribution supply chains to improve efficiency and move larger volumes of product (Bloom and Hinrichs, 2010; Abatekessa and Peterson, 2011; Conner et al., 2012; Clark and Inwood, 2015; Givens and Dunning, 2018). The conventional wisdom is that distributors have access to more efficient infrastructure, like refrigerated trucks and cold storage, that can reduce marketing costs, and that they have ordering, billing and payment systems that are compatible with SFAs and can reduce transaction costs. Distribution sector cost information is generally proprietary, making it difficult to verify this claim. It is possible that the sector's cost efficiencies are easily transferrable to the FTS supply chain, but it is also possible that distributors face supply chain costs associated with the same challenges that SFAs and producers face. If using the distribution sector does achieve efficiencies that lead to overall cost savings in the supply chain, distributors with market power may retain some portion of the cost savings as rent, limiting the potential increase in quantity supplied. Without explicitly accounting for the role of an intermediary distributor sector in the intermediated FTS market channel, by treating it as “frictionless”, it is difficult to assess the net impact intermediaries may have on the quantity supplied.

6.2.2 Producer Market Choice

Three approaches dominate how producer choices in local foods markets are modeled: 1) profit maximizing sales of a locally-differentiated product, 2) producer profit maximizing choice of market channels, or 3) producer utility maximizing choice of market channels. Local food is modeled as a vertically differentiated good, i.e. we assume that at the same price, all consumers (schools) prefer the local product to the commodity product. Models of firms’ strategic choices to differentiate products as local allow producers or retailers a location-based comparative advantage in cost (Winfree and Watson, 2017) or the capacity to diversify its product bundles by including local products to exploit consumer demand for product bundles that include local foods (Richards, et al., 2017). In these examples, firms offer different quality levels, where more efficient or proximate firms typically supply high-quality product or product bundles, and less-efficient or distant firms supply low-quality product or product bundles. Firms make a choice regarding whether to differentiate products, and aggregate supply is a function of heterogeneity in producers’ efficiencies. Firms’ choices to differentiate products as local are profit maximizing choice. Modeling producers’ choices to differentiate products to meet consumer demand is the standard approach that has been used in the literature.

Modeling producer choice of market channels is preferable to some authors because it is a more accurate reflection of the practical choice that small and medium-sized producers face (Hardesty and Leff, 2010;Kim, Curtis and Yeager, 2014; Leroux et al., 2010; Parks and Lohr, 2008). Models of profit and utility maximizing choice between markets or portfolios of markets implicitly embeds product differentiation within the market channel – products are differentiated as local because they are sold through a venue that is local. In these models, producers choose either to market the product as a commodity through a wholesaler, or directly to the consumer through a direct sub-channel like a CSA, farmers market, or farm stand. The above local foods literature may favor this approach because of its practical application, but also the framing of the decision as market channel choice appears to be, in large part, a legacy of federal policy. The Farmer-To-Consumer Direct Marketing Act Of 1976 was enacted to

> *"…promote…the development and expansion of direct marketing of agricultural commodities from farmers to consumers…" and it directed the USDA Secretary of Agriculture to "…initiate and coordinate a program designed to facilitate direct marketing from farmers to consumers for the mutual benefit of consumers and farmers…"*

While the Act expressly did not limit the definition of direct marketing, the definition that first appeared in the 1978 and 1982 Agricultural Censuses was based on language used in the act, and has, in practice, provided a benchmark for how researchers quantify direct marketing. Producers were asked:

> *"During 1978 did you SELL any crops, livestock, or livestock products DIRECTLY to individuals FOR HUMAN CONSUMPTION - roadside stands, farmers markets, pick your own, etc.?" (Bureau of the Census, 1978)*[14].

[14] USDA NASS took over administration of the Census of Agriculture in 1997, which had previously been administered by the Bureau of the Census.

The result has been that this Census category, with modest variation over subsequent censuses, has served as the sole national data source for agricultural products not marketed as commodities. More recently, the 2015 Local Food Marketing Practices (LFMP) Survey was conducted by USDA's National Agricultural Statistics Service (NASS) to provide data about producers' local food marketing practices. The survey identified four different "direct" marketing channels: "direct to consumer"; "direct to retail"; "direct to institution"; and "direct to intermediate". The survey design is particularly interesting in that the definition of the "direct to intermediate" market channel explicitly identifies locally branded products, while the others do not. Table 20. "Local Food Marketing Practices Survey Channel and Sub-Channel Definitions" provides the market channel definitions used by USDA NASS in the 2015 LFMPS.

Table 20 USDA 2015 Local Food Marketing Practices Survey Channel and Sub-Channel Definitions

Channel	Sub-Channel
CONSUMER	Farmers markets, on-farm stores or farm stands, roadside stands or stores, CSA (Community Supported Agriculture), online marketplaces.
RETAIL	Supermarkets, supercenters, restaurants, caterers, independently owned grocery stores, food cooperatives.
INSTITUTION	K-12 schools, colleges or universities, hospitals, workplace cafeterias, prisons, foodbanks
INTERMEDIATE	Businesses or organizations in the middle of the supply chain marketing locally- and/or regionally-branded products, such as distributers, food hubs, brokers, auction houses, wholesale and terminal markets, and food processors.

Producers may sell the product directly to a consumer, they may brand the product as “local” and sell it to a middle-man, or they may sell the product to a wholesale distributor as an unbranded commodity. In the case where the producer sells the product directly to a consumer, the product is presumed to be “local” by virtue of the lack of middle-men. In retail, institution, and intermediated markets, however, the process of branding the product as local and enforcing the branding through the supply chain so that the value of the local premium is realized at the point of purchase is costly (Hardesty and Leff, 2010; Leroux, et al., 2010). Further, intermediaries within the supply chain are concentrated and have the potential to act as oligopolists and/ or oligopsonists and capture a price premium and lower the price paid to farmers (Hardesty and Leff; 2010; Boys and Fraser, 2017). An additional consideration is that individual or family farm operators may be motivated to make marketing choices that are not solely profit maximizing (Conner et al. 2012; Barrowclaw et al., 2015; Heiss et al, 2014; Lehnerd et al., 2018; Lyson, Gillespie and Hilchey, 1995; Hunt, 2007).

Whether local food marketing is necessarily profitable to producers is inconclusive, particularly as the high cost of labor for direct marketing may offset the available premium for local (Hardesty and Leff, 2010; Lehnerd et l., 2018; Leroux, et al., 2010; Sitaker, et al., 2014). Much of the research on producer profitability has been limited by the lack of available data, and instead relies on region-specific small-sample studies (Fitzsimmons and Lass, 2015; Hardesty and Leff, 2010; Leroux, et al., 2010). The national LFMPS asked producers to identify some channel-specific marketing practices costs and revenues. Unfortunately, the response rates for these questions were too low to provide reliable inference for any given marketing channel, though future research may supplement these data with USDA Economic Research Service Agricultural Resource Management Survey data to find some channel-specific profitability measures. There is limited available research, however, that demonstrates that producers' costs to differentiate the product as local are less than the increased returns from the product differentiation (Fitzsimmons and Lass, 2015; Hardesty and Leff, 2010; Leroux; 2010). The costs of differentiation are inextricably tied to marketing channel choice. Implicitly differentiating products as local by selling at a farm stand, through Community Supported Agriculture (CSA), or at farmers' markets, are costly labor-intensive activities (Boys and Fraser, 2018; Fitzsimmons and Lass, 2015; Hardesty and Leff, 2010; Leroux; 2010). Explicitly differentiating products as local by labeling products, or otherwise transmitting information through an intermediated marketing channel increases variable costs, as well as enforcement costs. Importantly, explicitly differentiating products also involves uncertain downstream negotiation, information, and monitoring costs, or transactions costs, particularly when supply chain intermediaries are not committed to preserving the value of a label along the supply chain (Hobbs, 1997). In the case of FTS markets, SFAs who negotiate food service contracts and make procurement decisions have restricted budgets and may not have the ability to pay for locally differentiated products. Producers face increased transaction costs associated with explicitly differentiating their local product in the Farm to School marketing channel (Boys and Fraser, 2015; Vo and Holcombe; 2010). While other direct marketing practices have shown promise to be profitable in these small-scale studies, the potential profitability of FTS programs is less convincing (Sitaker et al., 2014).

Producers' ability to exercise market power derived from limited competition is another possible source of profitability in direct to consumer markets for locally differentiated food (Hardesty and Leff, 2010). A local product is defined by restricting the distance it has traveled from the producer to the end consumer. This restriction also limits the number of competitive producers that may sell "local" products to any group of consumers, effectively restricting market entry and potentially granting producers oligopoly power in the market for local foods. If direct-to-consumer marketing of locally differentiated food is, in fact, generally profitable for producers, the price-cost margin may be a result of both product differentiation and producers exercising oligopoly power.

If the profitability of direct-to-consumer local foods is partially due to producers exercising oligopoly power, this market power may be countervailed in an intermediated market with a downstream intermediary exercising oligopsony power. In the FTS market channel, producers increasingly sell product to intermediaries (Ralston, et al., 2017), which then sell to schools where product is provided to end consumers. These intermediaries potentially limit producers' abilities to reap benefits from oligopoly power and may subject them to oligopsony power. Market concentration upstream of SFAs validates the possibility that market power may be a factor. In FTS markets, SFAs may contract with food service management companies, who hire management staff and arrange procurement, or they may be self-operated by the authority. School food service management companies comprise about 25% of the food service contracting industry, in which 66% of revenues are accrued by the top four companies in the industry nationwide, indicating the potential for upstream market power (IBISWorld, 2018). While the national concentration of wholesale food distribution companies is lower in general, the broad line food distribution companies that often supply school food services are also concentrated, with the top three companies earning 60% of revenues, suggesting that even self-operated food service management may be subject to market power (Technomics, 2017). Regardless of food service management, upstream market concentration is a reasonable expectation.

Finally, agricultural producers' decisions are not always modeled as profit maximizing decisions. Often, producers' choices are modeled as utility maximizing choices. This modeling choice stems from Lin (1974) who demonstrated that commodity farm operators' choices are best explained in some circumstance as utility-maximizing. Agricultural producers' household income (off-farm employment) and farm operation income are combined in the household budget constraint, and off-farm economic factors influence on-farm economic decisions. The left-hand side of the producers' objective function might be defined as "viability", "survivability" and include off-farm income, for example, or simply be a utility function (Brown and Weber, 2013; Byerlee and Anderson, 1982; Parks and Lohr, 2008; Park, Mishra, Wozniak, 2011; Zuluaf, et al., 2014; UCSC, 2018). In addition, unlike firm operators in general, farm business operations may operate past the point when other firms would exit the industry. Producers may be risk averse, may dislike expending effort to enter new marketing channels, may have off-farm income, and may make decisions based on other non-pecuniary benefits, like preferring self-employment, independence, and the agricultural life-style (Lin, 1974; Low, et al., 2015; Hamilton, 2000; Key and Roberts, 2009). Producers may respond to encouragement or short-term incentives from entities that promote local foods, such as USDA's "Know Your Farmer, Know Your Food" campaign.

Low et al., (2015) suggest producers may enjoy the social aspects of direct-to-consumer marketing, and in some qualitative studies, producers' choices to sell to locally differentiated marketing channels are attributed to producers' personal preferences for the social goals identified with local foods (Lehnerd et al., 2018). Research also suggests producers' choices to sell to FTS are influenced by the outcomes attributed to Farm to School in particular, like educating students about agricultural, supporting health and nutrition outcomes, supporting the regional economy, or contributing to improved environmental outcomes (Batemen, Engel, and Meinen 2014; Heiss et al., 2014; Lehnerd, et al, 2018; Matts, 2011; Matts et al., 2015). Each of these circumstances represent a motivation other than profit maximization that might lead a producer to choose a market for locally differentiated products – personal attributes, encouragement or incentivization by entities with pro-social goals, or the producer's own pro-social goals.

A broad literature demonstrates that consumers regularly make decisions that are motivated by “pro-social behavior” rather than rational and self-regarding behavior (Camerer and Fehr, 2006). An emerging literature further identifies the potential for policy makers to employ non-price incentivization to encourage agricultural producer decision making intended to lead to socially optimal other-regarding outcomes. In these models, producers are utility maximizing, given exogenous cost and returns factors. The main thread of this literature uses insights from behavioral economics to suggest that, like consumer choices, producer choices to address environmental threats by adapting farming practices and/or adopting conservation technologies might be influenced by producers’ beliefs about environmental issues (Menapace, Colson, and Rafaelli, 2015) beliefs about social norms of adoption (Ferraro and Price, 2013; Ferraro, Messer and Wu, 2017), and the influence of social networks (Khanna, Swinton and Messer, 2018).

6.2.3 Producer Choice to Market to Schools

Producers, of course, should sell products to institutional buyers in general, and more specifically, FTS markets, if the markets contribute to farm profitability. Advocates for FTS suggest various reasons that explain why the markets should contribute to farm profitability: FTS markets might provide a premium price for the product, the costs associated with FTS sales may be lower than the price they receive, or producers may be able to achieve efficiencies through sales volume (Painter, 2008; Hardesty and Leff, 2010; Heiss et. al, 2014). FTS markets could reduce risk by diversifying the marketing portfolio or creating a stable future marketing relationship.

Unfortunately, there is little empirical evidence to rely upon to test profitability in this market, as price and quantity data are generally not publicly available. It is unlikely that severely price constrained public schools will be able to pay premium prices for commodities (Technomics, 2017). It is not clear that marketing costs are lower than those in other wholesale markets; in fact, previous research would suggest the opposite ((Boys and Fraser, 2017; Sitaker, et al., 2014). If FTS markets are chosen to primarily minimize risk, producers are unlikely to allocate the bulk of their product to this market.

What is known is that there are very few producers who actually sell directly to any institutional buyer. The 2015 LFMPS results show that the number of respondents selling directly to institutional purchasers was so low that NASS is unable to publish results from this category of sales without risking loss of producer anonymity, and instead combines this category with another (Intermediated Sales) for publication (Barham, Fitzsimmons, & O'Hara, forthcoming). It is not known how many producers sell to schools through intermediated markets.

6.3 Model of Producer Market Channel Choice

The goal of this paper is twofold. We develop a theoretical model of markets for local foods that encompasses value chain characteristics, and we apply the model to examine the effectiveness of different policy tools to enhance local food markets, in which there may be a trade-off between achieving different local foods systems goals. We are particularly interested in policy applications to support markets that may not be profitable to producers, but in which policy makers, advocates, and perhaps some producers, would like to encourage to achieve health and education outcomes. We focus on Farm to School (FTS) markets to demonstrate how subsidies and labeling may impact market outcomes such as quantity supplied and welfare effects when we account for pro-social behavior of both producers and consumers in a competitive market.

Producers who “directly” market local foods choose a marketing portfolio that can consist of just one marketing channel, or many. It can include direct and intermediated marketing channels for local foods and wholesale commodity marketing channels. To simplify and move closer to economic theory that can assist in modeling markets for local foods, we move away from the LFMPS definitions presented above and define two categories of marketing channels, Direct Marketing and Intermediated Marketing, each with a number of sub-channels. The Direct Marketing category includes marketing where the product is sold directly from the producer to an end consumer. Direct marketing sub-channels include farm stands, Community Supported Agriculture (CSAs), and farmers markets. The Intermediated Marketing category includes marketing where the product is sold to one or more “middle-men” between the producer and the end consumer. There can be just one middleman, or multiple middle-men. Intermediated marketing channels with one middleman can include farm sales to restaurants or institutional food service, and farm sales to retailers or grocers. Intermediated marketing sub-channels with multiple middlemen can include farm sales to producer aggregators, regional or broad line distributors, and food processors. These middlemen may then sell to restaurants and institutional food service providers, retailers, and grocers. The distinction between our definition and that of the LFMPS is the relationship between the local product and the direct market. In our definition of direct marketing, locally differentiated products do not need explicit labeling or coding, as the nature of the transaction verifies the product differentiation. Unlike the LFMPS definition, however, we specify that any product that passes through an intermediary requires some kind of labeling or coding to identify the “local” attribute of the product. The two categories that LFMPS categorizes as “direct” but we categorize as “intermediated” are retail and institutional markets in which “Businesses or organizations in the middle of the supply chain (are) marketing locally- and/or regionally-branded products” (NASS, 2015).

We first disentangle the quality of the local food product from the quality of the producer’s marketing practice. Next, we explore the impact of producers’ objective functions, i.e., profit maximization vs. utility maximization (Lin, 1974), on the resulting quantity marketed to FTS. The utility-maximizing framework includes a behavioral model of choice for producers’ marketing decisions applying Mussa and Rosen’s model (1978) of vertically differentiated product quality to the quality of markets. The model allows both consumers and producers to derive utility from perceived benefits of direct markets for local foods, and can be used to evaluate the welfare effects of various policies.

This section is organized in the following way: We begin with a standard model of consumer demand for a product that is viewed by SFAs (consumers) as vertically differentiated given its “local” origin. Then we introduce a simplified model in which producers maximize profit in an intermediated FTS market channel with a frictionless intermediary distributor. The first contribution we make is to modify the producer’s objective function to allow producers to maximize utility in their choice of market channel. We use this utility-maximizing producer model as our “base case” in which the distributor is assumed to be “frictionless”. We then add a distributor and analyze the effect of a distributor with market power and/ or economies of scale. Next we allow the distributor to reduce transaction costs in the market by labeling the product as "local" to consumers and label the market channel as "Farm to School" to producers. We then determine the effects of different "quality" information mechanisms, and the potential for such a distributor to exert market power, which may counteract the intended policy effect. Finally, we explore the effect of subsidies to support school food authority (SFA) procurement and producer marketing in the above cases.

6.3.1 Consumer Demand for Differentiated Local Product

We model consumer demand for locally differentiated food in the FTS market within the structure of Mussa and Rosen (1978) and Pietz (1995). We assume that consumers perceive that the locally differentiated product L is the "high-quality" (κ_L) product, and the wholesale product W is the "low-quality" (κ_W) product so that $\kappa_L > \kappa_W$, according to the literature demonstrating consumers' increased willingness to pay for the credence attribute of locally differentiated products (Darby et al., 2008; Feldmann and Hamm 2015; Fitzsimmons and Cicia, 2018; Loureiro et al., 2002; Martinez, 2010). While consumers perceive a quality difference between locally differentiated products and non-local products, the product's physical attributes are unlikely to be distinguishable from a similar product sourced elsewhere, such as a pepper from Chile. The difference is the information available to the consumer from interactions with producers or labeling regarding the products' origins and consumers' valuation of that origin information (Motta and Sharma, 2016). To simplify, we assume that end-consumer demand (students in schools) are perfectly represented by the SFA's purchasing. That is, we assume that

SFAs have perfect knowledge of the end-consumers' demands for local food in schools, and incur no additional costs to realize that demand.

SFAs have a constant base level of utility ω [15], heterogeneous preferences ψ for product quality κ_L, κ_W, and the population of SFAs is characterized by a uniform distribution of the preference parameter with $\psi \in [0,1]$. SFAs expend effort to procure product, where effort to procure locally differentiated foods (ν_L) is greater than that required to procure wholesale products (ν_W). Effort can be considered as the monetary value of the representative SFA's activities to procure product, including increased operating costs, distribution logistics, and ordering and managing financial transactions (Bloom and Hinrichs, 2010; Boys and Fraser, 2017; Fitzsimmons, 2011; Vo and Holcombe, 2011). In what follows, we assume that ν_L is the additional effort required to procure the local relative to the wholesale product, and thus $\nu_W = 0$ with no loss of generality.

Following Pietz (1995), we identify a numeraire good, $q_0 \geq 1$ with a normalized price $p_0 \equiv 1$, so that the price for product quality and an SFA's operating budget are measured in units of the numeraire. We use an indicator function for product quality, $i \in [L,W]$, to capture the SFA's discrete choice with unit demand $Q_i(q) = \begin{cases} 1 \text{ if } q_L \geq 1, q_L \geq q_W \text{ for W<L, and } q_L > q_W \text{ for W>L} \\ 0 \text{ otherwise} \end{cases}$, so that the function gives a value of 1 to the product quality of the chosen product, $Q_L(q) = 1$, and 0 otherwise. The typical

[15] This base level of utility can also be interpreted as the consumer's reservation price for a good with quality equal to zero (Pietz, 1995).

SFA's direct utility is $U(q_0,\mathbf{q};\psi)=\sum_{i=L,W}(\omega+\psi\kappa_i-\nu_i)Q_i(q)+q_0-(\omega+\psi\kappa_L)$. The SFA with a strength of preference ψ has an operating budget, Ω , which can be expressed as $\Omega=\omega+\psi\kappa_L$, the base level of utility for one unit of the high-quality local product. This suggests that the higher the operating budget, the more strongly an SFA prefers product quality. The operating budget constraint is $pq+q_0\le\Omega$, where the two qualities are available at prices p_L and p_W. We replace the operating budget Ω in the operating budget constraint with the base level of utility for one unit of the high-quality local product, so that $pq+p_0=\omega+\psi\kappa_L$. The indirect utility function is $V(p,\Omega;\psi)=\max_{q_0,q}\{u(q,q_0;\psi)\mid pq+q_0\le\omega+\psi\kappa_L\}$. The consumer decision is then to select the product that provides the highest indirect utility (V) among the three possible options:

$$V=\begin{cases}\omega+\psi\kappa_L-p_L-\nu_L & \text{if the local product is bought}\\ \omega+\psi\kappa_W-p_W & \text{if the wholesale product is bought}\\ \omega & \text{otherwise.}\end{cases}\qquad(12.0)$$

This set-up implies that the market is uncovered, that is, some SFAs with a low enough ψ will not purchase a product. This might be the case where SFAs access free USDA Foods or Department of Defense Fresh foods which can comprise between 15-20% of food served on any given day (USDA FNS, 2016). The consumer indifferent between purchasing the local versus the wholesale product is expressed as

$$\hat{\psi}=\frac{p_L-p_W+\nu_L}{\kappa_L-\kappa_W}.\qquad(12.1):$$

For an indifferent consumer to exist, it must be the case that $\hat{\psi}>0$, which implies that the additional cost of acquiring local product versus wholesale product must be greater than zero, that is that $p_L + v_L > p_W$. The consumer indifferent between purchasing the wholesale product and nothing can be expressed as:

$$\tilde{\psi} = \frac{p_W}{\kappa_W}. \tag{12.2}$$

As the wholesale price p_W increases relative to the quality of the wholesale product κ_W, (6.2) increases, and fewer consumers purchase the wholesale product while more consumers buy nothing. As the wholesale price decreases relative to quality, more consumers purchase the wholesale product and fewer consumers buy nothing. Figure 10 depicts the consumer demand for products of different qualities as a function of consumers' indirect utility curves for each of the two product qualities, and the opt-out. The vertical axis measures consumers' indirect utility, while the horizontal axis allots a uniform distribution of consumers according to their strength of preference for product quality.

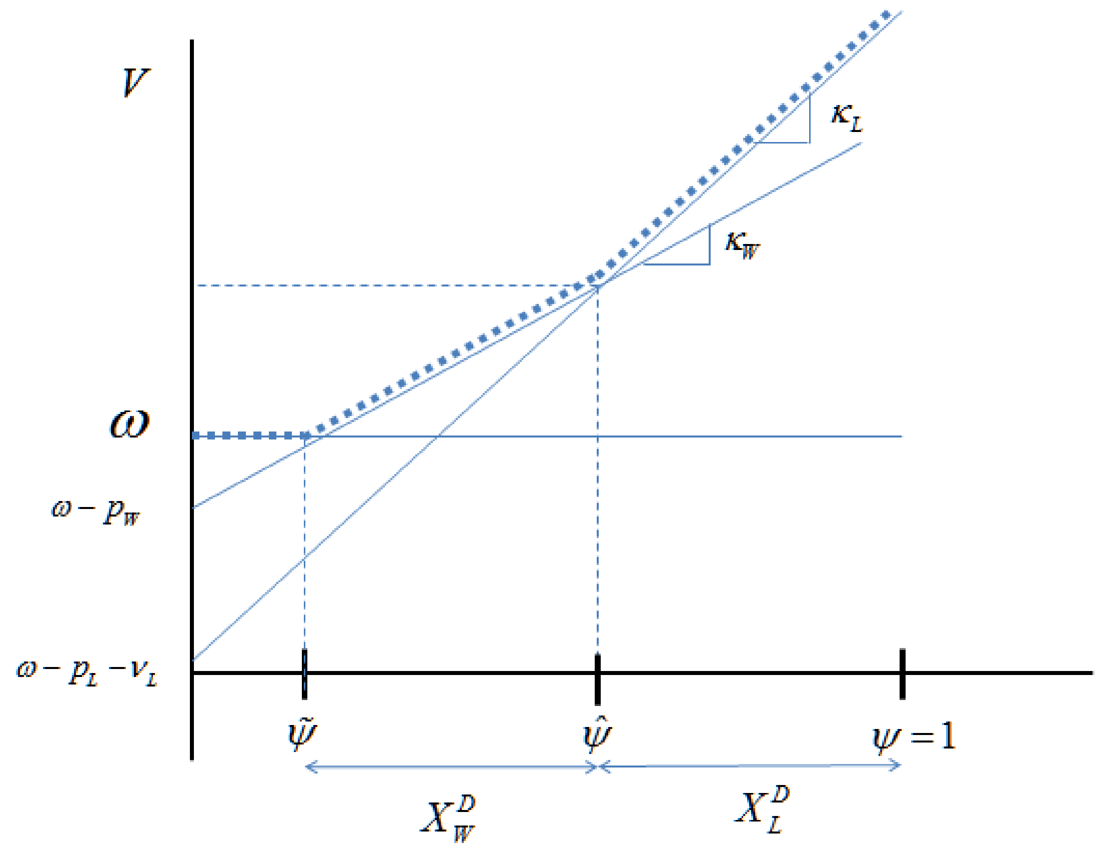

Figure 9 Consumer Indirect Utility from Product Quality

We consider the representative case where $0 < \tilde{\psi} \leq \hat{\psi} \leq 1$. Consumers with $\psi \in [\hat{\psi}, 1]$ buy the high-quality product, $\psi \in [\tilde{\psi}, \hat{\psi}]$ buy the low-quality product, and consumers with $\psi \in [0, \tilde{\psi}]$ buy nothing. To ensure that consumers buy a non-negative quantity of the local product, i.e., $\hat{\psi} \leq 1$, the following condition must hold:

$$(p_L + v_L) - p_W \leq \kappa_L - \kappa_W. \tag{12.3}$$

The value of the difference in quality for the consumer with the highest willingness to pay must be greater than the additional cost of acquiring the local relative to the wholesale product. Severely price constrained SFAs may not have the ability to pay a premium price per unit, but may have the ability to absorb effort costs from procuring local. Equation (6.4) also implies that the sum of effort and price for the local product is indexed to the wholesale price.

