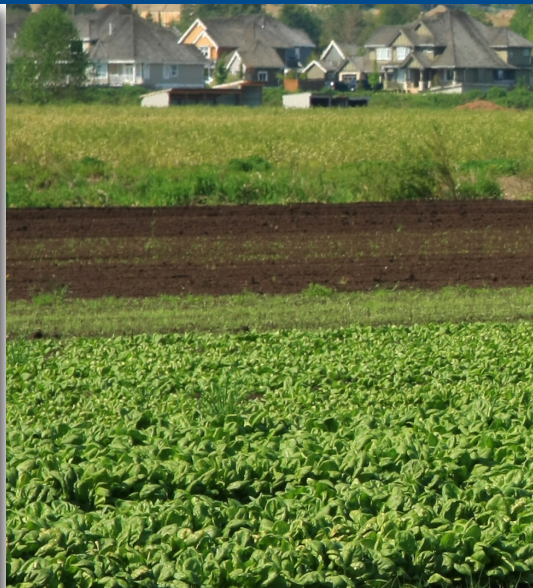


Comparing the Structure, Size, and Performance of Local and Mainstream Food Supply Chains

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June 2010

Robert P. King, Michael S. Hand, Gigi DiGiacomo,
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Robert P. King, Michael S. Hand, Gigi DiGiacomo, Kate Clancy, Miguel I. Gómez, Shermain D. Hardesty, Larry Lev, and Edward W. McLaughlin

Abstract

A series of coordinated case studies compares the structure, size, and performance of local food supply chains with those of mainstream supply chains. Interviews and site visits with farms and businesses, supplemented with secondary data, describe how food moves from farms to consumers in 15 food supply chains. Key comparisons between supply chains include the degree of product differentiation, diversification of marketing outlets, and information conveyed to consumers about product origin. The cases highlight differences in prices and the distribution of revenues among supply chain participants, local retention of wages and proprietor income, transportation fuel use, and social capital creation.

Keywords: Local foods, case studies, direct marketing, intermediated supply chains, farm-to-retail, farm-to-school, farmers markets, food miles.

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Summary

Demand for locally produced food has increased sharply in recent years. Consumers may seek out local foods to satisfy demand for product quality, to support local farmers and the local economy, or to express a preference for certain agricultural production and distribution practices. Interest in supporting local food systems is also rising among Federal, State, and local policymakers. Local foods are increasingly incorporated in programs designed to reduce food insecurity, support small farmers and rural economies, encourage more healthful eating habits, and foster closer connections between farmers and consumers.

What Is the Issue?

Despite increasing interest in locally grown and processed food, little is known about the supply chains that move local foods from farms to consumers. The objective of this report is to improve understanding of how local food products are being introduced or reintroduced into the broader food system and potential barriers to expansion of markets for local foods. Understanding the operation and performance of local food supply chains is an initial step toward gauging how the food system might incorporate more local foods in the future to meet growing demand.

What Did the Study Find?

Two general research questions in this report addressed factors that influence the structure and size of local food supply chains and how local food supply chains compare with mainstream supply chains on performance indicators.

Supply Chain Structure and Size

Products from local farms are marketed through both mainstream and local supply chains, and products from mainstream and local supply chains may be present in the same retail outlet. However, local supply chains handle a relatively small portion of total product demand, and, in some cases, local products fill a unique market niche as a differentiated product. Despite generally higher per unit costs than in mainstream chains, farms and businesses in local supply chains can still be successful if they offer unique product characteristics or services, diversify their operations, and have access to processing and distribution services.

Local food supply chains, particularly direct market (producer to consumer) chains, are more likely than mainstream chains to provide consumers with detailed information about where and by whom products were produced, but such information generally is not enough to persuade consumers to pay a higher price for local products. Local supply-and-demand relationships and product differentiation based on attributes other than local origin, such as organic or grass-fed production, appear to be the primary influences on prices in local supply chains.

A common feature among farms that participate in local food supply chains is a diverse portfolio of products and market outlets. Small farms may diversify product offerings to defray large fixed costs across multiple sources of revenue, or they may use multiple types of local market outlets. Some large farms in local supply chains diversify by using mainstream outlets as a residual market for excess supply.

The local supply chains studied have adequate access to processing and distribution services. Stable relationships with processors and internal investments in processing, packing, and distribution capabilities reduce potential constraints, although per unit costs for these services are higher in local supply chains than in mainstream chains. The local supply chains studied do not currently rely on infrastructure developed for a national industry or other local supply chains. Building ties to such supply chains may increase product volumes and reduce per unit costs as demand for local food products grows.

Supply Chain Performance

Producers receive a greater share of retail prices in local food supply chains than they do in mainstream chains, and producer net revenue per unit in local chains ranges from about equal to more than seven times the price received in mainstream chains. In all direct market chains examined, producers assume responsibility for additional supply chain functions, such as processing, distribution, and marketing, to capture revenue that would otherwise accrue to a third party. These supply chain functions can be costly and often involve the operator's own unpaid labor. Although farms in direct market supply chains retain nearly 100 percent of the retail price, costs incurred to bring their product to market total between 13 and 62 percent of the retail price.

Nearly all wage and proprietor income in the local supply chains is retained locally, but local areas also retain a large share of wage and proprietor income from the mainstream supply chains. Mainstream supply chains rely on national and international networks to deliver products to consumers, but many supply chain functions in mainstream supply chains, such as retail distribution services, are performed locally and contribute to local economic activity. Seasonality also plays a role in the share of revenue retained locally; some mainstream supply chains obtain products from local growers during certain times of the year and from national and international growers in the off-seasons.

Transportation fuel use is more closely related to supply chain structure and size than to the distance food products travel. Products in local supply chains travel fewer miles from farms to consumers, but fuel use per unit of product in local chains can be greater than in the corresponding mainstream chains. In these cases, greater fuel efficiency per unit of product is achieved with larger loads and logistical efficiencies that outweigh longer distances.

How Was the Study Conducted?

A coordinated series of 15 case studies was conducted in five metropolitan areas. Three supply chain types (mainstream, direct market, and intermediated) were studied for each of five product-place combinations: apples in Syracuse, NY; blueberries in Portland, OR; spring mix leafy greens in Sacramento, CA; beef in Minneapolis/St. Paul, MN; and milk in Washington, DC. Primary data were collected through interviews and site visits with principals of farm enterprises, supermarkets, cooperative grocery stores, retail distribution centers, and food processors. These interviews provided descriptions of each supply chain and detailed business information to make comparisons across supply chains. These data were supplemented with publicly available data from company websites, the Census of Agriculture published reports and articles, and observations of product prices and availability in each location.

Introduction

Consumer awareness of and interest in food that is locally produced has increased sharply in recent years. The number of farmers markets tripled nationwide between 1994 and 2009 (USDA, AMS, 2009), and supermarkets and restaurants have regularly begun to feature local food products through point-of-purchase materials and menu offerings. Consumer interest in “buying local” stems from a variety of economic, human health, environmental, and social perceptions. As O’Rourke (2009, pg. 2) states:

While some consumers buy local to save money, others appear to be willing to pay a substantial premium to buy local. Some believe that the product is fresher or freer of chemicals. Others appear to gain non-monetary satisfactions such as direct interaction with producers, a greater sense of community, and the belief that buying local is helping the environment, small farmers or the local economy.

Despite increasing consumer interest in locally grown and processed food, little is known about the variety of supply chain relationships that move local foods from farms to consumers.¹ Nor is the economic, human health, environmental, and social performance of local food supply chains well understood.

The objective of this study is to improve understanding of the way in which local food products are being introduced or reintroduced into the broader food system and potential barriers to expansion of markets for local foods. Two general research questions are addressed in this study:

1. What factors influence the structure and size of local food supply chains? Here, “structure” refers to the configuration of processes, participants, and product flows as a product moves from primary production to consumers. “Size” refers to aggregate sales volume as a percentage of total food sales for a product category.
2. How do local food supply chains compare with mainstream supply chains for key dimensions of economic, environmental, and social performance?

These questions are designed to provide insight into the role of local foods in several public policies and programs. Federal and State policymakers, as well as local community groups and private enterprises, increasingly look to local-food projects to reduce food insecurity, support small farmers and rural economies, and foster closer connections between farmers and consumers. But the degree to which local foods can accomplish these goals depends on a complex array of supply chain relationships. Understanding the operation and performance of local food supply chains is an initial step toward gauging how the food system might incorporate local foods in the future.

Case Study Methodology

A multiple-case-study design is used to address the research questions (see Yin, 1989 and 1994). Case studies were coordinated for five distinct product-place combinations across three supply chain types: mainstream, direct,

¹A supply chain is the set of processes, trading partner relationships, and transactions that delivers a product from the producer to the consumer.

and intermediated. Each supply chain case study describes the sequence of ownership changes; production standards, traceability, and information transparency; coordination and information sharing; food safety practices and relevant regulations; logistics and transaction costs; the distribution of revenues among chain participants; and transportation fuel use.

The case study method was chosen to yield a multiperspective analysis, allowing for an indepth study of all stages in the supply chain and interaction among those stages (Feagin et al., 1991). Case studies often preclude cause-effect analysis, particularly when dependent on a single case, but are appropriate for exploratory analysis (Hamel et al., 1993; Yin, 1989) and allow for the refinement of ideas (Stake, 1995). In choosing the case study methodology, the study team expected to uncover new observations within and among supply chain types not only to address the research questions but also to generate new hypotheses and questions for future study.

Defining Local

Lack of a publicly recognized definition for “local food” provides an obvious methodological challenge for the case studies. Despite the growing use of the term “local” in academic and civic discourse, there is no consensus on a precise definition. The term clearly refers to a place that is circumscribed by boundaries, but the relevant boundaries for what consumers perceive to be local may vary across locations and among consumers and products. The average radius of the area designated by consumers to be local varies considerably, and this area is larger for processed products than for fresh fruits and vegetables (Durham et al., 2008). Further, definitions of local based on State boundaries fail to capture many consumers’ beliefs (Ostrom, 2007). This is recognized in the definition of a “locally produced agricultural food product” for certain Federal rural development loan programs:

Any agricultural food product that is raised, produced, and distributed in – (1) the locality or region in which the final product is marketed, so that the total distance the product is transported is less than 400 miles from the origin of the product or (2) the State in which the product is produced.²

Many consumers also link production practices, cultural values, and distribution range to their concept of local. For example, sustainable production practices and family farms are often associated with local products, though these added attributes are usually not clearly defined.³ Similarly, products that are produced locally but distributed nationally may not be perceived by some as local products even in the production area.

For the purposes of this study, a local food product is defined as one that is raised, produced, and processed in the locality or region where the final product is marketed. This definition relies on the specification of a relevant “locality or region” that may vary from place to place. For each place in this study, a geographic area is circumscribed to define the locality or region where local food products originate (see box, “Definitions of Local Geography by Place”).

²Adopted in the Food, Conservation, and Energy Act of 2008, Public Law 110-246, June 18, 2008. The definition applies to Business and Industry loans and loan guarantees administered by USDA’s Rural Development Agency. See 7 USC 1932(g).

³Ostrom (2007, pg. 74) reports that: “... many consumers had equated “local” with a particular idealized type of farmer or their relationship to a farmer, making such associations as small, independent, or trustworthy.”

Definitions of Local Geography by Place

The relevant geographic area that defines a local food product may vary between places. In this study, a common definition of local food product is adopted, but each place has a unique geographic area that constitutes the local food production area. These geographic areas are meant to define local production across all products that consumers might perceive as local, not just the products studied in these cases. Below, each case study place is followed by the geographic area chosen for that location (see fig. 1 on page 4). Three of the locations use definitions based on State boundaries, while the other two are based on metropolitan statistical areas (MSAs) used by the U.S. Census Bureau (OMB, 2008).

- Syracuse, NY: New York State.
- Portland, OR: Oregon and Washington State.
- Sacramento, CA: Sacramento, CA, MSA, composed of El Dorado County, Placer County, Sacramento County, and Yolo County.
- Twin Cities, MN: Minnesota and Wisconsin.
- Washington, DC, area: Washington-Baltimore-Northern Virginia Combined Statistical Area, composed of the Baltimore-Towson, MD, MSA; Culpeper, VA, and Lexington Park micropolitan statistical areas; Washington-Arlington-Alexandria, DC-VA-MD-WV MSA; and Winchester, VA-WV, MSA; plus the counties immediately adjacent (i.e., share a border) to the combined statistical area.

It is helpful to distinguish between local food products and local food supply chains. A local food supply chain is defined as the set of trading partner relationships and transactions that delivers a local food product from producers to consumers. This definition implies that the supply chain conveys information about the product that enables consumers to recognize it as a local food product. That is, local food supply chains strive to establish a bond between the producer and the consumer, even when separated by intermediary segments in the supply chain.

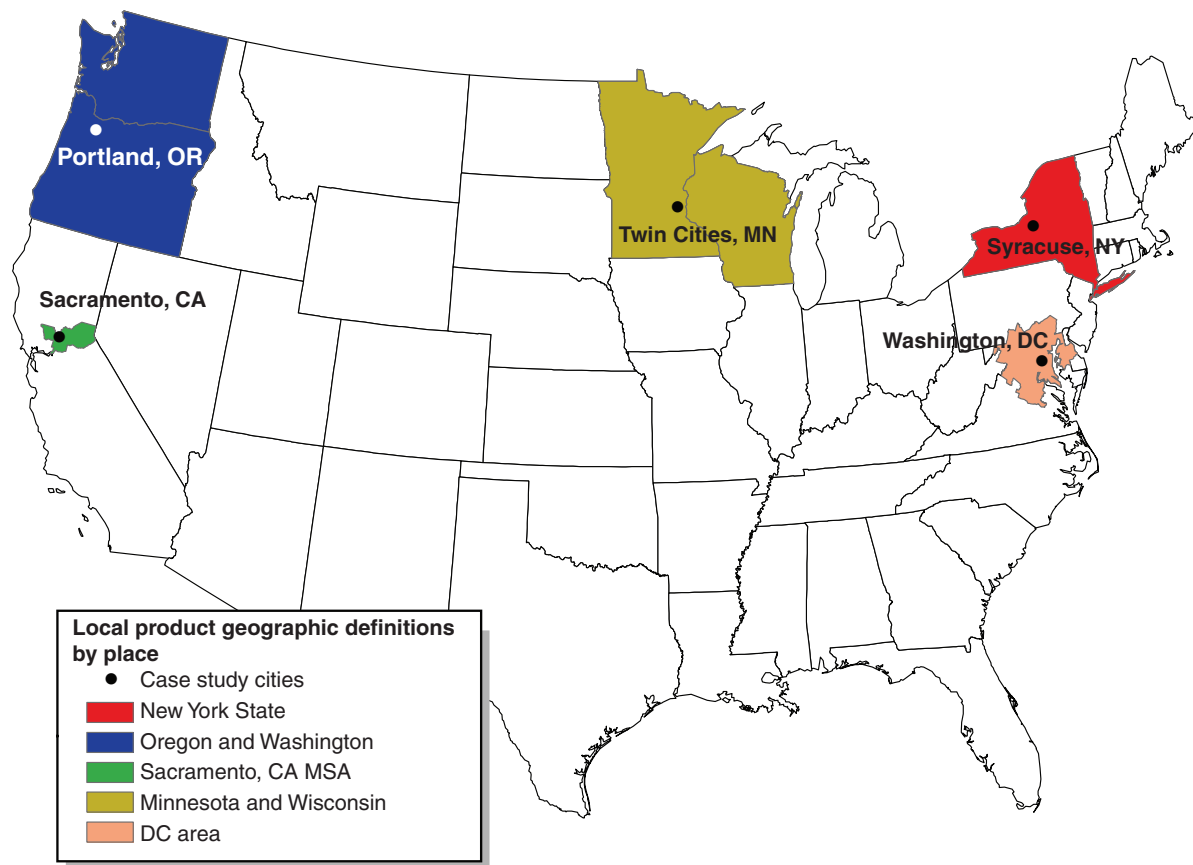
Case Study Design

Case studies are clustered along two dimensions. First, they are clustered by product-place combination (fig. 1). The five combinations are:

- Apples: Syracuse, NY
- Blueberries: Portland-Vancouver-Beaverton, OR-WA
- Spring mix: Sacramento, CA
- Beef: Minneapolis-St. Paul-Bloomington, MN-WI
- Fluid milk: Washington, DC

Figure 1

Case study locations and local product geographic definitions



Source: USDA, Economic Research Service.

As Stake (2006, p. 23) recommends, the product-place combinations were selected to provide rich comparative analysis across products, geographic locations, and chain types.⁴ This design provides opportunities to learn about both the complexity of supply chains and the relationship between a supply chain’s structure and its context. While a selection of five product-place combinations cannot be fully representative of the cultural and economic diversity that characterizes food supply chains in the United States, they can yield insights that can be applied to other places and products.

The products chosen represent a variety of foods, and each makes use of alternative production, processing, distribution, and marketing methods. Some products, for example, are value-added, branded foods (beef, spring mix, and milk), while others are highly seasonal with strong international competition (blueberries) or nationally distributed products (apples, blueberries, and spring mix).

The selected Metropolitan Statistical Areas (MSA) range considerably in population, with the Washington, DC, area population totaling more than eight times that of Syracuse, NY, the smallest MSA. Some MSAs, such as Minneapolis-St. Paul-Bloomington, MN, and Portland, OR, account for more than 50 percent of their respective State populations, while Sacramento, CA, and Syracuse, NY, account for less than 10 percent of their respective State

⁴Additional study locations, in the Southeast or the Southwest for example, would have increased the diversity of the food supply chains examined, but resource constraints limited the study to five product-place combinations.

populations. Per capita personal income also varies considerably among MSAs, from \$35,196 in Syracuse to \$54,211 in the DC area. All of the places exhibit average or above-average per capita income, compared with the national average.

Cases are further clustered by supply chain type:

- A major grocery supply chain for a product category (mainstream chain)
- A supply chain for a local product that is marketed directly by producers to consumers (direct market chain)
- A supply chain for a local product that reaches consumers through one or more intermediaries (intermediated chain)

The direct market and intermediated supply chains are studied as examples of local supply chains that emphasize connections between the food producer and food consumer.⁵ The mainstream chain serves as a baseline for comparing the structure, size, and performance of the local supply chains. Mainstream chains can supply local products and they often provide information on how products are produced (e.g., organic or “hormone free”), but they typically do not focus on establishing meaningful links between consumers and producers that are characteristic of the local food supply chains.

Data Collection Procedures

Five primary and secondary sources were used to collect data for this study: interviews with supply chain participants; news articles; websites; direct observation of product availability and prices in various market settings; and the collection of secondary economic and demographic data. Structured interviews, the most important source of case study information, allowed for the exploration of the supply chain structure, size, and performance-related research questions.⁶ Interview procedures and questions were pre-tested during a pilot case study and later refined for use in the case studies. Triangulation protocols were followed during the pilot and final case studies to invite multiperspective analysis and ensure data accuracy (Stake, 1995).⁷

Direct observation of product availability and prices took place at up to six locations within each MSA: two supermarkets, two natural foods stores, and two farmers markets. The individual stores and markets were selected to provide wide representation of retail outlet types but cannot be considered fully representative of food purchase opportunities in an area. A “recorders’ guide” was developed to outline data collection techniques and to help facilitate consistency across all study locations.⁸

Analysis

In total, the study covers 15 different supply chain cases, 3 in each of the 5 locations (see table 1). This design allows for comparisons of different supply chain types for the same product in the same location, and of the same supply chain type across products and locations. In the latter case, comparing similar chain types across product-place combinations will help to draw general conclusions about the factors associated with the size, scope, and performance of direct and intermediated food supply chains.⁹

⁵The local supply chains studied here are conceptually similar to short food supply chains (SFSC) described by Marsden et al. (2000). SFSC may be (1) face-to-face chains with direct purchases from farmers; (2) spatial proximity chains that make consumers aware of local origin at the point of purchase; and (3) spatially extended chains that convey the value and meaning of a place of production to consumers outside of the region where the product is produced. The first two of these correspond to the direct-market and intermediated supply chains, respectively.

⁶All individuals interviewed were given the option to have their names and business names withheld from publication. Pseudonyms are used in these cases, and the names of other businesses and individuals in those supply chains have also been changed to avoid inadvertent disclosure. The beginning of each case description notes when pseudonyms are used.

⁷Triangulation protocols call for the use of co-observers/interviewers, the study of research questions from multiple interviewees, and the use of technical reviewers from alternative theoretical perspectives.

⁸The recorders’ guide is available online at http://foodindustrycenter.umn.edu/Local_Food_Case_Studies.html.

⁹An extended discussion and literature review on the conceptual foundations for these research questions is presented in “Research Design for Case Studies on Local Food Systems,” which is available online at http://foodindustrycenter.umn.edu/Local_Food_Case_Studies.html.

Table 1

Case study descriptions, by product/place combination and supply chain type

Place (product)	Mainstream	Direct marketing	Intermediated
Syracuse, NY (apples)	Nationally distributed apples from NY- and WA-based integrated grower-packer-shippers sold in a regional supermarket chain.	Residual sales from a medium-sales grower at a Syracuse farmers market.	Farm sales to a small school district (about 1,600 students).
Portland, OR (blueberries)	OR-based integrated grower-packer-shipper distributing berries to a national supermarket chain.	Diversified 145-acre farm selling berries (and other crops) at farm stands and farmers markets.	Farm-to-retail sales of berries from a diversified 15-acre organic farm sold at a nine-store supermarket chain.
Sacramento, CA (spring mix)	Nationally distributed bagged organic spring mix from CA and AZ sold in an upscale regional supermarket.	Organic 32-acre diversified farm selling bulk spring mix in farmers markets and Community-Supported Agriculture (CSAs).	Bulk spring mix sold at a cooperative grocery sourced from a diversified farm or an organic produce distributor.
Twin Cities, MN (beef)	Nationally distributed natural beef sold in an upscale regional supermarket chain.	Branded, grass-fed beef from a small family farm sold through farmers markets, buying clubs, and CSAs.	Branded, grass-fed beef from about 40 producers distributed by a MN-based company to supermarkets, food cooperatives, and restaurants.
Washington, DC (milk)	Private-label milk sourced from a commercial dairy cooperative and sold in large supermarket chains.	Onfarm bottled milk sold through a home delivery service.	Private-label organic milk from a single supplier in PA sold in a five-store organic grocery chain.

Source: USDA, Economic Research Service.

Case study results are analyzed through a set of specific research questions related to the two general research questions posed earlier. The specific questions allow the researchers to examine important supply chain relationships, the source of supply chain efficiencies (or inefficiencies), and the degree to which the supply chain may grow and develop in the future. Although it is not possible to address all hypotheses that may be relevant to local food supply chains (e.g., this study does not examine consumer perceptions and behavior), the specific research questions were selected to provide a breadth of understanding of differences between types of supply chains.

Supply Chain Structure

Supply chain structure refers to the configuration of processes, participants, and product flows as a product moves from producers to consumers. Vertical integration and optimal ownership, product traceability and information transparency at the consumer level, contracting and ownership costs, and information sharing and decisionmaking are all presumed to affect the organization of local food supply chains. It is commonly perceived that, in contrast to mainstream supply chains, local food supply chains convey detailed information about where, how, and by whom products were produced. Local food supply chains are further assumed to operate with relatively few segments, linked by trading partner relationships characterized by high degrees of trust and information sharing.

Industry infrastructure and knowledge may be readily available for some products in some locations, but not in others. Thus, while supply chain structure may be governed by some common principles associated with reducing

costs and improving efficiency, it is anticipated that the structure of the supply chains will vary significantly from case to case.

Six specific research questions enable the study team to compare direct and intermediated supply chains with mainstream chains and to gain a greater understanding of observed organizational structures:

- Do direct and intermediated food supply chains provide the consumer with detailed information about where, by whom, and how the product was produced?
- Are durable relationships between supply chain partners—characterized by a high degree of trust, information sharing, and decision sharing over time—important in food supply chains where trading partners exhibit strong mutual interdependence or one partner depends on another in a unique way?
- Are prices in direct and intermediated food supply chains decoupled from prices determined in commodity markets?
- What is the role of collective organizations (such as producer and consumer cooperatives and farmers markets) in direct and intermediated food supply chains?
- Does the presence of a strong industry that distributes nationally or internationally help create an infrastructure of knowledge and services that facilitates the development of direct and intermediated food supply chains?
- Does the presence of local food supply chains for other products and broader local food initiatives help create an infrastructure of knowledge and services that facilitates the development of successful direct and/or intermediated food supply chains?

Supply Chain Size

The size of direct and intermediated food supply chains, as measured by sales volume relative to total demand from local consumers and for shipments outside the local area, is likely to be limited by a focus on selling within a circumscribed region and the desire to foster strong linkages between producers and consumers. Constraints associated with processing and distribution activities, regulations that impose costs for low-volume enterprises, and seasonal availability may also affect sales volume in local food supply chains.

Some factors affecting size may not simply be associated with a nascent industry; processes and prospects for growth may differ across supply chain types. For example, direct market chains are usually associated with a single farming operation that establishes close relationships with its customers. While farming operations often can scale up by expanding their land base and capital and labor resources, it is more difficult to scale up a marketing enterprise that is predicated on direct, personal relationships with customers.

This study addresses five questions related to supply chain size and growth:

- What is the portion of total demand in a general product category represented by products sold in direct and intermediated food supply chains?
- Do problems with access to and costs associated with processing and distribution services limit the size of direct and intermediated food supply chains and raise product costs to the point where it is difficult to compete with products in mainstream food supply chains?
- Do fixed costs for compliance with regulatory and operating standards (public or private) limit the ability of low-volume local food products to enter mainstream supply chains?
- Does lack of year-round availability limit market opportunities for local food products?
- Do direct and intermediated food supply chains respond to growth opportunities through replication of firms or through internal expansion?

Supply Chain Performance

Differences in the structure and size of supply chains may imply that direct and intermediated food supply chains perform differently than mainstream chains. Advocates have suggested that local foods can improve supply chain performance along a number of dimensions. For example, studies hypothesize that direct and intermediated supply chains provide farmers with greater returns for their products, keep greater wealth within a local community (Anderson, 2007), and reduce transportation energy use and greenhouse emissions from agriculture (Anderson, 2007; Thompson et al., 2008). Although some of these claims have been tested empirically, there is little research available that examines how the structure and size of direct and intermediated food supply chains impact performance.

This study addresses five specific questions about how direct market and intermediated supply chain performance compares with the performance of mainstream chains:

- After subtracting marketing costs, do producers receive higher per unit revenue and retain a greater share of the price paid by the final consumer in direct and intermediated food supply chains?
- Is differentiation by quality attributes other than “local” that require extra effort or unique capabilities necessary to receive and sustain price premiums for local food products?
- Does concentration of costs for employee and proprietor labor inputs in farm and processor segments of direct and intermediated food supply chains result in a larger contribution of wage and business proprietor income to local economies?
- Does a typical unit of product in direct and intermediated food supply chains travel fewer miles and use less fuel for transportation per unit of product sold?
- Do direct and intermediated food supply chains foster the creation of social capital and civic engagement in the consumption area?

Apple Case Studies in the Syracuse MSA¹⁰

This case describes three supply chains for apples in the Syracuse MSA (New York): a supermarket chain (mainstream), a producer who sells at a farmers market (direct market), and a school district that purchases local apples for inclusion in school lunches (intermediated). Syracuse is located in central New York (NY), with a population of approximately 720,000. The focal area is both a major apple producer—New York is the second-largest apple-producing State—and an important destination market for other U.S. apple-producing regions. The production area for local food products is defined as New York State for these case studies.

New York is a leading State in direct marketing, with more than 5,000 farms selling directly to consumers. Annual per farm sales through direct marketing in NY averaged \$14,512 in 2009, almost twice the national average (USDA, NASS 2009). The NY Department of Agriculture and Markets promotes direct marketing through grants and technical assistance, including a branding effort (Pride of New York) and a Farmers Market Nutrition Program. In addition, many organizations exist in NY, both public and private, to facilitate farmers' participation in direct marketing, such as the Farmers Markets Federation of New York. These organizations play a critical role in the expansion of direct market supply chains throughout the State.

Six of the top 75 U.S. food retailers operate in Syracuse, including national chains Wal-Mart and Aldi and 4 regional supermarket companies, each with 5 to 10 stores in Syracuse (Supermarket News, 2009). Syracuse also has a small group of independent supermarkets, a large number of ethnic markets, and a few food market cooperatives.

Apples are available nearly year round in Syracuse in most supermarkets, farmers markets, and natural food cooperatives, primarily due to controlled atmosphere coolers.¹¹ Apple prices in 2009 were fairly stable but with differences across outlets.¹² For example, although the public perception is that prices are often higher at farmers markets than at supermarkets, the lowest priced apples in this case were found at the farmers market. This finding challenges the conventional view that farmers markets target primarily affluent consumers who are willing to pay price premiums. In general, all retail outlets carried a wide assortment of apple varieties, except for the natural food cooperative and one farmers market.

Mainstream Supermarket Supply Chain: SuperFoods

The focal store belongs to a regional supermarket chain (called here SuperFoods) that operates its own distribution center.¹³ Five apple suppliers account for nearly 100 percent of the apples moving through SuperFoods' distribution center, and SuperFoods has had commercial relationships with these suppliers for many years. Four of the five suppliers are vertically integrated grower/packer/shippers (GPSs); two are from NY, while two are from Washington State (WA). All of these GPSs buy apples from other growers to supplement their own production. The fifth supplier is a broker from WA. The supermarket company follows a vertical marketing system whereby its wholesale and retail operations are integrated into one corporate entity.

¹⁰An extended version of this set of case studies is available online at http://foodindustrycenter.umn.edu/Local_Food_Case_Studies.html.

¹¹Weekly data collection conducted by authors in six retail outlets in the Syracuse MSA from January 1, 2009, through December 31, 2009.

¹²Based on weekly observations at six market locations in each case study location throughout 2009.

¹³All of the business names in the mainstream case have been changed to pseudonyms.

The two NY suppliers are similar and only one of them, GPS1, is referred to here. GPS1 supplies about 35 percent of SuperFoods' apples, has about 2,500 acres in production, and offers 23 distinct apple varieties. About 75 percent of the firm's production grades out at the highest quality. It also owns trailer trucks to deliver to SuperFoods' distribution center. About 80 percent of the sales from GPS1 are sourced from its own farms, and 20 percent are sourced from 20 to 25 independent NY growers and a few importers. GPS1 supplies apples labeled as "local" during a 12-week apple harvest period, from early September through late November. These local apples are delivered to SuperFoods' distribution center in 4-pound tote bags priced at \$0.89 per pound, lower than nonlocal apples.

The WA suppliers are much larger than the NY counterparts and, in fact, figure among the largest apple suppliers in the United States. One of them (referred to here as GPS3), for example, sells apples from about 3,100 acres and 70 growers. GPS3 packs 85 percent of all the apples it sells. SuperFoods is an important customer for the WA suppliers but, in contrast to NY suppliers, is not estimated to be in the top 10 customers by volume of any of the three WA suppliers.

All apples sold in the focal store arrive in SuperFoods' distribution center. The distribution center's apple category manager directs the pricing, merchandising, sourcing, and product assortment for the apple category and manages the strategic direction of the category. A buyer, working under the direction of the category manager, purchases apples from the five apple suppliers. The buyer gathers individual orders from produce managers in each store, places the aggregated orders with suppliers, tracks inventories, and deals directly with invoicing. From the time of order placement, WA apples arrive at SuperFoods' distribution center in 5 to 6 days, while NY apples arrive within 1 to 2 days. Due to very limited in-store cold storage, the store produce manager generally orders apples from the distribution center six times per week, with delivery expected the following day. The focal store offers a wide assortment of apples: the ordering system lists 129 different SKUs (Stock Keeping Units—includes differences not just in variety but in pack size and growing condition, that is, organic versus "conventional"), 20-25 of which are consistently available throughout the year. All bagged apples and some bulk apples have labels that identify the geographic origin of the product (e.g., New York, Washington, Chile).

Two factors facilitate market coordination. Under proper conditions, apples can be kept in storage longer than most produce items. Apples harvested in the fall are sometimes stored a full year, until the next harvest. As a result, suppliers know their annual inventories quite precisely once harvest is complete. Second, the supermarket chain employs an Electronic Data Interchange (EDI) system that facilitates placing orders to suppliers, monitoring product inventories, and receiving orders from the focal store. All vendors, along with the distribution center, are responsible for maintaining this database, which includes items available, projected supplier prices, and current inventory levels. Although this system contributes to efficiency and coordination, the category manager and the five suppliers engage in continuous, near daily, communication.

Direct Marketing Supply Chain: Central New York Regional Farmers Market Vendor

The Central New York Regional Market operates year round on weekends and currently (as of 2009) has more than 300 vendors, a 100-percent increase since 2002. This market accepts vendors who are farmers selling only products from their own farms and NY product re-sellers. In 2009, the market included 12 apple vendors: 6 farmers and 6 local, in-State resellers. Apples account for about 5-10 percent of total sales in the farmers market. Based on this information, it is estimated that all farmers markets in the Syracuse area account for less than 1 percent of apple consumption in the MSA.¹⁴

The focal vendor, Jim Jones, farms 90 diversified acres (about half planted to apples), which allows him to participate in the farmers market.¹⁵ Jones produces about 1.7 million pounds of apples per year and offers 20 different varieties, including small amounts of uncommon varieties, such as Northern Spy and Zestar. About 10 percent of Jones's total sales are to farmers markets, and 90 percent go to a packer-shipper. In addition to the Syracuse market, Jones sells in three other farmers markets in the region. Apples for the farmers markets are kept in his coolers and in controlled-atmosphere storage available in the region.

At the farmers market, Jones sells a wide variety of his own fruits and vegetables 3 days a week, from April through December. Depending on the time of year, apples represent between one-half and one-third of Jones's sales in the farmers market. He staffs the market with family members who load the products in a business-owned van, set up the stand at the market, sell the product, and close the stall at the end of the day. Apples are sold in tote bags of 4, 8, and 16 pounds. Jones and his two daughters sell in the farmers market, ensuring that shoppers know by whom the apples are produced. In addition, Jones has a banner with the name and location of his farm to communicate where the apples are produced. Most vendors sell apples at the same prices and in the same presentations, with little variation through the year. Only uncommon varieties, produced in very small quantities, command price premiums and, even then, only when only one vendor offers them.

When asked about the economic benefits of participating in the farmers market, Jones estimates that revenues per pound are almost twice the revenues of apples sold to the packer-shipper (\$0.50/lb and \$0.28/lb, respectively). However, it is important to note that charges for distribution activities beyond the farm gate are approximately \$0.10/lb, or 20 percent of the retail value at the farmers market. These marketing costs include leasing of a stall, transport in a business-owned box van, unpaid family labor (3 persons, 10 hours each), and tote bags.¹⁶ According to Jones, customers cite the most important factor in shopping at the market as the ability to buy directly from the grower, followed by the lower prices of apples relative to those at retail stores. Jones also believes that more apples could be sold if more retail space was available in the farmers market. However, expansion at the farmers market is difficult because all stalls are currently full and vendors rarely leave, suggesting that demand is high in this market.

¹⁴Annual consumption of apples in the MSA is estimated at 120.4 million pounds (16.4 pounds per capita times a population of 723,617); annual volume of apples sold in farmers markets is estimated at 1,019,988 pounds (28,333 pounds sold per vendor times 16 farmers markets in the MSA times 3 apple vendors per market), 0.85 percent of total apple consumption in the MSA.

¹⁵The name of the vendor has been changed for confidentiality purposes.

¹⁶One-third of total marketing costs are allocated to apples because they represent a third of sales on a typical market day. A wage rate of \$18.83 and a transportation cost of \$0.637 per mile are assumed. Labor costs are \$0.08/lb; transport costs are \$0.015/lb; and stall rental and tote bags are \$0.005/lb.

Intermediated Supply Chain: Hannibal (NY) School District

The Hannibal School District (<http://www.hannibal.cnyric.org/>) has three schools with a total enrollment of over 1,600 students. The foodservice director estimates that by the end of the 2009-10 school year, the district will have offered about 15,000 pounds of apples to students. About 95 percent of apples in the school district are sold as part of the school menu, and the rest are sold separately à la carte. These apples come from New York except for a small amount supplied to the school district by the U.S. Department of Defense (DOD) Fresh Fruit and Vegetable Program, usually Red Delicious apples produced in Washington State. The share of apples sold through school districts in the MSA is less than 1 percent of total MSA sales, but it is difficult to identify the share of local apples in this supply chain.¹⁷

This apple supply chain consists primarily of four channel members who have maintained business relationships for over 20 years: the school district, a produce wholesaler (C's Farms) located in the same county, and two local farms. C's Farms (www.csfarmmarket.com/) supplies nearly 100 percent of the school district apples. However, the foodservice director requests price quotes from a national broad line foodservice distributor periodically (as opposed to weekly from C's Farms) as a sort of pricing safeguard when making local purchasing decisions. The price of local apples is generally lower than the price offered by the distributor. The wholesaler procures apples primarily from two apple farms (Ontario Orchards and Fruit Valley Orchards), each with about a 50-percent share. Orders are placed on a weekly basis for delivery the following week. Order size is quite stable, about 420 pounds per week. The apples from the DOD Program account for approximately 10 percent of total apples in the school district. These apples are delivered by the DOD to the school district three to four times a year at no charge but on an irregular schedule communicated to the foodservice director about 2 weeks in advance so that adjustments in procurements can be made.

Ontario Orchards is one of the two apple suppliers to the school district via C's Farms. It supplies an average of 210 pounds per week to the school district. This family owned and operated business dates back generations and is now run by Dennis Oulette. Oulette has 125 acres in production, with the 90 acres planted to apples representing approximately 80 percent of farm sales.

The distribution shares of Ontario Orchard apples are 78 percent retail, 5 percent U-pick, 15 percent processed, and 2 percent through C's Farms. It is the distribution through the farm that serves the school district. Ontario Orchards specializes in a large variety of locally grown produce, offering 29 apple varieties, including small amounts of uncommon varieties. It operates a small production line in which apples are washed and sized, and packed in 42-pound boxes. Oulette stated that the availability of long-term storage facilities in the area has enhanced his ability to supply the school district during the academic year. No written contracts are employed between Ontario Orchards and C's Farms; the contract has been word of mouth for 20 years.

¹⁷Annual apple consumption in all school districts within the MSA was estimated to be 847,987 pounds in 2009. This amount was derived by extrapolating the consumption of 1,600 students in the Hannibal School District (15,000 pounds) to the population of the MSA aged between the ages of 5 and 18 from the U.S. Census, or 90,452. $(15,000/1,600)*90,452 = 847,987$.

C's Farms delivers fresh fruits and vegetables to 65 local restaurants, schools, and institutions in Oswego County. It also runs a retail operation that offers produce, fresh-cut trees, and ornamental plants. Apples account for about 7 percent of the farm's sales, totaling approximately 8,400 pounds per month, yielding monthly average revenues of \$3,700. About 18 percent of these apples are sold to the Hannibal School District. The primary variety sold is the NY Empire, specifically selected by the school district. C's Farms participates in the Pride of New York Program and uses its logo on all its local products. This program supports market access of agricultural products grown and processed in the State.

About 35 percent of the school district's fresh produce purchases are apples, making them the largest produce item. Apples are part of a reimbursable meal, in which two options of fresh fruit are always available. Apple prices and consumption exhibit very little variability throughout the school year. The price paid to the wholesaler is set for the harvest season based on market prices in NY published by USDA's Agricultural Marketing Service; the foodservice director and the wholesaler meet in January to explore possible price adjustments for the spring, based on USDA price projections.

The school district has had several programs to promote apple consumption. In 2009, for example, the school district nutrition team launched a program called "The Smart Choice Café," whereby wise nutrition choices, like local produce, are featured to students. In addition, the foodservice director collaborates with the county's Cooperative Extension office and the Oswego County Farm Bureau for promotion of local fruits and vegetables and participates in the New York Harvest for New York Kids Fest and Cornell's Farm to School Program.

Members of this supply chain mention the sometimes unintended negative impacts of the DOD Fresh Fruit and Vegetable Program. The State, not the foodservice director, makes decisions regarding the sourcing of DOD apples. This affects coordination in the supply chain because DOD apples, while free, do not have an established calendar for shipments.

Supply Chain Structure and Size

- Durable relationships exist between supply chain partners in the mainstream and intermediated chains. Partners in these chains have had business relationships based on longtime trust and frequent communication, without requiring formal contracts.
- Prices (local and nonlocal) are determined in commodity markets in the mainstream and intermediated cases. There is also a high degree of competition at the farmers market, making these apple vendors behave as price takers similar to those in commodity markets.
- Collective organizations play an important role only in the direct market supply chain. The Central New York Regional Farmers Market and the other farmers markets, all collective organizations, have facilitated the participation of Jim Jones in direct market supply chains. In addition, New York State hosts active trade associations that promote direct marketers such as the Farmers Market Federation of New York.

- Only the direct market chain provides the consumer with information about where and by whom apples were produced. The mainstream chain provides information about where apples were produced for some but not all apples. The school district conveys information about where and by whom the apples are produced but only indirectly, via community events (e.g., by participating in the New York Harvest for New York Kids).
- Lack of year-round availability is not an issue for apples in any of the chains due to their strong presence in the national market, state-wide production volume, and storage technology allowing year-round distribution.
- The sales volume of direct and intermediated chains represents a small proportion of total apple demand: it is estimated that less than 1 percent of all apples in the MSA are sold in the direct chain. Likewise, local and nonlocal apples distributed through all school lunch programs represent less than 1 percent of total consumption in the MSA.
- Apple sales in the direct market chain are expanding primarily through entry of new firms (more firms sell apples in the farmers market during the apple season), while the mainstream chain and, to a lesser extent, the intermediated chain have expanded primarily through internal growth.