A non-negative quantity of the wholesale product will be purchased if $\tilde{\psi} \leq \hat{\psi}$, thus

$$\frac{\kappa_W}{\kappa_L} > \frac{p_W}{\left(p_L + \nu_L\right)}, \tag{12.4}$$

so that the quality ratio of the wholesale relative to the local product should be greater than the cost of using the wholesale relative to the local product. Finally, the condition for some consumers to choose to buy neither the local nor the wholesale product, that is, $0 < \tilde{\psi}$, necessarily holds given that p_W and κ_W \ are assumed to be positive.

For a population of M consumers, the aggregate demand functions in the FTS market are:

$$X_L^D = M\left[1 - \hat{\psi}\right] = M\left[1 - \frac{p_L - p_W + \nu_L}{\kappa_L - \kappa_W}\right], \tag{12.5}$$

$$X_W^D = M\left[\hat{\psi} - \tilde{\psi}\right] = M\left[\frac{p_L - p_W + \nu_L}{\kappa_L - \kappa_W} - \frac{p_W}{\kappa_W}\right], \tag{12.6}$$

for the local product and the wholesale product respectively. The inverse demand functions are

$$p_L\left(X_L^D, X_W^D\right) = \kappa_L - \nu_L - \frac{\kappa_W X_W^D}{M} - \frac{\kappa_L X_L^D}{M}, \tag{12.7}$$

and

$$p_W\left(X_L^D, X_W^D\right) = \kappa_W\left[1 - \frac{X_W^D}{M} - \frac{X_L^D}{M}\right], \tag{12.8}$$

in the wholesale market.

Finally, we provide expressions to show the relationship between the fixed wholesale price, $\tilde{p}_W$ and the local product price p_L. We first solve (6.7) for $p_L\left(X_L^D\right)$ to obtain

$$p_L\left(X_L^D\right) = \tilde{p}_W - \nu_L + \left(\kappa_L - \kappa_W\right)\left[1 - \frac{X_L^D}{M}\right], \tag{12.9}$$

and (6.8) for $p_W\left(X_W^D\right)$ to obtain

$$p_W\left(X_W^D\right) = \frac{\kappa_W\left(\tilde{p}_W + \nu_L\right)}{\kappa_L} - \frac{X_W^D \kappa_W\left(\kappa_L - \kappa_W\right)}{M\kappa_L}. \tag{12.10}$$

6.3.2 Producer Supply

The producer supply model builds upon the profit-maximizing market channel choice literature, as in Leroux (2010) and Kim, Curtis and Yeager (2014), but diverges from the profit-maximizing producer choice to differentiate local product (Winfree and Watson, 2017). The typical producer's objective function is to maximize net income (*NI*) over the life of the farm operation for years $h = 1,\ldots,H$, by choosing a portfolio of market channels that may include up to five mutually exclusive channels l in a given year. The five channel categories are chosen based on the market channel costs and returns, with the intention of grouping channels with similar costs structures together. Four channels $l = d, s, h, r$ represent categories similar to those in the Local Food Marketing Practices

Survey (LFMPS). The four categories represent locally branded products sold; direct to consumer, $1=d$; through intermediated channels such as schools and institutions $2=s$; through distributors or food hubs, $3=h$; or through retailers $4=r$. The final market channel $5=u$ represents the traditional intermediated wholesale market channel for products not branded as local, in which the end buyer is not known to be a school food authority.

$$\max NI_{hl} = \sum_{h=1}^{H}\sum_{l=1}^{5}\pi_{hl}. \tag{12.11}$$

As in the LFMPS, each market channel may include several sub-channels, so that market channel, d, for example, may represent any combination of farm stands, farmers markets, or CSAs.

Note that (6.11) allows flexibility in the definition of both net income from any particular marketing channel and the relationships across marketing channels. It would be straightforward to introduce any number of modifications to this model to account for the many factors that influence an agricultural producers' net income. For example, expected profits or expected net present value of profits (Byerlee and Anderson, 1982; Kim, Curtis, and Yeager, 2014; Marra, 2002) off-farm income, crop insurance, risk aversion, portfolio diversification (Izumi, Wright and Hamm, 2010; Park and Lohr, 2008; Park, Mishra, Wozniak, 2011), cross-market branding effects[16] (Izumi, Wright and Hamm, 2010) would all be simple modifications to the LHS of (6.11). The model presented ignores those modeling possibilities in favor of modeling the parameter of interest, producers'

[16] Some FTS advocates suggest that selling to schools is a branding tool to market the local farm to parents.

strength of preference for social outcomes from local food marketing channels. In addition, a key feature of (6.11) is the ability for producers to earn negative net income in any given year through any given marketing channel, but to remain viable they must earn non-negative profits over the life of the farm operation.

6.3.2.1 Producer Supply: Profit Maximizing Producer

In applications of the canonical Mussa and Rosen (1978) model to markets with differentiated products, producer supply results from competition among heterogeneous firms that vary in production efficiency (Plastina, Giannakas, and Pick 2011; Joseph, Lavoie, and Caswell, 2014). Recall that models of firms' strategic choices in markets for local foods allow firms to choose to differentiate product or product bundle as "local" Winfree and Watson, 2017; Richards, et al., 2017). These models stand in contrast to literature that examines producer's choice of market channel, in which producers choose a market channel or portfolio of market channels to maximizing profit or utility and prices are exogenous (Hardesty and Leff, 2010;Kim, Curtis and Yeager, 2014; Leroux et al., 2010; Parks and Lohr, 2008; Brown and Weber, 2013; Byerlee and Anderson, 1982; Parks and Lohr, 2008; Park, Mishra, Wozniak, 2011; Zuluaf, et al., 2014).

To demonstrate the contrast between the profit-maximizing and utility-maximizing producer choice to sell to a local foods market channel that we present in this paper, we first frame the producer's objective function as a profit-maximizing choice. We simplify the objective function (6.11) above by limiting the typical producers' profit maximizing choice between selling to one of two intermediated marketing channels, $l = s,u$, in a given year, where s is FTS sales and u is sales to an NS (Not School) buyer.

One channel delivers the product to students through school meals; the other to the NS consumer. A strictly profit maximizing producer will choose to sell the unit of product to the most profitable channel, so that (6.11) becomes

$$\max NI_l = \begin{cases} \pi_s & \text{if } \pi_s > \pi_u \\ \pi_u & \text{if } \pi_u > \pi_s \end{cases}. \tag{12.12}$$

To begin, under assumptions of profit maximization in perfect competition, the producer sells the product to a frictionless distributor which then sells the product to an end buyer in either the FTS or NS market channel. A typical producer's profit in market l is revenues from sales minus variable and fixed costs. Both variable and fixed costs have three components: production, marketing, and transaction costs (Hardesty and Leff, 2010; Hobbs, 1997). We assume producers are homogenous in production (that is, all producers face the same production costs and do not vary in expertise or efficiency). The profit π_l of a typical producer in market channel l is given by:

$$\pi_l = p_l q_l - (c + \gamma_l + \tau_l) q_l - (FC + m_l + t_l) , \tag{12.13}$$

where p_l and q_l are the market price and quantity sold in market l, c, and FC are the constant marginal and fixed costs of production, which do not vary across market channels chosen; γ_l and m_l are the constant marginal and fixed marketing costs, which may vary across marketing channels; and τ_l and t_l are the constant marginal and fixed transaction costs to ensure delivery to each end buyer, which may also vary across marketing channels. In the FTS market, producers incur additional variable and fixed transaction costs τ_s, t_s to obtain information regarding distribution and terms of sales to SFAs as end buyers, negotiate ordering and payment terms and conditions, and monitor contracts (Boys and Fraser, 2017; Fitzsimmons and Lass, 2015; Matts et al., 2015). Without loss of generality, we assume that variable and fixed transaction costs in the "Not FTS" (NS) marketing channel are equal to zero, $\tau_u, t_u = 0$ while transaction costs in the FTS market are greater than zero, $\tau_s, t_s > 0$. Marketing costs include packaging, storing, and transporting products to the wholesaler. Without loss of generality, we also assume that fixed marketing costs in the NS marketing channel and fixed marketing costs in the FTS marketing channel are equal to zero $m_u, m_s = 0$, while variable marketing costs in the FTS marketing channel are greater than in the NS market $\gamma_s > \gamma_u$. Note that only the producers' cost of marketing product to a distributor enters the producer's profit function. In practice, a distributor will incur additional marketing costs, which are not accounted for when the distributor is "frictionless".

We normalize quantity to 1 and find a typical producer's profit in the FTS market *s*

$$\pi_s = \tilde{p} - (c + \tau_s + \gamma_s) - FC - t_s, \tag{12.14}$$

while a typical producer's profit in the NS market *u* is

$$\pi_u = \tilde{p} - c - \gamma_u - FC. \tag{12.15}$$

Price in the FTS and Not FTS market, $\tilde{p}$, are the same. While consumers have an increased willingness to pay a premium for locally versus non-locally differentiated products, producers supply a homogeneous product sold through the distributor, which does not label the products as local versus non-local. Instead, producers must incur transaction costs to guarantee that supply is delivered to the FTS market, as in (6.14), and SFAs incur effort costs to obtain the high-quality local product (12.0) . Given that a producer selling to FTS will incur additional variable transaction costs and will gain no monetary benefit from sales to schools, a profit-maximizing producer will choose to sell to the NS marketing channel, all else equal, and no product will be sold to the FTS marketing channel.

Alternatively, we may allow price to be endogenously determined as a function of consumer demand and producer supply, while the price of the good received from the Not FTS is a constant determined in a separate perfectly competitive market. Because producers are homogeneous, a typical producer's profit function in a given market will mirror those equations (6.14) and (6.15), so that FTS market profit is

$$\pi_s = p_s - (c + \tau_s + \gamma_s) - FC - t_s \quad , \qquad (12.16)$$

And NS profit is

$$\pi_u = p_u - c - \gamma_u - FC \quad , \qquad (12.17)$$

so that a producer will be indifferent between selling to the FTS market channel and the NS channel when $\pi_s = \pi_u$, or when the premium from the FTS channel exactly covers the additional costs of selling through that channel, i.e., $p_s - p_u = \tau_s + t_s + \gamma_s - \gamma_u$. When $p_s - p_u \geq \tau_s + t_s + \gamma_s - \gamma_u$, the difference between the SFA price and the NS market price is greater than the additional costs of selling to the FTS market, and all producers will supply to the FTS market. Assuming a population of N producers, $X_s^S = N$. When $p_s - p_u < \tau_s + t_s + \gamma_s - \gamma_u$, the premium is less than the additional cost of selling to the FTS market, and no producers will supply to the FTS market, so that $X_s^S = 0$, which is a plausible outcome given that SFAs are significantly price constrained (Izumi, Wright and Hamm, 2010; Motta and Sharma, 2016: IBISWorld, 2018).

6.3.2.2 Producer Supply: Utility-Maximizing Producer

While producer choice in markets for local foods is typically modeled as a profit maximizing choice to differentiate products or product bundles, the literature on how producers choose market channels when selling locally differentiated products does not model supply decisions in this way. Instead, producer choice of market channel is modeled as either a profit-maximizing (Park and Lohr, 2006; LeRoux, et al., 2010) or a utility-maximizing (Park, 2009) choice of market channel portfolios. In these models, the dependent variable is the choice of market channel portfolio, where market channel prices are exogenous. Aggregate supply functions are not obtained from these models, thus welfare effects of policy interventions are also not obtained.

Neither cost efficiencies nor portfolio choice models allow observed heterogeneity in producer motivations to supply to high-quality markets for local food for the purpose of contributing to social goals. Like incentivizing producer choice to implement on-farm environmental conservation techniques to achieve environmental goals (Khanna, Swinton, and Messer, 2018), a key insight to increasing supply of local foods to FTS markets may be to incentivize producer choice to market to SFAs, particularly given the evidence that such sales may satisfy producers' preferences for social goals to support the health and education of children in the producers' community (Izumi, Wright and Hamm, 2010; Lehnerd, et al., 2018).

To address this gap, we model the typical producer's choice between two vertically differentiated marketing channels, where, from the producers' point of view, the quality of the FTS marketing channel is assumed to be higher than that of the non-school marketing channel in which the end buyer is unknown, all else equal. This utility-maximizing model follows from both the literature reviewed above suggesting that agricultural producers are unique firms that consider non-pecuniary factors in their firm decision making, as well as from the growing literature suggesting that producers in FTS markets in particular are motivated by social considerations to supply to the FTS market. A typical producer's utility from choice of marketing channel is a function of profits earned in the marketing channels plus the strength of preference producers have for the "quality" of the marketing channel, as has been suggested by Barrowclough and Boys, (2017); Boys and Fraser (2017); Heiss et al., 2013; Matts et al. (2015), Lehnerd et al.(2018), Fitzsimmons and Lass (2015).

We model producer supply to a farm-to-school market channel within the consumer demand structure of Mussa and Rosen (1978)[17]. Market channels are vertically differentiated, and producers sell to one market channel, where the FTS market channel s is assumed to be the "high-quality" channel (k_s) in which food is delivered to school cafeterias, and the Not FTS market channel u is the "low-quality" market channel (k_u) in which the end-buyer is unknown, where $k_s > k_u$.

Producers have heterogeneous preferences (θ) for market channel quality, and the population of producers is characterized by a uniform distribution function of this

[17] In the Mussa and Rosen (1978) model, consumers are assumed to be heterogeneous on their willingness to pay for quality. We adapt this model to heterogeneous producers with respect to preferences for market channels with different perceived qualities.

preference parameter with $\theta \in [0,1]$. A typical producer's indirect utility is equal to the profit from the chosen market channel plus the strength of preference for quality θ for the market channel quality k_l.

$$W = \begin{cases} \pi_s + \theta k_s & \text{FTS market channel is chosen} \\ \pi_u + \theta k_u & \text{NS market channel is chosen.} \end{cases}, \tag{12.18}$$

where π_s and π_u are the profit from selling to the FTS and NS markets respectively and are given in equations (6.14) and (6.15) respectively. Because we assume a covered market, profit for the NS market channel is implied to be positive.

If $\pi_s > \pi_u$, or the price premium $(p_s - p_u)$ more than covers the additional cost of selling to the FTS market $(\tau_s + t_s + \gamma_s)$,all producers will choose to sell to this market, and the outcome of the utility-maximizing model is the same as that of profit maximization. However, if $\pi_u > \pi_s > 0$, due to higher transaction costs in the FTS market, then the producer's decision is to select the market channel that provides the highest indirect utility (W) among the possible options. The producer indifferent between selling to the FTS market channel and the market channel with the not FTS buyers is expressed as

$$\hat{\theta} = \frac{\pi_u - \pi_s}{k_s - k_u}. \tag{12.19}$$

Substituting (6.14) and (6.15) into (6.19), the indifferent producer can be expressed as:

$$\hat{\theta} = \frac{p_u - p_s + \tau_s + t_s + \gamma_s - \gamma_u}{(k_s - k_u)}. \tag{12.20}$$

The indifferent producer must satisfy $0 \le \hat{\theta} \le 1$. In the profit maximizing models presented above where $\pi_s > \pi_u$, all product will be supplied to the FTS market, but when $\pi_s < \pi_u$, all product will be supplied to the NS. In contrast, (6.20), implies that $p_u > p_s - \tau_s - t_s - \gamma_s - \gamma_u$, $\hat{\theta} > 0$ must hold for both the FTS and NS markets to be served[18]. When $\hat{\theta} \le 0$, only the FTS market is served because the profit from that market to the producer that does not value market quality (maximizes profit rather than utility) is positive. Unlike the profit maximization model where the aggregate supply to the FTS market is zero unless the price premium covers the cost of marketing, the utility maximization model allows a positive aggregate quantity to the FTS market when the premium does not cover costs. Since net income is realized over the life of the farm operation, producers absorb economic loss to sell to the high-quality market in any given year.

Producers with $\theta \in (\hat{\theta},1]$ will sell to the high-quality channel (FTS), producers with $\theta \in [0,\hat{\theta}]$ will sell to the low-quality channel. For, $\hat{\theta} \le 1$, the following condition must hold: $p_u - p_s + \tau_s + t_s + \gamma_s - \gamma_u \le k_s - k_u$, that is, the difference in profit between the two market channels must be smaller or equal to the value of the quality difference between the two marketing channels according to the producer with the highest preference for quality. When $\hat{\theta} > 1$, the additional profit from the NS market is greater than the additional value of the FTS market quality, and only the NS market is served. To ensure that the market is covered, utility must be greater than zero $\pi_u + \theta k_u \ge 0$, when $\tilde{\theta} = 0$, so that $\pi_u \ge 0$. Figure 11 depicts the producer supply to markets with different qualities as a function of

18 We ignore the extreme cases where $\hat{\theta} > 1, \hat{\theta} < 0$.

producers' indirect utility curves for each of the two market qualities. The vertical axis measures producers' indirect utility, while the horizontal axis allots a uniform distribution of producers according to their strength of preference for market quality.

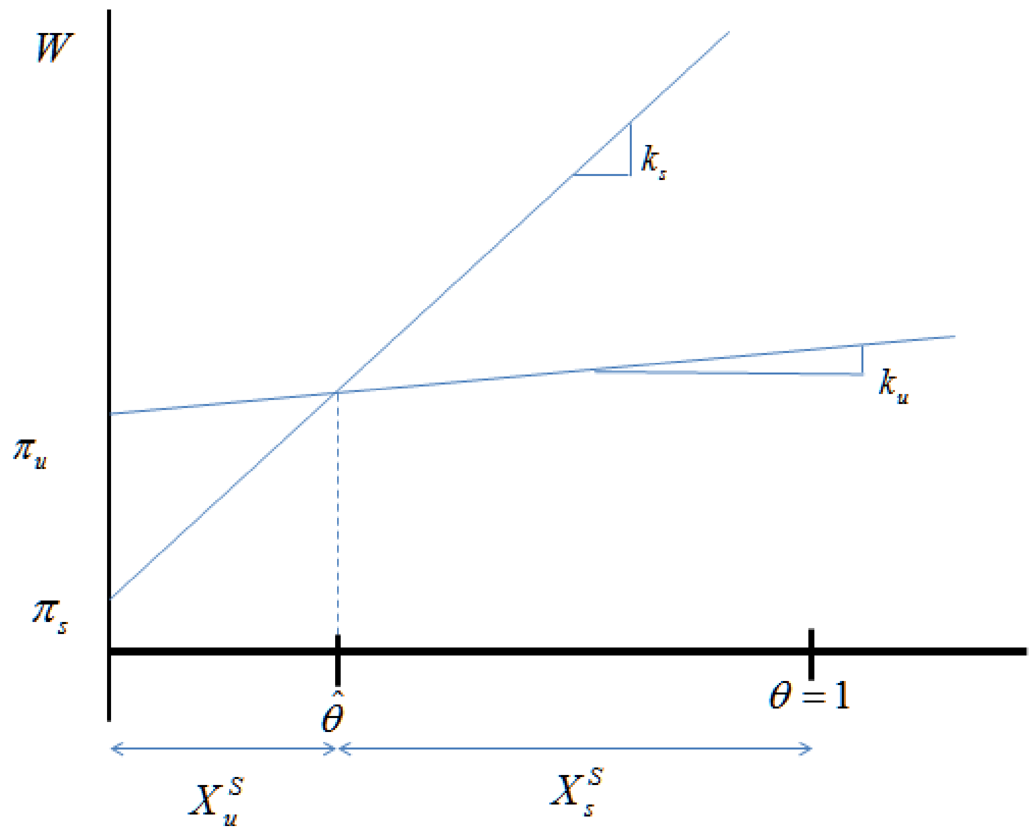

Figure 10 Producer Indirect Utility from Markets Quality

Given a population of N producers, market channel supply is obtained by integrating the unit supply of each producer given the distribution of producer types. Given the uniform distribution assumption, the aggregate market supply function for the FTS market channel is $X_s^S = N[1-\hat{\theta}]$ so that

$$X_s^S = N[1-\hat{\theta}] = N\left[1 - \frac{p_u - p_s + \tau_s + t_s + \gamma_s - \gamma_u}{(k_s - k_u)}\right]. \tag{12.21}$$

We further assume that the quality of the NS marketing channel is $k_u = \vartheta k_s$ where $\vartheta \leq 1$. We name the difference between variable marketing costs in the FTS and NS markets as $\gamma_s - \gamma_u = \Delta\gamma$. In a covered market, we are unable to find the inverse supply functions, however, with a fixed price in the NS market, $\tilde{p}_u$, we can express the price for product sold in the FTS market as a function of aggregate supply,

$$X_u^S = N\hat{\theta} = N\left[\frac{p_u - p_s + \tau_s + t_s + \Delta\gamma}{k_s(1-\vartheta)}\right]. \qquad (12.22)$$

Note that as the difference in market quality increases, the quantity supplied to the FTS market increases and the quantity supplied to the NS market decreases.

The utility maximizing choice between the high and low quality market provides a model of producer choice of marketing channel in local foods markets that is consistent with the literature on producer choice in local foods and FTS markets, and that allows price to be endogenous.

6.3.3 Market Equilibrium

To find the market equilibrium we equate food service consumers' demand for locally differentiated products (6.5) and producers' supply to FTS market channels (6.21)

$$X_L^D = M\left[1 - \frac{p_L - \tilde{p}_W + \nu_L}{\kappa_L - \kappa_W}\right] = N\left[1 - \frac{\tilde{p}_u - p_s + \tau_s + t_s + \Delta\gamma}{k_s - k_u}\right] = X_s^S, \qquad (12.23)$$

Recall that we assume that SFAs perfectly represent end consumer demand. We assume that the market price paid by food service consumers is equal to that received by producers, $p_s = p_L$. Note that we do not assume that the product supplied to the NS market is the wholesale product purchased by the SFA. Instead we assume that the wholesale market for commodity products and the NS market are unrelated and are much larger than the market for local products, so that producers and SFA cannot affect the price in these markets. Thus, $\tilde{p}_u$ and $\tilde{p}_W$ are constant and are not provided any a priori relationship. We further simplify by expressing difference in market qualities as $\Delta\kappa = (\kappa_L - \kappa_W)$ and product qualities as $\Delta k = k_s - k_u$. The equilibrium price is

$$p_L^* = p_s^* = \frac{M\Delta k\left(\Delta\kappa + \tilde{p}_W - \nu_L\right) + N\Delta\kappa\left(\tilde{p}_u + \tau_s + t_s + \Delta\gamma - \Delta k\right)}{N\Delta\kappa + M\Delta k}, \tag{12.24}$$

The equilibrium market quantity is

$$X_L^D\left(p_s^*\right) = X_s^S\left(p_s^*\right) = \frac{MN\left[\Delta\kappa + \Delta k + \tilde{p}_W - \nu_L - \tilde{p}_u - \tau_s - t_s - \Delta\gamma\right]}{N\Delta\kappa + M\Delta k}\ . \tag{12.25}$$

If the equilibrium price increases to a point where $\tilde{\psi} > \hat{\psi}$, then there are no consumer willing to buy local product. Note that the equilibrium quantity of local increases as market quality difference $\Delta k = k_s\left(1-\vartheta\right)$, and/ or product quality difference $\Delta\kappa = \left(\kappa_L - \kappa_W\right)$ increase. To ensure a positive quantity of product to FTS programs $X\left(p_L^*\right) > 0$, it must be the case that

$$\left(\kappa_L - \kappa_W - \nu_L\right) + \left(k_s\left(1-\vartheta\right) - \tau_s - t_s - \Delta\gamma\right) > \tilde{p}_u - \tilde{p}_W. \tag{12.26}$$

That is, the net value of the local product to the buyer and the FTS market to the seller is higher than the alternative. We can rearrange (6.26) to offer an additional interpretation comparing consumer valuation of the product versus producer valuation of the market. The difference between the total value of the local product to the consumer (that value of the product less the cost of effort to procure the product) and the total value of the wholesale product, $\kappa_L - \nu_L + \tilde{p}_W - \kappa_W > \tilde{p}_u + \tau_s + t_s + \Delta\gamma - k_s(1-\vartheta)$, must exceed the difference between the total value of the FTS and NS market to the producer. In the utility maximizing model, market specific fixed costs t_s continue to influence the producer's market channel choice.

As long as condition (6.26) holds, the model of utility maximizing producers allows the market to allocate a positive quantity of product to the FTS market for local product in equilibrium. Note that this is a different result from the profit maximizing model, in which either all product was allocated to this market, or none of the product was allocated to this market. Our results reflect the findings of the social sciences literature and empirical observations that some proportion of producer will supply to this market, though it is unlikely to be profitable to be the profit maximizing choice of market.

Substituting the equilibrium price p_L^* into equation 0.17, we find the equilibrium aggregate quantity of wholesale product demanded by SFAs

$$X_W^D = M\left[\frac{M\Delta k(\kappa_w - \tilde{p}_w) + N\left(\kappa_W\left(\nu_L + \tilde{p}_u + \tau_s + t_s + \Delta\gamma - \Delta k\right) - \tilde{p}_W\kappa_L\right)}{\kappa_w\left[N\Delta\kappa + M\Delta k\right]}\right]. \quad (12.27)$$

For the equilibrium quantity of wholesale product bought by SFAs to be greater than or equal to zero, it must be the case that

$$M\Delta k(\kappa_w - \tilde{p}_w) + N\left(\kappa_W\left(\nu_L + \tilde{p}_u + \tau_s + t_s + \Delta\gamma - \Delta k\right) - \tilde{p}_W\kappa_L\right) \geq 0 \ . \quad (12.28)$$

The first term of (6.29) can be interpreted as the consumer residual value of the wholesale product $(\kappa_w - \tilde{p}_w)$ weighted by the total number of SFAs and market quality that producers face. Recall that from (6.02) that the SFA that is indifferent between buying the wholesale product or not buying any product is $\tilde{\psi} = \frac{\tilde{p}_W}{\kappa_W}$. For any product (local or wholesale) to be demanded, the value of $\tilde{\psi} < 1$, so that $\kappa_W > p_W$, indicating that the residual value of the wholesale product must be greater than one. Wholesale quantity increases as the costs specific to the FTS market for local foods and the price paid to producers in the NS market increase, and decreases as wholesale price increases.

Substituting the equilibrium price p_L^* into (6.23), we find the equilibrium aggregate quantity of product supply by producers to the NS market

$$X_u^s = N\left[\frac{N\Delta\kappa + M\left(\nu_L + \tilde{p}_u + \tau_s + t_s + \Delta\gamma - \Delta\kappa - \tilde{p}_W\right)}{N\Delta\kappa + M\Delta k}\right]. \tag{12.29}$$

The equilibrium quantity to the NS market decreases as product quality difference and market quality difference increases. Quantity supplied to the NS market increases as the costs in the alternative market increase, and decreases as the price paid for the wholesale product increases. Rewriting the numerator inside the brackets of (6.29) as $\Delta\kappa\left(N - M\right) + M\left(\nu_L + \tilde{p}_u + \tau_s + t_s + \Delta\gamma - \tilde{p}_W\right)$, we can see that quantity supplied to the NS market is sensitive to the relative number of producers and SFAs in the market.

When the number of producers is equal to or greater than the number of SFAs $N \geq M$, increases in product quality difference increase producer surplus from sales to the NS market. When the number of SFAs is greater than the number of producers $M > N$, the product quality difference decreases producer surplus from the NS market. This is expected, as fewer producers would indicate a restricted supply to the FTS market, so that as the quality of the local product increases relative to the commodity product, more

SFAs buy local from producers, so that producers sell fewer units to the NS market. For the quantity supplied to the NS market to be greater than or equal to zero, it must be the case that

$$N\Delta\kappa + M\left(\nu_L + \tau_s + t_s + \Delta\gamma - \Delta\kappa + \tilde{p}_u - \tilde{p}_W\right) \geq 0 \,. \tag{12.30}$$

The common denominator $N\Delta\kappa + M\Delta k$ is the sum of product quality difference weighted by the number of producers and market quality difference weighted by the number of SFAs.

Subtracting the quantity purchased in the wholesale market (6.27) from the quantity sold to the NS market (6.29) , we find that

$$X_u^S - X_W^D = N + \frac{M\left[\left(\kappa_W - \tilde{p}_W\right)\left(N\kappa_W - M\Delta k\right) - N\kappa_L\tilde{p}_W\right]}{\kappa_W\left(N\Delta\kappa + M\Delta k\right)} \,. \tag{12.31}$$

We call $M\left(\kappa_W - \tilde{p}_W\right)$ the aggregate residual value of wholesale, which is weighted by $\left(N\kappa_W - M\Delta k\right)$. If the difference between this term and $MN\kappa_L\tilde{p}_W$ is positive, then the quantity that producers supply to the NS market is greater than the quantity of wholesale product purchased by SFAs. If this term is negative and greater than the number of producers in the market, N , then it will be the reverse. This might be the case, for example, if the number of SFAs is larger than the ratio of quality of the wholesale product to the difference in the market qualities weighted by the number of producers, $M > \frac{N\kappa_W}{\Delta k}$, given that $\kappa_W - p_W > 0$. If $N = M$, for example, then the quantity of wholesale product demanded would exceed that of quantity supplied to the NS market if the quality of the wholesale product is less than the quality difference between the FTS and NS markets.

The residual value to the buyer from purchasing the wholesale product is $\kappa_W - \tilde{p}_W$; $\kappa_L - \nu_L$ is the residual value to the buyer from buying the locally differentiated product; $k_s - \tau_s - t_s - \Delta\gamma$ is the residual value to the producer from selling the product to the differentiated FTS market; and $\tilde{p}_u + \vartheta k_s$ is the residual value to the producer from selling the product to the NS market. Restating

$$\kappa_L - \nu_L + k_s - \tau_s - t_s - \Delta\gamma > \tilde{p}_u + \vartheta k_s + \kappa_W - \tilde{p}_W, \tag{12.32}$$

we see that the total residual value for the FTS market is the sum of producer and consumer residual values from selling and buying in the market, which must be greater than the difference between the producers' residual value of selling to an Not FTS and the buyers' residual value of buying undifferentiated local products.

Next we take equation (6.24) and ensure that the equilibrium market price is positive, $p_s^* > 0$, providing $M\Delta k\left(\Delta\kappa + \tilde{p}_W - \nu_L\right) > -N\Delta\kappa\left(\tilde{p}_u + \tau_s + t_s + \Delta\gamma - \Delta k\right)$. Rearranging, we find $\frac{\Delta\kappa + \tilde{p}_W - \nu_L}{\Delta k + \tilde{p}_u - \tau_s - t_s - \Delta\gamma} > \frac{N\Delta\kappa}{M\Delta k}$. The RHS numerator is the product quality difference weighted by the number of producers, and the denominator is the market quality difference weighted by the number of SFAs. For the equilibrium price to be positive, the ratio of weighted product and market quality difference must be less than the ratio of the residual value of the local product to the consumer to the residual value of the FTS market to the seller, relative to the alternative.

6.3.4 Welfare

To capture Total Welfare, we add the sum of Consumer and Producer Surplus in the FTS market for local foods to the sum of Consumer and Producer Surplus in the wholesale market for SFAs and the NS market for producers, calculated from supply and demand curves in each market $TW^0 = TS_L^0 + PS_u^0 + CS_W^0$. Total surplus from local is the sum of consumer and producer surplus in the FTS market, $TS_L^0 = CS_L^0 + PS_L^0$, where consumer surplus from local food is $CS_L^0 = \frac{M\Delta\kappa}{2}\left[\frac{N\left[\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma + \tilde{p}_W - \tilde{p}_u\right]}{\left(N\Delta\kappa + M\Delta k\right)}\right]^2$, and producer surplus in the FTS market is $PS_L^0 = \frac{N\Delta k}{2}\left[\frac{M\left[\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma + \tilde{p}_W - \tilde{p}_u\right]}{N\Delta\kappa + M\Delta k}\right]^2$.

Total Surplus from the FTS market for local foods is obtained by taking the sum of the producer and consumer surplus and corresponds to

$TS_L^0 = \frac{MN\left[\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma + \tilde{p}_W - \tilde{p}_u\right]^2}{2\left(N\Delta\kappa + M\Delta k\right)}$. Surpluses from the FTS market for local food decreases as the residual values of either the wholesale product $(\kappa_W - \tilde{p}_W)$ or the NS market $(\tilde{p}_u + \vartheta k_s)$ increase, and increases as the residual value of either the local product $(\kappa_L - \nu_L)$ or the FTS market $(k_s - \tau_s - t_s - \Delta\gamma)$ increase. Surpluses from the FTS market for local decrease as SFA effort, transaction, and marketing costs increase.

Similarly, total surplus from the wholesale product and NS market is the sum of surpluses

$$TS_{W+u}^0 = CS_W^0 + PS_u^0 \quad . \tag{12.33}$$

Consumer surplus in the wholesale market is

$CS_W^0 = \frac{M}{2\kappa_W}\left[\frac{M\Delta k\left(\kappa_W - \tilde{p}_W\right) + N\left(\kappa_W\left(\nu_L - \Delta k + \tau_s + t_s + \Delta\gamma + \tilde{p}_u\right) - \kappa_L\tilde{p}_W\right)}{\left[N\Delta\kappa + M\Delta k\right]}\right]^2$. The equilibrium condition to ensure that the quantity of wholesale product (6.27) is at least zero also guarantees that consumer surplus from wholesale product is positive.

Producer surplus in the NS market is

$PS_u^0 = \frac{N\Delta\kappa}{2}\left[\frac{\left[M\left(\tilde{p}_u + \tau_s + t_s + \Delta\gamma - \tilde{p}_W + \nu_L\right) + \Delta\kappa\left(N - M\right)\right]^2}{N\Delta\kappa + M\Delta k}\right]$. Producer surplus in the NS market increases as the costs in the alternative market increase, and decreases as the price paid for the wholesale product increases.

Total Surplus from the Wholesale product and NS market is

$$\begin{aligned} TS_{W+u}^0 &= \frac{M}{2\kappa_W}\left[\frac{\left[M\Delta k\left(\kappa_W - \tilde{p}_W\right) + N\left(\kappa_W\left(\nu_L - \Delta k + \tau_s + t_s + \Delta\gamma + \tilde{p}_u\right) - \kappa_L\tilde{p}_W\right)\right]^2}{\left[N\Delta\kappa + M\Delta k\right]^2}\right] \\ &+ \frac{N\kappa_W\Delta\kappa\left(N\Delta\kappa + M\Delta k\right)}{2\kappa_W}\left[\frac{\left[M\left(\tilde{p}_u + \tau_s + t_s + \Delta\gamma - \tilde{p}_W + \nu_L - \Delta\kappa\right) + N\Delta\kappa\right]^2}{\left[N\Delta\kappa + M\Delta k\right]^2}\right] \end{aligned} \quad .(12.34)$$

Total surplus from wholesale product and NS market is decreasing in wholesale product price and increasing in effort costs, transaction and marketing costs, and NS price. Following our conditions to ensure that the equilibria in the alternative markets are positive, (6.27) and (6.29), we can see that total surplus from the alternative product/ market is positive.

We are interested in how changes in costs in the FTS market for local product impact total welfare. Recall that market-specific costs include SFA's effort to procure product and the producer's transaction and marketing costs. While the quantity supplied to the FTS market X_L^D and total surplus in the FTS market for local products TS_L^0 are decreasing in market-specific costs, surplus in the alternative product/ market TS_{W+u}^0 is increasing in FTS market-specific costs. Policy makers wishing to increase the quantity of product supplied to the market by reducing market –specific costs may be interested in the trade-off between increasing product supplied and total welfare. To understand the potential trade-offs, we simplify the costs in the FTS market for local product $F = \tau_s + t_s + \Delta\gamma + \nu_L$ and compare the magnitude of the decrease in surplus from local FTS to the magnitude of the increase from wholesale NS. We find that

$\frac{\partial TS_L^0}{\partial F} = -\frac{MN\left(F - \Delta\kappa - \Delta k - \tilde{p}_W + \tilde{p}_u\right)}{\left(N\Delta\kappa + M\Delta k\right)}$, where the expression inside the parenthesis is positive per our equilibrium condition (6.28) and

$$\frac{\partial TS_{W+u}^0}{\partial F} = \frac{MN\left[\Delta\kappa\left(M\left(F - \tilde{p}_W + \tilde{p}_u\right) + \Delta\kappa\left(N - M\right)\right) + M\Delta k\left(\kappa_W - \tilde{p}_W\right) - N\kappa_L\tilde{p}_W + N\kappa_W\left(F - \Delta k + \tilde{p}_u\right)\right]}{\left[N\Delta\kappa + M\Delta k\right]^2} ,$$

where the expressions inside the brackets are positive as a result of conditions (6.27) and (6.29).

We equate the change in Total Surplus from local in the FTS market to the change in Total Surplus from NS markets and wholesale products, obtaining

$$\left(N\Delta\kappa + M\Delta k\right)\left[\Delta k - F - \tilde{p}_u\right] - \left(N\kappa_W + M\Delta k\right)\left[\tilde{p}_W - F - \tilde{p}_u\right] > \kappa_W\left[\left(N + M\right)\Delta k + 2N\Delta\kappa\right]. \quad (12.35)$$

When the LHS of (6.35) is greater than the RHS, the increase in total welfare from an increase in FTS market-specific costs will be increasing. Recall that we have assumed that $\kappa_L > \kappa_W$, so that $N\Delta\kappa + M\Delta k > N\kappa_W + M\Delta k$ and therefore $\left(N\Delta\kappa + M\Delta k\right)\left[-F - \tilde{p}_u\right] - \left(N\kappa_W + M\Delta k\right)\left[-F - \tilde{p}_u\right] > 0$. When market quality difference times

the sum of product quality difference weighted by the number of producers and market quality difference weighted by the number of SFAs is greater than the wholesale price times the sum of wholesale product quality weighted by the number of producers and market quality difference weighted by the number of SFAs,
$\Delta k\left(N\Delta\kappa + M\Delta k\right) > \tilde{p}_W\left(N\kappa_W + M\Delta k\right)$, the LHS of (6.35) will be positive. The RHS is positive as a result of our assumptions. Another way to consider this relationship is to assume that $\Delta k = \tilde{p}_W$, and simplify so that $F + \tilde{p}_u = 0$. The inequality (6.35) now reduces to
$\Delta k > \dfrac{2N\kappa_L\kappa_W}{N\Delta\kappa - M\kappa_W}$ so that the welfare trade-offs depend on the relative qualities of the two markets. Further analysis of this trade-off can best be determined through simulation.

6.4 Quality Information Costs and Distributor Market Power

The base case model above treats the distributor as "frictionless" and so does not explicitly include the role of market intermediaries. Market intermediaries with the ability to exert market power may reduce quantity supplied in the FTS market which is not accounted for when the distributor is "frictionless". In the following sections, we add a distribution sector that distributes product to markets and may provide information, negotiation, and monitoring services more efficiently than SFAs and producers by labeling product and market quality, but that may also exert market power.[19] We subsume the possible market structures that may exist between upstream producers and downstream SFAs into a single distribution sector. For example, some SFAs are self-operated, while others are managed by a contracted food service management company.

[19] Quality information services differ from distribution services performed by the distributor, which include the costs of storing and transporting products.

Self-operated SFAs procure inputs from the wholesale distribution sector, which is a highly concentrated industry with potential upstream and downstream market power (Technomics, 2017). Food service management companies are themselves a highly concentrated sector, and may exert market power in setting contract terms that include food procurement price schedules (Hyland, 2018). In both cases, mid-market concentration is indicated, though the actor exercising market power may vary.

6.4.1 Quality Information Costs/ Labeling

Farm to School and local foods literature suggests that quality information in direct markets for local food is communicated via point-of-sale interaction and producer-consumer relationships (Colasanti, Matts, and Hamm, 2012). One byproduct of an SFA's cost of procurement efforts and producers' transaction costs is to communicate the value of the product and market quality along the supply chain. Another option to communicate the value of the product to consumers and/ or the market to producers is for the distributor to provide quality information through labeling or coding. Typically, information is provided to the downstream actor, but in the case that producers value the quality of the FTS market, we must also consider the transfer of information back to the upstream actor. To simplify, we will refer to the distributor provision of product and market quality information as "labeling".[20]

We present and discuss model results with policy applications that demonstrate the unique contribution of the model. The "base case" equilibrium price (6.24) and quantity (6.25) depict a frictionless model that omits the potential role of distributors. We

[20] Quality information for product may also be provided by coding, for example in the case of bulk delivery to processors, restaurants, and cafeterias.

choose the frictionless model as our base case because it reflects the current assumptions of FTS advocates and policy makers. In the following Scenarios, we include the distributor, change its role in providing quality information, and allow it to exercise market power. Since FTS procurement is only valuable to SFAs when product quality κ_L is known, either as a result of effort ν_L or as a result of the distributor labeling product as local, we restrict the models presented to those where product quality is known to the buyer. On the other hand, producer's access to market quality information k_s is generally only known when producers are actively involved in coordinating supply to SFAs as a result of transaction and marketing costs τ_s, t_s, γ_s, or when market quality information is provided upstream to producers by downstream distributors via labeling.

In Scenario A, we depart from the base case utility-maximizing producer presented above in that a distributor is included, incurring distribution costs. Both upstream and downstream actors continue to have preferences for product and market quality and the quality is communicated as a byproduct of interactions, incurring transaction and effort costs. Utility-maximizing producers prefer the FTS market, but in the absence of labeling, only know whether sales to a distributor will be sold downstream to a FTS market if they incur transaction costs to coordinate sales with an SFA. In Scenario B, we allow the distributor to label both downstream product quality and upstream market quality to producers in lieu of SFA effort and producer transaction costs.

6.4.2 Distributor with Market Power

Following Alston, Sexton and Zhang (1997), we include a distribution sector with Z distributors with market power, and in some cases, the ability to label quality, so that the costs of distribution and quality information vary. All intermediary distribution functions are subsumed within a single sector called "distribution," with multiple homogenous distributors nesting the possibility of a single distributor. We assume constant returns to scale in the distribution sector.[21] We present two Scenarios, one in which a distribution sector with the ability to exert market power is included, and another in which the added distribution has the ability to label products

For each Scenario, we first present equilibria and welfare effects, and then compare the Scenario results with the base case presented above.

6.4.2.1 Scenario A: Known Qualities, No Labeling

To determine the equilibrium quantities and prices with a distribution sector, we solve a representative distributor's profit-maximization problem where utility-maximizing producers incur transaction costs and SFAs incur effort costs. Like the base case, market and product qualities are known in the FTS market as a result of interactions between SFAs and producers, where procurement effort costs, v_L are incurred by SFAs and FTS market transaction costs, τ_s, t_s, are incurred by producers. We now further assume that product sold to the NS market may be sold by a distributor as a wholesale, commodity product to SFAs, where the input and market prices of the good are constants determined in separate perfectly competitive markets. Recall that base case inverse demand for local product is

[21] This simplification suggests that the management and contracting structure of any given SFA's food service operation does not affect the oligopsony power of the intermediary. Both self-operated and contracted food services face upstream market power.

$$p_L(X_L^D, X_W^D) = \kappa_L - \nu_L - \left[\frac{\kappa_W X_W^D + \kappa_L X_L^D}{M}\right] , \tag{12.36}$$

while the base case inverse demand for wholesale product is

$$p_W\left(X_L^D, X_W^D\right) = \kappa_W\left[1 - \frac{\left(X_W^D + X_L^D\right)}{M}\right] . \tag{12.37}$$

The typical distributor maximizes profit from both sales of local product to the FTS market and wholesale product sourced from local producers to the NS market. The quantity of product purchased by distributor i from producers marketing to the FTS channel is denoted as q_{is}, the quantity of locally differentiated product distributed to SFAs is q_{iD}, and we assume fixed proportions in the FTS market for local foods so that all product marketed by producers to FTS is distributed to SFAs, such that $q_{is} = q_{iD} = q_{iL}$. The quantity of product purchased by a distributor from producers marketing to the NS channel is denoted by q_{iu}, and q_{iW} is the quantity of product distributed as a wholesale commodity product. We use superscript A to denote results from Scenario A, to write distributor 1's profit function as

$$\underset{\max q_{1L}, q_{1W}}{\pi_1^A} = \left[p_L^D\left(X_L^D, X_W^D\right) - \left(p_s^s\left(X_s^S, X_u^S\right) + y\right)\right] q_{1L} + \tilde{p}_W q_{1W} - \left(\tilde{p}_u + g\right) q_{1u} , \tag{12.38}$$

where y represents variable distribution and transaction costs for the local product, such as segregated docking and traceability protocols per unit distributed in the FTS market, and g represents the variable costs of distribution for the commodity product. Consistent with Motta and Sharma (2016) which found increased transaction costs associated with the purchase of locally grown products, and Izumi Wright and Hamm (2010) which found that increased information, negotiation and payment costs for SFAs and increased delivery and storage costs for producers, we restrict variable costs for the undifferentiated product g to be less than in the FTS market, $g < y$.

The inverse demand for local is

$$p_L\left(X_L^D, X_W^D\right) = \kappa_L\left(1 - \frac{X_L^D}{M}\right) - \kappa_W \frac{X_W^D}{M} - \nu_L \ . \qquad (12.39)$$

Because the price of the wholesale product is constant and given from the wholesale market, the SFAs' aggregate quantity demanded for wholesale product can be expressed as a function of aggregate quantity of local and the fixed price for wholesale product by inverting (6.39), so that $X_W\left(X_L, \tilde{p}_W\right) = M\left[1 - \frac{\tilde{p}_W}{\kappa_W}\right] - X_L$. Substituting this expression into the SFAs' inverse aggregate demand for local product is a function of aggregate quantity of local and the fixed price for wholesale product, $p_L\left(X_L, \tilde{p}_W\right) = \Delta\kappa\left[1 - \frac{X_L}{M}\right] + \tilde{p}_W - \nu_L$.