Supply Chain Performance

- Producer share of the price paid by the final consumer is greatest for the direct marketing chain (table 2). The price received by the farmers market vendor net of marketing expenses is \$0.40 per pound. This is substantially higher than the average grower price, \$0.26 per pound, as estimated by USDA Agricultural Marketing Service, received by the apple grower portion of the grower-packer-shippers in the study. Marketing expenses of the direct marketing chain are estimated to total \$0.10/lb, or 20 percent of the retail value.
- The supplier share of the retail dollar decreases with distance to market: in the direct case, the producer's share of the retail dollar is 80 percent, whereas in the mainstream case, the shares of Washington and New York suppliers are 35 percent and 47-60 percent (depending on package type) of the retail price, respectively (table 2).¹⁸
- The "local" attribute does not command price premiums, perhaps because New York is a national player in the apple market. In fact, apples at the farmers market, all of which are local, usually exhibit the lowest retail prices in Syracuse. Instead, it is differentiation by apple variety that commands premiums.
- Direct and intermediated supply chains contribute a larger share of wage and business proprietor income to local economies than do mainstream supply chains.
- Findings reveal that local apples marketed through the direct and intermediated supply chains perform better than nonlocal apples in terms of food miles and fuel efficiency (table 3). Apples supplied by the mainstream GPS3 in Washington State have the worst fuel usage performance (1.41 gallons/cwt).

¹⁸These suppliers are integrated grower-packer-shippers. Therefore, the share of the retail dollar for Washington supplier GPS3 is the summation of several supply chain segments in table 2, 14+21=35 percent; for New York supplier GPS1-bulk is 17+30=47 percent; and for New York supplier GPS1-bagged is 26+34=60 percent.

Table 2

Allocation of retail revenue in Syracuse, NY—apple chains, by supply chain and segment

Supply chain segment	Mainstream ¹						Direct		Intermediated ²	
	SuperFoods GPS3 (WA-Bulk)		SuperFoods GPS1 (NY-Bulk)		SuperFoods GPS1 (NY-bagged)		Jim Jones Farm		Hannibal School District	
	Revenue (\$/lb)	% of total	Revenue (\$/lb)	% of total	Revenue (\$/lb)	% of total	Revenue (\$/lb)	% of total	Revenue (\$/lb)	% of total
Producer ³	0.26	14	0.26	17	0.26	26	0.40	80	0.26	29
Producer-estimated marketing costs ⁴	-	-	-	-	-	-	0.10	20	-	-
Packer-shipper	0.40	21	0.45	30	0.34	34	-	-	0.06	7
Transport	0.23	12	0.03	2	0.03	3	-	-	-	-
Wholesaler	-	-	-	-	-	-	-	-	0.10	11
Retailer	1.00	53	0.76	51	0.37	37	-	-	0.48	53
Total retail value	1.89	100	1.50	100	1.00	100	0.50	100	0.90 ⁵	100

Notes: - indicates “not applicable.”

¹GPS1 and GPS3 are grower-packer-shippers; SuperFoods is a wholesaler-retailer.

²The producer, Ontario Orchards, is a grower-packer-shipper in the school district supply chain.

³Producer prices are the monthly average for the period 2000-08 reported by USDA (<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1377>).

⁴Includes estimated costs of farmers market stall fees, transport to market, the opportunity cost of family labor, and tote bags for customers. Total producer per unit revenue is $0.40+0.10 = 0.50$ (\$/lb).

⁵Ninety-five percent of apples in the school district are sold as part of the school menu and thus do not have a specific retail price. We calculate the retail price as the wholesale price times 2.25 ($\$0.42 \times 2.25 = \0.90), the markup rule employed by the school district.

Source: USDA, Economic Research Service using SuperFoods records from August 2008 through July 2009 (for mainstream) and data from authors' interviews with supply chain member (for direct and intermediated).

- The intermediated supply chain, where the school district organizes an extensive variety of events aimed at promoting local produce (and apples), ranks first in social capital formation. Likewise, SuperFoods participates in activities to support the local community, including support to local farmers and college scholarships for its employees. Interestingly, the study found no evidence of social capital formation in the direct market chain.

Key Lessons

The apple supply chains described in these three cases all exhibit a high degree of diversification in their distribution strategies. Local and mainstream apples complement one another in the supermarket supply chain. In addition, the focal farmers market vendor engages in some direct marketing but is also linked to the mainstream chain through his relationship with a conventional packer-shipper. Moreover, the school district procures from mainstream suppliers and from local apple supply chains. Local supply chains are profitable and important for participating firms, even if the volume is small.

The presence of a strong industry that distributes nationally has substantially facilitated the development of local food supply chains. The NY apple sector offers a wide variety of products to consumers regionally and nationally and, as a result, it has the postharvest infrastructure (e.g., packing, shipping, short- and long-term storage) and marketing expertise to support distribution of apples from local farms to various local retail and foodservice outlets.

Table 3

Food miles and fuel use in Syracuse, NY—apple supply chains

Supply chain segment	Food miles	Truck miles	Retail weight	Fuel use ¹	Fuel use per cwt shipped
Mainstream: SuperFoods, GPS3 (WA)	<i>Number</i>		<i>Cwt</i>	<i>Gallons</i>	
Producer to packer-shipper	150	300	100	25.0	0.25
Packer-shipper to distribution	2,600	2,600	400	433.3	1.08
Distribution to retail ²	100	200	400	33.3	0.08
All segments	2,850				1.41
Mainstream: SuperFoods, GPS1 (NY)					
Producer to packer-shipper	25	50	100	4.2	0.04
Packer-shipper to distribution	100	200	400	33.3	0.08
Distribution to retail	100	200	400	33.3	0.08
All segments	225				0.20
Direct: Jim Jones Farm³					
Producer to retail	61	122	20	3.1	0.16
All segments	61				0.16
Intermediated: Hannibal School District⁴					
Producer to wholesaler	3	6	10.0	0.3	0.03
Wholesaler to school district	10	20	40.0	0.3	0.01
All segments	13				0.04

¹Miles per gallon (mpg) vary by segment. Trailer trucks shipping apples from packing shed to the distribution center have a capacity of 40,000 pounds and obtain 6 mpg; trucks used to transport apples from the farm to the packing shed have a capacity of 10,000 pounds and obtain 12 mpg.

²Apples are about 5 percent of the total weight of products transported in trailer trucks from the distribution center to the store. These trucks have a capacity of 40,000 pounds and obtain 6 mpg.

³The box van employed in the direct market has a capacity of 2,000 pounds and obtains 20 mpg.

⁴The box-van employed from the producer to the wholesaler transports 1,000 pounds and obtains 20 mpg; the truck employed to transport apples from the wholesaler to the school district has a capacity of 4,000 pounds and obtains 20 mpg.

Source: USDA, Economic Research Service calculations based on case interviews.

The case studies underscore the high degree of competition within the apple sector as reflected by the price formation mechanisms. Final prices are generally established by the market in all supply chains considered, with the exception of a few truly uncommon apple varieties in the farmers market produced in very small quantities. In all supply chains, apple growers appear to be price takers. It is noteworthy that no price premiums were observed for local apples in any of the direct supply chains studied. It is speculated that, because New York is a major apple producer with year-round supplies, “local” is not a significant differentiating attribute.

Blueberry Case Studies in the Portland-Vancouver MSA¹⁹

This set of case studies describes three fresh blueberry supply chains in the Portland-Vancouver MSA (referred to as Portland): a major super-market chain supplied in part by a local packer (mainstream supply chain), a producer who sells through farmers markets and farm stands (direct market supply chain), and a regional natural foods chain that features locally produced berries (intermediated supply chain). The Portland metropolitan area straddles two States and has a population of 2.2 million. The production area for local food products for these case studies is defined as Oregon and Washington (also called the Northwest).

U.S. consumer demand for blueberries has increased significantly over the past three decades due to favorable publicity related to the health benefits of blueberries. The value of U.S. farm cash receipts for blueberries grew more quickly during 1980-2008 than for any other fruit—twelvefold as compared with threefold for the overall category (USDA, ERS, 2009). Imports also increased rapidly, and fresh blueberries are now available nearly year round in supermarkets as foreign sources fill the gaps in the domestic production calendar. Although U.S. per capita fresh blueberry consumption is still only 1 pound per person per year, this represents a tripling in the past decade (Pollack and Perez, 2009).

As a summer season crop, blueberries are a popular signature item in Northwest direct market supply chains, including farmers markets and farm stands. Availability of the local crop is limited to 10 to 12 weeks (July through September), as fresh blueberries cannot be stored for long periods. Among all States, Oregon and Washington rank third and fifth, respectively, in 2009 cultivated blueberry production, and the Northwest represents just under 24 percent of domestic production.

Because the Northwest industry produces far more than residents choose to purchase, the region supplies both fresh and processed blueberries to consumers elsewhere in the United States and in other countries. Organic production represents the primary means for differentiating blueberries, and certified organic blueberry acreage, which has increased rapidly in the Northwest, now represents 9 percent of the region's acreage (Kirby and Granatstein 2009a, 2009b).

The Portland marketplace features the top five national food retailers, with Safeway and Fred Meyer (Kroger) having the largest share of food sales (Supermarket News, 2009; Beaman and Johnson, 2006). In addition, the area has numerous regional food retailers and food cooperatives. A total of 11,692 farms, or 18 percent of the Northwest total, sold nearly \$100 million through farm-direct supply chains in 2007, with average per farm sales of \$8,552. By comparison, 6 percent of U.S. farms sell farm-direct, with average sales of \$8,904 per farm. Northwest consumers purchased just over \$10 per capita through farm-direct supply chains in 2007, or 2.5 times the national average of \$4 for that year (USDA, NASS, 2009). The Portland area supports 40 farmers markets in addition to many farm stands and consumer-supported agriculture farms (Oregon Farmers Market Association, 2009; Washington Farmers Market Association, 2009).

¹⁹An extended version of this set of case studies is available online at http://foodindustrycenter.umn.edu/Local_Food_Case_Studies.html.

Mainstream Supply Chain: Allfoods²⁰

Allfoods, with more than 1,000 stores nationwide, including many in Portland, is representative of the primary way that most area consumers purchase fresh blueberries. Allfoods sells fresh blueberries throughout the year from domestic and international sources that change by season. Over the course of a year, Portland Allfoods stores sold berries from more than a dozen distributors and often carried blueberries from multiple distributors simultaneously. A single Allfoods buyer at the national level makes all fresh, nonorganic blueberry purchase decisions for the entire chain while regional produce merchandisers make the retail advertising and pricing decisions. Allfoods is a self-distributing chain, so the fresh blueberries pass through a regional Allfoods distribution center before they go out to the individual stores. As is true for many retailers, Allfoods is focusing more on local produce sources and claims that, on a nationwide basis, 30 percent of its produce is locally procured.²¹ The Northwest berries discussed in this section are promoted as local.

Hurst's Berry Farm (referred to as Hurst's) (<http://www.hursts-berry.com/>) is an Oregon-based berry packer that supplies Allfoods stores in Portland. Hurst's distributes a broad range of fresh berries, with blueberries the largest single crop. While a major player in the Northwest, Hurst's is significantly smaller than the largest U.S. berry distributors. The company produces blueberries in Oregon and Mexico and supplements this production by also distributing berries produced in California, Argentina, and Chile. Owner Mark Hurst entered the berry business as a small-scale producer in 1980 and gradually developed year-round berry sources so the firm could be a consistent supplier for major U.S. retailers and export markets.²²

Producing and distributing Oregon berries remains the heart of the Hurst's Berry Farm's business. In addition to handling berries from the company's own 75 acres, it also packs and distributes berries from 40 Oregon producers. The relationships that Hurst's has with these growers are stable over time but in general are not based on written contracts. Written agreements with a limited number of growers who fill specific harvest windows are the exception to this general practice. Northwest growers have the highest average blueberry yield in the country at 8,000 lbs/acre (USDA, ERS, 2009), and the growers who supply the Hurst's facility come close to that average yield.

Hurst's distributes about 15 percent of all Northwest fresh blueberries. Before they are packed, some superior quality berries are separated out and placed in controlled-atmosphere storage for up to 1 month. This allows Hurst's to guarantee supply to customers even if poor weather limits producer deliveries for a period. At the packing house, the bulk berries pass through three separate sorting lines, where a combination of mechanical and human assessment separates out substandard berries and packs the product that meets Hurst's standards into clamshells in one of six sizes. The Oregon-produced berries are packed in clamshells labeled with the Hurst's Farm name and the firm's address (Sheridan, OR). Because California-produced berries that Hurst's distributes are sold in similar clamshells, retail consumers may be confused as to the geographic source of Hurst's berries. Allfoods makes an effort to address this problem by using additional signage to high-

²⁰The name of the retailer has been changed to preserve confidentiality.

²¹Allfoods does not provide a definition of local.

²²The Mexican berries currently produced by Hurst's are not exported to the United States but that may change.

light the local origin of Oregon-produced Hurst's berries sold in its Portland stores.

Once the Oregon season is finished, the sophisticated packing lines are dismantled and shipped to California so they can be used for a greater portion of the year. The blueberries that Hurst's imports are packed before they are shipped so they do not go through Hurst's packing houses. The key services that Hurst's provides include good quality, reliable supply, and high food safety standards that meet domestic and export requirements. Traceability of all blueberries back to the individual farm and processing run is a key component of the food safety program, but this information is not available to consumers. The overall operation requires a full-time, year-round staff of 25 and an additional 200 seasonal workers for the main packing facility. Because Hurst's recognizes that the availability of labor for harvesting is the greatest production challenge facing Oregon growers, the company operates a separate farm labor contracting business that employs about 100 farm-workers and moves them around from the corporate farm to supplier farms as needed.

The limited size of the Northwest consumer market means that Hurst's and other Northwest packers ship most of the fresh berries out of the region. The rapid growth of the national blueberry industry in recent decades has been marked by alternating periods of under- and oversupply. In 2009, the market experienced oversupply, and Northwest farm-gate and shipping-point prices for that year were about 30 percent below levels for 2008. The dock, or receiving, prices quoted by all Northwest fresh-market packers are quite similar and closely linked to prices in the broader marketplace. Most industry observers believe that growers lost money at the 2009 price levels. Because the fresh market packing houses such as Hurst's charge for some of their services at a fixed per pound rate, their receipts fell by less—only about 10 percent.

Allfoods and Hurst's have a strong but not exclusive relationship as both have multiple supply chain partners with whom they trade similar volumes. Sales to Allfoods represent less than 10 percent of the Oregon blueberries packed by Hurst's. In 2009, Allfoods sold Hurst's distributed blueberries (from all locations) about 60 percent of the time. When the firms are trading with each other, the Allfoods buyer and the Hurst's sales staff talk multiple times a day.

In the Northwest marketing season, Hurst's berries are featured by Allfoods and other Portland-area retailers as local products. In 2009, mainstream Portland supermarkets sold Northwest blueberries at \$3.00 to \$5.00/lb in consumer pack sizes as large as 5 pounds. When featured, in-season blueberries dipped in price to as low as \$1.58/lb. These summer prices contrast with prices in other times of the year when Portland supermarket blueberry prices were mostly \$8.00 to \$12.00/lb and consumer pack sizes were generally 6 ounces or less.²³

²³Based on weekly observations at six retail locations in each case study site throughout 2009.

Direct Market Supply Chain: Thompson Farms

Larry Thompson farms 145 acres within 20 miles of downtown Portland. The farm was started 60 years ago by Thompson's parents, who originally grew three crops (broccoli, strawberries, and raspberries) and sold them primarily through wholesalers. When Thompson took over management of the farm in the early 1980s, he did so as a part-time farmer with an off-farm job. After considering his alternatives, Thompson concluded that given his limited acreage and his proximity to urban markets, he could only farm full-time successfully by refocusing the farm on direct market supply chains that would produce greater per acre returns. The farm currently (in 2009) produces 50 berry and vegetable crops that Thompson direct markets through diverse supply chains to local consumers. All products are advertised as "no-spray" and/or "insecticide and fungicide free" but are without any third-party certification.²⁴

Thompson Farm's diversification of crops and market outlets is typical for full-time direct market farms in the Northwest. About 60 percent of farm receipts come from berry crops, while the vegetable crops are used to extend the marketing season on both ends and provide additional sales during the prime berry season. Blueberries are part of the berry focus, but as an individual crop they represent only 5 percent of Thompson Farm's acreage and a slightly larger share of total receipts. Farm-direct production/marketing is a labor-intensive business, and the farm employs 10 field workers to produce and harvest the crops, 3 packing-shed workers to prepare products for sale, and a sales staff of 12 to do the actual selling.²⁵ Recruiting and managing all of these people represents a significant challenge and is one of the strengths of the business.

For 2009, Thompson estimates that 35 percent of farm receipts came from the seven farmers markets, 35 percent came from seven periodic farm stands hosted on hospital campuses, and 30 percent came from three traditional farm stands. Prices at the traditional farm stands are generally 10 percent lower than the prices at the farmers market and hospital sites. All of these outlets allow Thompson's sales staff to highlight where and by whom the crops have been produced through carefully crafted signage and discussions with customers. Thompson believes that freshness and flavor are the two characteristics that consumers value most. Therefore, he minimizes the time from the field to the selling points. For all market outlets, berries are directly harvested into pint containers and then transported to the staging area where the products are refrigerated. In most instances, the berries leave the farm the next day to be delivered to one of the market outlets (a single delivery truck makes the initial rounds and then resupplies a farm stand or market as products run short).

The blueberry price (\$3.33/lb) that Thompson received in 2009 was roughly four times that received by Oregon fresh-market growers for delivering to packing houses and similar to the average price charged by area supermarkets for conventional blueberries. Thompson recognizes that the higher per pound price he earns does not take into account two key elements: (1) as a highly diversified producer, he achieves a blueberry yield that is only about 60 percent of the statewide average, and (2) as a direct marketer, he must take on the roles of packing, transporting, and selling the berries. Thompson

²⁴The farm was third-party certified by the Food Alliance (<http://www.food-alliance.org/>) for a number of years, but Thompson concluded this certification did not help him in his markets.

²⁵Relatively large direct marketers such as Thompson often focus on production and management issues, so all selling is done by employees.

estimates that the costs associated with direct marketing his crops represent about 27 percent of his gross sales revenues, yielding a net blueberry price received of \$2.43/lb.

The farm's expansion possibilities and pricing power are constrained by the many competitors it faces. At the largest farmers market Thompson attends, as many as 15 other producers sell blueberries. Many area markets are not accepting any new blueberry producers.

Intermediated Supply Chain: New Seasons Market

New Seasons Market (<http://www.newseasonsmarket.com>), a chain of nine Portland supermarkets, prides itself as being a store that develops close relationships with both its customers and its suppliers. The key strengths that the chain emphasizes are the scope and quality of its "home-grown" offerings (defined by News Seasons as "products from Oregon, Washington and Northern California"), excellent in-store service, and active participation in and support of community activities. The chain has more than 1,800 employees and averages 140,000 customer trips per week.

Jeff Fairchild manages a two-person department that handles all produce purchasing and merchandising for New Seasons. While over the course of the year the majority of the produce sold by New Seasons passes through a distributor, Fairchild places an emphasis on working with individual growers to buy what is available from the store's home-grown region.²⁶ He recognizes that working effectively with individual growers is a complex, time-consuming process and thus limits the number of producers who supply New Seasons and works to ensure that the relationships are for the long term. As is true for the major national supermarket chains in Portland, New Seasons sells blueberries throughout the year. During much of the year, it purchases berries from a produce distributor. Depending on the time of year, these berries are sourced from either the United States or the Southern Hemisphere. During the 10-week Northwest production season, New Seasons purchases blueberries from a limited number of individual growers, with three or four responsible for the majority of the berries. Currently, New Seasons does not require producers to have any third-party certification of food safety. That policy may change, however, and Fairchild recognizes that a lack of certification may pose a significant hurdle for some current suppliers.

Blueberries are an increasingly popular item but still represent less than 1 percent of New Seasons' produce sales. Fairchild believes that while most of New Seasons' customers distinguish between produce labeled as "home-grown" and other produce, they do not further distinguish by proximity to Portland within the home-grown category. The chain prefers to carry organic berries only, and Fairchild notes that this is increasingly possible for him to do. In the Portland market, New Seasons recognizes that it faces significant in-season competition from farmers market vendors (many of whom are also New Seasons' suppliers), and it also recognizes the challenges provided by mainstream supermarkets that frequently run specials on blueberries.

Since the chain opened in 2000, New Seasons has purchased organic blueberries from Scott Frost, owner of Nature's Fountain Farm. The farm is 60 miles south of Portland and grows blueberries on half of its 15 farmed acres.

²⁶Even when Fairchild makes direct purchases from individual producers, a Portland-area distributor—the Organically Grown Company (<http://www.organicgrown.com/>)—often makes the store deliveries.

Frost sells about 50 percent of his berries to New Seasons and sells the rest (along with 50 vegetable crops) in 3 Portland-area farmers markets and to a few restaurants. Although Frost harvests blueberries for 8 or 9 weeks, he only sells berries to New Seasons for the middle 4 or 5 weeks and reserves his smaller quantities of early and late season berries for farmers market sales. New Seasons and Frost do not have a formal contract and simply pick up where they left off the previous season. Fairchild handles ordering for all stores and communicates with Frost by phone as Frost does not use email.