On the supply side, the market is covered (producers sell an aggregate quantity N to either the FTS or the NS market channel). Thus, the quantity sold to the NS market is

$$X_u^S = N - X_s^S \ . \qquad (12.40)$$

Aggregate input supply from producers to the NS market can be expressed as the sum of the NS product from distributor 1 and the product of the other distributors $X_u = q_{1u} + \sum_{i=2}^{Z} q_{iu}$. Aggregate quantity of wholesale product demanded can be expressed similarly, $X_W = q_{iW} + \sum_{i=2}^{Z} q_{iW}$. Producers' inverse input supply of product to the FTS market, expressed as a function of fixed input price $\tilde{p}_u$, is $P_s(X_s^S) = \Delta k\left[\frac{X_s^S}{N} - 1\right] + \tilde{p}_u + \tau_s + t_s + \Delta\gamma$,

where $X_s^S = X_L^D = X_L$ so that the expression becomes

$p_s^A\left(X_L, \tilde{p}_u\right) = \Delta k\left[\frac{X_L}{N} - 1\right] + \tilde{p}_u + \tau_s + t_s + \Delta\gamma$. Substituting these expression into distributor 1's

profit function yields

$$\underset{\max q_{1L}, q_{1W}}{\pi_1^A} = \left[p_L\left(X_L, \tilde{p}_W\right) - \left(p_s^s\left(X_L, \tilde{p}_u\right) + y\right)\right] q_{1L} + \tilde{p}_W\left[X_W\left(X_L, \tilde{p}_W\right) - \sum_{i=2}^{Z} q_{iW}\right] - \left(\tilde{p}_u + g\right)\left[N - X_L - \sum_{i=2}^{Z} q_{iL}\right].$$

(12.41)

The first-order necessary condition for maximizing equation (6.41) is

$$\frac{\partial \pi_1^A}{\partial q_{1L}} = p_L\left(X_L, \tilde{p}_W\right) + \frac{\partial p_L}{\partial X_L}\frac{\partial X_L}{\partial q_{1L}} q_{1L} + \frac{\partial X_W}{\partial X_L}\frac{\partial X_L}{\partial q_{i1L}} \tilde{p}_W - p_s^s\left(X_L^s, \tilde{p}_u\right) - y - \frac{\partial p_s^s}{\partial X_L}\frac{\partial X_L^s}{\partial q_{1L}} q_{1L} + \left(\tilde{p}_u + g\right)\frac{\partial X_L}{\partial q_{1L}} = 0$$

. (12.42)

We manipulate this expression as follows to introduce conjectural variation elasticities

$$p_L\left(X_L, \tilde{p}_W\right) + \frac{\partial X_L}{\partial q_{1L}}\frac{q_{1L}}{X_L}\frac{\partial p_L}{\partial X_L} X_L + \frac{\partial X_W}{\partial X_L}\frac{\partial X_L}{\partial q_{1L}} \tilde{p}_W - p_s^s\left(X_L, \tilde{p}_u\right) - y - \frac{\partial X_L^s}{\partial q_{1L}}\frac{q_{1L}}{X_L^s}\frac{\partial p_s^s}{\partial X_L} X_L + \left(\tilde{p}_u + g\right)\frac{\partial X_L}{\partial q_{1L}} = 0.$$

(12.43)

Recall that the distribution sector's aggregate demand for wholesale $X_W^D\left(\tilde{p}_W, X_L^D\right) = M\left(1 - \frac{\tilde{p}_W}{\kappa_W}\right) - X_L^D$, so that a one unit change in the aggregate quantity in the FTS market results in a one unit decrease in aggregate quantity in the wholesale market, $\frac{\partial X_W}{\partial X_L} = -1$. The aggregate quantity supplied to the FTS market is the sum of individual distributor's supply $X_L = \sum_{i=1}^{N} q_{iL}$, so that $\frac{\partial X_L}{\partial q_{iL}} = 1$. For any distributor i, the conjectural elasticity of demand is $\xi_i = \left(\frac{\partial X_L^D}{\partial q_{iL}}\right)\left(\frac{q_{iL}}{X_L^D}\right)$, and conjectural elasticity of supply is $\varsigma_i = \left(\frac{\partial X_L^S}{\partial q_{iL}}\right)\left(\frac{q_{iL}}{X_L^S}\right)$. As with Alston, Sexton and Zhang (1997), conjectural elasticities represent indices of market power, rather than conjectures regarding competitive behavior, so that

$$p_L\left(X_L, \tilde{p}_W\right) + \frac{\partial p_L}{\partial X_L}\xi_i X_L - \tilde{p}_W - p_s\left(X_L, \tilde{p}_u\right) - y - \frac{\partial p_s}{\partial X_L}\varsigma_i X_L + \left(\tilde{p}_u + g\right) = 0 \quad . \qquad (12.44)$$

Homogenous distributors have identical conjectural variations in equilibrium, i.e., $\xi_i = \xi$ and $\varsigma_i = \varsigma$, where $\xi, \varsigma \in [0,1]$ indicates perfect competition when equal to 0, and monopoly/ monopsony when equal to 1. Intermediate forms of market power, such as oligopoly or oligopsony competition, are represented by ς, ξ values between 0 and 1, with higher values representing less competitive markets. Since distributors are homogenous and have identical conjectural variations, distributor 1's objective function can be treated as the representative objective function for each distributor in the sector, as well as the industry equilibrium condition, and is represented by

$$p_L\left(X_L, \tilde{p}_W\right) + \frac{\partial p_L}{\partial X_L}\xi X_L - \tilde{p}_W - p_s\left(X_L, \tilde{p}_u\right) - y - \frac{\partial p_s}{\partial X_L}\varsigma X_L + \left(\tilde{p}_u + g\right) = 0 \quad . \qquad (12.45)$$

We denote results from Scenario A with a superscript A, so that the aggregate quantity supplied to the FTS market is

$$X_L^{A*} = \frac{MN\left[\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma - \left(y - g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu} \;, \qquad (12.46)$$

where $\lambda = 1+\xi$ and $\mu = 1+\varsigma$. Note that for the equilibrium quantity X_L^{A*} to be positive,

$$\left(\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma - \left(y-g\right)\right) > 0 \tag{12.47}$$

The equilibrium quantity of local product supplied to FTS markets when a distributor is included is increasing in wholesale NS distribution costs and market and product quality differences, and is decreasing in effort, transaction, marketing, and local FTS distribution costs. The equilibrium quantity is decreasing in distributor market power.

We use the X_L^{A*} to find the equilibrium quantity in the wholesale market

$$X_W^{A*}\left(X_L^{A*}, \tilde{p}_W\right) = \frac{M}{\kappa_W}\frac{\left[\left(\kappa_W - \tilde{p}_W\right)\left(N\Delta\kappa\lambda + M\Delta k\mu\right) - N\kappa_W\left(\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma - \left(y-g\right)\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}. \tag{12.48}$$

The equilibrium quantity in the wholesale market increases as residual value in the wholesale market $\left(\kappa_W - \tilde{p}_W\right)$ and FTS market-specific costs increase, and decreases as the differences in market and product qualities increase and the wholesale distribution costs increase. Given condition (6.47) holds, the wholesale quantity supplied increases as distributor market power increases. As distributor market power increases, the distribution sector restricts quantity supplied to the FTS market to increase market price and maximize profit from the market. Distributors shift product to the wholesale market.

Recall that all producers supply to either the FTS or NS market so that the sum of supply is equal to the number of producers in the market. The equilibrium quantity of product supplied by producers to the NS market is therefore the difference between the number of producers and the quantity supplied to the FTS market, $X_u^{A*} = N - X_L^{A*}$,

$$X_u^{A*} = N\left[1 - \frac{M\left(\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma - y + g\right)}{\left(N\Delta\kappa\lambda + M\Delta k\mu\right)}\right]. \tag{12.49}$$

We compare the quantity sold as a wholesale product (6.48) X_W^{A*} to the quantity supplied to the NS market (6.49), X_u^{A*}. Recall that $\frac{\tilde{p}_W}{\kappa_W} = \tilde{\psi}$, is the equilibrium value of the indifferent consumer between those who buy the wholesale product and those who opt out and buy nothing, so that $M\left[1 - \frac{\tilde{p}_W}{\kappa_W}\right]$ represents the quantity of total products (local or wholesale) bought by SFAs. Given, by assumption in our consumer model, that each SFA buys one unit of product, this expression also represents the number of SFAs that choose to buy either local or wholesale product. We find that when the number of producers is greater than the number of SFAs that purchase either the local or wholesale product, $N > M\left[1 - \frac{\tilde{p}_W}{\kappa_W}\right]$, the quantity supplied to the NS market will be greater than that bought as a wholesale product then $X_u^{A*} > X_W^{A*}$, and when $N < M\left[1 - \frac{\tilde{p}_W}{\kappa_W}\right]$ it is the reverse.

The downstream price to the SFA is

$$p_L^{A*} = \left(\Delta\kappa - \nu_L + \tilde{p}_W\right) - \frac{N\Delta\kappa\left[\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma - y + g\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\ , \tag{12.50}$$

The equilibrium price paid by SFAs for local product supplied to FTS markets when a distributor is included is increasing in transaction costs, marketing costs, wholesale price, and local FTS distribution costs, and is decreasing in wholesale NS distribution costs and effort costs. An increase in wholesale product quality will increase the equilibrium price of local product in the FTS market. Since from (6.47), $\left(\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma - y + g\right) > 0$

, equilibrium price paid by SFAs increases as distributor market power increases, $\frac{\partial p_L^{A*}}{\partial \lambda} > 0, \frac{\partial p_L^{A*}}{\partial \mu} > 0$.

Upstream input price paid to the producer is

$$p_s^{A*} = \left(\tilde{p}_u + \tau_s + t_s + \Delta\gamma - \Delta k\right) + \left[\frac{M\Delta k\left[\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma - y + g\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\right]. \qquad (12.51)$$

The upstream input price paid to the producer is increasing in the price received in the NS market, wholesale distribution costs, transaction and marketing costs, and decreasing in FTS distribution costs, and FTS market quality. Because from (6.47) $\left(\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma - y + g\right) > 0$, the input price paid to the supplier decreases as the distributor market power increases, $\frac{\partial p_s^{A*}}{\partial \lambda} < 0, \frac{\partial p_s^{A*}}{\partial \mu} < 0$.

We compare the downstream price paid by the SFA, p_L^{A*}, to the upstream price that the distributor pays to the producer, p_s^{A*}. The upstream price is greater than the price paid to producers $p_L^{A*} > p_s^{A*}$ in perfect competition $\lambda, \mu = 1$, when $\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma + \tilde{p}_W - \tilde{p}_u > \Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma - y + g$, so that

$$\left(\tilde{p}_W - \tilde{p}_u\right) + \left(y - g\right) > 0 \ , \qquad (12.52)$$

Setting $E = \Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \Delta\gamma$, we can see that since (6.47) says that $E - (y - g) > 0$, it must also be the case that $E + (y - g) > 0$. Recall that we have assumed that $\left(y - g\right)$ is positive, since distribution costs in the FTS market are greater than those in the NS market. If we further assume that the price paid by the SFA for the wholesale product is greater than the input supply price paid to the farmer in the NS market $\tilde{p}_W > \tilde{p}_u$, which is plausible since distributors will incur some positive operating costs to distribute the product.

When the distributor is a monopolist/ monopsonist such that $\lambda, \mu = 2$, the price difference grows so that the when $E + 2(\tilde{p}_W - \tilde{p}_u) + (y - g) > 0$, price paid by SFAs is greater than that received by producers, as the distributor is able to extract the value of product and market qualities and excess market costs.

6.4.2.2 Base Case versus Scenario A Equilibria

Comparing the FTS market equilibria results in Scenario A to the base case aggregate equilibrium quantity (6.24) we find that

$$X_L^{0*} - X_L^{A*} = \frac{MN\left[N\Delta\kappa\left[(\lambda-1)(\Delta\kappa + \Delta k - F) + \lambda(\tilde{p}_W - \tilde{p}_u) + (y-g)\right] + M\Delta k\left[(\mu-1)(\Delta\kappa + \Delta k - F) + \mu(\tilde{p}_W - \tilde{p}_u) + (y-g)\right]\right]}{(N\Delta\kappa\lambda + M\Delta k\mu)(N\Delta\kappa + M\Delta k)} \quad (12.53)$$

where we simplify the additional costs specific to the FTS market as $F = \nu_L + \tau_s + t_s + \Delta\gamma$.

Under perfect competition this reduces to

$$X_L^{0*} - X_L^{A*} = MN\left[\frac{(\tilde{p}_W - \tilde{p}_u) + (y-g)}{N\Delta\kappa + M\Delta k}\right]. \quad (12.54)$$

The difference in equilibrium quantity between the base case and Scenario A will therefore be positive $X_L^{*} - X_L^{A*} > 0$ if $(\tilde{p}_W - \tilde{p}_u) + (y-g) > 0$. Recall that we have assumed that $(y-g)$ is positive. Thus, under the reasonable assumption that the price paid by the SFA for the wholesale product is greater than the input supply price paid to the farmer in the NS market $\tilde{p}_W > \tilde{p}_u$, the quantity marketed to SFAs under perfect competition and a frictionless distributor is greater than that under a distributor that incurs positive distribution costs. In the base case model where the distributor is “frictionless”, producers and SFAs do not account for downstream distribution costs, but in Scenario A these costs have the effect of reducing the equilibrium quantity of local product supplied to FTS markets. Similarly, the quantity supplied is affected by the alternative prices received by distributors for wholesale product and that is paid to producers who supply to the NS market. As the difference between these prices increases, the difference between the equilibrium quantities with and without the distributor increases.

Distributors, even when acting as perfect competitors, have an advantage that individual producers do not have. Distributors can allocate the entire quantity produced between two markets in a profit-maximizing way, whereas individual producers, in this model, are restricted to a choice between two markets.

With an increase in distributor market power, the aggregate quantity supplied to the FTS market decreases, $\frac{\partial X_L^{A*}}{\partial \lambda} < 0, \frac{\partial X_L^{A*}}{\partial \mu} < 0$, and the difference between the base case quantity and the quantity in Scenario A increases. The difference is largest when the distributor is a monopolist/ monopsonist, and corresponds to

$$X_L^{0*} - X_L^{A*Mon} = MN\left[\frac{\left(\Delta\kappa + \Delta k - F + (y-g)\right) + 2\left(\tilde{p}_W - \tilde{p}_u\right)}{2\left(N\Delta\kappa + M\Delta k\right)}\right]. \qquad (12.55)$$

The difference between the perfect competitive quantity and quantity in a monopsony/ monopoly increases with FTS market-specific costs and product and market qualities.

Including a distributor in the model of this market, in contrast to the base-case model in which a distributor is assumed to be "frictionless," raises the price paid by SFAs, even under perfect competition. There are two reasons why this is the case. First, profit maximizing distributors have the ability to allocate product between markets, and second, including a distributor more accurately reflects distribution-specific costs. When the distributor has market power, the quantity allocated to SFAs decreases, relative to a frictionless distributor. Policy makers and FTS advocates that do not account for the role of market intermediaries run the risk of over-estimating the quantity of product that is allocated to the FTS market for local foods.

We compare the equilibrium quantity supplied to the wholesale market in the base case to that in Scenario A, so that when

$$\frac{M\Delta k\left(\kappa_W - \tilde{p}_W\right) + N\kappa_W\left(F + \tilde{p}_u - \Delta k\right) - N\kappa_L\tilde{p}_W}{\left(N\Delta\kappa + M\Delta k\right)} > \left(\kappa_W - \tilde{p}_W\right) - \frac{\left[N\kappa_W\left(\Delta\kappa + \Delta k - F - y + g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}.,$$ the

equilibrium quantity of wholesale is greater in the base case $X_W^0 > X_W^{A*}$. When this condition does not hold, the reverse is true. In perfect competition, we find that the base case will be larger than Scenario A when $\frac{\tilde{p}_u - y + g}{2\kappa_L - \kappa_W} > \frac{\tilde{p}_W}{\kappa_W}$. When the distributor is a monopolist/ monopsonist , the base case will be larger when $\frac{F + 2\tilde{p}_u - \Delta k - y + g}{\kappa_L + \kappa_W} > \frac{\tilde{p}_W}{\kappa_W}$.

Comparing the FTS market price for local in the base case to that in Scenario A,

$$p_L^{A*} - p_L^{0*} = N\Delta\kappa\left[\frac{\left(\Delta\kappa + \Delta k - F + \tilde{p}_W - \tilde{p}_u\right)}{\left(N\Delta\kappa + M\Delta k\right)} - \frac{\left[\Delta\kappa + \Delta k - F - y + g\right]}{\left(N\Delta\kappa\lambda + M\Delta k\mu\right)}\right]. \qquad (12.56)$$

When the distributor has no market power $\lambda = 1, \mu = 1$, the difference will be

$$p_L^{A*} - p_L^{0*} = N\Delta\kappa\left[\frac{\tilde{p}_W - \tilde{p}_u + y - g}{\left(N\Delta\kappa + M\Delta k\right)}\right]. \tag{12.57}$$

Following the treatment above (6.56), this is a positive difference so that the downstream price paid by the SFA is higher under Scenario A than in the base case. When the distributor is a monopolist/ monopsonist,

$$p_L^{A*Mono} - p_L^{0*} = N\Delta\kappa\left[\frac{\left(\Delta\kappa + \Delta k + 2\tilde{p}_W - 2\tilde{p}_u - F + y - g\right)}{2\left(N\Delta\kappa + M\Delta k\right)}\right]. \tag{12.58}$$

The difference is decreasing in SFA effort, market quality, transaction, marketing, and wholesale distribution costs, and increasing in product quality difference and FTS distribution costs. The comparison is similar to the above comparison of quantity differences between the frictionless base case and Scenario A in which there is an explicit distribution sector. With the addition of the distributor, the price paid by SFAs increases and the price difference increases when the distributor has market power, so that subtracting (6.58) from (6.59) we have a difference of $N\Delta\kappa\left[\frac{\left(\Delta\kappa + \Delta k - F - \left(y - g\right)\right)}{2\left(N\Delta\kappa + M\Delta k\right)}\right]$. Policy makers and FTS advocates that do not account for the role of market intermediaries run the risk of under-estimating the price of product that is allocated to the FTS market for local foods.

6.4.2.3 Scenario A: Welfare

Total welfare is now the sum of distributor profit, consumer and producer surpluses in two markets, the FTS market for local product and the NS market for undifferentiated wholesale product, $TW^{A}=TS_{L}^{A}+TS_{W+u}^{A}$, calculated from supply and demand curves in each market. Consumer surplus in the FTS market for local food is

$$CS_{L}^{A}=\frac{M\Delta\kappa}{2}\left[\frac{N\left[\left(\Delta\kappa+\Delta k-F-y+g\right)\right]}{N\Delta\kappa\lambda+M\Delta k\mu}\right]^{2}, \tag{12.59}$$

Similarly, total producer surplus is the sum of producer surplus in the FTS market and the NS market where FTS producer surplus is

$$PS_{L}^{A}=\frac{N\Delta k}{2}\left[\frac{M\left[\left(\Delta\kappa+\Delta k-F-y+g\right)\right]}{N\Delta\kappa\lambda+M\Delta k\mu}\right]^{2}. \tag{12.60}$$

Both consumer and producer surpluses from local product sold in the FTS market are decreasing in FTS market effort, transaction marketing, and FTS distribution costs, and increasing in wholesale distribution costs, and market and product qualities.

We find profit in the distribution sector from the FTS market by solving the distribution sector profit from sales of local product purchased from producers supply to the FTS market in equation (6.41) $\pi_{L}^{A*}=\left[p_{L}^{A*}\left(X_{L}^{A*},\tilde{p}_{W}\right)-\left(p_{s}^{A*}\left(X_{L}^{A*},\tilde{p}_{u}\right)+y\right)\right]X_{L}^{A*}$ with the equilibria to obtain

$$\pi_{L}^{A*}=\frac{MN\left[\Delta\kappa+\Delta k-F-y+g\right]}{\left(N\Delta\kappa\lambda+M\Delta k\mu\right)}\left[\left[\Delta\kappa+\Delta k-F-y+\tilde{p}_{W}-\tilde{p}_{u}\right]-\frac{\left(N\Delta\kappa+M\Delta k\right)\left[\Delta\kappa+\Delta k-F-y+g\right]}{\left(N\Delta\kappa\lambda+M\Delta k\mu\right)}\right]. \tag{12.61}$$

When the distribution sector has no market power $\lambda,\mu=1$, profit in the distribution sector from sales of local product to FTS markets is

$\pi_{L}^{PC,A*}=\frac{MN\left[\Delta\kappa+\Delta k-F-y+g\right]}{\left(N\Delta\kappa+M\Delta k\right)}\left(\tilde{p}_{W}-\tilde{p}_{u}-g\right)$. As we would expect, distribution sector profit in the FTS market for local food is decreasing in FTS market distribution costs, transaction effort and marketing costs, and increasing in product and market quality. Distributor profit is increasing in the wholesale price paid by consumers, and decreasing in the input price paid to producers for the NS market, and positive distribution costs in the wholesale market. Following the analysis above, we would expect that the wholesale price paid by SFAs is greater than the input price paid to producers for the NS market, $\tilde{p}_W > \tilde{p}_u$ and that $\Delta\kappa + \Delta k - F - y + g > 0$. When $\tilde{p}_W - \tilde{p}_u > g$, the distribution sector will earn positive profits from the FTS market.

When the distributor is a monopolist/ monopsonist, profit becomes $\pi_L^{M,A*} = \frac{MN\left[\Delta\kappa + \Delta k - F - y + g\right]}{4\left(N\Delta\kappa\lambda + M\Delta k\mu\right)}\left[\left[\Delta\kappa + \Delta k - F - y + 2\left(\tilde{p}_W - \tilde{p}_u\right)\right] - g\right]$. Distributor profit is positive when $\Delta\kappa + \Delta k + 2\left(\tilde{p}_W - \tilde{p}_u\right) > F + y + g$, and increases as product and market quality increase, and decreases as marketing, transaction and distribution costs increase. Recall that the oligopolist/ oligopsonist distributors restrict quantity supplied to the FTS market. Note that in both the perfectly competitive and the monopolist/ monopsonist environment additional efficiencies in the distribution sector that decrease distribution costs y, g will increase profits in the distribution sector.

Consumer surplus in the wholesale market is $CS_{W+u}^A = \frac{M}{2\kappa_W}\left[\left(\kappa_W - \tilde{p}_W\right) - \frac{\left[N\kappa_W\left(\Delta\kappa + \Delta k - F - y + g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\right]^2$, and producer surplus in the market with NS buyers $PS_{W+u}^A = \frac{N\Delta\kappa}{2}\left[1 - \frac{\left[M\left(\Delta\kappa + \Delta k - F - y + g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\right]^2$. Both Producer and Consumer Surpluses in the NS market for wholesale product increase in wholesale product quality, SFA effort and producer FTS market costs, and decrease in wholesale market costs. Consumer Surplus from wholesale also decreases in wholesale price. More efficient distribution decreases consumer surplus from wholesale product, and increases in market power decrease it. Note that in the base case $X_u^{*S} = N - X_L^*$, but that is not the case in Scenario A.

In the NS market with wholesale product, the distribution sector profit is found by solving (6.41) for the sales of wholesale product purchased from producers supply to the NS market, $\pi_{W+u}^{A*} = \tilde{p}_W \left[X_{W+u} \left(X_L^{A*}, \tilde{p}_W \right) \right] - \left(\tilde{p}_u + g \right) \left[N - X_L^{A*} \right]$ yielding

$$\pi_{W+u}^{Dist,A*} = \frac{M\tilde{p}_W{}^2}{\kappa_W} + \left[M\tilde{p}_W - N\left(\tilde{p}_u + g \right) \right] + \frac{MN\left(\tilde{p}_u + g - \tilde{p}_W \right)\left[\Delta\kappa + \Delta k - F - y + g \right]}{\left(N\Delta\kappa\lambda + M\Delta k\mu \right)} . \quad (12.62)$$

Distribution profit in the NS market with wholesale product is increasing in input price paid to the producer, NS market distribution costs, transaction effort and marketing costs, and decreasing in FTS distribution costs. Distribution profit is decreasing in wholesale product quality, and increasing in local product quality and FTS market quality. The decrease in profit due to wholesale product quality results from an increase in sales from a product/ market combination in which consumers have no increased willingness to pay. When the distribution sector has no market power $\lambda, \mu = 1$, profit in the distribution sector from sales of wholesale product to NS markets is $\pi_{W+u}^{Dist,A*} = \frac{M\tilde{p}_W{}^2}{\kappa_W} + \left[M\tilde{p}_W - N\left(\tilde{p}_u + g \right) \right] + \frac{MN\left(\tilde{p}_u + g - \tilde{p}_W \right)\left[\Delta\kappa + \Delta k - F - y + g \right]}{\left(N\Delta\kappa + M\Delta k \right)}$. Total distributor profit is the sum of profits in the FTS market for local food and profit in the alternative market, $\pi^{Dist,A*} = \pi_{W+u}^{Dist,A*} + \pi_L^{Dist,A*}$. Under perfect competition, when $\lambda, \mu = 1$ we find that total distributor sector profit is the difference between wholesale revenues and input costs

from the NS market $\pi^{Dist,A*} = M\tilde{p}_W\left[1-\frac{\kappa_W}{\tilde{p}_W}\right] - N\left[\tilde{p}_u + g\right]$ where prices are exogenous.

Total surplus from local in Scenario A is $TS_L^A = CS_L^A + PS_L^A + \pi_L^A$. Summing profit with producer and consumer surpluses in the FTS market for local product, we find

$$TS_L^{A*} = \frac{MN\left(N\Delta\kappa + M\Delta k\right)\left[\Delta\kappa + \Delta k - F - y + g\right]}{2\left(N\Delta\kappa\lambda + M\Delta k\mu\right)^2} + MN\left[\Delta\kappa + \Delta k - F - y + g\right]\left[\frac{\left(N\Delta\kappa\lambda + M\Delta k\mu\right)\left[\Delta\kappa + \Delta k - F - y + \tilde{p}_W - \tilde{p}_u\right] - \left[\Delta\kappa + \Delta k - F - y + g\right]}{\left(N\Delta\kappa\lambda + M\Delta k\mu\right)}\right]. \quad (12.63)$$

Note that as the costs of effort, transactions, and local FTS distribution increase, Total Surplus from local decreases, but increases in the quality difference of products and markets, as well as distribution costs from wholesale product to the NS market. In perfect competition, this simplifies to

$$TS_L^{A*} = MN\left[\Delta\kappa + \Delta k - F - y + g\right]\left[\frac{1 - 2\left[\Delta\kappa + \Delta k - F - y + g\right]}{2\left(N\Delta\kappa + M\Delta k\right)} - \left[\Delta\kappa + \Delta k - F - y + \tilde{p}_W - \tilde{p}_u\right]\right].$$

We denote the base case welfare with the superscript 0, and show welfare in the FTS market for local product as $PS_L^0 + CS_L^0 = \frac{MN\left[\Delta\kappa + \Delta k - F + \tilde{p}_W - \tilde{p}_u\right]^2}{2\left(N\Delta\kappa + M\Delta k\right)}$. We subtract Total Surplus in Scenario A from the base case $\Delta_{0,A}^{PC}TS_L = \left[PS_L^0 + CS_L^0\right] - \left[PS_L^A + CS_L^A + \pi_L^A\right]$ and find that is less than that in the base case under perfect competition when

$$\left[\Delta\kappa + \Delta k - F - y + g\right] - 2\left[\Delta\kappa + \Delta k - F - y + g\right]^2 - 2\left(N\Delta\kappa + M\Delta k\right)\left[\Delta\kappa + \Delta k - F - y + g\right]\left[\Delta\kappa + \Delta k - F - y + \tilde{p}_W - \tilde{p}_u\right] < 1$$

. By inspection, the LHS is likely to be less than one. Compared to the base case, welfare in the FTS market decreases with the addition of the distribution sector. When the distributor has monopoly/ monopsony power, Total Surplus decreases

$$TS_L^{A,Mono} = PS_L^A + CS_L^A + \pi_L^A = \\ MN\left[\Delta\kappa + \Delta k - F - y + g\right]\left[\frac{1-2\left[\Delta\kappa + \Delta k - F - y + g\right]}{4\left(N\Delta\kappa + M\Delta k\right)} - \left[\Delta\kappa + \Delta k - F - y + \tilde{p}_W - \tilde{p}_u\right]\right]. \quad (12.64)$$

Welfare from the wholesale product sold to the NS market is

$$TS_{W+u}^A = \frac{M\left[\left(\kappa_W - \tilde{p}_W\right)\left(N\Delta\kappa\lambda + M\Delta k\mu\right) - N\kappa_W G_{W+u}^A\right]^2 + N\Delta\kappa\kappa_W\left[\left(N\Delta\kappa\lambda + M\Delta k\mu\right) - \left[MG_{W+u}^A\right]\right]^2}{2\kappa_W\left(N\Delta\kappa\lambda + M\Delta k\mu\right)^2}, \quad (12.65)$$

where we simplify so that $\Delta\kappa + \Delta k - \nu_L - \tau_s - t_s - \gamma_s - y + g = G_{W+u}^A$. Here, wholesale quantity supplied and Total Surplus from wholesale product to the NS market increases as the costs of effort, transactions, and local FTS distribution increase, but decreases in the quality difference of products and markets, as well as distribution costs from wholesale product to the NS market.