Frost's field workers harvest berries into buckets, and then a separate crew sorts and packs the berries into pint containers. The sorting and packing expenses are treated as marketing expenses, as these services would not be required for berries delivered to a packer/shipper. The arrival of Frost's berries in open cardboard pint containers allows the New Seasons produce departments to provide a visual clue that the local blueberry season has begun (at other times of the year, berries are sold in closed plastic clamshells). The stores indicate geographic origin through the use of home-grown signage and also display individual farm names whenever possible (but do not always succeed in updating signage as needed). Frost prefers to make his own deliveries to the nine stores and estimates that it takes most of a day to make the rounds. During this period, he makes deliveries once or twice a week. The total cost—packing, sorting, delivery time, and vehicle use—represents about 9.5 percent of his revenues. While as a general rule, Fairchild prefers that local producers take advantage of a distributor's delivery services so that they have more time to devote to their farms, Frost is not eager to pay delivery fees and meet the distributor's timing requirements.

Pricing is a significant challenge in this intermediated, direct-to-retail chain. In the mainstream chain, prices are market determined. In the direct markets, producers have some ability to set their own prices. In this chain, while the participants value their relationship, they also recognize both the need and the challenge of determining a mutually beneficial price. This proved difficult in 2009 and may precipitate a change.

Fairchild is constrained by competing prices in the marketplace and the need to set his purchase price low enough to earn an adequate margin for New Seasons. His general goal is a margin approaching 50 percent of the retail price, although this is not always achieved, particularly for local products. Frost, however, wants to charge New Seasons the same discount price that he has established for bulk farmers-market purchases. Since that price is only 17 percent less than Frost's full retail price, it is not feasible for New Seasons to pay this amount, earn a 50-percent retail margin, and still charge prices that are similar to farmers market prices. These conflicting price goals were heightened in 2009 by the large blueberry crop and reduced price level. Still, Fairchild ended up paying an amount close to Frost's minimum price requirement and setting the New Season retail price (about \$5.45/lb) higher than the farmers market price for organic berries for that time period.

As the 2009 season was coming to an end, both intermediate chain participants recognized that they needed to examine alternatives. Local blueberries will continue to be sold at New Seasons; it is just a question of which farms will supply them. Nature's Fountain will continue to produce crops but may

have to cut back on blueberries, further diversify production, and find additional direct market outlets.

Supply Chain Structure and Size

- Consumers receive more detailed information about where, how, and by whom their blueberries are produced in the direct and intermediated food supply chains through labels, signage, and conversation than in the mainstream chain, where only the packing firm name and address is listed.
- Trading partner relationships are valued and durable in all three of the chains but differ in nature. The mainstream chain relationships are long-standing and reflect business partners with specific expectations. The direct market relationships are weaker but involve many more people. The intermediated chain features close and very personal relationships, but all the participants recognize the need to take into account market price pressures.
- Collective organizations are important as market outlets for two of the supply chains studied. Portland-area farmers markets play prominent roles for the producers in both the direct market and intermediated chains. In addition, New Seasons provides monetary support to many markets in the area.
- All Northwest blueberry production is influenced by the presence of a strong industry, with the mainstream industry gaining the greatest benefits. The mainstream producer/distributor has the strongest links to the wide range of infrastructure present, including research and education, promotion, and packing and processing.
- The direct market and intermediated chains derive the greatest benefits from the presence of other local food chains and initiatives. The mainstream participants are largely unaffected by other food supply chains, while the direct and intermediated participants are well integrated within the local food network of other farmers, government agencies, and nongovernmental organizations.
- The supply chains vary greatly in size. The mainstream supply chain handles the vast majority of Northwest-produced fresh berries and extends far beyond the region because the quantity produced exceeds the demands of the local market by a factor of 10. Hurst's, the mainstream distributor, also recognizes the need from a business perspective to overcome the short Northwest blueberry season by developing a year-round distribution network. The producers who direct market and/or sell through an intermediated supply chain face short harvest seasons, and the total amount they market is much less than the volume of product moved through the mainstream supply chain. These locally oriented producers have responded by diversifying their farms to produce much more than just blueberries.
- Lack of year-round availability limits market opportunities for local blueberries. Since blueberries are a perishable crop with a relatively short harvest season (10-12 weeks for the region as a whole), the market opportunities through all three supply chains are restricted.

Supply Chain Performance

- Even after marketing costs have been subtracted, the direct and intermediated chain producers earn much higher per unit revenues than the mainstream producers. Table 4 documents the prices and the allocation of revenue across all supply chains.²⁷ The net producer revenues are \$2.43/lb and \$2.53/lb, respectively, for the direct and intermediated producers versus \$0.86 for the mainstream producers.²⁸ The producers in the two locally oriented supply chains are much more diversified than the producers who participate in the mainstream supply chain, and there are limits to the quantity of blueberries they can sell in the short marketing season. The proportion of revenue received by the producer ranges from a low of 27 percent in the mainstream chain to 46 percent in the intermediated chain and 73 percent in the direct market chain. The retailers in the mainstream and intermediated supply chains earn roughly the same proportions of the revenue.
- Aside from organic production methods, there is relatively little product differentiation for blueberries. It is difficult to determine whether the “local” designation provides a higher price as the increased availability of product actually drives down the price during the Northwest season.
- Food miles and fuel use are lowest in the direct market chain as the average distance from the farm to market is only 10 miles (table 5). Food miles are lower for the intermediated chain (70) than for the mainstream chain (115), but fuel use per cwt is considerably higher in the intermediated chain.
- Contributions to social capital can be most clearly seen in the intermediated and direct market case, where New Seasons has a strong community program centered on donating 10 percent of its after-tax profits to community groups/activities and has been a leader in local food initiatives. Thompson Farms has been a cornerstone participant in many local food organizations and has taken on a supporting role for immigrant farmers by providing land and market outlets.

²⁷In making these price comparisons, it is important to recognize that the blueberries in the mainstream and intermediated chains are conventional while the blueberries in the intermediated channel are organic.

²⁸The costs associated with marketing their products are 27 percent for the direct market producer and 9.5 percent for the producer in the intermediated chain.

Table 4

Allocation of retail revenue in Portland, OR—blueberry chains, by supply chain and segment

Supply chain segment	Mainstream		Direct		Intermediated	
	Allfoods		Thompson Farm		New Seasons	
	<i>Revenue (\$/lb)</i>	<i>% of total</i>	<i>Revenue (\$/lb)</i>	<i>% of total</i>	<i>Revenue (\$/lb)</i>	<i>% of total</i>
Producer	0.86	26.8	2.43	73.0	2.53	46.4
Producer estimated marketing costs ¹	-	-	0.90	27.0	0.52	9.5
Packer/distributor	0.58	18.1	-	-	-. ²	-
Transport	0.16	5.0	-	-	-	-
Retail store	1.60	50.0	-	-	2.40	44.0
Total retail value	3.20	100	3.33	100	5.45	100

Notes: - indicates “not applicable.”

¹Direct: Includes estimated costs of packing, transportation, and marketing. Total farm per unit revenue is 2.43+0.90 = 3.33 (\$/lb). Intermediated: Includes packing and transportation costs and estimated opportunity cost of time for marketing activities. Total farm per unit revenue is 2.53+0.52 = 3.05 (\$/lb).

²Using a distributor in the intermediated supply chain would add another \$0.21 to producer’s distribution costs and reduce net farm revenue to \$2.32.

Source: USDA, Economic Research Service.

Table 5

Food miles and fuel use in Portland, OR—blueberry supply chains

Supply chain segment	Food miles	Truck miles	Retail weight	Fuel use	Fuel use per cwt
<i>Mainstream: Allfoods¹</i>	<i>Number</i>		<i>Cwt</i>	<i>Gallons</i>	
Producer	35	70	100	7	0.07
Packer-distributor	50	100	400	16.7	0.04
Distributor-store	20	40	400	6.7	0.02
All segments	115				0.13
<i>Direct: Thompson Farms²</i>					
Producer	10	20	15	1.8	0.12
All segments	10				0.12
<i>Intermediated: New Seasons³</i>					
Producer	70	140	18	10.8	0.60
All segments	70				0.60

¹Transportation in this chain is in open trucks with a fuel efficiency of 10 mpg for the segment between the farms and the packing facility and 48-foot trucks with a fuel efficiency of 6 mpg for the segments between the packing facility and the distribution center and between the distribution center and the stores. For each segment, the trucks are assumed to return empty, so the one-way distances are doubled.

²Transportation in this chain is in a panel truck with a fuel efficiency of 11 mpg for all trips. The truck is assumed to return empty, so the one-way distances to the marketing outlets are doubled.

³Transportation in this chain is in a delivery van with a fuel efficiency of 13 mpg for all trips. The truck is assumed to return empty, so the one-way distances to make the store deliveries is doubled.

Source: USDA, Economic Research Service calculations based on case interviews.

Key Lessons

Specializing in Northwest-produced and marketed blueberries is insufficient to provide a viable business for all of the participants in these three supply chains. The mainstream national retailer and the intermediated retailer treat Northwest blueberries as one component of an annual supply cycle that allows them to supply blueberries throughout the year. The mainstream producer/distributor recognized the need to move toward year-round supply through setting up distribution arrangements with other production areas so that his company would have product to service the needs of the major retail players.²⁹ The locally oriented producers recognize the need to produce a wide range of products to expand their seasons and increase sales, even during the berry season.

The net producer prices are far different in the three supply chains and reflect the need for the industry as a whole to ship most fresh berries out of State. The prices in the mainstream chain are based on international supply-and-demand conditions. The mainstream producers receive about 35 percent of the net price charged by direct market growers. Larger mainstream growers could flood local direct markets with lower price berries but have not done so because they recognize how little their net earnings would be from selling in these limited and labor-intensive markets. The direct market prices reflect local supply-and-demand conditions and, in looking at those prices, it is important to recognize that the producer estimates that his marketing costs are equal to 27 percent of his revenues. The intermediated market prices must also be understood in the context of the limited size of the Portland marketplace. The retailer and producer in this chain value their long-term relationship but have struggled to find a price that is satisfactory for both businesses.

²⁹Arrangements with growers in California, Chile, and Argentina expand its ability to distribute berries year-round.

Spring Mix Case Studies in the Sacramento MSA³⁰

These case studies describe three supply chains of spring mix leafy greens in the Sacramento MSA (referred to as the Sacramento area): an upscale supermarket chain (mainstream supply chain); a local producer selling at a farmers market (direct market supply chain); and a natural foods grocery cooperative selling locally grown spring mix (intermediated supply chain). The Sacramento area has a population of approximately 2.1 million and comprises four central California counties: Sacramento; Placer; El Dorado; and Yolo. The production area for local food products is defined as the Sacramento area for these case studies.

According to USDA's 2007 Census of Agriculture, 5,152 farms in the Sacramento area generated sales of \$795 million; 92 percent of the farms were classified as "small" (with annual revenues under \$250,000) (USDA, NASS, 2009). The area's highest revenue crops are processing tomatoes, wine grapes, rice, almonds, apples, and pears. Fourteen percent of the farms in the Sacramento area were involved with direct marketing, compared with 6 percent nationally. These direct marketers averaged \$19,395 in revenues from this supply chain, with a high of \$65,621 for Yolo County producers. The Sacramento area has 36 farmers markets (USDA, AMS, 2009); in 2009, the Davis Farmers Market was voted the most popular large farmers market in the Nation during a contest organized by American Farmland Trust. Regional agricultural promotion programs include Capay Valley Grown, Apple Hill Growers Association, and Placer Grown.

Eight of the top 75 North American food retailers market in the Sacramento area, including national companies Wal-Mart, Costco, Safeway, Whole Foods, and Trader Joe's, and regional supermarket companies Raley's and Savemart (Supermarket News, 2009). Specialty grocers include Nugget Markets, three natural foods cooperatives, and numerous small ethnic markets.

There is no standard of identity for spring mix as a product. The leading marketer, Earthbound Farms, lists the following organic greens as ingredients for its spring mix with the caveat that the ingredients in each package may vary: baby lettuces (red and green romaine, red and green oak leaf, lollo rosa, tango), red and green chard, mizuna, arugula, frisée, and radicchio. Spring mix is available in the Sacramento area year round in most retail outlets. It is sold in bulk as well as in varying package sizes. Price varies by outlet and type of packaging. In 2009, local spring mix was available at only one of the two farmers markets and briefly in the two natural food stores. Median prices during 2009 ranged from \$4.69/lb for conventional bulk product at a farmers market to \$12.77/lb for organic product in a 5-ounce package at a mainstream supermarket.³¹

Mainstream Supply Chain: Nugget Market

Nugget Market Inc. (referred to as Nugget—www.nuggetmarket.com) is a regional chain owned by the Stille family, who founded the firm in 1926. The firm operates ten upscale Nugget supermarkets and three Food4Less warehouse-type discount stores; nine of the stores are in the Sacramento

³⁰An extended version of this set of case studies is available online at http://foodindustrycenter.umn.edu/Local_Food_Case_Studies.html.

³¹Based on project data collected weekly at two supermarkets, two natural food stores, and two farmers markets.

area. Nugget's sales revenues totaled \$288 million in 2009. Most of its stores have a European-style open-air store format. The firm has approximately 1,500 employees, 60 percent of whom are full time; its annual payroll totals approximately \$40 million.

Nugget does not have a distribution warehouse; NorCal Produce (NorCal), a local firm, has been its sole produce distributor for over 20 years. Produce managers at Nugget stores call in their orders directly to NorCal 6 days a week. Overall, the chain's produce departments have a 40-percent target gross margin, which drops to approximately 35 percent after accounting for product loss.

Earthbound Farm (called Earthbound) is Nugget's primary spring mix brand (www.ebfarm.com). Nugget displays 5-ounce and 1-pound clamshells of Earthbound spring mix in a large refrigerated unit at each store, along with a variety of other Earthbound packaged salads, 5-ounce clamshells of another organic spring mix brand, and 5-ounce bags of another brand of conventional spring mix and other packaged salads. Earthbound spring mix is also marketed bulk in a large bowl (labeled only as "spring mix," with a USA country-of-origin designation) alongside other organic produce. Although Nugget does market some local produce, such as apples and heirloom tomatoes, it does not sell any local spring mix.

Earthbound is located in the Salinas Valley, which is often called "America's salad bowl." Twenty-five years ago, the privately held firm was founded as a 2.5-acre farm; soon thereafter, it became the first company in the Nation to sell small bags of prewashed mixed organic baby lettuces to retail customers and is largely responsible for the success of spring mix as a widely distributed salad product in the United States. While Earthbound now describes itself on its website as the world's largest grower of organic produce, it actually sources its leafy greens and other produce from 150 farms.³² All of its produce is now certified organic. The front of Earthbound's spring mix packages includes the USDA-organic logo and a label indicating that the product was "grown in the USA and Mexico and processed in the USA." Its website includes a "Meet Our Farmers" section, with profiles of six growers (<http://www.ebfarm.com/WhyOrganic/MeetOurFarmers/index.aspx>).

Approximately 60 percent of Earthbound's spring mix is grown in the Salinas Valley, located about 175 miles from downtown Sacramento. During the late fall and winter, spring mix is produced in the "desert region," which consists of Imperial County in southeastern California, neighboring Yuma County in Arizona, and northern Mexico. Earthbound's packaging equipment is moved in mid-November from its processing facility in San Juan Bautista to its Yuma plant (about 585 miles) to process leafy greens grown in the desert region.

Baby leafy greens are machine-harvested and transported to Earthbound's processing facility to be tested for contamination; then they are washed, dried, mixed, packaged, and stored until shipped to customers across the Nation. Earthbound prides itself on maintaining a cold chain from harvest through the loading of the packaged salads onto refrigerated trucks. When stored properly, the spring mix has an expected shelf life of 17 days.

³²Source: <http://www.ebfarm.com/AboutUs/OurMission.aspx>, accessed 05/21/09.

Assuming that 60 percent of the spring mix crop was grown in Monterey County and 40 percent was grown in Imperial County, growers received farm-gate prices averaging \$0.77/lb in 2008.³³ Assuming that organic products earned a 10-percent premium and accounted for 45 percent of each county's reported production, the average price paid to growers for organic spring mix was \$0.81/lb.

NorCal dispatches trucks to pick up produce from Earthbound and other nearby suppliers. The products are in refrigerated storage at NorCal's warehouse for usually no more than 1 or 2 days and then loaded into NorCal's refrigerated trucks for delivery to Nugget stores and other customers within a 150-mile roundtrip route. The average distance traveled from the field to the processing plant, combined with shipping from NorCal's warehouse to a Nugget store in Davis, CA, totals 238 food miles from the Salinas Valley and 679 food miles from the desert region. Trucks travel a total of 582 truck miles for product from the Salinas Valley and 1,490 miles from the desert region.

All of Earthbound's products are supplied to Nugget with fixed prices by NorCal. Retail sales at all Nugget stores (based on sales through November 20, 2009) of Earthbound spring mix products are projected to total almost \$400,000 in 2009. Bulk product accounts for 63 percent of Nugget's spring mix weight volume and an additional 31 percent from sales of the 1-pound clamshells. Nugget's retail price for bulk spring mix held steady at \$6.49/lb during 2009.³⁴

Direct Marketing Supply Chain: Fiddler's Green Farm

Fiddler's Green Farm (referred to as Fiddler's) is a small organic farm located in Yolo County's Capay Valley, approximately 60 miles from downtown Sacramento. Jim Eldon joined Fiddler's in 1991 as the farm manager; since 1996, he and his wife have been the sole owners of the 37-acre farm. Eldon also leases an additional 25 acres nearby and sells most of his produce through farmers markets and a Community-Supported Agriculture (CSA) program. In 1999, however, a deep freeze during the spring forced Eldon to discontinue the CSA and lay off all but one of the farm's 15 employees.

Currently, Eldon is farming organically full time on 32 acres, producing 90 to 100 different crops annually, including asparagus, beets, carrots, leeks, melons, peas, summer squash, and numerous salad greens. Fiddler's has one full-time employee who works about 10 months of the year and has a house on the farm, along with three employees who work 60 hours a week for about 5 months and 16 hours a week for about 2 months of the year. In 2008, Fiddler's grossed about \$120,000, which is substantially less than the \$500,000 it generated before its 1999 crop disaster.

Fiddler's markets its produce through three supply chains: farmers markets, restaurants, and natural foods cooperatives. To prepare for a farmers market, Eldon develops a load list of crops. Most crops are harvested the day before, brought into the packing shed, hand-dunked in a 500-gallon stock tank, and rinsed. Greens for spring mix are drip-dried and loosely packed in 4-pound boxes and stored in a cooler. During cool weather, Eldon loads his truck the evening before a market.

³³Based on the Agricultural Commissioner's Crop Reports for Monterey and Imperial Counties, which report the combined revenues for organic and conventional spring mix.

³⁴Based on project data collected weekly.

Fiddler's generates 70 percent of its revenues by selling at three farmers markets: the Davis Farmers Market (Davis FM) on Saturdays, and the Marin Farmers Market on Thursdays and Sundays. In 2008, its revenues totaled approximately \$45,000 at the Davis FM and \$20,000 at each of the Marin Farmers Markets. Sales to two local natural foods cooperatives and restaurants generated the remaining 30 percent of revenues. Fiddler's markets about 2,000 pounds of spring mix annually, which accounts for approximately 12 percent of its sales and represents its highest revenue crop.

The Davis FM (<http://www.davisfarmersmarket.org/>) was established in 1976. During the peak of the summer, it has about 55 farmers selling at the Saturday market, compared with 45 during the fall and spring and 35 during the winter. On Saturdays, Eldon makes a delivery to the Davis Food Co-op in his unrefrigerated truck before arriving at the Davis FM. Five farms sold spring mix at the Davis FM during 2009, with prices for organic product ranging from \$5.00 to \$8.00/lb. Eldon usually brings 40 pounds of spring mix to the market and sells it for \$8.00/lb.

Fiddler's is located within a unique microclimate that enabled the farm to be the only vendor at the Davis FM selling spring mix between mid-June and mid-October in 2009, when it was too hot for other local farms to grow the product. At the Davis FM, Eldon has a large banner indicating his farm's name, location, and organic certification. None of the products is individually labeled. After the Saturday market closes, Eldon makes a delivery at a downtown Davis restaurant, then heads to Sacramento to make a delivery to another natural foods cooperative before returning to his farm. While Eldon earns a considerable premium for his spring mix (and other crops) at the Davis FM, he also incurs marketing costs, such as stall fees, transportation expenses, and the opportunity cost for his time spent driving and selling at the market. The marketing costs for the 46 trips during the year total an estimated \$18,349, which represents 26 percent of Eldon's associated revenues of \$70,000.

Eldon enjoys talking to his customers at farmers markets; several of them are chefs whose restaurants have become regular clients. Many customers ask him about how to serve the more unusual vegetables, such as Chinese red meat radishes and rainbow kale. Several customers have urged Eldon to re-establish a CSA, but he is concerned that the local CSA market is already saturated.