Summing total surplus from the FTS market for local products with total surplus from the wholesale product from the non FTS market, we find that, like in the base case, total welfare increases as the costs of effort, transactions, and local FTS distribution increase, but decreases in distribution costs from wholesale product to the NS market. Recall that the quantity supplied to the FTS market decreases in these costs, suggesting that there is a trade-off between total economic welfare and the quantity supplied to the FTS market. This trade-off becomes more striking as intermediary market power increases.

6.4.2.4 Efficient Distribution Sector

The addition of an explicit distribution sector has two potentially conflicting effects on equilibria. On one hand, adding a distribution sector with market power may restrict the aggregate quantity and increase the price of local product in the FTS market, as seen above. On the other hand, there is the possibility that the distribution sector is more efficient and therefore reduces the overall costs in the supply chain, increasing the aggregate quantity and reducing the price of local product in the FTS market.

While we have not restricted the distributor costs, y, g to be positive, we have proceeded with our interpretation of results as if they are. However, policy makers and advocates argue that existing food distribution systems are specialized businesses with expertise in procurement, shipping, storage, traceability, ordering, and billing and payment systems. This expertise may make distributors more efficient at procuring and distributing product, and thereby may reduce total supply chain distribution costs. Distributors' expertise, however, may be less applicable in FTS markets. For example, efficiencies established when distributors procure product from large wholesalers may not apply when procuring product from individual producers, and traceability information such as local or regional origin may not be compatible with existing information tracking systems. If distributors are in fact more efficient, they may pass some cost savings on to SFAs in the perfectly competitive case, however, a distributor with monopoly/ monopsony power may instead extract some portion of the savings. The frictionless base case model presented above may be unrealistic in that it assumes the potential benefits from efficiencies that might accrue from the use of a distribution sector in FTS markets, but ignores the potential negative effects from distribution sector that exercises market power. The addition of the distribution sector in Scenario A allows us to explore the possible conflicting effects of that sector on equilibria.

First we consider how our model allows efficient distributors to reduce costs in the supply chain. Recall that in both the base case and Scenario A we have expressed the difference in producers' marketing costs between FTS and NS markets as $\Delta\gamma = \gamma_s - \gamma_u$ and transaction costs t_s, τ_s , and SFA effort ν_L, as components of the total FTS market-specific costs, $F = \nu_L + \tau_s + t_s + \Delta\gamma$. Previously we interpreted the distribution costs as being positive $y, g > 0$, and assumed distributors' costs to supply the FTS market would be higher than costs to supply the NS market ($y > g$) so that the effect of adding a distribution sector resulted in increased costs, $(y - g) > 0$. We now allow distributors' costs to be less than zero $y, g < 0$, so that they reduce the overall marketing and distribution costs in each market. We look at two possible relationships between distribution efficiencies in the FTS and NS markets. First, distributors could reduce costs through efficiencies, $y, g < 0$, but the cost reductions in the NS market exceed those in the FTS market, $|y| < |g|$. This might be the case if the FTS market is still relatively more costly to supply, even if distributors realize relative efficiencies and reduce overall distribution costs, F. The outcomes for equilibria are qualitatively equivalent to those in Scenario A, since $(y - g) > 0$. Alternatively, cost reductions in the NS market could be less than or equal to those in the FTS market, $|y| \geq |g|$. This might be the case if distributors reduce FTS market costs more than NS market costs, or if the costs to distribute are equal in both markets. All else equal, equilibrium quantities of local product supplied to the market increases relative to Scenario A as a result of decreased overall supply chains costs, equilibrium price paid by SFAs for local product decreases, and the equilibrium price paid to producers increases, since $(y-g)\le 0$.

When $(y-g)\le 0$, price decreases and quantity increases in the FTS market whether the distribution sector is concentrated or is perfectly competitive. Recall Equation (6.54), the difference between the base-case *versus* the Scenario A equilibrium quantity of local product supplied under perfect competition $X_L^{0*}-X_L^{A*}=MN\left[\frac{(\tilde{p}_W-\tilde{p}_u)+(y-g)}{N\Delta\kappa+M\Delta k}\right]$. Clearly, distribution costs savings could reduce the discrepancy between these models, and might erase them if $(\tilde{p}_W-\tilde{p}_u)<(y-g)$. The net effect on equilibria, however, may vary, depending on the relationship between cost savings and market power. To demonstrate, we compare the effect of a change in the net distributor costs $\frac{\partial X_L^{A*}}{\partial(y-g)}>0$ when $(y-g)\le 0$, on equilibrium aggregate quantity (6.47) to the effect of a change in market power parameters $\frac{\partial X_L^{A*}}{\partial\lambda}<0$, where we simplify by assuming that the distributors' upstream and downstream market power are equal, $\mu=\lambda$. When $\lambda>(F-(y-g)-(\Delta k+\Delta\kappa))$, the increase in aggregate quantity of local product that results from cost efficiencies dominates the decrease that results from market power. The term $(F-(y-g))$ can be interpreted as the extent to which distribution sector cost efficiencies mitigate FTS market-specific costs. In perfect competition, $\lambda=1$, the cost efficiency effect dominates when this mitigation effect does not exceed the qualities of the local product and FTS market by more than a value of 1, $1>(F-(y-g)-(\Delta k+\Delta\kappa))$.

As market power increases, the distribution sector must become increasingly efficient for the cost savings effect to dominate the market power effect. For example, in monopoly / monopsony, $\lambda = 2$, the difference in the mitigation effect and qualities must be twice that in the perfectly competitive case, $2 > \left(F - (y - g) - (\Delta k + \Delta \kappa)\right)$ for the cost efficiency effect to dominate. When this mitigation effect does exceed product and market qualities by more than 2, the decrease in aggregate quantity of local product supplied resulting from distribution sector market power dominates, and aggregate quantity supplied decreases. As market power increases in the distribution sector, the more efficient the sector is, the more the sector can reduce quantity of local product and extract rents.

Ultimately, policy makers should note that assuming a frictionless distribution sector can suggest that a greater quantity is supplied to the FTS market than that if the distributor is taken into account, depending on whether or not distributors introduce efficiencies that reduce overall supply chain costs, and do or do not exert market power. When distributors do have market power, the difference between the presumed quantity supplied due to efficiency and the actual quantity supplied increase. Taken together with evidence that intermediaries in between producers and consumers in the FTS supply chain are highly concentrated, these results suggest that policy makers would be well advised to consider the potential for market intermediaries to exercise market power to reduce equilibrium quantities relative to the frictionless base case and counter to the goal of increasing local foods supplied to FTS programs. It is possible that distributors enjoy higher efficiency, perhaps as a result of economies of scale, which can increase the quantity supplied to the market.

6.4.2.5 Scenario B: Known Qualities, Labeling

In Scenario B, a typical distributor labels both the product as local, incurring product labeling cost d , and the market as FTS, incurring market labeling cost b . Product and market quality labeling allows SFAs to avoid the effort ν_L associated with procuring local product, and producers to avoid the transaction costs τ_s, t_s associated with selling to FTS markets, but still allows producers and consumers to know product and market qualities. We assume that distributor labeling is more efficient and less costly than SFA effort or producers transaction costs, so that $d < \nu_L$ and $b < \tau_s + t_s$, set $\nu_L, \tau_s, t_s = 0$ equal to zero to find inverse demand for local product

$$p_L(X_L^D, X_W^D) = \kappa_L - \left[\frac{\kappa_W X_W^D + \kappa_L X_L^D}{M}\right] . \tag{12.66}$$

SFAs' aggregate demand for wholesale product is again expressed as a function of aggregate quantity of local and the fixed price for wholesale product, so that $X_W\left(X_L, \tilde{p}_W\right) = M\left[1 - \frac{\tilde{p}_W}{\kappa_W}\right] - X_L$, SFAs' inverse aggregate demand for local product is a function of aggregate quantity of local and the fixed price for wholesale product,

$p_L\left(X_L, \tilde{p}_W\right) = \Delta\kappa\left[1 - \frac{X_L}{M}\right] + \tilde{p}_W$, and input supply with a not FTS buyer is

$p_s\left(X_L, \tilde{p}_u\right) = \Delta k\left[\frac{X_L}{N} - 1\right] + \tilde{p}_u + \Delta\gamma$, which again follows $X_u^S = N - X_s^S$. Labeling costs now enter the Distributor's profit function, so that the typical distributor's profit function, denoted with the superscript B , is

$$\pi^B_{\substack{i\\ \max q_{iL}, q_{iW}}} = \left[p_L\left(X_L, \tilde{p}_W\right) - \left(p_s\left(X_L, \tilde{p}_u\right) + y + d + b\right)\right] q_{iL} + \left[X_W\left(X_L, \tilde{p}_W\right) - \sum_{i=2}^{Z} q_{iW} \right] \tilde{p}_W - \left[X_u - \sum_{i=2}^{Z} q_{iW} \right] \left(\tilde{p}_u + g\right). \tag{12.67}$$

Using the FOC we find the equilibria quantities sold to FTS and wholesale markets. With perfectly competitive upstream and downstream markets, the aggregate supply or local food to the FTS market is

$$X_L^{B*} = \frac{MN\left[\Delta\kappa + \Delta k - \Delta\gamma - y - d - b + g\right]}{N\Delta\kappa\lambda + M\Delta k\mu}, \tag{12.68}$$

which decreases as the conjectural variation of supply and/ or demand elasticity increases, $\frac{\partial X_L^{B*}}{\partial\lambda} < 0, \frac{\partial X_L^{B*}}{\partial\mu} < 0$. The equilibrium price of local food in the FTS market is $p_L^{B*} = \frac{\left(N\Delta\kappa\lambda + M\Delta k\mu\right)\left(\Delta\kappa + \tilde{p}_W\right) - N\Delta\kappa\left[\Delta\kappa + \Delta k - \Delta\gamma - y - d - b + g\right]}{N\Delta\kappa\lambda + M\Delta k\mu}$, which increases as the conjectural variation of demand increases, $\frac{\partial P_L^{B*}}{\partial\lambda} > 0$, while the upstream price paid to the producer is $p_s^{B*} = \left[\frac{\left(M\Delta k\mu + N\Delta\kappa\lambda\right)\left(\tilde{p}_u + \gamma_s - \Delta k\right) + M\Delta k\left[\Delta\kappa + \Delta k - \gamma_s - y - d - b + g\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\right]$,which decreases as the conjectural variation of supply elasticity increases $\frac{\partial P_s^{B*}}{\partial\mu} < 0$. The wholesale aggregate supply of wholesale product to the NS market is

$$X_W^{B*}\left(X_L^{B*}, \tilde{p}_W\right) = \frac{M}{\kappa_W} \frac{\left[\left(\kappa_W - \tilde{p}_W\right)\left(N\Delta\kappa\lambda + M\Delta k\mu\right) - N\kappa_W\left(\Delta\kappa + \Delta k - \gamma_s - y - d - b + g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}.$$

6.4.2.6 Scenario B: Welfare

Consumer surplus in the local market is

$CS_L^B = \frac{\Delta\kappa_L}{2M}\left[\frac{MN\left[\Delta\kappa + \Delta k - \Delta\gamma - y - d - b + g\right]}{M\Delta k\lambda + N\kappa_L\mu}\right]^2$, and consumer surplus in the wholesale

market $CS_W^B = \frac{M}{2\kappa_W}\left[\frac{\left[\left(\kappa_W - \tilde{p}_W\right)\left(N\Delta\kappa\lambda + M\Delta k\mu\right) - N\kappa_W\left(\Delta\kappa + \Delta k - \Delta\gamma - y - d - b + g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\right]^2$. Similarly,

total producer surplus is the sum of producer surplus in the FTS market and the NS

market $TPS = PS^s + PS^u$ where FTS producer surplus is $PS_L^B = \frac{\Delta k}{2N}\left[\frac{MN\left[\Delta\kappa + \Delta k - \Delta\gamma - y - d - b + g\right]}{M\Delta k\lambda + N\kappa_L\mu}\right]^2$

and producer surplus in the market with not FTS buyers

$$PS_W^B = \frac{N\Delta k}{2}\left[\frac{M}{\kappa_W}\frac{\left[\left[\left(\kappa_W - \tilde{p}_W\right)\left(N\Delta\kappa\lambda + M\Delta k\mu\right) - N\kappa_W\left(\Delta\kappa + \Delta k - \Delta\gamma - y - d - b + g\right)\right]\right]}{N\Delta\kappa\lambda + M\Delta k\mu}.\right]^2$$

6.4.2.7 Scenario A versus B

The perfectly competitive comparative welfare outcomes of the Scenarios presented above depend primarily on the relationship between the labeling costs and the effort and transaction costs. A primary motivation that advocates cite for “scaling up” FTS procurement by using established market intermediaries like distributors and foods service management companies is the assumption that intermediaries have economies of scale and technological expertise, and are therefore able to provide services that reduce or eliminate transaction and effort costs, like the provision of quality information, more cost-effectively than SFAs and producers.

If we assume that the distribution sector is more efficient than producers and SFAs in the provision of quality information, so that product labeling costs are less than SFA effort to procure local, $d < \nu_L$ and distributors market labeling costs are more efficient than producers' transaction costs incurred in selling to SFAs, $b < \tau_s + t_s$, we find that Scenario B provides a larger aggregate quantity of product and increased total welfare compared to Scenario A, no matter the level of market power exerted by distributors.

6.4.3 The Effect of Subsidies on Effort and Transaction Costs

How can policy makers increase the quantity of local foods that are served in schools? Current policy focuses on subsidizing the effort that SFAs must expend to procure local foods. We introduce subsidies into the consumers' and producers' indirect utility functions to demonstrate the possibilities and challenges associated with policy interventions like subsidies on SFA effort or producer transaction costs to support these markets.

6.4.3.1 Subsidy on Consumers' Effort Cost and on Producers' Transaction Costs

First we introduce a subsidy, ρ, to Scenario A to supplement some portion of the SFA's effort in the FTS market channel such that $\rho \in [0,1]$. This subsidy is in effect the current strategy to increase the quantity of local product in schools.

$$V = \begin{cases} \omega + \psi_g \kappa_L - p_L - \nu_L (1-\rho) & \text{if the local product is bought} \\ \omega + \psi_g \kappa_W - p_W & \text{if the wholesale product is bought} \\ \omega & \text{otherwise.} \end{cases} \quad (12.69)$$

The indifferent consumer is now $\hat{\psi} \equiv \frac{p_L - p_W + \nu_L(1-\rho)}{\Delta\kappa}$, and aggregate market demand is $X_L^D = M[1-\hat{\psi}] = M\left[1-\frac{p_L - p_W + \nu_L(1-\rho)}{\Delta\kappa}\right]$. Next we consider the producers' profit function, and add a subsidy δ , to supplement some portion of the transaction costs in the FTS market channel, where $\delta \in [0,1]$, so that $\pi_s = p_s - (c+\gamma+\tau_s(1-\delta)+\gamma_s) - FC - t_s$. We update the indifferent producer so that $\hat{\theta}_i = \frac{p_u - p_s + \tau_s(1-\delta)+t_s+\Delta\gamma}{\Delta k}$, and aggregate market supply, $X_s^S = N[1-\hat{\theta}] = N\left[1-\frac{p_u - p_s + \tau_s(1-\delta)+t_s+\Delta\gamma}{\Delta k}\right]$.

6.4.3.2 Equilibrium with Subsidies

We refer back to Scenario A to provide context for an analysis of subsides, as Scenario B has eliminated the FTS market specific costs that could be minimized through subsidy policy. The aggregate quantity supplied to the FTS market is

$X_L^{A*} = \frac{MN\left[\Delta\kappa + \Delta k - \nu_L(1-\rho) - \tau_s(1-\delta) - t_s - \Delta\gamma - y + g\right]}{N\Delta\kappa\lambda + M\Delta k\mu}$. Equilibrium quantity is increasing in both a subsidy on effort $\frac{dX_s^*}{d\rho} = \frac{MN\nu_L}{(N\Delta\kappa\lambda + M\Delta k\mu)}$, and in a subsidy on transaction costs,

$\frac{dX_s^*}{d\delta} = \frac{MN\tau_s}{(N\Delta\kappa\lambda + M\Delta k\mu)}$, suggesting that policy makers wishing to increase the quantity supplied to the FTS market could consider policies to supplement either supply or demand.

The resulting downstream price to the SFA is

$p_L^{A*} = (\Delta\kappa - \nu_L(1-\rho) - \tilde{p}_W) - \frac{N\Delta\kappa\left[\Delta\kappa + \Delta k - \nu_L(1-\rho) - \tau_s(1-\delta) - t_s - \Delta\gamma - y + g\right]}{N\Delta\kappa\lambda + M\Delta k\mu}$. Equilibrium market price, however, is increasing in a subsidy on schools' efforts, but decreasing in a subsidy on transaction costs, $\frac{dp_s^*}{d\rho}=v_L\left[1-\frac{N\Delta\kappa}{\left(N\Delta\kappa\lambda+M\Delta k\mu\right)}\right]$ and $\frac{dp_L^{A*}}{d\delta}=-\frac{N\Delta\kappa\tau_s}{\left(N\Delta\kappa\lambda+M\Delta k\mu\right)}$. To the extent that the increase in equilibrium price is reflective of the value of the subsidy on effort, the effect should be the same as any other subsidy – namely that demand increases according to the value of the subsidy. Policy makers, however, must take into account the effect of a subsidy on market price into account. A subsidy on SFA effort does increase demand, but since price is endogenous this increase in demand results in an increase in price. An increase in price past an SFA's ability to pay due to budget restrictions will result in a shift in a consumer's indirect utility such that no consumer will demand the local product.

Alternatively, policy makers could consider a subsidy on producers' transaction costs. In this case the equilibrium market quantity increases, but price decreases, $\frac{dp_s^*}{d\delta}=-\frac{N\kappa_L\tau_s}{\left(N\Delta\kappa\lambda+M\Delta k\mu\right)}$. A subsidy on transaction costs could counteract the increased challenges that producers must meet to supply to the FTS market, and, in theory, could fully offset these costs so that the indifferent producer would find FTS to be as profitable as sales to an not FTS buyer.

Additional policy considerations could be to directly subsidize price to the SFA or to the producer, or to increase marketing a market promotion to increase the perceived quality of the market or the product. While some states have introduced legislation to allow some portion of SFAs food budget to be purchased at market price without a bid, or at a percentage above the market bid price, it is not likely to be politically feasible to for these policies to pass in any way that would have a significant ability to raise market prices for local foods in FTS markets.

FTS market promotion has already been a significant focus of resources, with federal, state, municipal and private funders investing the promotion of FTS markets, primarily to schools. The quality of the market could be increased by this kind of promotion, or by an increase in evidence that procurement of local foods does in fact significantly and positively impact the short- or long-term goals of FTS, namely to increase student learning about health and nutrition and to reduce health and diet related disease and illnesses.

While upstream input price paid to the producer is

$$p_s^{A*} = \left[\frac{(M\Delta k\mu + N\Delta\kappa\lambda)(\tilde{p}_u + \tau_s(1-\delta) + t_s + \Delta\gamma - \Delta k) + M\Delta k\left[\Delta\kappa + \Delta k - \nu_L(1-\rho) - \tau_s(1-\delta) - t_s - \Delta\gamma - y + g\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\right].$$

We use the X_L^{A*} to find the equilibrium quantity in the wholesale market

$$X_W^{A*}\left(X_L^{A*}, \tilde{p}_W\right) = \frac{M}{\kappa_W}\frac{\left[\Gamma_W\left(N\Delta\kappa\lambda + M\Delta k\mu\right) - N\kappa_W\left(\Delta\kappa + \Delta k - \nu_L(1-\rho) - \tau_s(1-\delta) - t_s - \Delta\gamma - y + g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}.$$

6.4.3.3 Subsidies: Welfare

Total welfare is now the sum of consumer and producer welfare in two markets, the FTS market for local product and the NS market for undifferentiated wholesale product. Total welfare is the sum of Local and Wholesale Surplus, calculated from supply and demand curves in each market, so that for Scenario A, $TW^A = TS_L^A + TS_W^A$. Consumer surplus in the FTS market for local food is

$$CS_L^A = \frac{M\Delta\kappa}{2}\left[\frac{N\left[\left(\Delta\kappa + \Delta k - \nu_L\left(1-\rho\right) - \tau_s\left(1-\delta\right) - t_s - \Delta\gamma - y + g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\right]^2$$, And consumer

surplus in the wholesale market is

$$CS_W^A = \frac{M}{2\kappa_W}\left[\frac{\left[\Gamma_W\left(N\Delta\kappa\lambda + M\Delta k\mu\right) - N\kappa_W\left(\Delta\kappa + \Delta k - \nu_L\left(1-\rho\right) - \tau_s\left(1-\delta\right) - t_s - \Delta\gamma - y + g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\right]^2, .$$

Similarly, total producer surplus is the sum of producer surplus in the FTS market and the NS market where FTS producer surplus is

$$PS_L^A = \frac{N\Delta k}{2}\left[\frac{M\left[\left(\Delta\kappa + \Delta k - \nu_L\left(1-\rho\right) - \tau_s\left(1-\delta\right) - t_s - \Delta\gamma - y + g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\right]^2$$, and producer surplus in the

market with NS buyers $PS_u^A = \frac{N\Delta\kappa}{2}\left[1 - \frac{\left[M\left(\Delta\kappa + \Delta k - \nu_L\left(1-\rho\right) - \tau_s\left(1-\delta\right) - t_s - y + g\right)\right]}{N\Delta\kappa\lambda + M\Delta k\mu}\right]^2$.

Welfare in the FTS market in Scenario A in the absence of market power is

$$TS_L^{A,PC} = PS_L^A + CS_L^A = \frac{MN\left[\Delta\kappa + \Delta k - \nu_L\left(1-\rho\right) - \tau_s\left(1-\delta\right) - t_s - y + g\right]^2}{2\left(N\Delta\kappa + M\Delta k\right)}.$$

Note that as the costs of effort, transactions, and local FTS distribution increase, Total Surplus from local decreases, but increases in the quality difference of products and markets, as well as distribution costs from wholesale product to the NS market. When the distributor has monopoly/ monopsony power, Total Surplus decreases further to

$$TS_L^{A,Mono} = PS_L^A + CS_L^A = \frac{MN\left[\Delta\kappa + \Delta k - \nu_L\left(1-\rho\right) - \tau_s\left(1-\delta\right) - t_s - y + g\right]^2}{4\left(N\Delta\kappa + M\Delta k\right)}$$. Welfare from the

wholesale product sold to the NS market is

$$TS_{W+u}^A = \frac{M\left[\Gamma_W\left(N\Delta\kappa\lambda + M\Delta k\mu\right) - N\kappa_W G_{W+u}^A\right]^2 + N\Delta\kappa\kappa_W\left[\left(N\Delta\kappa\lambda + M\Delta k\mu\right) - \left[MG_{W+u}^A\right]\right]^2}{2\kappa_W\left(N\Delta\kappa\lambda + M\Delta k\mu\right)^2}$$, where

$\Delta\kappa + \Delta k - \nu_L\left(1-\rho\right) - \tau_s\left(1-\delta\right) - t_s - y + g = G_{W+u}^{A}$. Equilibrium price, however, is increasing in a subsidy on schools' efforts, but decreasing in a subsidy on transaction costs, $\frac{dp_s^*}{d\rho} = \frac{Mk_s\nu_L}{\left(N\Delta\kappa\lambda + M\Delta k\mu\right)}$. To the extent that the increase in equilibrium price is reflective of the value of the subsidy on effort, the effect should be the same as any other subsidy – namely that demand increases according to the value of the subsidy. Policy makers, however, must take into account the effect of a subsidy on market price into account. A subsidy on SFA effort does increase demand, but since price is endogenous this increase in demand results in an increase in price. An increase in price past an SFA's ability to pay due to budget restrictions will result in a shift in a consumer's indirect utility such that no consumer will demand the local product.