Intermediated Supply Chain: Davis Food Cooperative

Davis Food Cooperative (www.davisfood.coop) (referred to as the Co-op) is a full-service natural foods market owned by approximately 10,000 households in Davis, a university-oriented community. The Co-op's revenues totaled \$18.1 million in 2008, making it the third largest cooperative grocer in California. The Co-op has approximately 130 employees, with payroll expenses of \$4.3 million in 2008.

The Co-op's board recently adopted a policy statement including the following: "We are the best source of healthful, sustainable, higher quality, and locally grown and produced foods. Buying from local growers makes sense for any number of reasons, including flavor, freshness, reduced trans-

portation, and preservation of local farms.³⁵ The Co-op's produce department carries more than 900 items during the year; over half of the items are organic. Produce sales for the 2008-09 fiscal year totaled \$3 million, with approximately 80 percent for organic product. The Co-op is staffed by 13 employees (9 are full time) and has had the same manager for the past 15 years. It does not have any contracts with its produce suppliers.

The Co-op markets local spring mix from four farms, which accounted for only 1 percent of its total spring mix sales in 2009. Local spring mix is displayed in the organic section with a small sign indicating "Local/California" because the produce manager does not want to have to change the sign if the Co-op runs out of the local product, which is common. Unlike for most other local products, no farm is identified for spring mix.

Terra Firma is the Co-op's primary local spring mix supplier. It grows approximately 60 crops annually, including fruits, vegetables, nuts, and grains on 240 acres. It has been selling spring mix to the Co-op for about 20 years. For most of the year, Terra Firma has 35 full-time employees. It generates approximately 40 percent of its revenues from its 1,400 CSA memberships. Terra Firma has contracted its previously substantial farmers market program down to a fledgling local market that generates less than 1 percent of its revenues. About 15 percent of its revenues come from wholesale sales to the Co-op, another grocery cooperative in the Sacramento area, and the Whole Foods store in Sacramento. Restaurants account for approximately 5 percent of Terra Firma's revenues. The remaining 40 percent come from sales to distributors, including NorCal and another Sacramento-area firm.

Terra Firma is known for its heirloom tomatoes, which it also sells to the Co-op. It generates approximately 2 percent of its revenues from spring mix and does not consider spring mix to be a highly profitable crop. Rather, like the Co-op's other spring mix suppliers, it grows spring mix because half-pound bags are a popular item with its CSA members during the fall and winter months. Terra Firma harvests the greens in its spring mix by hand early in the morning. The harvested greens are transported to a packing shed where they are washed together in tubs that have been sterilized with bleach. After washing, the greens are dried in mechanical salad spinners and packaged in perforated salad bags which are placed into 4-pound boxes for delivery to the two grocery cooperatives and 8-pound boxes to be bagged for CSA boxes. The boxed product is hauled 3 miles in a refrigerated truck to one of Terra Firma's coolers.

Whenever there is no local spring mix, the Co-op sources bulk spring mix from Veritable Vegetable, a long-time San Francisco-based distributor of primarily organic produce. It also markets packaged Earthbound spring mix year round from NorCal, which also supplies Nugget. The Co-op's wholesale price for bulk spring mix from local growers ranges from \$3.50 to \$4.00/lb, which is noticeably higher than the \$2.17/lb median price it pays for bulk spring mix purchased from Veritable Vegetable. Nevertheless, the Co-op's price is lower than what local growers earn by selling spring mix at farmers markets or through their CSA programs. Thus, there appears to be little likelihood of increased sales of locally grown spring mix at the Co-op.

³⁵The Co-op defines "local" as being within 100 miles, which encompasses locations that are west and south of the Sacramento area.

Supply Chain Structure and Size

- Consumers receive more detailed information about where, how, and by whom their spring mix is produced in the direct market and intermediated food chains. Direct market channels, in particular, provide the greatest potential for information exchange between producers and consumers. Although the intermediated natural foods cooperative has a well-developed local food program, it does not identify local spring mix with individual farm names and labels it as “Local/California” because it frequently runs out of the local product. Spring mix is not part of the mainstream retailer’s limited local produce marketing program.
- Durable relationships between supply chain partners are evident across all chains. There is significant information exchange and trust between Nugget and NorCal and between the Co-op and its local grower suppliers. Similarly, Fiddler’s has loyal customers at the farmers market who trust Eldon to provide them with safe and fresh product.
- Pricing in the direct and intermediated supply chains is decoupled from the commodity markets. Since Earthbound is the brand leader for organic spring mix (as well as a major supplier of private-label spring mix), Earthbound has major influence on the commodity price of spring mix. Information on prices paid to Earthbound’s growers was not available; however, it is surmised that, to ensure steady supplies, growers have season-long contracts with Earthbound paying a stable price.
- Collective organizations, particularly farmers markets, have contributed significantly to the success of local supply chains for spring mix. The direct marketer, Fiddler’s, is currently generating 70 percent of its revenues from sales at farmers markets. When the producers first began marketing their spring mix and other produce, farmers markets served as a marketplace where they could earn a premium for their organic produce, access wholesale customers as well as consumers, and create the initial customer base for their CSA programs. While other collective organizations, namely consumer grocery cooperatives, serve as intermediaries in the marketing of local spring mix, their role has been limited due to the higher prices earned by producers in direct market channels.
- The direct and intermediated supply chains are not linked to the national industry infrastructure that is based only 175 miles away. Instead, the local producers have benefited significantly from the strong local food infrastructure provided by the farmers markets, consumer grocery cooperatives, and CSAs in the Sacramento area.
- Lack of year-round availability limits market opportunities for local spring mix. Although spring mix was available at the Davis Food Co-op during 49 of the 51 weeks for which data were collected for this project, supplies were limited during half of the year. This limited availability creates a thin market with high prices for local spring mix and restricts supplies in the intermediated supply chain where wholesale prices of nonlocal spring mix are significantly lower.
- Size differences among these supply chains are noticeable. Fiddler’s markets about 2,000 pounds of spring mix annually, while the Co-op’s volume totals approximately 8,800 pounds, with only 100 pounds of local

product. Nugget’s spring mix sales average approximately 6,500 pounds per store annually, and none of the product is local.

- Access to processing and distribution is not a significant barrier to expansion for the direct and intermediated supply chains, although Earthbound does benefit from significant scale economies associated with its mechanized harvesting and processing.
- Fixed costs for compliance with regulatory and operating standards limit the potential size of chains. Following recent outbreaks of foodborne illness, food-safety operating standards have been adopted broadly by leafy greens handlers supplying mainstream markets; thus far, the impact on the smaller local producers has been negligible because these growers have not sought distribution in these markets. The U.S. Food and Drug Administration, however, has issued a draft guidance document for leafy greens; if voluntary food-safety operating standards become regulations, high compliance costs could make spring mix production unprofitable for small local growers (Hardesty and Kusunose, 2009).
- Expansion opportunities are mixed across the supply chains. For example, in the supply of direct marketed spring mix, expansion is likely to come through entry of new growers; growth in the intermediated supply is unlikely because growers earn higher prices by direct marketing their spring mix.

Supply Chain Performance

- Allocation of retail revenue for spring mix varies widely across the three supply chains. When adjusted for marketing costs, producer’s share of revenues decreases with distances to market and the number of intermediaries involved in the supply chain (table 6).

Table 6

Allocation of retail revenue in Sacramento, CA—spring mix chains, by supply chain and segment

Supply chain segment	Mainstream		Direct		Intermediated	
	Nugget Market		Fiddler’s Green		Davis Food Co-op	
	Revenue (\$/lb)	% of total	Revenue (\$/lb)	% of total	Revenue (\$/lb)	% of total
Producer ¹	0.79	12.2	5.92	74.0	3.00	50.1
Producer-estimated marketing costs ²	0.02	0.30	2.08	26.0	0.75	12.5
Processor	1.16	17.9	-	-	-	-
Distributor ³	0.77	11.9	-	-	-	-
Retail stores	3.75	57.8	-	-	2.24	37.4
Total retail value ⁴	6.49	100	8.00	100	5.99	100

Notes: - indicates “not applicable.” For the direct and intermediated supply chains, the farm also operates as the processor.

¹Mainstream: Calculated as a weighted average of farm-gate prices paid in Monterey and Imperial Counties, 60 percent and 40 percent, respectively, and adjusted for 45 percent of the production in each county earning a 10-percent price premium for organic product. Direct and Intermediated: Includes compensation for processing activities, such as washing, mixing, and bagging.

²Mainstream: Includes estimated costs of transportation to the processor. Total farm per unit revenue is 0.79+0.02 = 0.81 (\$/lb). Direct: Includes estimated transportation costs, farmers market stall fees, and opportunity costs of time for marketing activities. Total farm per unit revenue is 5.92+2.08 = 8.00 (\$/lb). Intermediated: Includes estimated transportation and packaging costs. Total farm per unit revenue is 3.00+0.75 = 3.75 (\$/lb).

³Includes compensation for inbound freight charges averaging \$0.50/pound for bulk spring mix.

⁴Mainstream and Direct: Median retail price of bulk spring mix from January to December, 2009. Intermediated: Median retail price of bulk spring mix from January through March, 2009.

Source: USDA, Economic Research Service.

- Revenue retention within the local economy appears to be relatively high in all three supply chains: 100 percent for the local supply chains and over 60 percent in the mainstream supply chain where the supermarket is locally owned with most of its employees living in the Sacramento area.
- Local growers are earning a price premium in both the direct and intermediated supply chains, ranging from 23 to 73 percent.
- Spring mix travels fewer miles in the direct and intermediated supply chains. However, fuel-use results are mixed when factoring in transportation loads, demonstrating how product aggregation can provide fuel efficiency in local food chains (table 7).
- The direct and intermediated supply chains contribute substantial social capital to the community. The Co-op appears to have had the greatest impact in strengthening local growers' entrepreneurial skills; it incurs substantial transaction costs to purchase from local growers, features local growers through its newsletter and in-store events, and promotes local seasonal foods at the farmers market.

Table 7

Food miles and fuel use in Sacramento, CA—spring mix supply chains

Supply chain segment	Food miles	Truck miles	Retail weight	Fuel use	Fuel use per cwt shipped
Mainstream: Nugget Market (CA)	<i>Number</i>		<i>Cwt</i>	<i>Gallons</i>	
Producer to processor-shipper ¹	30	60	130	10.0	0.08
Processor-shipper to distribution ²	192	372	400	67.6	0.17
Distribution to retail ³	16	150	250	25.0	0.10
All segments	238				0.35
Mainstream: Nugget Market (AZ)					
Producer to processor-shipper ¹	45	90	130	15.0	0.12
Processor-shipper to distribution ²	618	1250	400	227.3	0.57
Distribution to retail ³	16	150	250	25.0	0.10
All segments	679				0.79
Mainstream: Nugget Market (CA & AZ combined)					
All segments ⁴	414				0.52
Direct: Fiddler's Green					
Producer to retail ⁵	35	105	14.0	8.8	0.63
All segments	35		14.0		0.63
Intermediated: Davis Food Co-op					
Producer to co-op ⁶	22	95	60.0	10.5	0.18
All segments	22				0.18

¹These short-haul loads use a trailer that achieves fuel economy of 6 miles per gallon (mpg).

²These loads are transported in a tractor-trailer that achieves fuel economy of 5.5 mpg.

³These loads are transported in a tractor-trailer that achieves fuel economy of 6 mpg.

⁴Food miles and fuel use per hundredweight (cwt) are calculated as the average of the CA and AZ chains, weighted by the total product weight in each chain (60 percent for CA, 40 percent for AZ).

⁵All transport in this chain is in a box truck that achieves fuel economy of 12 mpg.

⁶All transport in this chain is in a refrigerated box van truck that achieves fuel economy of 10 mpg.

Source: USDA, Economic Research Service calculations based on case interviews.

Key Lessons

Despite the strong potential that intermediated supply chains offer conceptually, it is highly unlikely that this structure will expand sales of local spring mix. Although the growers have durable relationships with the local natural foods cooperative, they view the cooperative as a residual market for their excess supply; they are able to earn higher returns from marketing their spring mix at farmers markets and through their CSA programs. This indicates that local growers are capturing significant premiums through their direct marketing efforts, which the retailers cannot pay when nonlocal spring mix is available at a much lower cost.

Related to the previous lesson is the fact that the mainstream supply chain is providing formidable competition in the spring mix market. Earthbound has been largely responsible for building the Nation's spring mix market over the past 25 years; it started as a niche marketer and has now become a highly competitive nationwide supplier of an organic commodity. Unlike local growers, Earthbound manages production in two growing regions, which enables it to be a highly reliable year-round supplier of organically grown leafy greens, and gains substantial scale economies by using highly mechanized harvesting and processing technologies.

There are several linkages between entities across the supply chains. The distributor for the Nugget Markets, NorCal, is also one of the Co-op's distributors. While Terra Firma is a spring mix supplier to the Co-op, it also markets some of its produce (but not spring mix) through NorCal. Fiddler's, the direct marketer, is also a spring mix supplier to the Co-op. This crossing of boundaries across the supply chains indicates that the entities involved are using entrepreneurial flexibility to take advantage of opportunities created by demand for locally produced foods.

Beef Case Studies in the Minneapolis-St. Paul-Bloomington MSA³⁶

This set of case studies describes three supply chains for beef product lines marketed in the Minneapolis-St. Paul-Bloomington, MN-WI Metropolitan Statistical Area (referred to as the Twin Cities): an upscale supermarket's store-brand beef (mainstream supply chain); local grass-fed beef sold direct to consumers (direct market supply chain); and local grass-fed beef sold in supermarkets, restaurants, and foodservice outlets (intermediated supply chain). The production area for local food products is defined as Minnesota and Wisconsin for these case studies.

The Twin Cities, with a population of 3.2 million, accounts for more than 62 percent of Minnesota's population and is the third largest metropolitan area in the Midwest. On average, Twin Cities' residents earn \$46,500 per capita annually—well above the national average and that of most metro areas in the study. Food and agriculture are important in Minnesota's economy. Approximately 81,000 farms occupy more than half of the State's land, producing \$15 billion in commodity sales in 2007. Three of the Nation's 20 largest food processing companies—Cargill, General Mills, and Hormel Foods—are headquartered in Minnesota. Eight of the top 75 national U.S. retail food companies operate stores in the Twin Cities, including 2 locally headquartered companies, SUPERVALU and Nash Finch (Supermarket News, 2009). The area is served by an unusually large number of locally owned retail companies, including high-end chains, independent stores, and natural foods cooperatives, which maintain flexibility in sourcing and marketing local products.

The Twin Cities has a growing direct market sector, with more than 40 farmers markets in the metro area and approximately 9,000 Minnesota and Wisconsin farms engaged in some form of direct marketing (USDA, AMS, 2009). These farms generated \$67.7 million in sales direct to consumers in 2007 (USDA, NASS, 2009). Promotional efforts aimed at increasing the consumption of local foods include the 20-year-old State-sponsored "Minnesota Grown Program" as well as several regional "Buy Local" programs.

Minnesota's \$1.4 billion beef sector supports the movement of product through each segment of the supply chain while maintaining local ownership. Approximately 25,000 beef producers—30 percent of Minnesota's farms—engage in some aspect of beef production, including breeding, backgrounding, and finishing (USDA, NASS, 2009). Once ready for slaughter, beef animals can be processed at one of the 93 State and 22 federally inspected plants distributed throughout Minnesota. Twin Cities consumers purchase an estimated 209 million pounds of beef annually.³⁷ Local beef products are available year round in a variety of market venues, including one of two supermarkets, two natural foods stores, and two farmers markets observed throughout 2009. Despite the presence of significant beef and dairy industries in all other case study locations, only Portland, OR, has a regular supply of local beef products in most market venues monitored in this study.³⁸

³⁶An extended version of this set of case studies is available online at http://foodindustrycenter.umn.edu/Local_Food_Case_Studies.html.

³⁷Consumption estimated by authors using metro population data and national per capita beef consumption data.

³⁸Based on weekly observations at six market locations in each case study location throughout 2009.

Mainstream Supply Chain: Kowalski's All Natural Choice and Prime Beef

Kowalski's Markets (<http://www.kowalskis.com/>, referred to as Kowalski's) is a privately held company that operates nine upscale supermarkets in the Twin Cities. Its Grand Avenue store is the focal supermarket for this case. Located in an affluent St. Paul neighborhood, this 22,000-square-foot-store has average weekly sales of \$425,000. It employs approximately 150 full-time and part-time workers. The meat department has seven employees—six full time and one part time. On its website, Kowalski's describes its commitment to local foods: "When we opened our doors over 25 years ago, we knew that a big part of our focus would be on supporting local growers, businesses, and nearby communities."

Kowalski's is of particular interest as the focus for a local foods case study because it is a mainstream supermarket operation that is especially innovative in working with producers and processors to offer a nationally distributed natural beef product as well as a local grass-fed beef product.³⁹ Kowalski's All Natural USDA Prime and Choice beef products account for nearly 95 percent of the operation's beef sales and are supplied by Creekstone Farms Premium Beef (<http://www.creekstonefarms.com/>, referred to as Creekstone). Creekstone, which has facilities in Arkansas City, KS, and Campbellsburg, KY, offers Natural and Premium product lines under its USDA-certified branded beef program. Under the Natural program, which is used by Kowalski's, U.S.-born Black Angus beef are grazed on farms around the Midwest and finished in feedlots, where they are fed a corn-based ration with no animal byproducts. Animals in the program receive no hormones, growth promotants, or antibiotics.⁴⁰ Consumer-ready products are labeled "Kowalski's Premium All Natural Beef. No added hormones/antibiotics! Source verified. Product of the USA. USDA Choice." This provides consumers with information about production methods, quality, and geographic origin.

Kowalski's chose Creekstone after a rigorous evaluation that included visits to cow-calf operations, feedlots, and processing facilities. The two companies have a verbal, long-term pricing agreement that is essentially a cost-plus program based on USDA, Agricultural Marketing Service commodity prices for live animals.

A typical Creekstone beef-finishing operation transports Black Angus calves approximately 250 miles by semi-trailer from cow-calf operations in Montana, Nebraska, North Dakota, and South Dakota to a facility in Southwestern Minnesota. There, the calves are finished to a weight of 1,300 to 1,350 pounds (Roti, 2008). The finisher receives a \$6 to \$10 premium per cwt over commodity prices. Based on average figures for Minnesota beef-finishing operations in 2009, as reported in the Center for Farm Financial Management's FINBIN Database, this implies estimated revenue of \$1,183/head for the finisher and an estimated margin over feed and animal purchase costs of \$216/head.⁴¹ Finished animals are transported from Minnesota by semi-trailer approximately 615 miles to Arkansas City, KS, where Creekstone slaughters and processes beef in its own processing plant, which has a daily capacity of approximately 1,100 head.

³⁹The local beef product is supplied by Thousand Hills Cattle Company and is the focus for this chapter's intermediated supply chain case.

⁴⁰Only Black Angus genetics and humane animal treatment are certified under the premium program.

⁴¹<http://www.finbin.umn.edu/output/144379.htm>

Kowalski's purchases boxed primal cuts of Creekstone beef through J&B Wholesale Distributing, Inc. (<http://www.jbgroup.com/>, hereafter referred to as J&B).⁴² J&B purchases meat from Creekstone, which is transported by semi-trailer to a J&B facility in Minnesota. Kowalski's stores phone orders to J&B two to five times weekly, and J&B delivers product direct to the stores the day after orders are placed. Prices are based on a weekly price sheet provided by Creekstone. J&B receives a flat overage fee for its distribution services, and the amount of the fee is confidential.

J&B plays a pivotal role in maintaining product quality and food safety across the supply chain. It requires that Creekstone comply with 128UCC scan code requirements, which allows J&B to trace products by plant, shift, date, lot number, product name, and weight of product in case of a product recall. The distance from the J&B distribution facility in St. Michael, MN, to the Grand Avenue store in St. Paul is approximately 36 miles. Deliveries are made by a semi-trailer with a 45,000-pound hauling capacity. The vehicle makes stops at several stores and typically travels a 120-mile round-trip route.

The meat department in each Kowalski's store includes backroom facilities for meatcutting, trimming, and packaging; a full-service custom meat counter; and a self-service refrigerator and freezer cases. Meat and seafood account for approximately 12.5 percent of company sales, and beef products represent approximately one-third of meat and seafood sales. The company averages \$425,000 in weekly sales at its Grand Avenue store, with sales of beef products accounting for approximately \$17,700 of the total. The margin on Kowalski's All Natural Beef is approximately 33 percent, before taking product losses into account. Median prices for 85-percent lean ground beef and ribeye steak during 2009 were \$3.99/lb and \$13.99/lb, respectively. The retail value of meat from the whole animal was estimated to be \$3,054 (or \$6.18/lb) in December 2009.

Direct Market Supply Chain: SunShineHarvest Farm

SunShineHarvest Farm (www.sunshineharvestfarm.com) is a small family farm located 35 miles outside the center of the Twin Cities. It is the hub of a diverse direct-marketing supply chain that markets meat and poultry products in farmers markets through CSA shares and bulk and individual item sales delivered to several drop sites. SunShineHarvest Farm is of particular interest as a local foods case study because, like other small startup businesses that rely on owner-operators, its rapid growth has prompted the search for strategies to conserve time spent on marketing and deliveries while maintaining close ties with local customers who value knowing where their food comes from. In 2008, SunShineHarvest Farm owners Mike and Colleen Braucher marketed frozen beef from 40 animals. Beef sales for the year were \$75,000, or approximately 65 percent of total gross sales.

Mike Braucher is primarily responsible for livestock production and raises grass-fed cattle using management-intensive grazing practices on 160 acres of pasture at five locations. He buys hay for winter feed and moves the entire herd to a single site in winter to facilitate feeding and animal care. In late May 2009, he had 30 cow-calf pairs and 20 yearling beef steers and heifers. Over the course of a year, he typically purchases and finishes 15 to 20 calves

⁴²Primals are basic cuts of meat from which other subprimals and consumer-ready cuts are produced. Primals include chuck, rib, loin, round, shank, flank, plate, and brisket.

from a neighbor, who also feeds livestock exclusively on grass. In 2008, Braucher harvested 34 steers and heifers and 6 cull cows. Total pasture and hay costs for a typical animal raised from birth are estimated to be \$940.

SunShineHarvest Farm processes three to six cattle per month at Odenthal Meats in New Prague, MN, (<http://odenthalmeats.com/>). Odenthal is a family owned and operated, State-inspected plant with inspection standards that are “at least equal to” those imposed under the Federal Meat and Poultry Products Inspection Acts.⁴³ It employs seven full-time and two part-time employees and has an annual wage bill of approximately \$210,000. All SunShineHarvest Farm meat is flash frozen. A typical animal from SunShineHarvest Farm weighs 1,100 pounds at slaughter, dresses out to a hot rail weight of 600 pounds, and yields approximately 392 pounds of beef products. The estimated processing cost for a typical steer is \$346.

The Brauchers actively market SunShineHarvest Farm products—selling about 25 percent of their beef in 24 weekly seasonal markets at the Mill City Farmers Market (<http://www.millcityfarmersmarket.org/>) and 6 monthly winter markets at Local D’Lish (<http://www.localdlsh.com/>), a nearby store specializing in local foods. The farmers markets offer opportunities for customer contacts that may evolve into longer term, lower cost relationships through the meat CSA, buying clubs, and sale of quarter or half animals. The Brauchers deliver direct to their non-farmers-market customers three evenings each month. All products are labeled “Braucher’s SunShineHarvest Farm, 100% Grass Fed Beef, Processed for the Braucher Family, Webster, MN.” The Braucher’s street address and telephone number as well as the “Minnesota Grown” label from the MN Department of Agriculture are also included on all packaging. Consumers who purchase SunShineHarvest Farm beef know where and how the product was produced and can easily identify and contact the producers. There is full transparency and traceability.

The estimated value of a whole animal sold in the farmers market in 2009 is \$2,660, while the estimated value of meat from a whole animal sold through other supply chains is \$2,010. Both values are well above the \$896-average-market value for a 1,100-pound steer sold into commodity markets by beef finishers in Minnesota in 2009.⁴⁴ However, it is important to note that the Brauchers pay an estimated \$346 per head for processing and devote significant resources to their marketing activities. Annual costs for farmers market participation—including stall fees, transportation to and from the market, and the opportunity cost of the 16 hours devoted to this each market week—are estimated to be \$10,378, or about 32 percent of total sales through this supply chain.⁴⁵ Annual transportation and labor costs for CSA, buying club, and other direct purchase deliveries are estimated to be \$4,317, or about 5 percent of total sales of all products through these supply chains. Netting out processing and marketing costs from whole animal revenue yields a value ranging from \$1,463 to \$1,563 per animal for farmers market and buying club sales. Going on to net out estimated pasture and feed costs, the margin over feed, processing, and marketing costs ranges from \$563 to \$663. This is still well above the \$45 return over direct expenses (feed, transportation, and marketing) received by beef finishers in 2009 who sold into commodity markets.

⁴³ “[Processing] establishments have the option to apply for Federal or State inspection. States operate under a cooperative agreement with FSIS. States’ programs must enforce requirements “at least equal to” those imposed under the Federal Meat and Poultry Products Inspection Acts. However, product produced under State inspection is limited to intrastate commerce.” USDA, Food Safety and Inspection Service. http://www.fsis.usda.gov/regulations_&_policies/state_inspection_programs/index.asp (accessed March 30, 2010).

⁴⁴The average sale price for finished beef was \$81.45/cwt in 2009. FINBIN Database, <http://www.finbin.umn.edu/output/144379.htm>.

⁴⁵A rate of \$18.83/hour was charged for the opportunity cost of labor. Fuel, maintenance, tire, and depreciation expenses were charged at \$0.637/mile.

For comparison with other chains, SunShineHarvest Farm typically charges \$5.00/lb for ground beef and \$16.00/lb for ribeye steak sold in farmers markets. Its farmers market prices, which average \$6.78/lb for all cuts, are slightly higher than those charged by beef producers who sell direct to consumers in other Twin Cities farmers markets where there is more competition among vendors. Taking the lower price for buying club and CSA sales into account, the overall average price for SunShineHarvest Farm beef is \$5.54/lb.

Intermediated Supply Chain: Thousand Hills Cattle Company

Thousand Hills Cattle Company (<http://www.thousandhillscattleco.com/>, referred to as Thousand Hills) is a privately held business that markets “gourmet quality” grass-fed beef in the Twin Cities metro area. The headline on the Thousand Hills’ website reads: “Our 100% grass fed beef is not only delicious, but good for your health and locally produced.” At the upstream end of this intermediated supply chain, the close, long-term relationships Thousand Hills has with its producers and processor, the scale of operations and mode of distribution, and the unique attributes of its products all are distinctly different from the mainstream supply chain for grain-finished beef. At the downstream end of the supply chain, however, Thousand Hills’ products reach consumers through mainstream supermarkets, high-end restaurants, and institutional foodservice operations.

Founded by Todd Churchill in 2003, Thousand Hills has grown rapidly and currently markets meat from 1,300 cattle annually out of its 10,000-square-foot facility in Cannon Falls, MN, roughly 40 miles southeast of the Twin Cities. Churchill finishes about 11 percent of the Thousand Hills cattle supply—140 head—on his own land located near Cannon Falls. He purchases most of these animals as calves or yearlings, but he is also experimenting with cow-calf production. Churchill sources the remainder of finished animals from approximately 40 producers located in Minnesota, Wisconsin, Iowa, Nebraska, and South Dakota. These producers conform to a strict Thousand Hills production protocol that specifies allowable feeding, husbandry, veterinary care, source verification practices, and terms of sale.⁴⁶ Producers currently receive a base price of \$1.75/lb. hot carcass weight. A steer that weighs 1,200 pounds live will normally have a hot carcass weight of approximately 650 pounds, according to Churchill, and will yield a pay price to the producer of \$1,138 from Thousand Hills plus a \$20/head allowance for transportation costs to Cannon Falls.

Jim Larsen is a typical Thousand Hills producer.⁴⁷ He operates a 200-acre farm near Cannon Falls and markets 25 purebred Black Angus steers and heifers in a typical year, selling about half of these to Thousand Hills and the rest as halves and quarters to direct market customers. He uses rotational grazing, though he also makes hay available year round. Larsen estimates his costs for pasture ownership and management and for hay to be between \$900 and \$1,000 per head. With estimated revenue of \$1,138 from Thousand Hills and \$1,463 from direct market sales, Larsen’s margin over feed costs is between \$138 and \$563. Again, this is well above the \$45 return over

⁴⁶Currently, the majority of animals are finished in the local production area, and all are processed in Cannon Falls, MN.

⁴⁷Name changed to honor confidentiality.

direct expenses received by beef finishers in 2009 who sold into commodity markets.

Thousand Hills' producers deliver 25 cattle weekly to Lorentz Meats (<http://www.lorentzmeats.com/>)—also located in Cannon Falls. Carcasses hang for 5 days and then are cut and packaged according to Thousand Hills' specifications, which vary greatly from week to week due to fluctuations in demand. Lorentz Meats operates a 10,000-square-foot plant equipped to process and vacuum package fresh and frozen primal cuts as well as case-ready retail products. The plant is USDA inspected⁴⁸ and certified organic and has a daily capacity of 40 beef or bison or 120 hogs. It employs 54 staff and has an annual wage and salary bill of approximately \$1,440,000.

Thousand Hills is one of three large customers for Lorentz and accounts for approximately 12 percent of its business. The per animal cost for processing varies greatly, but a typical cost is approximately \$400 for an animal processed into case-ready retail cuts—which require more trimming and greater quality control than comparable cuts for direct market customers. Lorentz Meats plays a critical role in assuring product quality and food safety for Thousand Hills. The knowledge and business skills embodied in these two firms are highly complementary and help ensure a high-quality product.

Thousand Hills customers place orders by phone for next-day delivery. Thousand Hills owns a 16-foot refrigerated delivery truck with a 10,000-pound capacity. This truck makes weekly direct deliveries to grocery stores, restaurants, and institutional customers. The only exception to this direct-delivery model is the use of Co-op Partners Warehouse in St. Paul for orders placed by natural food cooperatives. Most retail outlets order product in case-ready packaging, though some customers order boxed beef primals in quantities that may or may not balance out to whole carcasses. Restaurants order either standard retail cuts or primals. Most institutional sales are either bulk ground beef or processed products, such as wieners. By design, the customer base is highly diversified. No single outlet represents more than 4 percent of total sales.

Thousand Hills has a standard wholesale price list and provides suggested retail prices, which are confidential. Typical retail margins are approximately one-fourth of the retail price, but margins vary across stores. The estimated retail value for a whole animal is \$3,040. Nonpromotional retail prices vary considerably across retail locations—by as much as \$2.00/lb for ground beef (\$4.99 to \$6.99/lb) and \$5.00/lb for ribeye steak (\$16.99 to \$21.99/lb) in the same week at the six Twin Cities locations monitored for this study. The average price across all cuts for Thousand Hills beef was \$7.17/lb in 2009. All Thousand Hills consumer-ready products are labeled “100% grass-fed beef. Pasture raised on local farms and source verified. Not given hormones, antibiotics, or animal by-products. U.S. inspected and passed by the Department of Agriculture. Cannon Falls, MN.” This provides consumers with information about production methods, product quality, and geographic origin. Particular reference is made to local farms, but individual producers are not identified.

Finally, it is noteworthy that both Thousand Hills and Lorentz Meats are linked to other local food supply chains. Thousand Hills is beginning to

⁴⁸“Under authority of the Federal Meat, Poultry and Egg Products Inspection Acts, FSIS inspects and monitors all meat, poultry and egg products sold” at USDA-inspected facilities. Meat from USDA-inspected facilities can be sold in interstate and foreign commerce. USDA, Food Safety and Inspection Service. http://www.fsis.usda.gov/regulations_&_policies/Federal_Inspection_Programs/index.asp (accessed March 30, 2010).

provide distribution services to local poultry producers and to Lorentz Meats for its processed pork products. Lorentz Meats, in addition to processing for many direct market producers, has been active in providing educational programs for direct market livestock producers around the region and nationally.

Supply Chain Structure and Size

- All three supply chains provide the consumer with information about where and how the product was produced, though the information provided by local chains is more detailed and includes a “local” claim. Only beef sold through the direct market channel is labeled with information that allows the consumer to trace the product back to the farm of origin.
- Durable trading partner relationships are evident across all supply chains though they vary in degree. High levels of trust and information sharing are most evident in the Kowalski’s chain—where they link Kowalski’s, Creekstone, and J&B—and in the relationship between Thousand Hills and Lorentz Meats in the Thousand Hills chain.
- Prices in the direct and intermediated chains are decoupled from commodity prices. However, prices in the mainstream supply chain are based on national commodity meat prices, albeit with significant premiums.
- The Mill City Farmers Market, a collective organization, has played an important role in the development of SunShineHarvest Farm’s customer base, though its reliance on the market may diminish over time. Natural food cooperatives are important outlets for Thousand Hills beef products, and Thousand Hills uses Co-op Partners Warehouse for distribution to some customers. However, collective organizations are not critical for the success of this supply chain.
- Only the mainstream supply chain has strong linkages to the national industry. On the other hand, the local food supply chains have benefitted from the strong local foods infrastructure in the Twin Cities and have listings on local food websites.
- The supply chains differ greatly in size. Thousand Hills markets roughly 30 times more beef animals than SunShineHarvest Farm. Assuming that sales volume for SunShineHarvest Farm is typical for the approximately 50 farms that market beef direct in the Twin Cities,⁴⁹ it is estimated that Thousand Hills alone markets almost two-thirds as much beef as is direct marketed by all producers in the Twin Cities. Yet Thousand Hills’ sales represent only a very small percentage of supermarket beef sales in the Twin Cities. Sales of Creekstone beef from five or six Kowalski’s stores would exceed the entire sales volume of Thousand Hills, and Kowalski’s stores have a relatively small share of the overall Twin Cities grocery market. Despite their small size, the direct market and intermediated chains do not appear to be affected by a lack of access to processing and distribution services or fixed costs associated with compliance with regulatory and operating standards.

⁴⁹The Minnesota Grown online directory lists 48 farms that sell beef and are located within 100 miles of the center of the Twin Cities.

- Products are available year round, and, therefore, seasonality does not affect local supply. Kowalski’s and Thousand Hills beef products are marketed fresh, so animal processing and inventory management are year-round concerns. SunShineHarvest Farm sells only frozen beef products. This reduces the need to smooth processing over the course of the year and simplifies inventory management.
- Anticipated responses to growth opportunities differ for the intermediated supply chains. Major expansions in the supply of direct marketed beef are likely to come through the entry of new farm operations, largely due to the lack of economies of size in direct marketing activities. In contrast, Thousand Hills has both plans and the potential for growth through internal expansion.

Supply Chain Performance

- The allocation of producer revenues differs significantly across supply chains (table 8). As expected, SunShineHarvest Farm retains 71 percent of the revenue from its direct market enterprises, even after netting out processing and estimated marketing costs. In contrast, producers in the intermediated Thousand Hills supply chain retain 37 percent of consumer revenue, while producers in the Kowalski’s supply chain retain 39 percent.
- Most of the revenue from the direct and intermediated supply chains remains within the local economies, while a relatively large portion leaves the region in the mainstream chain.
- Products in the farmers market portion of the direct chain and in the intermediated supply chain command a significant premium—ranging from 14 to 50 percent above the ground beef and ribeye products

Table 8

Allocation of retail revenue in Twin Cities, MN - beef chains, by supply chain and segment

Supply chain segment	Mainstream		Direct		Intermediated	
	Kowalski's ¹		SunShineHarvest ²		Thousand Hills ³	
	Revenue (\$/lb)	% of total	Revenue (\$/lb)	% of total	Revenue (\$/lb)	% of total
Producer/finisher	2.39	38.7	3.92	70.8	2.68	37.4
Producer/finisher estimated marketing costs ⁴	-	-	.74	13.3	-	-
Processor ⁵	1.73 ⁶	28.0	0.88	15.9	0.94	13.2
Distributor/aggregator	-	-	-	-	1.89	26.3
Retailer	2.06	33.3	-	-	1.65	23.1
Total retail value ⁷	6.18	100	5.54	100	7.16	100

Notes: - indicates “not applicable.”

¹We assume a retail value of \$3,054 for meat from a whole animal with a live weight of 1,300 lbs and a meat yield of 494 lbs. Transportation costs from the producer to processor and from the processor to the distributor are borne by the processor. Transportation costs from the distributor to the retailer are borne by the distributor. Distributor/aggregator revenue is combined with revenue accruing to the processor segment to maintain confidentiality.

²We assume a retail value of \$2,172 for a whole animal with a live weight of 1,110 lbs and a meat yield of 392 lbs. This is based on 25 percent of meat being sold in farmers markets and 75 percent of meat being sold through buying clubs or the meat Community-Supported Agriculture.

³We assume a retail value of \$3,040 for meat from a whole animal with a live weight of 1,200 lbs and a meat yield of 424 lbs. All transportation costs are borne by the aggregator.

⁴Includes the estimated portion of producer revenue attributed to costs of transport to market, market stall fees, and the opportunity cost of labor devoted to marketing activities. Total per unit revenue for the producer/finisher is 3.92+0.74=4.66 (\$/lb).

⁵These calculations do not include revenue from processing byproducts.

⁶The processor value in the mainstream chain also includes distribution costs. For confidentiality reasons, we did not separate these values.

⁷Retail values are based on an estimated value for an entire animal, since prices vary considerably for cuts of meat.

Source: USDA, Economic Research Service.

marketed through the mainstream chain. While Kowalski’s store-brand beef has many of the same qualities as beef marketed through the direct and intermediated chains, it is not grass fed nor is it available direct from the production source. Consumers are often willing to pay more for both of these product attributes.

- Products travel fewer miles in the direct and intermediated supply chains (table 9). However, fuel use per 100 pounds of product is highest for the direct marketer due to its relatively small load sizes. Thousand Hills has by far the lowest fuel use per 100 pounds of product; shorter transport distances offset the inefficiencies of transporting products in smaller loads than the full semi-trailer loads used in the Kowalski’s mainstream chain. This demonstrates that direct and intermediated supply chains can be efficient when product is aggregated.
- All three chains contribute to social capital and civic engagement through community-building efforts. However, the intensity of these efforts varies across chain type and appears to have the greatest impact at the mainstream level through support of startup, local food companies. In addition, both Thousand Hills and Lorentz Meats are strengthening the local foods infrastructure through collaboration and educational programming.

Table 9

Food miles and transportation fuel use in Twin Cities, MN—beef supply chains

Supply chain segment	Food miles	Truck miles	Retail weight	Fuel use	Fuel use per cwt shipped
<i>Mainstream Chain Kowalski's¹</i>	<i>Number</i>		<i>Cwt</i>	<i>Gallons</i>	
Cow-calf to finisher	250	500	272	83.3	0.31
Finisher to processor	615	1,230	198	205	1.04
Processor to distribution	720	1,440	450	240	0.53
Distribution to retail	60	120	450	20	0.04
All segments	1,645				1.92
<i>Direct Chain SunShineHarvest²</i>					
Producer to processor	20	40	11.8	2.5	0.21
Processor to distribution	20	40	11.8	2.5	0.21
Distribution to retail	35	70	2.5	4.4	1.76
All segments	75				2.18
<i>Intermediated Chain Thousand Hills³</i>					
Producer to processor	250	500	115	56	0.49
Processor to distribution	5	10	106	2	0.02
Distribution to retail	45	90	76	14	0.18
All segments	300				0.69

¹All transport in this chain is in semi-trailers that achieve fuel economy of 6 mpg. Live animals are assumed to yield meat with a retail weight of 494 lbs. A load of 55 live feeder cattle is transported from the cow-calf operation to the finisher. A load of 40 live cattle is transported from the finisher to the processor. In subsequent segments of the chain, 45,000-lb loads of fresh meat are transported.

²All transport in this chain is in a pickup truck that achieves fuel economy of 16 mpg. Live animals are assumed to yield meat with a retail weight of 392 lbs. Three animals are transported to the processor, and the meat from three animals is transported back from the processor.

³We assume that a load of 27 cattle born and finished on a farm 250 miles from Cannon Falls, MN, is transported in a small semi-trailer that achieves fuel efficiency of 9 mpg. Each of these cattle yields meat with a retail weight of 424 lbs. All subsequent transportation of meat is in a refrigerated delivery truck that achieves fuel efficiency of 6.5 mpg.

Source: USDA, Economic Research Service calculations based on case interviews.

Key Lessons

Processing is an essential segment in the supply chain for any meat product. While small-scale processing technology is available for poultry, large animal processing plants require a scale of operation and level of expertise that could not be achieved by either SunShineHarvest Farm or Thousand Hills in their current configurations. Therefore, the availability of processing facilities was an essential precondition for both of these businesses, and strong relationships with their processors have played an important role in their business success.

The mainstream supply chain is formidable competition for local food supply chains. Kowalski's supply chain allows it to offer a high-quality, differentiated beef product with health and animal welfare attributes valued by consumers at prices consistently below those observed for the farmers market portion of the direct market chain and for the intermediated chain. Products sold through the two local food supply chains do have additional attributes for which consumers are willing to pay a premium, but these products currently capture only a very small part of the overall market for beef in the Twin Cities.

Fluid Milk Case Studies in the DC Area⁵⁰

This set of case studies describes three supply chains for milk in the Washington, DC, metropolitan area (referred to as the DC area): private-label milk from a commercial dairy cooperative (mainstream supply chain), a local brand sold through a home delivery service (direct market supply chain), and a local organic private-label brand sold in a small chain of grocery stores (intermediated supply chain). For these case studies, the production area for local food products is defined as the Washington – Baltimore – Northern Virginia, DC-MD-VA-WV combined statistical area (defined by the U.S. Census Bureau) plus the counties that share a border with the combined statistical area. The total population of the DC area is nearly 10.4 million.⁵¹

The product focus of these case studies is white fluid milk. Milk is a ubiquitous staple of the U.S. household food basket, with the average household in the DC area purchasing 24.3 gallons of milk per year.⁵² Milk is increasingly differentiated by product characteristics, including organic, rBST hormone free, and varying degrees of grass-based or grass-fed production. The DC area has about 3,480 dairy farms, with a total dairy cow herd of 252,640 in 2007, which would rank 11th among U.S. States in herd size (USDA, NASS, 2009). A majority of the dairy farms and cows in the area are located in Lancaster County and Franklin County in Southeastern Pennsylvania.