Alternatively, policy makers could consider a subsidy on producers' transaction costs. In this case the equilibrium market quantity increases, but price decreases, $\frac{dp_s^*}{d\delta} = -\frac{N\kappa_L\tau_s}{\left(N\Delta\kappa\lambda + M\Delta k\mu\right)}$. A subsidy on transaction costs could counteract the increased challenges that producers must meet to supply to the FTS market, and, in theory, could fully offset these costs so that the indifferent producer would find FTS to be as profitable as sales to an not FTS buyer.

Additional policy considerations could be to directly subsidize price to the SFA or to the producer, or to increase marketing a market promotion to increase the perceived quality of the market or the product. While some states have introduced legislation to allow some portion of SFAs food budget to be purchased at market price without a bid, or at a percentage above the market bid price, it is not likely to be politically feasible to for these policies to pass in any way that would have a significant ability to raise market prices for local foods in FTS markets.

FTS market promotion has already been a significant focus of resources, with federal, state, municipal and private funders investing the promotion of FTS markets, primarily to schools. The quality of the market could be increased by this kind of promotion, or by an increase in evidence that procurement of local foods does in fact significantly and positively impact the short- or long-term goals of FTS, namely to increase student learning about health and nutrition and to reduce health and diet related disease and illnesses.

6.5 Discussion and Conclusion

We develop a theoretical model of producer utility maximizing choice of market channel with endogenous equilibria and welfare analysis markets for local food, and apply the model to the case of FTS markets. A positive quantity of product can be supplied by producers even when the market is not the most profitable market choice. Producers who supply to the market even when it is not the most profitable choice are those producers with strength of preference for a high quality market that may contribute to other pro-social goals, like improved child health and nutrition or improved local economic development. We find that increasing the quantity of local food to SFAs increases the welfare in the FTS market for local food, but may decrease total welfare due to welfare losses in the alternative markets.

We then add a distribution sector and allow it to exert both upstream and downstream market power, leverage efficiencies of scale to reduce overall supply chain costs, and label product and market quality. We find that adding a distribution sector does introduce the possibility of reduced supply chain costs under certain assumptions, but that the upstream and downstream actors may not benefit fully from these efficiencies when market power is present. We note that even in the case where efficiencies are passed through, policy makers and advocates may over-estimate the quantity of local food that is supplied and under-estimate the market price paid by omitting the role of market power in the distribution sector from policy considerations. We explore the effect of the most prevalent market support, subsidies on SFA procurement effort, and find that while the subsidy does increase quantity supplied, it also increases the equilibrium price, which may limit the effectiveness of the subsidy. Alternatively, policy makers could subsidize producers' transaction costs, which would both increase the quantity supplied and decrease the market price to SFAs. Policy makers may also wish to encourage distributors to adapt to the role of providing upstream information to producers regarding the end consumer and more traditional downstream information regarding product attributes, including product origin, but note that in the presence of market power and with the limited opportunity for oversight this could result in mislabeling.

Future work will include modeling producers' choice to sell to an unlabeled market under the expectation that some portion of product supplied will go to an SFA, even in the absence of transaction costs and labeling. This additional scenario and the effect of subsidies will be compared to the results in which a distribution sector is included to provide a comparison that is relevant for policy makers going forward. We will conduct simulations that allow for different parameter values. While there is substantial evidence in social sciences literature that producers make utility maximizing choices in markets for local food, additional work is needed to demonstrate the external validity of this model. We intend to test the assumption that producers have strength of preference for market quality, as developed in this paper, via choice experiments with a convenience sample of agriculture producers with existing sales of locally branded products, and to test the market equilibria in an experimental lab with undergraduate students. Finally, will we consider the possibility that policy makers may be able to increase the quantity of product in the market by decreasing the value at which producers are indifferent between the two market channels, $\hat{\theta}$, through the use of nudges.

The case of producer choice to sell locally differentiated products to schools highlights a number of potential trade-offs that often go unexplored in local foods research but that can be addressed through our approach. In particular, in the case of Farm to School markets, there are trade-offs between increasing the quantity of local foods supplied to schools and total welfare. In addition, policy subsidies for FTS implementation at SFAs intended to increase the quantity of local foods in Farm to School programs might have improved success if they were used to support producer supply. The Farm to School case highlights that policy interventions like subsidies to reduce FTS market costs to support social outcomes of local foods systems might be most effective if applied to producers instead of SFAs, and highlights the need for more rigorous economic theories that can incorporate different dimensions of local foods systems.

CHAPTER 7

CONCLUSION

In this dissertation, I combine field research, econometric methods, and economic theory to analyze a market in which both firms' and consumers' choices are motivated by social preferences. This work contributes to the fields of behavioral economics, industrial organization, and local food systems economics. The dissertation expands the growing literature on social preferences to incorporate firms' choices that are motivated by utility maximizing objectives in an environment that allows endogenous equilibrium prices and quantities.

This dissertation attempts to develop a framework for understanding the relationships among market forces that operate to improve economic efficiency and those that operate to achieve pro-social values in a way that allows prices and quantities to be endogenous. In addition to contributing to theory that advances the application of behavioral economics to firms in a competitive market environment, I seek to provide policy makers with a framework through which the effect of policies to promote local foods can be evaluated. To provide a concrete application, most of this dissertation focuses on understanding the key components of a specific value chain – the Farm to School market for local foods. The second chapter veers from the Farm to School application to provide empirical evidence of how human values can influence consumer decision making in markets for local foods.

In the second chapter this dissertation, "Consumers' Human Values and Preferences for Social Outcomes of Regional Food Attributes," written with Gianni Cicia, (2018) we investigate heterogeneity in consumers' human values and willingness to pay (WTP) for social outcomes of credence process attributes that might have some positive social impact on purchases of early potatoes in Italy and Germany.

In the third chapter, “Food Service Authorities’ Motivations to Buy Regional Food,” and fourth chapter, “Market Channel and School Meal Costs in Farm to School Programs” written with Jeffrey O’Hara, I analyze school food authorities’ local food procurement choices. The third chapter uses primary historical data from the Massachusetts Farm to School program to analyze how different social forces converge to promote a common goal of increasing the volume of local food in Massachusetts’ schools. The fourth chapter analyzes perceptions of costs of procuring local foods in regards to school food authorities’ choice of procurement channel. We combine two years’ of USDA’s Food and Nutrition Service national Farm to School Census data with USDA’s National Agricultural Statistics Service Census of Agriculture to test, among schools participating in farm to school programs, whether procuring directly from producers is more likely to lower costs than procuring through a distributor.

In the fifth chapter, “Producer Costs and Returns from New England Farm to Institution Sales,” I present the results of field research from interviews with producers in six New England states who market at least some product to Farm to Institution markets. I gather information about producers’ costs and returns in selling to farm to institution markets. Notably, while very few farm operations specifically track costs and returns to farm to institution marketing, only two producers target this market for future growth. The barriers cited to increased participation include low prices, volume requirements, and logistical challenges.

The sixth chapter, “Equilibria and Welfare in Markets With Social Preferences,” written with Nathalie Lavoie and Dan Lass, develops a behavioral model of producer choice for high-quality local food markets in which marketing choices may be influenced by social preferences, while allowing price and quantity to be determined in the market. We draw upon theory from behavioral economics and industrial organization, as well as field research results, to develop a theoretical model that advances the existing literature on producer choice of market channels, in which price is treated as exogenous. Non-pecuniary motivations in marketing choices are increasingly identified in the literature as relevant to producer decision making. The paper provides a theoretical framework to model the potential effects of policy interventions when producers may be motivated by non-pecuniary factors and downstream intermediaries may exercise oligopsony power. We apply the model to producer marketing choices in farm to school markets, which policy makers currently provide demand-side support by subsidizing school food purchasers’ procurement of local foods. We find that if policy makers wish to increase the quantity of local product supplied to schools, supply-side interventions are likely to more effective. Effective interventions could include mitigating producers’ transaction costs. We also find that market power in the distribution sector may, in certain cases, serve to counteract policy-makers’ goals to increase quantity of local foods supplied to schools. It is also possible that distributors enjoy higher efficiency, perhaps as a result of economies of scale, which can increase the quantity supplied to the market. Future work using this framework will include evaluating interventions like promoting farm to school markets to producers, or providing technical assistance to producers, to establish contracts with intermediaries that support price pass-through and communicate information about downstream market activity.

APPENDIX A

LOCAL FOOD PROCUREMENT PROBLEMS (2013-2014)

	Number	Percent
On-Site		
Lack of kitchen equipment to process/prepare local foods.	553	12%
GAP or other food safety requirements	552	12%
Lack of compliance with your institution's purchasing regulations and policies	275	6%
Delivery		
Lack of reliability in delivering ordered items	874	19%
Getting on time deliveries	393	8%
Having quantity delivered equal to quantity ordered	381	8%
Price		
Higher prices	1,810	38%
Unstable product prices	729	15%
Product		
Hard to find year-round availability of key items	2,674	57%
Local items not available from primary vendors	1,268	27%
Vendors for local items don't offer a broad range of products	1,033	22%
Lack of availability of processed/precut products	709	15%
Getting product delivered that meets your quality requirements & other specs (i.e., size)	718	15%
Transaction		
Local producers aren't bidding	774	16%
Hard to coordinate procurement of local with regular procurement	1,208	26%
Hard to find new suppliers/growers or distributors	909	19%
Hard to get information about product availability	736	16%
Hard to place orders with vendors	298	6%
Resolving problem deliveries	171	4%
Inability to pay farmers according to farmers' needs due to school district payment procedures	363	8%
No Reported Problems	1,203	25%
Total	4,718	

APPENDIX B

LOCAL FOOD PROCUREMENT CHANNELS (2013-2014)

Direct		
At least one direct channel	**2,832**	**60%**
Individual producers (Farmers, fishers, ranchers)	1,886	40%
Farmer, rancher, or fisher cooperatives	798	17%
Farmers markets	373	8%
Community Supported Agriculture (CSA) model	157	3%
Intermediated		
At least one intermediated channel	**2,995**	**63%**
Food processors and manufacturers	1,772	38%
Distributors	2,995	63%
Food buying cooperative	647	14%
Food hub	403	9%
Food service management companies	101	2%
Dept. of Defense Fresh Program vendors	1,379	29%
USDA foods	1,440	31%
State Farm to School program office	142	3%
Total	**4,718**	

APPENDIX C

2015 NEW ENGLAND FARM TO INSTITUTION COST & RETURNS INTERVIEW

Section 1	Social Preferences						
A.	**Beliefs**						
		Agree Strongly	Agree	Neither agree nor disagree	Disagree	Disagree Strongly	Can't Choose
1.	Increasing the sales of New England food to New England consumers benefits the environment.	☐	☐	☐	☐	☐	☐
2.	Increasing the sales of New England food to New England consumers helps preserve the region's working landscape.	☐	☐	☐	☐	☐	☐
3.	Increasing the sales of New England food to New England consumers decreases the environmental impact of large-scale agriculture.	☐	☐	☐	☐	☐	☐
4.	Increasing the sales of local and regional foods is a driver of local economic development	☐	☐	☐	☐	☐	☐
5.	Increasing the sales of local and regional foods is a driver of regional economic development.	☐	☐	☐	☐	☐	☐
6.	Increasing the sales of local and regional foods to consumers in New England could improve health and nutrition outcomes.	☐	☐	☐	☐	☐	☐
7.	Increasing the sales of local and regional foods could improve health and nutrition outcomes for students k-12.	☐	☐	☐	☐	☐	☐
8.	Increasing the sales of local and regional foods could improve health and nutrition outcomes for the elderly	☐	☐	☐	☐	☐	☐
9.	Increasing the sales of local and regional foods could improve health and nutrition outcomes for incarcerated individuals	☐	☐	☐	☐	☐	☐
10.	Increasing the sales of local and regional foods could improve health and nutrition outcomes for hospital patients.	☐	☐	☐	☐	☐	☐
11.	Small and medium sized farms are important drivers of rural economies.	☐	☐	☐	☐	☐	☐

Section 1	Social Preferences							
B.	**Rating of Organizations**							
			Very Effective	**Effective**	**Neither Effective nor Ineffective**	**Ineffective**	**Very Ineffective**	**Unsure/ Not familiar with organization**
1.	How effective are the following organizations?							
a.	Sierra Club		☐	☐	☐	☐	☐	☐
b.	Appalachian Mountain Club		☐	☐	☐	☐	☐	☐
c.	National Audubon society		☐	☐	☐	☐	☐	☐
d.	State Natural Resources Council		☐	☐	☐	☐	☐	☐
e.	Local Fire Department		☐	☐	☐	☐	☐	☐
f.	Local Hardware store franchise		☐	☐	☐	☐	☐	☐
g.	Local or regional economic development organization		☐	☐	☐	☐	☐	☐
h.	Feed the Children		☐	☐	☐	☐	☐	☐
i.	Children's Hospitals Associations		☐	☐	☐	☐	☐	☐
j.	Feeding America		☐	☐	☐	☐	☐	☐
k.	American farmland Trust		☐	☐	☐	☐	☐	☐
l.	Farm Aid		☐	☐	☐	☐	☐	☐
2.	How familiar are you with the following organizations?		**Extremely Familiar**	**Moderately familiar**	**Somewhat familiar**	**Slightly familiar**	**Not at all familiar**	
a.	Sierra Club		☐	☐	☐	☐	☐	
b.	Appalachian Mountain Club		☐	☐	☐	☐	☐	
c.	National Audubon society		☐	☐	☐	☐	☐	
d.	State Natural Resources Council		☐	☐	☐	☐	☐	
e.	Local Fire Department		☐	☐	☐	☐	☐	
f.	Local Hardware store franchise		☐	☐	☐	☐	☐	
g.	Local or regional economic development organization		☐	☐	☐	☐	☐	
h.	Feed the Children		☐	☐	☐	☐	☐	
i.	Children's Hospitals Associations		☐	☐	☐	☐	☐	
j.	Feeding America		☐	☐	☐	☐	☐	
k.	American farmland Trust		☐	☐	☐	☐	☐	
l.	Farm Aid		☐	☐	☐	☐	☐	

Section 2	Markets & Marketing Contracts

A. What was your gross farm income for 2014? (Schedule F, line 9 or 50)? $

B. What was the net income or loss from the sale of business assets for 2014? $

C. In 2014, what was your principle crop or activity?

1. Principal Crop or Activity (Schedule F, Line A)	2. Code from Part IV (Schedule F, Line B)

D. How/ to whom did you sell your products in 2014?

"0" if did NOT sell to this market, "1" if DID sell to this market.

1 Direct to consumer (fresh or processed)

a.	Farmstand	
b.	CSA	
c.	Farmers' market	
d.	PYO	

"Direct" marketing *is defined as sales from the producer directly to the end consumer of the product.* ***"Intermediated" marketing*** *is defined as any sales where an additional business or organization owns the product before it reaches the end consumer.*

2 Intermediated (fresh or processed)

a.	Direct to restaurant	
b.	Direct to retail	
c.	Direct to buying club	
d.	Direct to aggregator	
e.	Direct to processor	

		i. public k-12	ii. pre-school	iii. private k-12	iv. private college	v. public college/univ	vi. hospital	vii. other
f.	Direct to institution							

g.	Wholesaler						
h.	End buyer known?						
	if "yes" to g. :	i. institution	ii. retail	iii. restaurant	iv. buying club	v. processor	vi. other
i.							

Section 3 Acreage, Production, Marketing and Income

						DIRECT to Institution				WHOLESALE to Institution			
Crop	Code	How many acres were harvested? (acres and tenths)		Total production / Quantity Harvested?	Unit Code (C&R Section D)	MARKETING Contract = "1", PRODUCTION contract= "2", Cash or Open Market sales = "3", Other ="4"	What Quantity of this product was delivered through this contract?	FINAL PRICE /FEE RECEIVED per Unit by this operation for this product marketed under this contract?	Total dollar amount received in 2014 from this contract?	MARKETING Contract = "1", PRODUCTION contract= "2", Cash or Open Market sales = "3", Other ="4"	What Quantity of this product was delivered through this contract?	FINAL PRICE/ FEE RECEIVED per Unit by this operation for this product marketed under this contract?	Total dollar amount received in 2014 from this contract?
	Code	Acres	Tenths	Quantity	Code	Value [1,2,3,4]	Quantity	Dollars & cents	Total Dollars	Value [1,2,3,4]	Quantity	Dollars & cents	Total Dollars
Vegetables, Potatoes and Melons													
Carrots	*0397*	*10*	*3*	*2000*	*1*	*3*	*400*	*0.4*	*160*	*2*	*600*	*0.37*	*222*
Fruit and Nuts													
Berries													

Section 3, *cont.*	Acreage, Production, Marketing and Income												
						DIRECT to Institution				**WHOLESALE to Institution**			
Crop	Code	How many acres were harvested? (acres and tenths)		Total production / Quantity Harvested?	Unit Code (C&R Section D)	MARKETING Contract = "1", PRODUCTION contract= "2", Cash or Open Market sales = "3", Other ="4"	What Quantity of this product was delivered through this contract?	FINAL PRICE /FEE RECEIVED per Unit by this operation for this product marketed under this contract?	Total dollar amount received in 2014 from this contract?	MARKETING Contract = "1", PRODUCTION contract= "2", Cash or Open Market sales = "3", Other ="4"	What Quantity of this product was delivered through this contract?	FINAL PRICE/ FEE RECEIVED per Unit by this operation for this product marketed under this contract?	Total dollar amount received in 2014 from this contract?
	Code	Acres	Tenths	Quantity	Code	Value [1,2,3,4]	Quantity	Dollars & cents	Total Dollars	Value [1,2,3,4]	Quantity	Dollars & cents	Total Dollars
Other field crops, hay, trees & maple syrup, nursery													
Cattle and Calves													
Hogs and Pigs													
Poultry													
Equine, Sheep & goats, Aquaculture, Bees, other livestock & livestock products													

** public k-12, pre-school, private k-12, private college, public college/univ, hospital, other*

Section 4	Other Farm-Related Income		
1	In 2014, what was the total income received by you and all partners for the following:		
	a. custom work, machine hire, and other agricultural services provided by this operation		$
	b. grazing of livestock? (Exclude contract arrangements previously reported.)		$
	c. recreational and agri-tourism activities such as hunting, fishing, farm tours, hospitality services, petting zoos, etc.		$
	d. sales of all forest products? (Include firewood, timber, etc. Exclude maple syrup and Christmas trees.)		$
	e. sales of farm machinery and vehicles? (farm share only)		$
	f. proceeds from sales of farmland and other farm real estate owned by this operation only		$
	(i) recognized gain/loss on sales of farmland and other farm real		$
	(ii) Were the sales of any farmland or other farm real estate made to :		
	1 a non-relative	"0" if NO, "1" if YES.	
	2 a relative		
	3 both non-relatives and relatives		
	g. Federal crop and livestock insurance payments?		$
	h. other crop and livestock insurance indemnity payments?		$
	i. cooperative patronage dividends and refunds?		$
	j. sales of value-added goods produced (e.g. cheese, cider, jams, jellies, wines, and other prepared farm commodities?) EXCLUDE if this is a separate business.		$
	k. income from royalties or leases associated with energy production (e.g. natural gas, oil and wind turbines)?		$
	l. all other farm related sources of income? [This may be a negative (-) number for hedging losses.]		$

2	Did you:	*"0" if NO, "1" if yes*	
	a. apply for any grants that were received all or in part for expenses incurred in 2014? (Include operating, capital, technical assistance and training, workshop waivers etc.)		
	b. receive any grants all or in part for expenses incurred in 2014?		
	i. Grant titles		
	ii. Granting Organizations		
	iii. Total Dollar amount of Grants	iv. % total Dollar amount Received for Direct to Institution Marketing	v. % total Dollar Amount Received for Wholesale to Institution marketing
	$		
	c. request and receive any in-kind services from public, private sector for and non-profit sources in 2014? (Include marketing, professional or public sector services)		
	i. How many hours of assistance did you receive?		
	ii. Estimated Dollar value of services received	iii. % total $ Received for Direct to Institution Marketing	iv. % total $ Received for Wholesale to Institution marketing
	$		

Section 5	Labor and Wages.

A. What were the total cash wages paid in 2014? Please add to this any cash bonuses paid to all hired workers during 2014. (Include payments to the operator, family members, and corporate officers, but exclude cash draw, partnership draw, contract labor, housework, custom work, and social security on the owner operator.)

Total Cash Wages	$

B. Of the total cash wages paid (question 1), how much was paid to the following? Report the wage rate and units (eg., $/hour, $/week, or $/month) for the following. If no wages were paid for a line, please enter 0.

		Number of Employees	Total Cash Wages ($)	Wage Rate (indicate units)
1.	Operator(s) or Managers(s)			
2.	Family Members (not operators)			
3.	Other salaried employees			
4.	Other full-time employees paid hourly.			
5.	Other part-time employees paid hourly.			
6.	Compensated Apprentices or Interns (please specify terms)			
7.	Contract labor			
8.	Custom Work			
9.	Professional or Farm management services such as record keeping, accounting, tax and business planning, farm product advice			
10.	Interns			
11	Total (Total cash wages should equal question 1).			

C. What were the total cash draws on the farm business during 2012?

$

D. What were the total payroll taxes for hired labor?

$

E. What were the total expenses for fringe benefits provided for hired workers for: life or health insurance, pension or retirement plans, employer's share of social security taxes, workman's compensation and unemployment compensation? If no fringe benefits were provided, please enter zero.

$

Section 5, *cont.*	**Labor and Wages.**

F. Were any non-cash benefits provided for hired workers? (Meals, other foods, housing, fuel, vehicles, utilities, etc.) *"0" if NO, "1" if yes* [ ]

If yes, enter estimated value of benefits for all workers combined below.

G.

	i. Benefit	ii. Meals or other food	iii. Housing	iv. Fuel	v. Vehicle Use	vi. Utilities	vii. Farm Produ	viii. Other
Estimated Value ($)								

H. On average, how many hours per week did you (the operator) and any other operators work with or without pay on this operation during each month of 2014? Indicate all hours worked even if not paid.

Month (2014)	Operator 1	Operator 2	Operator 3	Operator 4	Operator 5
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					

I. Please estimate the average number of hours per week your hired or salaried employees worked on this operation during each month of 2014. Do not include salaried personnel that were already listed as operators in question 6.

Month (2014)	Employee 1	Employee 2	Employee 3	Employee 4	Employee 5	Employ	Employee 7
January							
February							
March							
April							
May							
June							
July							
August							
September							
October							
November							
December							

Section 5, *cont.*	**Labor and Wages.**

J. Did anyone else, not reported above, do farm work in 2014 on this operation without pay or other remuneration? Please indicate the average number of hours worked per week without pay on this operation during each month of 2014. Please indicate whether labor was manual = "1", Professional/ farm management Services = "2", or other = "3"

"0" if NO, "1" if yes

If yes, please complete the table below.

Month (2014)	Worker 1	Worker 2	Worker 3	Worker 4	Worker 5	Worker 6
Under 16 (ü)						
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

K. Did anyone else, not reported above, do farm work in 2014 on this operation with payment in the form of academic credit or internship experience? Please indicate the average number of hours worked per week without pay on this operation during each month of 2014. Please indicate whether labor was manual = "1", Professional/ farm management Services = "2", or other = "3"

"0" if NO, "1" if yes

If yes, please complete the table below.