Food retailing in the DC area is dominated by a few large supermarket chains. Three supermarket chains account for about 58 percent of the supermarket market share (Food World, 2009). Outside of these top three chains, no food retailer holds more than a 7-percent market share in the DC area.

Local foods are supported in the DC area through a number of outlets and programs. There are a total of 177 farmers markets and a total of 4,009 farms that sell products directly to consumers, with sales of \$49.8 million in 2007 (USDA, AMS, 2009). Several of the States represented in the DC area maintain State product promotion programs (e.g., Maryland's Best, West Virginia Grown, and Virginia Grown), and the District of Columbia includes local food outlets in its interactive map of food resources.⁵³

Mainstream Supply Chain: Maryland and Virginia Milk Producers

The Maryland and Virginia Milk Producers Cooperative Association (called Maryland and Virginia Co-op) produces and supplies private-label milk to supermarket retailers in the DC area. Milk sold under a private-label supermarket brand is common in the Northeast United States, including the Washington, DC, area. In a study from 2005, between 71 and 85 percent of milk sold in supermarkets in the Northeast was found to be marketed as a private-label brand (Bonanno and Lopez, 2005).

Based in the DC area, Maryland and Virginia Co-op comprises about 1,500 farms in 11 Mid-Atlantic and Midwest States, with about 1,000 farms located in Maryland and Pennsylvania. In total, Maryland and Virginia Co-op processes and distributes about 7 million gallons of milk per month in the

⁵⁰An extended version of this set of case studies is available online at http://foodindustrycenter.umn.edu/Local_Food_Case_Studies.html.

⁵¹Population estimate as of July 1, 2008. Source: U.S. Census Bureau, available at: <http://www.census.gov/popest/datasets.html>, accessed November 23, 2009.

⁵²ERS calculations of 2006 Nielsen HomeScan data. Includes purchases of households in the Washington, DC, and Baltimore, MD, market areas.

⁵³DC Food Finder, <http://dcfoodfinder.org>, accessed December 31, 2009.

DC area (Dudlicek, 2009). The majority of milk produced by Maryland and Virginia member farms is produced without the hormone rBST.

The co-op operates several plants in the Mid-Atlantic region; two of these process milk in the DC area for sale in area supermarkets. In addition to processing and packaging milk for private-label customers, Maryland and Virginia Co-op operates a creamery (e.g., to produce butter and ice cream) and has balancing operations to produce milk powder and condensed milk (Dudlicek, 2009). Operating multiple plants and offering several product lines provides Maryland and Virginia Co-op with flexibility in managing production for a large volume of a highly perishable product.

Milk is typically picked up from member farms by third-party haulers or by trucks owned by the co-op. Semi-trailer milk tankers with gross vehicle weight ratings greater than 33,000 lbs are used to assemble milk and deliver it to processing plants operated by Maryland and Virginia Co-op. Routes are planned and scheduled to maximize the size of tanker loads to the processing plant and to minimize distance traveled. Because the co-op's member farms are concentrated in States that contain the DC area and two of the plants are within the DC area, it is likely that most private-label milk produced by the co-op is sourced from within or nearby the DC area.⁵⁴

Co-op members receive prices that are based on the Federal Milk Order for the Northeast Area. From September through November 2009, the average price of raw milk was about \$0.64 per half-gallon.⁵⁵ Average production costs for dairy farms in the region ranged from \$0.63 to \$0.66 per half-gallon, indicating that the average farm in the mainstream supply chain for milk recently received prices that just covered production costs during the study period.⁵⁶

The median retail price of private-label milk at selected supermarkets in the DC area was about \$1.99 per half-gallon.⁵⁷ Because it is associated with a supermarket brand, private-label milk generally conveys little information about where and by whom it was produced. This holds true in the DC area, where information on labels and at the point of sale for the major private-label brands displays the location of the processing plant or distribution center only.

Direct Marketing Supply Chain: South Mountain Creamery

South Mountain Creamery (called South Mountain) (<http://www.southmountaincreamery.com>) is a milk producer and processor located near Middletown, MD (in Frederick County). Operating as a dairy since 1981, South Mountain began bottling its own milk for home delivery in 2001. South Mountain delivers to about 4,000 homes in the DC area; the majority of these customers are outside of Frederick County but within a 70-mile radius. South Mountain has annual sales of about \$4.68 million. It employs about 35 full-time employees and has an estimated annual wage bill of \$970,000.

⁵⁴Precise information about the distance traveled from farms to the processing plants and from plants to retail stores either was not available or could not be disclosed due to confidentiality concerns.

⁵⁵September-November 3-month average class 1 price announcement for Federal Milk Order Number 1, Frederick, MD/New Holland, PA (\$14.95/hundred pounds of milk, or cwt). One-hundred pounds of milk equals about 23.26 half-gallons. A larger total volume of milk is sold in gallon containers at larger supermarket chains. This study bases price comparisons and other analyses on the price of half-gallons because gallon containers are less common in the other supply chains.

⁵⁶Production costs were not available for Maryland and Virginia Co-op member farms. Average production costs for 2009 were \$14.74/cwt in the Northern Crescent production region (which includes most of PA and MD) and \$15.36/cwt in the Southern Seaboard region (which includes most of VA, DE, and parts of MD). See "Commodity Costs and Returns: Data," available at www.ers.usda.gov/data/costsandreturns/testpick.htm (accessed June 16, 2010). Farms with smaller herds tend to have higher production costs per cwt (MacDonald et al., 2007).

⁵⁷Price data were collected for whole milk in half-gallon containers during 2009 through informal in-store observations at two supermarket chain locations.

South Mountain typically sells about 5,000 gallons of milk per week in glass half-gallon and quart containers. Milk accounts for about 36 percent of total sales. It also sells creamery products (e.g., butter and yogurt) manufactured onsite and a variety of other food and specialty products from nearby farms and food distributors.

South Mountain milks a herd of 220 cows, comprising mostly Holsteins, that produces between 5,370 and 6,700 gallons of milk per week. The farm operates on 1,400 acres, with 80 acres of pasture used as a feeding option for the herd.⁵⁸ The herd consumes about 28,000 lbs. per day of a grain feed composed of 85-90 percent wet silage and 10-15 percent grain and minerals. Aside from minerals, all feed is grown on the farm. The necessary daily feed ration can drop by 25-35 percent with peak pasture production. South Mountain does not use the hormone rBST in its milk production.

Raw milk is pumped daily via an underground pipeline from a storage tank to the adjacent creamery. Milk is processed 4 days per week using HTST pasteurization. South Mountain bottles half gallons and quarts of skim, 2-percent, homogenized whole milk, and nonhomogenized whole milk. All milk is bottled in returnable glass bottles that are washed at the creamery. Bottle labels display the South Mountain name and logo, its website address, and its origin in Middletown, MD. The South Mountain website emphasizes product quality and delivery characteristics, as well as the fact that the company's milk is produced without the hormone rBST and with minimal antibiotics.

Home delivery accounts for about 85 percent of South Mountain's sales. Customers place orders through the South Mountain website, although most customers have a standing order that they receive without placing a new order each week. Deliveries are made to a cooler or box on the residence's porch or front step, or, in some cases, left in garage refrigerators. South Mountain employs 13 full-time delivery drivers who operate 52 delivery routes per week. Each delivery route encompasses a round-trip distance of 150 to 200 miles. There is no minimum order size, although each order is charged a delivery fee of \$3.75. Milk purchases are charged a bottle deposit of \$1.50 per bottle. In November 2009, the price of a half-gallon of milk was listed at \$3.25 on the South Mountain website. Total marketing costs, including transportation fuel, vehicle maintenance and depreciations, and driver wages total about \$1.03 per half gallon.⁵⁹

In addition to home delivery, South Mountain sells milk at four farmers markets in Maryland and Virginia, operates a small farm store, and sells to a handful of wholesale accounts. Although these enterprises account for a minority of South Mountain's sales (about 15 percent), they are an important part of the business and serve as a venue for contacting new customers.

⁵⁸Cows are not confined to pens or barns and can feed from available pasture or the provided grain ration. Milk production is lowest during months with peak pasture availability.

⁵⁹Fuel costs and driver wages calculated based on total full-time drivers and delivery route driving distances reported in interviews. Vehicle costs are calculated from per mile, heavy-duty truck cost estimates in Barnes and Langworthy (2003) for tires (\$0.04 per mile), depreciation (\$0.09 per mile), and maintenance and repair (\$0.12 per mile), adjusting for inflation. Calculations based on a total of 9,100 vehicle miles traveled per week and 430 cwt of milk sold.

Intermediated Supply Chain: Trickling Springs Creamery

Trickling Springs Creamery (referred to as Trickling Springs) (<http://www.tricklingspringscreamery.com>) is an organic manufacturer of milk and dairy products located in Chambersburg, PA, about 100 miles from Washington, DC. Trickling Springs sells organic milk to wholesale customers under its own label and under private-label agreements. MOM's Organic Market (called MOM's) (<http://www.myorganicmarket.com>), with five retail stores in the DC area, is Trickling Springs's largest private-label customer. Trickling Springs products are also sold in food cooperatives and grocery stores in the area, and in Whole Foods Market stores in Maryland and Pennsylvania.

As of 2009, milk processed at Trickling Springs is sourced exclusively from Shankstead EcoFarm, a 250-head organic dairy farm about 9 miles from the Trickling Springs plant. In addition to family labor, three full-time employees with an annual wage bill of \$120,000 help operate the farm. The primarily Jersey cow herd's diet is based on rotation through 120 acres of grass and legume pasture. The herd also receives between 1 and 10 lbs. of corn-based feed as a supplement, depending on pasture production. Shankstead also raises layer hens for eggs and broiler chickens. Movable chicken pens are rotated through the pasture a few days after the cows have grazed to provide "pasture sanitation." In total, Shankstead produces about 8,000 gallons of milk per week. About 90 percent of this supplies Trickling Springs, with the remaining 10 percent bottled at the farm for sale to consumers as raw milk.

Trickling Springs picks up milk from Shankstead 4 days a week in a Trickling Springs-owned milk tanker. Milk is processed 4 days per week, HTST pasteurized, and bottled in either glass or plastic bottles. Approximately 30 full-time workers are involved in milk production and distribution at Trickling Springs, with an annual estimated wage bill of about \$780,000. Trickling Springs typically processes about 6,150 gallons of milk per week, but occasionally processes up to 7,000 gallons per week; it sends unprocessed surplus milk to the Lancaster Organic Farmers Cooperative. Storage space at Trickling Springs is limited, so inventory is turned around for delivery relatively quickly.

About 1,035 gallons of Trickling Springs milk is sold per week in MOM's stores, either as private-labeled gallons or half-gallons or as Trickling Springs-labeled half-gallon glass bottles. Each MOM's store places individual orders with Trickling Springs by phone or fax and receives deliveries twice a week. Trickling Springs operates up to five delivery routes per day, with three routes serving MOM's (and other wholesale accounts) twice per week. MOM's stores are between 50 and 100 miles from the Trickling Springs plant; delivery routes that serve MOM's typically average 250 miles per round trip.

Private-label milk from Trickling Springs is an important part of MOM's milk business. About 44 percent of white milk sales in all MOM's stores is accounted for by private-label milk; another 13 percent is accounted for by Trickling Springs-labeled milk in glass bottles. In October 2009, the price of MOM's private-label milk in half gallons was \$3.29, and the price for half-

gallons in glass bottles was \$3.59. The label on MOM's private-label milk is primarily associated with the store brand, but it displays the name of the milk's bottler (Trickling Springs), the bottler's location, and the production type (pasture-fed cows). Shankstead is not identified on Trickling Springs or MOM's labels. On Trickling Springs-labeled glass bottles, the label says that the milk comes from pasture-fed cows on family farms.

Supply Chain Structure and Size

- The direct market and intermediated supply chains are relatively small, compared with the mainstream chain; the two local supply chains combined handle only a small fraction of the milk produced and distributed in the mainstream chain. This general pattern likely holds for the DC-area milk market as a whole.
- Durable relationships are evident in the mainstream and intermediated supply chains. Interdependence, trust, and information sharing have likely developed between the cooperative (Maryland and Virginia Co-op) and its private-label customers; efficient management of a large volume of milk for many customers and stores requires a high degree of coordination and communication. In the intermediated chain, Shankstead is the sole supplier for Trickling Springs, and Trickling Springs values the unique production and product characteristics maintained by Shankstead.
- The direct market case provides customers with the most information about where and by whom the product was produced. In the intermediated case, the product label identifies the location of the milk processor, but not the farm that supplies the milk.
- Prices are decoupled from commodity market prices only in the direct market case where they appear to be more closely linked to production and distribution costs and the retail milk market. Prices in the intermediated case are based on commodity prices for organic milk but are set through agreements with longer terms (i.e., 6 months) than are typical for producers selling in commodity markets.
- Access to processing and distribution services does not limit supply chain size, nor are any of the supply chains restricted by fixed costs for regulatory compliance. However, achieving compliance may be costly for new enterprises; South Mountain initially found it difficult to work with State regulators to identify and resolve compliance problems. Low production volume and lack of specialization in the direct and intermediated supply chains may limit the ability to engage in low-cost and highly efficient production and distribution.
- Collective organizations play a prominent role in the mainstream supply chain but a minimal role in the intermediated chain and no role in the direct marketing chain. The mainstream producer cooperative (Maryland and Virginia Co-op) is a key enterprise in the supply chain for private-label milk in the DC area, responsible for production, processing, and distribution.

Supply Chain Performance

- Producers receive a greater share of retail revenue in the direct and intermediated supply chains (table 10). South Mountain retains 100 percent of the revenue but it also incurs processing and marketing costs totaling an estimated 63 percent of the retail revenue. Shankstead receives about 39 percent of the retail revenue in the intermediated case, compared with 32 percent for farms in the mainstream case. Revenues per unit, net of marketing costs, are significantly higher in the local supply chains, although there is little difference in producer revenue per unit between the direct marketing and intermediated supply chains.
- Wages and business proprietor income for all supply chains accrue primarily within the DC area. All wages and income in the direct market and intermediated chains accrue within the DC area. In the mainstream chain, corporate ownership of large supermarket chains may be based outside of the region, but many of the dairy farms, the processing plants, and retail stores are located within the DC area.
- The distance that the product travels from production to consumers (food miles) is 48 miles in the direct supply chain and 94 miles in the intermediated supply chain (table 11). However, the intermediated supply chain uses less fuel per unit of product delivered than the direct supply chain. Information about food miles and fuel use was not available for the mainstream supply chain.

Table 10

Allocation of retail revenue in DC area—milk chains, by supply chain and segment

Supply chain segment	Mainstream		Direct		Intermediated	
	Maryland and Virginia Co-op ¹		South Mountain Creamery		Trickling Springs—MOM's ²	
	Revenue (\$/half gal.)	% of total	Revenue (\$/half gal.)	% of total	Revenue (\$/half gal.)	% of total
Producer(s) ³	0.64	32.3	1.22	37.5	1.29	39.2
Producer-estimated marketing costs ⁴	-	-	2.03	62.5		
Dairy cooperative ⁵	0.18	9.0	-	-	-	-
Processor ⁶	0.58	28.9	-	-	1.82	55.3
Retail stores	0.59	29.8	-	-	0.18	5.5
Total retail value ⁷	1.99	100	3.25	100	3.29	100

Notes: - indicates "not applicable."

¹Mainstream chain revenue allocations are calculated from the Virginia State Milk Commission Presumed Costs reports, Eastern Market, for plastic half-gallon 100+ cases. Estimates are based on 3-month averages from September-November, 2009. These reports do not specifically identify revenue allocations for the Maryland and Virginia Cooperative or its retail customers and are representative of the milk industry in the DC area in general.

²Revenue shares calculated for Trickling Springs milk sold as MOM's private-label milk. Trickling Springs-labeled glass bottles add \$0.30 per half gallon to the retail value, which accrues solely to the retail stores.

³Mainstream: Based on September-November 3-month average class 1 price announcement for Federal Milk Order Number 1, Frederick, MD/ New Holland, PA (\$14.95/cwt). Direct: the dairy farm also operates as the processor.

⁴Includes the estimated portion of producer revenue attributed to costs of processing and home delivery. Total per unit revenue for the producer is 1.22+2.03 = 3.25 (\$/half gal.).

⁵Calculated as the difference between raw product costs in the VA Presumed Costs reports and the class 1 price announcement (i.e., producer revenue). Includes revenue that may accrue to the cooperative or third-party milk haulers.

⁶Mainstream: Calculated as the difference between wholesale delivered costs and raw product costs from the VA Presumed Costs reports. Includes revenues attributable to delivery to the retail stores. Intermediated: Trickling Springs operates as both the processor and distributor to retail stores.

⁷Mainstream: Median retail price of half-gallons from January to December, 2009. Direct: Half-gallon prices listed on the South Mountain website as of December 2009. Intermediated: Median retail price of half-gallons from January to December, 2009.

Source: USDA, Economic Research Service.

Table 11

Food miles and transportation fuel use in DC area – milk supply chains

Supply chain segment ¹	Food miles ²	Total vehicle miles	Retail weight	Total fuel use ³	Fuel use per cwt shipped
<i>Direct: South Mountain Creamery</i>	<i>Number</i>		<i>Cwt</i>	<i>Gallons</i>	
Home delivery ⁴	48	175	9.2	17.5	1.90
<i>Intermediated: Trickling Springs Creamery</i>					
Farm to processing plant	9	18	160.0	3.6	0.02
Processing plant to retail stores ⁵	85	250	41.1	31.1	0.76
All segments	94				0.78

Notes: Milk volumes expressed in hundredweight (cwt); one hundredweight of milk is equal to approximately 11.6 gallons.

¹Food miles, fuel use, and product volume in the mainstream supply chain were not available.

²Food miles is the typical one-way distance a unit of product travels. South Mountain: Distance calculated from South Mountain to the Maryland – DC border at Chevy Chase Circle. Trickling Springs: Plant-to-retail segment calculated as average distance to the five MOM's stores.

³Fuel use for Trickling Springs is in gallons of diesel fuel; South Mountain fuel use reported as gallons of gasoline.

⁴Delivery routes also carry nonmilk products. Fuel use is calculated as the milk portion of total fuel use based on the average share of each load that is accounted for by milk (about 90 percent).

⁵Delivery routes that serve MOM's stores also serve other accounts. Fuel use is apportioned to the MOM's deliveries based on the average share of each load that is accounted for by MOM's milk deliveries (about 36 percent).

Source: USDA, Economic Research Service calculations based on case interviews.

- Differentiation beyond “local” is necessary in the direct and intermediated supply chains to receive price premiums. These supply chains are differentiated by production characteristics (organic and grass-based production for Shankstead), service (home delivery for South Mountain), and packaging (glass bottles).
- The creation of social capital and civic engagement is not a prominent feature of any of the cases. Large supermarket chains in the DC area often make communitywide contributions to various charitable causes but do not tend to support social capital creation specifically related to milk supply chains. Shankstead has fostered closer relationships with nearby residents as it has transitioned to organic production, and South Mountain hosts some onfarm activities.

Key Lessons

Direct and intermediated supply chains for milk currently capture a relatively small portion of the total market for milk in the DC area but fill a market niche where consumers are willing to pay extra for certain product and service characteristics. These supply chains appear to rely on differentiation to receive a premium over mainstream milk products (prices are about 64 percent higher in the local supply chains) and on diversification to maintain multiple revenue streams.

Differentiation and diversification may be a response to relatively high per unit processing and distribution costs. Large economies of scale keep processing and distribution costs in the mainstream supply chain well below the local supply chains. For the direct and intermediated supply chains, offering a variety of products allows Trickling Springs and South Mountain to increase revenue per unit of milk delivered to customers.

Locality of production and processing is not used as a primary differentiating characteristic in the direct and intermediated supply chains, although the products in the local supply chains are distinguished by their origin. Product labels in the local supply chains identify where the product comes from, but only in the direct market case is the farm identified. More information is available on company websites about origin (e.g., that Trickling Springs milk is sourced from nearby farms) and production practices. Much of the milk sold in the mainstream case is processed and sourced from within the DC area, although it is typically not marketed with any designation of origin or identification of the producer. Thus, a large portion of the milk sold in the DC area meets the definition of a local product, but the lack of information about the milk's origin means that it is not marketed through a local food supply chain under the definitions used here.

Cross-Case Comparisons for Supply Chain Types

The five product-place case studies include comparisons of mainstream, direct market, and intermediated supply chains. This helps identify similarities and differences with respect to supply chain structure, size, and performance within a product-place combination. It is also useful to compare each type of supply chain—mainstream, direct market, and intermediated—across products and places. Comparisons from this perspective shed additional light on supply chain structure, size, and performance and help clarify the extent to which findings from particular product-place combinations can be generalized.