Month (2014)	Worker 1	Worker 2	Worker 3	Worker 4	Worker 5	Worker 6
Under 16 (ü)						
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

Section 6	Farm Operating Expenses			
	A. Farm Operating Expense. How much was spent during 2013, including operator, partners and custom expenses for the categories below. Please list the cash expenses. Do not include personal living expenses such as taxes, insurance, repairs, etc., on your home. If no expenditure was made for a particular item, please enter 0. Include the costs incurred from producing value-added products. (Note: Schedule F line numbers included below.)			
		Expenses ($)	% total Expenses Direct to Institution	% total Expenses Wholesale to Institution
	1. Car and truck expenses (Schedule F line 10)			
	2. Chemicals (Schedule F line 11)			
	3. Conservation expenses (Schedule F line 12)			
	4. Custom hire (machine work, etc.) (Schedule F line 13)			
	5. Depreciation (Schedule F line 14)			
	6. Employee benefit other than pension and profit-sharing plans (Schedule F line 15)			
	7. Feed (grains, hay, haylage, silage, minerals and other purchased feeds.) (Schedule F line 16)			
	8. Fertilizers and lime (Schedule F line 17)			
	9. Freight and trucking (include product hauling) (Schedule F line 18)			
	10. Gasoline, fuel, and oil (Schedule F line 19)			
	11. Insurance other than health (Schedule F line 20)			
	a. Food safety liability insurance (related capital Expenses below)			
	12. Interest and service fees on farmland, buildings and other real estate debt (Schedule F line 21a??)			
	13. Interest and service fees on operating loans. (Schedule F line 21b??)			
	14. Labor hired (Schedule F line 22)			
	15. Pension and profit-sharing plans (Schedule F line 23)			
	16. Rent or lease of any farm machinery, equipment or structures (Schedule F line 24a)			
	17. Rent or lease of any farm land, animals, etc. (Schedule F line 24b)			
	18. Repair and maintenance (items a and b below should sum to this line) (Schedule F line 25)			
	a. Repair and maintenance to buildings			
	i) Expenses required for GAP certification or state equivalent			
	ii) Expenses required for Approved Vendor Status certification			
	iii) Expenses required for other state/ federal food safety licensing			
	b. Repair and maintenance to machinery and equipment			
	i) Expenses required for GAP certification or state equivalent			
	ii) Expenses required for Approved Vendor Status certification			
	iii) Expenses required for other state/ federal food safety licensing			
	19. Seeds and plants purchased(Schedule F line 26)			

Section 6, *cont.*	**Farm Operating Expenses**			
	20. Storage and warehousing (Schedule F line 27)			
	21. Supplies purchased such as acid, soap, paper towels, etc. (Schedule F line 28)			
	22. Taxes (items a and b below should sum to this line) (Schedule F line 29)			
	a. Real Estate Taxes			
	b. Other property and excise tax			
	23. Utilities (electricity, water, telephone, etc.) (Schedule F line 30)			
	24. Veterinary, breeding, hoof trimming and medicine expenses(Schedule F line 31)			
	25. Accounting and tax preparation			
	26. Dues			
	27. Other marketing expenses			
	28. Promotion			
	29. What was the market value of commoditites produced and used on this operation for home or employee/ volunteer consumption?			
	30. What was the market value of in-kind services provided to community groups, employees or volunteers?			
	31. GAP certification or state equivalent (Capital expense below)			
	a. Annual Fees			
	b. Consultant services			
	32.Expenses associated with becoming an approved vendor for a FtI Distributor or Wholesaler			
	34. Additional expenses not recorded above (please list items)			
	a.			
	b.			
	c.			
	d.			
	e.			
	f.			
	g.			
	Total (line 33 from 1040 Schedule F)			

Section 6, *cont.*	Farm Operating Expenses			
B.	**Capital Expenses**			
		Expenses ($)	% total Expenses Direct to Institution	% total Expenses Wholesale to Institution
	1. Improvements on land such as land preparation, irrigation improvements, well drilling, ponds, feedlots, trench silos, lagoons, new fences etc			
	i) Expenses required for GAP certification or state equivalent			
	ii) Expenses required for Approved Vendor Status certification			
	iii) Expenses required for other state/federal food safety licensing			
	2. New Construction and remodeling of dwellings (exlcuding operators dwelling) barns, buildings, storage facilities, livestock facilities, sheds, silos, etc.			
	i) Expenses required for GAP certification or state equivalent			
	ii) Expenses required for Approved Vendor Status certification			
	iii) Expenses required for other state/ federal food safety licensing			
	3. New construction or remodeling of the operator's dwelling, if owned by operation?			
	4. Cars and trucks (before trade)			
	a. What percent of this item was the farm's share?			
	5. Machinery, implements and livestock equipment (please list)			
	6. Land			
	7. Other Capital expenses			
	i) Expenses required for GAP certification or state equivalent			
	ii) Expenses required for Approved Vendor Status certification			
	iii) Expenses required for other state/ federal food safety licensing			
C.	**Capital Assets.** Please indicate the value (a fair market value) of the capital assets listed as of January 1, 2013 and as of December 31, 2013 and changes that occurred during 2013.			
		Market Value (January 1, 2013)	Market Value (Dec. 31, 2013)	Net Change
	a. Owned farm land			
	b. Operator dwellings (if on farm)			
	c. Other dwellings			
	d. Farm buildings and structures			
	e. Machinery and equipment			
	f. Livestock (include all types)			
	g. Other capital assets not listed:			

Section 6, *cont.*	Farm Operating Expenses			

D. Operating Assets. Please indicate the value of the operating assets listed as of January 1, 2014 and as of December 31, 2014 and changes that occurred during 2014.

	Market Value (January 1, 2014)	Market Value (Dec. 31, 2014)	Net Change
a. Supplies (packaging, labeling,soap etc.)			
b. Accounts receivable			
c. Product on hand			
d. Seed and plants purchased			
e. Feed			
f. Chemicals, Fertilizer and Lime			
g. Other operating assets not listed:			

E. **Farm Liabilities and Debt. Please indicate farm liabilities as of January 1, 2014 and as of December 31, 2014, and changes that occurred.**

	Liability Value (January 1,	Liability Value (Dec. 31, 2014)	Net Change
a. Production loans			
b. Accounts payable			
c. If you have an established line of farm credit with a lender, how much did you borrow in 2014?			
d. What was the total amount of all farm business loans taken out and repaid in 2014?			
e. How much did this operation owe money to any banks, co-ops, individuals, merchants or Federal agencies on december 31, 2014?			
f. Other liabilities (please list):			

Section 7	Operator Information	
	Farm Name	
	Farmer(s) Name(s)	
	Street Address	
	Town	
	State	
	Zip	
	Telephone Number	
	Cell Phone Number	
	fax Number	
	Website	
	Email Address	
	Sex	

REFERENCES

Abatekassa, G. and H.C. Peterson "Market access for local food through the conventional food supply chain." International Food and Agribusiness Management Review 14 (2011):41-60.

Adams, D.C. and M.J. Salois "Local versus organic: A turn in consumer preferences and willingness-to-pay." Renewable Agriculture and Food Systems 25 (2010):331-41.

Ajzen, I. "Nature and operation of attitudes." Annual Review of Psychology 52 (2001):27-58.

Alfnes, F. and K. Rickertsen "European Consumers' Willingness to Pay for U.S. Beef in Experimental Auction Markets." American Journal of Agricultural Economics 85 (2003):396-405.

Allain, M., C. Chambolle, S. Turolla and S. Villas-Boas "The impact of retail mergers on food prices: evidence from France." (2013):

Allen, M.W. and S. Baines "Manipulating the symbolic meaning of meat to encourage greater acceptance of fruits and vegetables and less proclivity for red and white meat." Appetite 38 (2002):118-30.

Alston, J.M., R.J. Sexton and M. Zhang "The effects of imperfect competition on the size and distribution of research benefits." American Journal of Agricultural Economics 79 (1997):1252-65.

Anderson, M.D. "The Case for Local and Regional Food Marketing." Farm and Food Policy Project issue brief.Northeast-Midwest Institute, Washington, DC.Accessed November (2009):

Andreoni, J. "Impure altruism and donations to public goods: A theory of warm-glow giving." The economic journal 100 (1990):464-77.

Angrist, J.D., J. Pischke and J. Pischke Mostly harmless econometrics: an empiricists companionCram101 Publishing, 2013.

Aschemann-Witzel, J., K.G. Grunert, H.C.M. van Trijp, S. Bialkova, M.M. Raats, C. Hodgkins, G. Wasowicz-Kirylo and J. Koenigstorfer "Effects of nutrition label format and product assortment on the healthfulness of food choice." Appetite 71 (2013):63-74.

Ashenfelter, O.C., D.S. Hosken and M.C. Weinberg "Efficiencies brewed: pricing and consolidation in the US beer industry." The Rand journal of economics 46 (2015):328-61.

Ashraf, N., O. Bandiera and B.K. Jack "No margin, no mission? A field experiment on incentives for public service delivery." Journal of Public Economics 120 (2014):1-17.

Bagozzi, R.P. and Y. Yi "On the evaluation of structural equation models." Journal of the academy of marketing science 16 (1988):74-94.

Barham, B.L., J. Chavas, D. Fitz, V.R. Salas and L. Schechter "The roles of risk and ambiguity in technology adoption." Journal of Economic Behavior & Organization 97 (2014):204-18.

Barrowclough, M., K.A. Boys and C. Carpio An Evaluation of Firm and Contract Characteristics Valued by Supply Chain Partners in Specialty Crop Marketing Channels Agricultural and Applied Economics Association & Western Agricultural Economics Association, 2015.

Bartlett, S., F. Glantz, and C. Logan. School Lunch and Breakfast Cost Study – II: Final Report. Alexandria, VA.: Food and Nutrition Service, U.S. Department of Agriculture, 2008.

Bateman, J., T. Engel and A. Meinen "Understanding Wisconsin producer and distributor perceptions to inform farm to school programs and policies." Journal of hunger & environmental nutrition 9 (2014):48-63.

Belleflamme, P. and M. Peitz Industrial organization: markets and strategiesCambridge University Press, 2015.

Ben-Akiva, M. and J. Swait "The Akaike likelihood ratio index." Transportation Science 20 (1986):133-6.

Benson, M.C. "Exploring extension involvement in farm to school program activities." Journal of Extension 52 (2014):4FEA4.

Berezowitz, C.K., A.B. Bontrager Yoder and D.A. Schoeller "School gardens enhance academic performance and dietary outcomes in children." Journal of School Health 85 (2015):508-18.

Berger, A.N. "The profit-structure relationship in banking--tests of market-power and efficient-structure hypotheses." Journal of Money, Credit and Banking 27 (1995):404-31.

Berry, J.W. Cross-cultural psychology: Research and applicationsCambridge University Press, 2002.

Blanco, M., D. Engelmann and H.T. Normann "A within-subject analysis of other-regarding preferences." Games and Economic Behavior 72 (2011):321-38.

Bloom, J.D. and C.C. Hinrichs "Moving local food through conventional food system infrastructure: Value chain framework comparisons and insights." Renewable Agriculture and Food Systems 26 (2011):13-23.

Bolton, G.E. and A. Ockenfels "ERC: A theory of equity, reciprocity, and competition." American economic review (2000):166-93.

Bonanno, G. and B. Haworth "Intensity of competition and the choice between product and process innovation." International Journal of Industrial Organization 16 (1998):495-510.

Bond, C.A., D. Thilmany and J. Keeling Bond "Understanding consumer interest in product and process-based attributes for fresh produce." Agribusiness: An International Journal 24 (2008):231-52.

Botkins, E.R. and B.E. Roe "Understanding participation in farm to school programs: Results integrating school and supply-side factors." Food Policy 74 (2018):126-37.

Bourguignon, F., M. Fournier and M. Gurgand "Selection bias corrections based on the multinomial logit model: Monte Carlo comparisons." Journal of Economic Surveys 21 (2007):174-205.

Bowell, B., C. Coffin, M. Eley and D. Mittasch Farms for the Futu re Massa chusetts' Inves tments i n Farmland Conserva tion American Farmland Trust, 2008.

Boyle, D. "Authenticity Brands, Fakes, Spin and the Lust for Real Life." (2003):

Boys, K.A. and A.M. Fraser "Linking small fruit and vegetable farmers and institutional foodservice operations: marketing challenges and considerations." Renewable Agriculture and Food Systems (2018):1-13.

Brandon, A., P.J. Ferraro, J.A. List, R.D. Metcalfe, M.K. Price and F. Rundhammer Do the effects of social nudges persist? Theory and evidence from 38 natural field experiments (2017):

Briefel, R.R., M.K. Crepinsek, C. Cabili, A. Wilson and P.M. Gleason "School Food Environments and Practices Affect Dietary Behaviors of US Public School Children." Journal of the American Dietetic Association 109 (2009):S91-S107.

Brown, C. and S. Miller "The impacts of local markets: a review of research on farmers markets and community supported agriculture (CSA)." American Journal of Agricultural Economics 90 (2008):1298-302.

Brown, J.P., S.J. Goetz and D.A. Fleming Multifunctional Agriculture and Farm Viability in the United StatesAgricultural and Applied Economics Association, 2012.

Brown, J.P. and J.G. Weber "The off-farm occupations of US farm operators and their spouses." (2013):

Brown, K.H. and A.L. Jameton "Public health implications of urban agriculture." Journal of public health policy 21 (2000):20-39.

Bruno, A., T.P. Hustad and E.A. Pessemier An Integrated Examination of Media Approaches to Market SegmentationHerman C. Krannert Graduate School of Industrial Administration, Purdue University, 1972.

Brunsø, K., J. Scholderer and K.G. Grunert "Closing the gap between values and behavior—a means–end theory of lifestyle." Journal of business research 57 (2004):665-70.

Buchan, N.R., E.J. Johnson and R.T.A. Croson "Let's get personal: An international examination of the influence of communication, culture and social distance on other regarding preferences." Journal of Economic Behavior & Organization 60 (2006):373-98.

Byerlee, D. and J.R. Anderson "Risk, utility and the value of information in farmer decision making." (1982):

Byerly, H., A. Balmford, P.J. Ferraro, C. Hammond Wagner, E. Palchak, S. Polasky, T.H. Ricketts, A.J. Schwartz and B. Fisher "Nudging pro-environmental behavior: evidence and opportunities." Frontiers in Ecology and the Environment 16 (2018):159-68.

Cakir, M. and J.V. Balagtas "Estimating Market Power of U.S. Dairy Cooperatives in the Fluid Milk Market." American Journal of Agricultural Economics 94 (2012):647-58.

Camerer, C.F. and E. Fehr "When Does "Economic Man" Dominate Social Behavior?" Science 311 (2006):47-52.

Campbell, J., R.B. DiPietro and D. Remar "Local foods in a university setting: Price consciousness, product involvement, price/quality inference and consumer's willingness-to-pay." International Journal of Hospitality Management 42 (2014):39-49.

Caracciolo, F., G. Cicia, T. Del Giudice, L. Cembalo, A. Krystallis, K.G. Grunert and P. Lombardi "Human values and preferences for cleaner livestock production." Journal of Cleaner Production 112 (2016):121-30.

Carlton, D.W. and J.M. Perloff Modern Industrial Organization, 2005Boston: Addison Wesley, 1994.

Carpenter, J.P. and E. Gong "Motivating Agents: How much does the mission matter?" (2013):

Casler, K., L. Bickel and E. Hackett "Separate but equal? A comparison of participants and data gathered via Amazon’s MTurk, social media, and face-to-face behavioral testing." Computers in Human Behavior 29 (2013):2156-60.

Cason, T.N. and V. Mui "Social Influence in the Sequential Dictator Game." Journal of mathematical psychology 42 (1998):248-65.

Caswell, J.A. "How labeling of safety and process attributes affects markets for food." Agricultural and Resource Economics Review 27 (1998):151-8.

Cavallo, C. and B. Piqueras-Fiszman "Visual elements of packaging shaping healthiness evaluations of consumers: The case of olive oil." Journal of Sensory Studies 32 (2017):e12246.

Cembalo, L., A. Lombardi, S. Pascucci, D. Dentoni, G. Migliore, F. Verneau and G. Schifani The Beauty of the Commons? Consumers’ participation in Food Community NetworksAgricultural and Applied Economics Association, 2012.

Cembalo, L., F. Caracciolo, A. Lombardi, T. Del Giudice, K. Grunert and G. Cicia "Determinants of individual attitudes toward animal welfare-friendly food products." Journal of Agricultural and Environmental Ethics 29 (2016):237-54.

Cembalo, L., A. Lombardi, S. Pascucci, D. Dentoni, G. Migliore, F. Verneau and G. Schifani The Beauty of the Commons? Consumers’ participation in Food Community NetworksAgricultural and Applied Economics Association, 2012.

Centers for Disease Control and Prevention (CDC) Childhood Obesity Prevention.” 2018.

Chambers, C., P. Kouvelis and J. Semple "Quality-Based Competition, Profitability, and Variable Costs." Management Science 52 (2006):1884-95.

Chambolle, C. and S.B. Villas-Boas "Buyer power through producer's differentiation." Department of Agricultural & Resource Economics, UCB (2008):

Cho, H. and M. Zbell Nadow "UNDERSTANDING BARRIERS TO IMPLEMENTING QUALITY LUNCH AND NUTRITION EDUCATION." Journal of Community Health, 29 (2004):421.

Christensen, L.O., B.B. Jablonski and J.K. O'Hara "School districts and their local food supply chains." Renewable Agriculture and Food Systems (2017):1-9.

Cicia, G. "La “sostenibilità” in agricoltura: un confronto tra l’approccio utilitarista e quello ambientalista." Rivista di Economia Agraria 48 (1993):4.

Cicia, G., M. Corduas, T. Del Giudice and D. Piccolo "Valuing consumer preferences with the CUB model: a casestudy of fair trade coffee." International Journal on Food System Dynamics 1 (2010):82-93.

Cicia, G., T. Del Giudice and R. Scarpa "Consumers’ perception of quality in organic food: a random utility model under preference heterogeneity and choice correlation from rank-orderings." British Food Journal 104 (2002):200-13.

Clark, M.A. and M.K. Fox "Nutritional quality of the diets of US public school children and the role of the school meal programs." Journal of the American Dietetic Association 109 (2009):S44-56.

Cleveland, D.A., N.M. Müller, A.C. Tranovich, D.N. Mazaroli and K. Hinson "Local food hubs for alternative food systems: A case study from Santa Barbara County, California." Journal of Rural Studies 35 (2014):26-36.

Cohen, J.F.W., L.A. Smit, E. Parker, S.B. Austin, A.L. Frazier, C.D. Economos and E.B. Rimm "Long-Term Impact of a Chef on School Lunch Consumption: Findings from a 2-Year Pilot Study in Boston Middle Schools." Journal of the Academy of Nutrition and Dietetics 112 (2012):927-33.

Colasanti, K.J., C. Matts and M.W. Hamm "Results from the 2009 Michigan farm to school survey: Participation grows from 2004." Journal of nutrition education and behavior 44 (2012):343-9.

Community Food Security Coalition ,Strengthening Farm to School Programs, 2012.

Community Food Security Coalition, School Food FOCUS and National Farm to School Network, Nourishing the Nation One Tray at a Time, 2010.

Conner, D.S., B.T. Izumi, T. Liquori and M.W. Hamm "Sustainable School Food Procurement in Large K-12 Districts: Prospects for Value Chain Partnerships." Agricultural and Resource Economics Review 41 (2012):100.

Conner, D., B. King, J. Kolodinsky, E. Roche, C. Koliba and A. Trubek "You can know your school and feed it too: Vermont farmers' motivations and distribution practices in direct sales to school food services." Agriculture and Human Values 29 (2012):321-32.

Connolly, C. and H.A. Klaiber "Does organic command a premium when the food is already local?" American Journal of Agricultural Economics 96 (2014):1102-16.

———Are Consumers Willing to Pay for Organic When the Food is Already Local?Agricultural and Applied Economics Association, 2012.

Costanigro, M. and J.L. Lusk "The signaling effect of mandatory labels on genetically engineered food." Food Policy 49 (2014):259-67.

Crespi, J.M., T.L. Saitone and R.J. Sexton "Competition in US Farm Product Markets: Do Long-Run Incentives Trump Short-Run Market Power?" Applied Economic Perspectives and Policy 34 (2012):669-95.

Cummings, R.C., C.A. Holt and S. Laury "Using laboratory experiments for policy making: an example from the Georgia irrigation reduction auction." Andrew Young School of Policy Studies Research Paper Series (2003):

Curtis, L.H., B.G. Hammill, E.L. Eisenstein, J.M. Kramer and K.J. Anstrom "Using inverse probability-weighted estimators in comparative effectiveness analyses with observational databases." Medical care 45 (2007):S103-7.

Darby, K., M.T. Batte, S. Ernst and B. Roe "Decomposing local: a conjoint analysis of locally produced foods." American Journal of Agricultural Economics 90 (2008):476-86.

Datler, G., W. Jagodzinski and P. Schmidt "Two theories on the test bench: Internal and external validity of the theories of Ronald Inglehart and Shalom Schwartz." Social science research 42 (2013):906-25.

Dentoni, D., G.T. Tonsor, R.J. Calantone and H.C. Peterson "The Direct and Indirect Effects of ‘ Locally Grown’ on Consumers’ Attitudes towards Agri-Food Products." Agricultural and Resource Economics Review 38 (2012):

Diamond, A. and J. Barham "Moving Food Along the Value Chain: Innovations in Regional Food Distribution." US Department of Agriculture, Agricultural Marketing Service, Market Services Division 53 (2012):

Dietz, T. "Environmental value." Handbook of Value: Perspectives from Economics, Neuroscience, Philosophy, Psychology and Sociology (2015):329.

Dimitri, C., J. Hanson and L. Oberholtzer "Local food in Maryland schools: a real possibility or a wishful dream?" (2010):

Erwin, K. Massachusetts Farm to School Project Executive Director (2013).

———Massachusetts Farm to School Project Executive Director. (2012).

Faith, M.S., K.R. Fontaine, M.L. Baskin and D.B. Allison "Toward the reduction of population obesity: Macrolevel environmental approaches to the problems of food, eating, and obesity." Psychological bulletin 133 (2007):205-26.

Feenstra, G., P. Allen, S. Hardesty, J. Ohmart and J. Perez "Using a Supply Chain Analysis to Assess the Sustainability of Farm to Institution Programs." Journal of Agriculture, Food Systems, and Community Development 1 (2011):69-85.

Feenstra, G.W. "Local food systems and sustainable communities." American Journal of Alternative Agriculture 12 (1997):28-36.

Feldmann, C. and U. Hamm "Consumers' perceptions and preferences for local food: A review." Food Quality and Preference 40 (2015):152-64.

Ferraro, P.J. and M.K. Price "Using nonpecuniary strategies to influence behavior: evidence from a large-scale field experiment." Review of Economics and Statistics 95 (2013):64-73.

Ferraro, P., K.D. Messer and S. Wu "Applying behavioral insights to improve water security." Choices 32 (2017):1-6.

Fitzsimmons, J. and D.A. . Lass Costs and Returns to New England Farmers in the Farm-to-Institution Supply Chain

Fitzsimmons, J.A. Freezing Regional Produce for Western New England . MA: CISA, 2011.

Fitzsimmons, J. and G. Cicia "Different Tubers for Different Consumers: Heterogeneity in Human Values and Willingness to Pay for Social Outcomes of Potato Credence Attributes." International Journal on Food System Dynamics 9 (2018):354-74.

Food and Nutrition Service National School Lunch Program Fact SheetUSDA Food and Nutrition Service, August, 2012.

Food and Nutrition Service, USDA Farm to School, http://www.fns.usda.gov/farmtoschool/farm-school ed

Fox, M.K., E. Condon, M.K. Crepinsek, K. Niland, D. Mercury, S. Forrestal, C. Cabili, V. Oddo, A. Gordon and N. Wozny School Nutrition Dietary Assessment Study IV: School Foodservice Operations, School Environments, and Meals Offered and Served.Cambridge, MA: Mathematica Policy Research (2012):

García-Gallego, A. and N. Georgantzís "Market Effects of Changes in Consumers' Social Responsibility." Journal of Economics & Management Strategy 18 (2009):235-62.

Gil, J.M., A. Gracia and M. Sanchez "Market segmentation and willingness to pay for organic products in Spain." The International Food and Agribusiness Management Review 3 (2000):207-26.

Givens, G. and R. Dunning "Distributor intermediation in the farm to food service value chain." Renewable Agriculture and Food Systems (2018):1-3.

Golan, E.H., B. Krissoff, F. Kuchler, L. Calvin, K. Nelson and G. Price Traceability in the US food supply: economic theory and industry studies (2004):

Gordon, A. and M.K. Fox School nutrition dietary assessment study-III: Summary of findings (2007):

Gordon, A.R., M.K. Crepinsek, R.R. Briefel, M.A. Clark and M.K. Fox "The Third School Nutrition Dietary Assessment Study: Summary and Implications." Journal of the American Dietetic Association 109 (2009):S129-35.

Graham, H., G. Feenstra, A. Evans and S. Zidenberg-Cherr "Davis school program supports life-long healthy eating habits in children." California Agriculture 58 (2004):200.

Green, G.P. and T.J. Richards "Discounting Environmental Goods." Journal of Agricultural and Resource Economics 43 (2018):215-32.

Greiner, R., M. Bliemer and J. Ballweg "Design considerations of a choice experiment to estimate likely participation by north Australian pastoralists in contractual biodiversity conservation." Journal of Choice Modelling 10 (2014):34-45.

Grolleau, G. and J.A. Caswell "Interaction between food attributes in markets: the case of environmental labeling." Journal of Agricultural and Resource Economics (2006):471-84.

Grunert, K.G. "Towards a concept of food-related life style." Appetite 21 (1993):151-5.

Grunert, K.G., S. Hieke and J. Wills "Sustainability labels on food products: Consumer motivation, understanding and use." Food Policy 44 (2014):177-89.

Grunert, K.G., T. Perrea, Y. Zhou, G. Huang, B.T. Sørensen and A. Krystallis "Is food-related lifestyle (FRL) able to reveal food consumption patterns in non-Western cultural environments? Its adaptation and application in urban China." Appetite 56 (2011):357-67.

Grunert, K.G., J. Wills, L.F. Celemín, L. Lähteenmäki, J. Scholderer and S. Storcksdieck genannt Bonsmann "Socio-demographic and attitudinal determinants of nutrition knowledge of food shoppers in six European countries." Food Quality and Preference 26 (2012):166-77.

Gunter, A. Rebuilding Local Food Systems: Marketing and Economic Implications for Communities, Master of Science ed. Fort Collins, CO: University of Colorado, 2011.

Hardesty, S.D. and P. Leff "Determining marketing costs and returns in alternative marketing channels." Renewable agriculture and food systems 25 (2010):24-34.

Harrison, G.W. and J.A. List "Field experiments." Journal of Economic literature (2004):1009-55.

Heiss, S.N., N.K. Sevoian, D.S. Conner and L. Berlin "Farm to institution programs: organizing practices that enable and constrain Vermont’s alternative food supply chains." Agriculture and human values 32 (2015):87-97.

Henkle, D. "Gap Inc. sees supplier ownership of compliance with workplace standards as an essential element of socially responsible sourcing." Journal of Organizational Excellence 25 (2005):17-25.

Hilchey, D. "Food systems research priorities: Blueprints for the next 5 years." (2013):

Hinson, R.A. "Responses to Industry Concentration by Small-and Medium Sized Fruit and Vegetable Wholesalers." Journal of Food Distribution Research 36 (2005):

Hinton, P.R., I. McMurray and C. Brownlow SPSS explainedRoutledge, 2004.

Hobbs, J.E. "Traceability in meat supply chains." CAFRI: Current Agriculture, Food and Resource Issues (2003):

———"Measuring the importance of transaction costs in cattle marketing." American Journal of Agricultural Economics 79 (1997):1083-95.

———"A transaction cost approach to supply chain management." Supply Chain Management: An International Journal 1 (1996):15-27.

Hole, A.R. "Modelling heterogeneity in patients' preferences for the attributes of a general practitioner appointment." Journal of health economics 27 (2008):1078-94.

———"Estimating mixed logit models using maximum simulated likelihood." Stata Journal 7 (2007):388-401.

Hole, A.R. and J.R. Kolstad "Mixed logit estimation of willingness to pay distributions: a comparison of models in preference and WTP space using data from a health-related choice experiment." Empirical Economics 42 (2012):445-69.

Holmes, T., E. Blackmore, R. Hawkins and T. Wakeford "The common cause handbook." Public Interest Research Centre (2011):

Hortaçsu, A. and C. Syverson "Cementing relationships: Vertical integration, foreclosure, productivity, and prices." Journal of political economy 115 (2007):250-301.

Hu, W., A. Hünnemeyer, M. Veeman, W. Adamowicz and L. Srivastava "Trading off health, environmental and genetic modification attributes in food." European Review of Agricultural Economics 31 (2004):389-408.

Hughner, R.S., P. McDonagh, A. Prothero, C.J. Shultz and J. Stanton "Who are organic food consumers? A compilation and review of why people purchase organic food." Journal of Consumer Behaviour: An International Research Review 6 (2007):94-110.

Hyde, C.E. and J.M. Perloff "Can monopsony power be estimated?" American Journal of Agricultural Economics (1994):1151-5.

Hyland, R. Food Service Contractors in the U.SIBISWorld Industry Report, 2018.

Inglehart, R.F., M. Basanez, M. Basanez and A. Moreno Human values and beliefs: A cross-cultural sourcebook. University of Michigan Press, 1998.

———Human values and beliefs: A cross-cultural sourcebook. University of Michigan Press, 1998.

Izumi, B.T., D.W. Wright and M.W. Hamm "Market diversification and social benefits: Motivations of farmers participating in farm to school programs." Journal of Rural Studies 26 (2010):374-82.

Izumi, B.T., O.S. Rostant, M.J. Moss and M.W. Hamm "Results from the 2004 Michigan Farm-to-School Survey." Journal of School Health 76 (2006):169-74.

Izumi, B.T., D. Wynne Wright and M.W. Hamm "Market diversification and social benefits: Motivations of farmers participating in farm to school programs." Journal of Rural Studies 26 (2010):374-82.

Joseph, S., N. Lavoie and J.A. Caswell "Implementing COOL: comparative welfare effects of different labeling schemes." Food Policy 44 (2014):14-25.

Joshi, A., M. Kalb and M. Beery Going Local: Paths to Success for Farm to School Programs. Los Angeles, CA: Center for Food & Justice, 2006.

Jun, S. and J.M. Irudayaraj. Food processing operations modeling: design and analysis. CRC press, 2008.

Just, D.R., B. Wansink, L. Mancino and J. Guthrie Behavioral Economic Concepts To Encourage Healthy Eating in School Cafeterias. USDA Economic Research Service, December, 2008.

Just, R.E. and R.D. Pope "Agricultural risk analysis: adequacy of models, data, and issues." American Journal of Agricultural Economics 85 (2003):1249-56.

Kamakura, W.A. and T.P. Novak "Value-system segmentation: Exploring the meaning of LOV." Journal of consumer research 19 (1992):119-32.

Katchova, A.L. and M.J. Miranda "Two-step econometric estimation of farm characteristics affecting marketing contract decisions." American Journal of Agricultural Economics 86 (2004):88-102.

Katzner, D.W. "Cultural Variation in the Theory of the Firm." Journal of Post Keynesian Economics 28 (2005):pp. 277-293.

Key, N. and M.J. Roberts "Nonpecuniary benefits to farming: Implications for supply response to decoupled payments." American Journal of Agricultural Economics 91 (2009):1-18.

Khanna, M., S.M. Swinton and K.D. Messer "Sustaining our Natural Resources in the Face of Increasing Societal Demands on Agriculture: Directions for Future Research." Applied Economic Perspectives and Policy 40 (2018):38-59.

Kim, M., K.R. Curtis and I. Yeager "An assessment of market strategies for small-scale produce growers." International Food and Agribusiness Management Review 17 (2014):187.

King, R.P., M.S. Hand, G. DiGiacomo, K. Clancy, M.I. Gómez, S.D. Hardesty, L. Lev and E.W. McLaughlin Comparing the Structure, Size, and Performance of Local and Mainstream Food Supply ChainsUSDA Economic Research Service, 2010.

Lea, E. and T. Worsley "Australians' organic food beliefs, demographics and values." British Food Journal 107 (2005):855-69.

Lehnerd, M.E., J.M. Sacheck, T.S. Griffin, J.P. Goldberg and S.B. Cash "Farmers' Perspectives on the Adoption and Impacts of Nutrition Incentive and Farm to School Programs." Journal of Agriculture, Food Systems, and Community Development 8 (2018):1-19.

Leib, E.B. INCREASING LOCAL FOOD PROCUREMENT BY MASSACHUSETTS STATE COLLEGES & UNIVERSITIES . Cambridge, MA: Harvard Food Law and Policy Center, 2012.

LeRoux, M.N., T.M. Schmit, M. Roth and D.H. Streeter "Evaluating marketing channel options for small-scale fruit and vegetable producers." Renewable agriculture and food systems 25 (2010):16-23.

Lin, W., G.W. Dean and C.V. Moore "An Empirical Test of Utility vs. Profit Maximization in Agricultural Production." American Journal of Agricultural Economics 56 (1974):497-508.

Loureiro, M.L. and S. Hine "Discovering niche markets: A comparison of consumer willingness to pay for local (Colorado grown), organic, and GMO-free products." Journal of Agricultural and Applied Economics 34 (2002):477-87.

Low, S. and S. Vogel "Direct and intermediated marketing of local foods in the United States." USDA-ERS Economic Research Report (2011):

Low, Sarah A., Aaron Adalja, Elizabeth Beaulieu, Nigel Key, Steve Martinez, Alex Melton, Agnes Perez, Katherine Ralston, Hayden Stewart, Shellye Suttles, Stephen Vogel, and Becca B.R. Jablonski. Trends in U.S. Local and Regional Food Systems. (2015).

Lusk, J.L. and B.C. Briggeman "Food values." American Journal of Agricultural Economics 91 (2009):184-96.

Lusk, J.L., J. Brown, T. Mark, I. Proseku, R. Thompson and J. Welsh "Consumer Behavior, Public Policy, and Country-of-Origin Labeling." Applied Economic Perspectives and Policy 28 (2006):284-92.

Lyson, H.C. "National policy and state dynamics: A state-level analysis of the factors influencing the prevalence of farm to school programs in the United States." Food Policy 63 (2016):23-35.

Lyson, T.A., G.W. Gillespie and D. Hilchey "Farmers' markets and the local community: Bridging the formal and informal economy." American Journal of Alternative Agriculture 10 (1995):108-13.

Macher, J.T. and B.D. Richman "Transaction cost economics: An assessment of empirical research in the social sciences." Business and Politics 10 (2008):

Magnier, A., N. Kalaitzandonakes and D.J. Miller Measuring market power in agricultural industries with a large number of differentiated products

Marra, M., D.J. Pannell and A.A. Ghadim "The economics of risk, uncertainty and learning in the adoption of new agricultural technologies: where are we on the learning curve?" Agricultural systems 75 (2003):215-34.

Marshall, M.N. "Sampling for qualitative research." Family practice 13 (1996):522-6.

Martinez, S. "Local food systems : concepts, impacts, and issues / Steve Martinez ... [et al.]." Economic research report ; no. 97. Anonymous [Washington, D.C.] : U.S. Dept. of Agriculture, Economic Research Service, 2010, 2010.

Matts, C., D.S. Conner, C. Fisher, S. Tyler and M.W. Hamm "Farmer perspectives of Farm to Institution in Michigan: 2012 survey results of vegetable farmers." Renewable Agriculture and Food Systems 31 (2016):60-71.

McCarthy, A.C., A.S. Steiner and R.F. Houser "Do state farm-to-school–related laws increase participation in farm-to-school programs?" Journal of Hunger & Environmental Nutrition 12 (2017):466-80.

McFadden, D. "Conditional logit analysis of qualitative choice behavior." (1973):

McFadden, D.T., A. Bauman, B.B. Jablonski, B. Angelo and D. Shideler "Expanding the farmer's share of the food dollar: exploring the potential effects of emerging food supply chain models." Economic development report (Colorado State University.Dept.of Agricultural and Resource Economics); EDR 15-01 (2015):

McGuirt, J.T., S.B. Jilcott, H. Liu and A.S. Ammerman "Produce price savings for consumers at farmers' markets compared to supermarkets in North Carolina." Journal of Hunger & Environmental Nutrition 6 (2011):86-98.

Menapace, L., G. Colson and R. Raffaelli "Climate change beliefs and perceptions of agricultural risks: An application of the exchangeability method." Global Environmental Change 35 (2015):70-81.

Menapace, L., G. Colson and R. Raffaelli Climate change beliefs and perceptions of agricultural risks: An application of the exchangeability method2015.

M FTSP Massachusetts Farm to School Project, www.massfarmtoschool.org/ ed2012.

Minton, E., E. Gurel-Atay, L. Kahle and K. Ring Comparing Data Collection Alternatives: Amazon Mturk, College Students, and Secondary Data AnalysisAmerican Marketing Association, 2013.

Monson, J., D. Mainville and N. Kuminoff "The decision to direct market: an analysis of small fruit and specialty-product markets in Virginia." Journal of Food Distribution Research 39 (2008):1-11.

Moschini, G., L. Menapace and D. Pick "Geographical indications and the competitive provision of quality in agricultural markets." American Journal of Agricultural Economics 90 (2008):794-812.

Motta, V. and A. Sharma "Benefits and transaction costs of purchasing local foods in school districts." International Journal of Hospitality Management 55 (2016):81-7.

Mussa, M. and S. Rosen "Monopoly and product quality." Journal of Economic Theory 18 (1978):301-17.

Nanney, M.S., M.B. Schwartz and M. Story "Schools and Obesity Prevention: Creating School Environments and Policies to Promote Healthy Eating and Physical Activity." The Milbank quarterly 87 (2009):71.

National Farm to School Network Home Page., http://www.farmtoschool.org/ ed2018.

———About/What is Farm to School?, http://www.farmtoschool.org/about/what-is-farm-to-school ed2016.

National Farm to School Network (NFSN Growth of Farm to School in the U.S. (1997-2014).”2014.

Nie, C. and L. Zepeda "Lifestyle segmentation of US food shoppers to examine organic and local food consumption." Appetite 57 (2011):28-37.

Nocke, V. and L. White "Do vertical mergers facilitate upstream collusion?" American Economic Review 97 (2007):1321-39.

Noton, C. and A. Elberg "Revealing Bargaining Power through Actual Wholesale Prices." (2011):

Nylund, K.L., T. Asparouhov and B.O. Muthén "Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study." Structural equation modeling 14 (2007):535-69.

Oberholtzer, L., C. Dimitri and E.C. Jaenicke "Examining US food retailers’ decisions to procure local and organic produce from farmer direct-to-retail supply chains." Journal of Food Products Marketing 20 (2014):345-61.

Ofek, E. and V. Srinivasan "How much does the market value an improvement in a product attribute?" Marketing Science 21 (2002):398-411.

Office of Community Food Systems USDA Farm to School Program FY 2013 – FY 2017 Summary of Grant AwardsFood and Nutrition Services, United States Department of Agriculture, 2017.

O'Hara, J.K. and M.C. Benson "The impact of local agricultural production on farm to school expenditures." Renewable Agriculture and Food Systems (2017):1-10.

Ollinger, M. and J. Guthrie Economies of Scale, the Lunch-Breakfast Ratio, and the Cost of USDA School Breakfasts and Lunches (2015):

Omamo, S.W. "Farm-to-market transaction costs and specialisation in small-scale agriculture: Explorations with a non-separable household model." The Journal of Development Studies 35 (1998):152-63.

Onozaka, Y. and D.T. Mcfadden "Does Local Labeling Complement or Compete with Other Sustainable Labels? A Conjoint Analysis of Direct and Joint Values for Fresh Produce Claim." American Journal of Agricultural Economics 93 (2011):693-706.

Otto, D. and T. Varner Consumers, vendors, and the economic importance of Iowa farmers' markets: An economic impact survey analysis

Leopold Center for Sustainable Agriculture and its Regional Food Systems Working Group: Iowa State University:, 2005.

Painter, K. "An analysis of food-chain demand for differentiated farm commodities: Implications for the farm sector." Report to Agriculture of the Middle.Pullman, WA: Washington State University (2007):

Park, T.A., A.K. Mishra and S.J. Wozniak "Farm Operator Benefits from Direct Marketing Strategies: How Does Local Food Impact Farm Financial Performance?" Agricultural and Applied Economics Association (2011):

Park, T. and L. Lohr "Choices of marketing outlets by organic producers: accounting for selectivity effects." Journal of Agricultural & Food Industrial Organization 4 (2006):

Park, T.A. "Assessing the Returns from Organic Marketing Channels." Journal of Agricultural and Resource Economics 34 (2009):483-97.

Phillipson, J., M. Gorton, M. Raley and A. Moxey "Treating farms as firms? The evolution of farm business support from productionist to entrepreneurial models." Environment and Planning C: Government and policy 22 (2004):31-54.

Peitz, Martin. "Utility Maximization in Models of Discrete Choice." Economics Letters 49.1 (1995): 91-4. Web.

Plastina, A., K. Giannakas and D. Pick "Market and Welfare Effects of Mandatory Country-of-Origin Labeling in the US Specialty Crops Sector: An Application to Fresh Market Apples." Southern Economic Journal 77 (2011):1044-69.

Porter, M.E. and M.R. Kramer "The link between competitive advantage and corporate social responsibility." Harvard business review 84 (2006):78-92.

Pothukuchi, K. and J.L. Kaufman "Placing the food system on the urban agenda: The role of municipal institutions in food systems planning." Agriculture and human values 16 (1999):213-24.

Probst, L., E. Houedjofonon, H.M. Ayerakwa and R. Haas "Will they buy it? The potential for marketing organic vegetables in the food vending sector to strengthen vegetable safety: A choice experiment study in three West African cities." Food Policy 37 (2012):296-308.

Ralston, K., E. Beaulieu, J. Hyman, M. Benson and M. Smith Daily Access to Local Foods for School Meals: Key Drivers. United States Department of Agriculture, Economic Research Service, 2017.

Ralston, K. and C.B. Newman School meals in transition. United States Department of Agriculture, Economic Research Service Washington, DC, 2015.

Rand, D.G. The promise of Mechanical Turk: How online labor markets can help theorists run behavioral experiments2012.

Richards, T.J., S.F. Hamilton, M. Gomez and E. Rabinovich "Retail intermediation and local foods." American Journal of Agricultural Economics 99 (2017):637-59.

Rischatsch, M. Simulating WTP values from random-coefficient models (2009):

Rojas, C. "The role of demand information and monitoring in tacit collusion." The Rand journal of economics 43 (2012):78-109.

Rokeach, M. and S. Ball-Rokeach "Stability and change in American value priorities, 1968–1981." American Psychologist 44 (1989):775-84.

Rouse, S.V. A reliability analysis of Mechanical Turk data2015.

Rousu, M. "European Consumers' Willingness to Pay for U.S. Beef in Experimental Auction Markets: Comment." American Journal of Agricultural Economics 87 (2005):255-7.

Roy, S. and P. Goswami "Structural equation modeling of value-psychographic trait-clothing purchase behavior: a study on the urban college-goers of India." Young Consumers: Insight and Ideas for Responsible Marketers 8 (2007):269-77.

Rulon D. Pope and R.E. Just "On Testing the Structure of Risk Preferences in Agricultural Supply Analysis." American Journal of Agricultural Economics 73 (1991):pp. 743-748.

Saitone, T.L., R.J. Sexton and S.E. Sexton "Market power in the corn sector: How does it affect the impacts of the ethanol subsidy?" Journal of Agricultural and Resource Economics (2008):169-94.

Salisbury, K., K. Curtis, V. Pozo and C. Durwardd "Is Local Produce Really More Expensive? A Comparison of Direct Market and Conventional Grocery Produce Pricing." Journal of Food Distribution Research 49 (2018):

Sandelowski, M. "Sample size in qualitative research." Research in nursing & health 18 (1995):179-83.

Schafft, K., C.C. Hinrichs and J.D. Bloom "Pennsylvania Farm-to-School Programs and the Articulation of Local Context." Journal of Hunger & Environmental Nutrition 5 (2010):23-40.

Schilizzi, S.G. and F. Boulier "'Why do farmers do it?'Validating whole-farm models." Agricultural Systems 54 (1997):477-99.

Schwartz, S.H. "Universalism values and the inclusiveness of our moral universe." Journal of Cross-Cultural Psychology 38 (2007):711-28.

———"Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries." Advances in experimental social psychology 25 (1992):1-65.

Schwartz, S.H. and K. Boehnke "Evaluating the structure of human values with confirmatory factor analysis." Journal of research in personality 38 (2004):230-55.

Schwartz, S.H., G. Melech, A. Lehmann, S. Burgess, M. Harris and V. Owens "Extending the cross-cultural validity of the theory of basic human values with a different method of measurement." Journal of cross-cultural psychology 32 (2001):519-42.

Sexton, R.J. "Market Power, Misconceptions, and Modern Agricultural Markets." American Journal of Agricultural Economics (2012):

Sitaker, M., J. Kolodinsky, S.J. Pitts and R. Seguin "Do entrepreneurial food systems innovations impact Rural economies and health? Evidence and gaps." American Journal of Entrepreneurship (2014):11.

Smith, B.J., H.M. Kaiser and M.I. Gómez "Identifying factors influencing a hospital's decision to adopt a farm-to-hospital program." Agricultural and Resource Economics Review 42 (2013):508-17.

Spash, C.L. and A. Vatn "Transferring environmental value estimates: Issues and alternatives." Ecological Economics 60 (2006):379-88.

Steenkamp, J.E. "Conceptual model of the quality perception process." Journal of Business research 21 (1990):309-33.

Swenson, D. The Regional Economic Development Potential and Constraints to Local foods Development in the Midwest, New Orleans, LA edIowa State University Department of Economics, 2011.

———Selected Measures of the Economic Values of Increased Fruit and Vegetable Prodcuction and Consumption in the Upper Midwest. Iowa: Leopold Center for Sustainable Agriculture, 2010.

Swinnen, J. and A. Vandeplas "Price transmission and market power in modern agricultural value chains." LICOS-Discussion paper series 347/2014 (2014):1-29.

Technomics. Technomic ranks performance of top broadline foodservice distributors. Plus Company Updates.2017.

Thilmany, D., C.A. Bond and J.K. Bond "Going local: Exploring consumer behavior and motivations for direct food purchases." American Journal of Agricultural Economics 90 (2008):1303-9.

Thøgersen, J. and F. Ölander "Human values and the emergence of a sustainable consumption pattern: A panel study." Journal of Economic Psychology 23 (2002):605-30.

Toong, K. Statement from Ken Toong, Director of Dining Services, http://oncampussustainability.com/Resources/toong.htm edMay 13, 2010.

Train, K. and M. Weeks "Discrete choice models in preference space and willingness-to-pay space." Applications of simulation methods in environmental and resource economics. Anonymous 1-16. Springer, 2005.

Tuck, B., M. Haynes, R. King and R. Pesch The Economic Impact of Farm- to - School Lunch Programs: A Central Minnesota ExampleUniversity of Minnesota Extension, June 2010.

U.S. Department of Agriculture (USDA). 2012 Census Publications.

2017.

U.S. Department of Agriculture Economic Research Service 2013.

U.S. Department of Agriculture Economic Research Service (USDA ERS) Food Environment Atlas (2017).

U.S. Department of Agriculture Food and Nutrition Service (USDA FNS) The Farm to School Census (2017).

U.S. Department of Agriculture Food and Nutrition Service (USDA FNS) "Community Food Systems." (2017)

Ubilava, D. and K. Foster "Quality certification vs. product traceability: Consumer preferences for informational attributes of pork in Georgia." Food Policy 34 (2009):305-10.

Umberger, W.J. Country-of-origin labeling of beef products: US consumers' perceptions (2003):

United States Bureau of the Census Census of AgricultureUnited States Bureau of the Census, 1978.

USDA, NASS. Direct Farm Sales of Food Results from the 2015 Local Food Marketing Practices Survey (2016).

Valpiani, N.H., P.E. Wilde, B.L. Rogers and H.G. Stewart "Price differences across farmers’ markets, roadside stands, and supermarkets in North Carolina." Applied Economic Perspectives and Policy 38 (2015):276-91.

van der Lans, I.A., K. van Ittersum, A. De Cicco and M. Loseby "The role of the region of origin and EU certificates of origin in consumer evaluation of food products." European Review of Agricultural Economics 28 (2001):451-77.

Van Rijswijk, W., L.J. Frewer, D. Menozzi and G. Faioli "Consumer perceptions of traceability: A cross-national comparison of the associated benefits." Food Quality and Preference 19 (2008):452-64.

Van Wezemael, L., V. Caputo, R.M. Nayga, G. Chryssochoidis and W. Verbeke "European consumer preferences for beef with nutrition and health claims: A multi-country investigation using discrete choice experiments." Food Policy 44 (2014):167-76.

Vaske, J.J. "A Value-Attitude-Behavior Model Predicting Wildland Preservation Voting Intentions." Society & Natural Resources 12 (1999):523-37.

Verbeke, W. and R.W. Ward "Consumer interest in information cues denoting quality, traceability and origin: An application of ordered probit models to beef labels." Food quality and preference 17 (2006):453-67.

Verlegh, P.W. and J.E. Steenkamp "A review and meta-analysis of country-of-origin research." Journal of economic psychology 20 (1999):521-46.

Vo, A. and R.B. Holcomb "Impacts of school district characteristics on farm-to-school program participation: the case for Oklahoma." Journal of Food Distribution Research 42 (2011):43-59.

Waldman, D.E. and E.J. Jensen Industrial organization: theory and practiceAddison Wesley Longman, 2001.

Wauthy, X. "Quality Choice in Models of Vertical Differentiation." The Journal of Industrial Economics 44 (1996):345-53.

White, M.D. "Mixed oligopoly, privatization and subsidization." Economics letters 53 (1996):189-95.

Winfree, J. and P. Watson "The Welfare Economics of “Buy Local”." American Journal of Agricultural Economics 99 (2017):971-87.

Wirth, F.F., J.L. Stanton and J.B. Wiley "The relative importance of search versus credence product attributes: Organic and Locally Grown." Agricultural and Resource Economics Review 40 (2012):

Wooldridge, J.M. Econometric analysis of cross section and panel dataMIT press, 2010.

Worsley, A. and E. Lea "Consumer concerns about food and health: Examination of general and specific relationships with personal values and demographics." British Food Journal 110 (2008):1106-18.

Wu, S.Y. Adapting Contract Theory to Fit Contract FarmingAgricultural and Applied Economics Association, 2013.

Yaghmale, F. "Content validity and its estimation." Journal of medical education 3 (2003):25-7.

Zulauf, C., G. Schnitkey, J. Coppess and N. Paulson "2014 Farm Bill Decisions: Program Choice–A Big Picture Perspective." farmdoc daily (2014):