Mainstream Cross-Case Comparisons

The mainstream cases serve as a baseline for comparison with the direct market and intermediated supply chains. Consumer purchases in all five mainstream cases take place in supermarkets. The supermarkets studied range from large, publicly held companies with national, even international scope, integrated wholesale operations, elaborate infrastructures, and billions of dollars in annual sales to much smaller, privately held supermarket companies with no wholesale division and hundreds of millions of dollars in annual sales.

Supply Chain Structure and Size

The mainstream supply chains share many structural characteristics. None provides the customer with detailed information about where and by whom the product was produced, although Allfoods in Portland provides some information on grower-packer-shipper identity as part of its local sourcing initiative. Mainstream retailers in Portland and Syracuse also provide information on local geographic origin of produce products.

Durable trading partner relationships, with high levels of trust, information sharing, and partners depending on one another, are important in all five mainstream supply chains. In most instances, processing, distribution, and/or retail firms have developed long-term interdependencies by collaborating on the design of specific supply chain logistics and operations that serve mutual needs. On the other hand, producer prices in all five mainstream chains are closely linked with prices determined in national or international commodity markets, even when the final product is branded and has a fairly stable retail price (e.g., spring mix).

Collective organizations generally do not play an important role in mainstream chains for the products and locations studied. The only exception is in the DC area, where a dairy farmer cooperative plays a prominent role in the mainstream supply chain. However, the mainstream chains do have strong linkages to a wide range of industry research and education, promotion, packing, and processing resources that assist the supply chain in creating a strong knowledge base and service infrastructure.

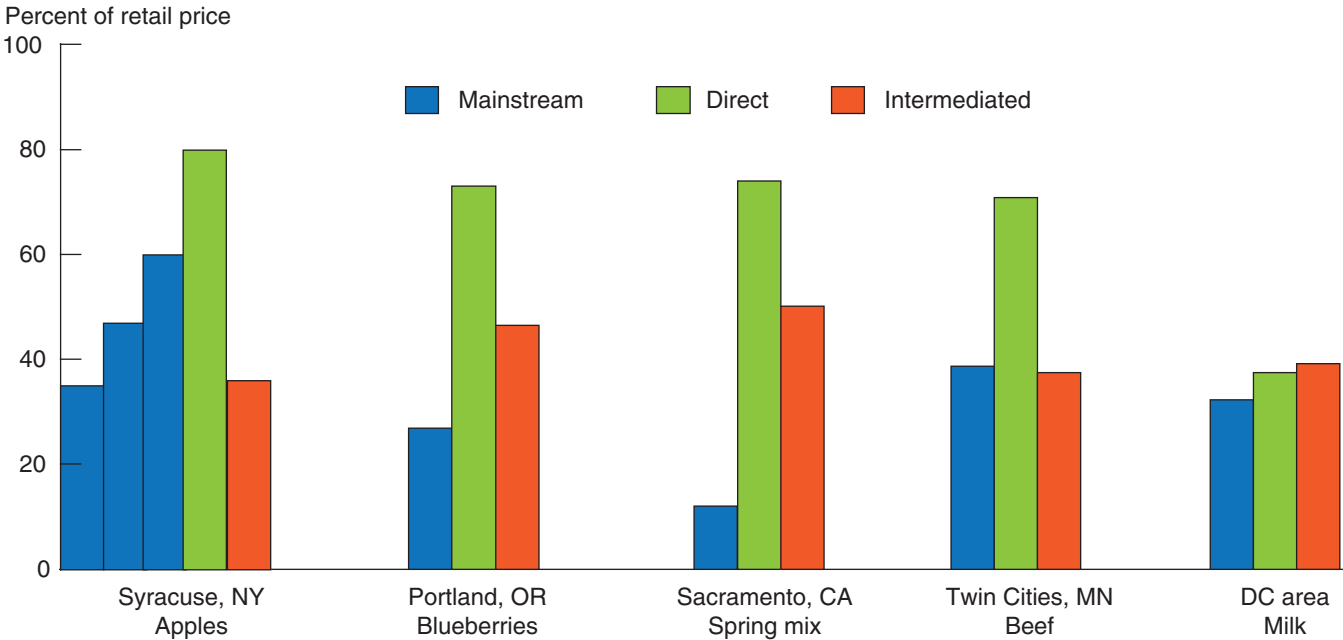
Sales volumes in each of the five mainstream chains represent a major portion of total category demand in the study area. Large sales volumes allow mainstream chains to take advantage of size economies in transporta-

tion and distribution, and lack of year-round availability is not a problem. Mainstream chains source perishable products with seasonal production from multiple regions and countries (e.g., blueberries) over the course of the year. Apples are primarily harvested in the fall and can maintain high quality in year-round controlled-atmosphere storage, but counter-seasonal imports also play a role in year-round availability. Finally, milk and beef have year-round production.

Supply Chain Performance

Producer shares of retail revenues and the proportion of wage and proprietor income retained in the region vary across products and locations. The producer’s share of revenues generally decreases with distance to market and the number of intermediaries involved in the mainstream chain. The share of final consumer price retained by producers in the mainstream supply chains varies from 12 percent for spring mix to roughly 60 percent for apples (fig. 2). The producer share for apples is high due to supplier proximity to the retailer, the existence of only two ownership transfers in the chain, and the absence of processing. Even when products are sourced outside the local region, wage and proprietor income retained in the local economies ranges from roughly half to nearly 100 percent across the mainstream chains. This can be attributed to the fact that distribution and retail operations are locally based and labor intensive.

Figure 2
Percent of retail prices received by producers net of marketing and processing costs, by place and supply chain type



Notes: Syracuse, NY - Mainstream reports the percent for GPS1, GPS3 bulk, and GPS3 bagged (see table 1). Twin Cities, MN - Beef direct marketing costs calculated for farmers market sales; processing costs are paid to a third party. The direct marketer in the DC area - Milk case processes its own milk; costs estimated based on case interviews. See text for other notes on direct market costs.

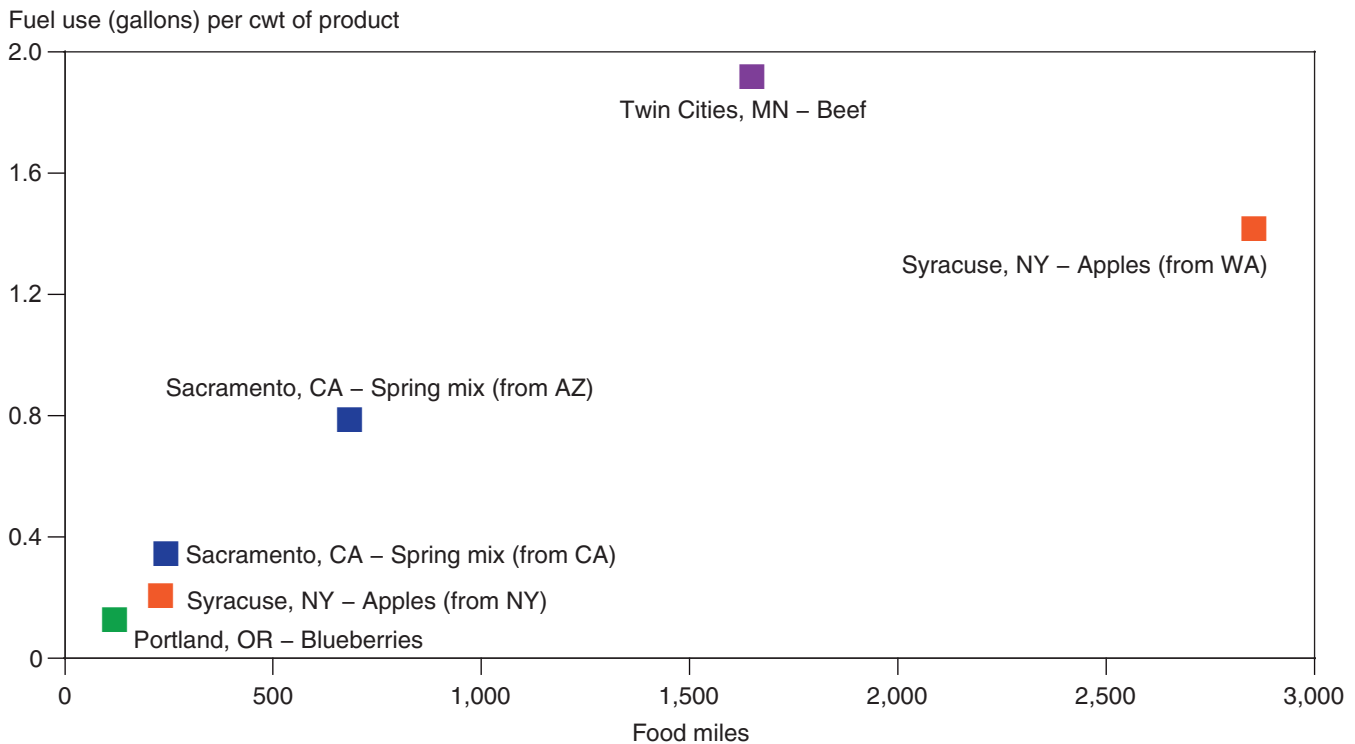
Source: USDA, Economic Research Service.

Food miles in mainstream chains vary considerably (fig. 3). Out-of-season blueberries sold in Portland’s mainstream chain travel roughly 6,000 miles from South America, and a small percentage of the apples sold in Syracuse travel 3,000 miles from Washington State. Fuel usage per 100 pounds of product sold also ranges widely—from a low of only 0.13 gal/cwt for Northwest blueberries sold in a Portland supermarket, to 0.35-0.79 gal/cwt for spring mix sold in Sacramento, to 1.42 gal/cwt for apples transported from the West Coast to Syracuse, and to 1.92 gal/cwt for beef sold in the Twin Cities (fig. 3).⁶⁰ All mainstream chains gain fuel efficiency through transport of large loads between each segment of the chain.

Fostering social capital in the metropolitan consumption areas is not a prominent priority for firms participating in most of the mainstream supply chains, though retailers typically do make some visible community contributions. The mainstream retailers in Portland have few if any social capital-building activities that are specific to the supply chains studied, but they support charitable causes and community-oriented activities. In Sacramento and Syracuse, mainstream supermarkets provide significant donations to community causes and employee welfare, though these activities are not linked to the specific supply chains that are the focus in this study. In the Twin Cities, the mainstream retailer has long been active in helping local food companies get established and generally promotes local foods.

⁶⁰Mileage and fuel use for the mainstream chain in the DC area was not available.

Figure 3
Food miles and fuel use in mainstream cases, by product-place combination



Source: USDA, Economic Research Service calculations based on case interviews. See tables 2, 4, 6, 8, and 10 for additional notes.

Direct Market Cross-Case Comparisons

The direct market supply chains represent a variety of strategies for local food distribution: farmers markets, traditional farm stands, CSAs, buying clubs, and home delivery. All of the producers sell through multiple direct market supply chains. Four of the producers in the direct market cases (all except Syracuse) earn 70 percent or more of their total revenue from direct market sales.

A farmers market is not the dominant marketing outlet in four of the five cases. The apple producer (Syracuse) uses farmers markets and farm stands but earns 90 percent of its revenues through sales to a packer-shipper. The milk producer (DC area) sells 85 percent through home delivery, with additional sales through farmers markets and to retailers. The beef producer (Twin Cities) earns approximately 25 percent from farmers market sales, 35 percent from CSA sales, and about 20 percent each from buying club and other direct sales. The blueberry producer (Portland) revenues are almost equally split among three direct market supply chains—farmers markets, traditional farm stands, and farm stands hosted by hospitals. The spring mix producer (Sacramento) is the only one to have the majority of total farm revenue from farmers market sales (70 percent), with the remaining 30 percent coming from sales to retailers and restaurants.

The direct market producers vary in terms of their gross farm revenues. Using the USDA definition that small farms have annual gross sales of less than \$250,000, only two of the five direct market producers are small farmers (Twin Cities and Sacramento).

While the inclusion of direct market activities is a key difference between these producers and their mainstream counterparts, four of the businesses also have something else that further distinguishes them from many mainstream producers. The milk producer (DC area) integrates processing into the business, while the beef operation (Twin Cities) takes responsibility for having its animals processed. Both the Sacramento and Portland direct marketers are much more diversified in the crops they grow than typical mainstream leafy greens and blueberry producers.

Supply Chain Structure and Size

In contrast to the mainstream chains, all the direct market chains emphasize providing consumers with information about where and by whom the products are produced. By definition, the direct market supply chains provide consumers with information about the origin of their food through the direct contact between producer and consumer when products are sold. However, the degree to which information is communicated and the strength of the relationship between producers and consumers varies across the cases. In two instances (milk in the DC area and beef in the Twin Cities), there are relatively stable relationships based on home delivery and CSA arrangements, respectively. The strength of the relationships in the farmers market and farm stand supply chains is more difficult to characterize, as some buyer/seller interactions are anonymous while others are quite close. In all cases, the producer/consumer relationships in these supply chains are different from the business-to-business relationships in the mainstream cases.

Direct market producers set prices that are not linked to commodity market prices. Rather, direct market prices tend to reflect production costs and local supply-and-demand conditions. Similarly, direct market producers are not strongly linked to State or national commodity organizations. The apple (Syracuse) and blueberry (Portland) cases are the only two instances in which producers felt they were gaining some benefit from industry organizations. However, direct-market producers value and benefit from linkages to local food institutions and locally based collective organizations, such as farmers markets, which offer even small producers an opportunity to make their products available to many consumers in a single location. This creates customer awareness that makes it easier to sell through other direct-to-consumer supply chains.

Finally, relative to mainstream supply chains, the aggregate quantity of product distributed through direct market chains in each of the five locations represents a small percentage of the total quantities consumed in the study area. For example, estimated aggregate direct market sales of beef in the Twin Cities represent a very small fraction of total beef demand in the area. Furthermore, for spring mix (Sacramento) and blueberries (Portland), seasonality is a key factor that limits market opportunities. Despite low sales volumes, current regulatory costs and commercial standards are not viewed as constraints to the growth of these supply chains. However, direct market blueberry (Portland) and spring mix (Sacramento) producers voiced concerns over the potential barriers that future regulatory and commercial requirements, such as Good Agricultural Practices (GAP), may pose for them.

Supply Chain Performance

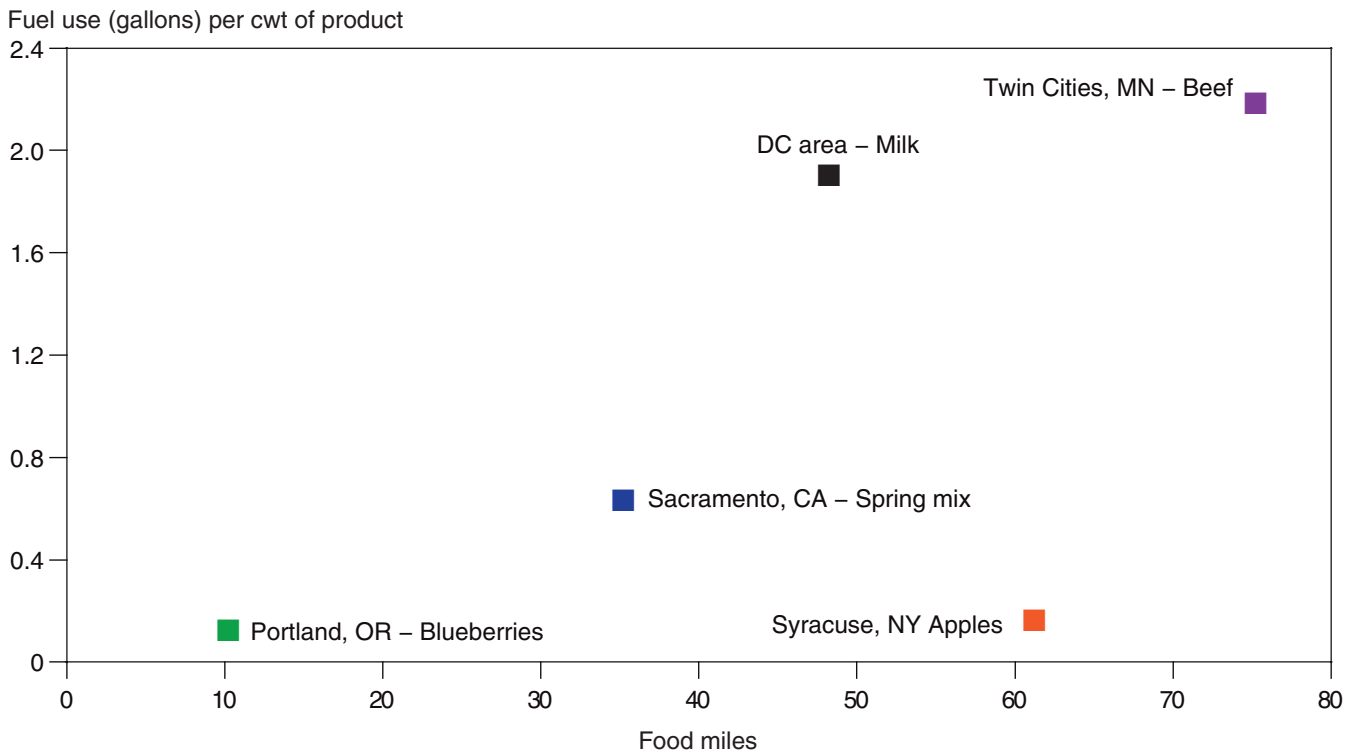
On a per unit basis, the direct market producers receive revenues that are greater, often by a substantial percentage, than their mainstream counterparts. These producers consistently retain a large percent of the retail value of their products, even after estimated marketing and processing costs are netted out.

Absolute price levels are also high for most of the direct market producers. However, it is important to note that these direct market revenues are for very small volumes, and some producers might see significant price decreases if there were new entrants. Also, large per unit revenues are partially offset by the additional costs that the producers internalize. In one case (milk), the processing activity is carried out by the producer, and in all cases, direct-market producers assume packing, transportation, and retailing costs that are not borne by producers in mainstream and intermediated chains. These direct marketing costs are estimated to range from 13 to 62 percent of direct market revenues. Relative to producer prices in mainstream chains, producer per unit revenues after netting out estimated marketing costs are 649 percent greater for salad mix (Sacramento), 183 percent greater for blueberries (Portland), 91 percent greater for milk (DC area), almost 65 percent greater for beef (Twin Cities), and 50 percent greater for apples (Syracuse). In all five cases, essentially all of the wage and proprietor income earned in the direct market chains is retained in the local economy.

Food miles in the direct market supply chains are all less than 100 miles, ranging from 10 miles for blueberries in Portland to 75 miles for beef in the Twin Cities (fig. 4). However, fuel efficiency is often relatively poor due to

Figure 4

Food miles and fuel use in direct marketing cases, by product-place combination



Source: USDA, Economic Research Service calculations based on case interviews. See tables 2, 4, 6, 8, and 10 for additional notes.

the transport of small loads. Fuel use per 100 pounds of product ranges from 0.12 gal/cwt for blueberries in Portland and 0.16 gal/cwt for apples sold in the Syracuse farmers market, to 0.63 gal/cwt for spring mix sold direct in Sacramento, 1.90 gal/cwt for home delivered milk in the DC area, and 2.18 gal/cwt for direct market beef in the Twin Cities. Despite having substantially lower food miles, the direct market chains in Sacramento and the Twin Cities have higher fuel use per 100 pounds of product than the corresponding mainstream chains.

Finally, direct market producers contribute to a stronger sense of community through their participation in the farmers markets, which could not flourish without a strong vendor base. In addition, the DC area direct market farm distributes products from other local producers through its delivery service.

Intermediated Cross-Case Comparisons

The five intermediated supply chains include two producers (of blueberries and spring mix) who sell directly to retailers. The blueberry producer sells to a regional natural foods chain, and the spring mix producer sells to a natural foods cooperative. The third case focuses on a dairy processor/distributor that sources raw milk from one farm and sells organic milk to mainstream wholesale customers under its own label and through private-label agreements. The fourth intermediated chain centers around a grass-fed beef company that sources cattle from 40 producers (including the owner of the company)

and markets branded grass-fed beef to mainstream supermarkets, high-end restaurants, and institutional foodservice operations. The fifth case focuses on a local produce wholesaler who purchases apples from two local farms and markets them to a school district foodservice operation. These differences demonstrate the broad applicability of the intermediated structure. In four of the intermediated supply chains, at least some of the participating producers also engage in direct marketing.

Supply Chain Structure and Size

Despite the local origin of their product and in contrast to direct market supply chains, the intermediated supply chains in this study provide consumers only limited information about where and by whom the product was produced. Although some of the intermediated chains convey information about grower identity through in-store tastings (Twin Cities and Sacramento) and labeling of geographic origin (Portland and Sacramento), producers have little direct contact with consumers, and consumers generally are not able to link these products to a particular farm. The Portland case is an exception, as New Seasons Market displays signage that lists individual farm names.

Like mainstream chains, intermediated supply chains consistently involve important durable trading partner relationships that extend to producers in intermediated chains. In all five of these chains, producers have durable relationships with intermediaries because one of the parties provides a relatively unique product or service. The dairy farmer in the DC area is the processor's sole supplier of milk with unique product characteristics. The Twin Cities beef aggregator relies heavily on its processor to ensure product quality and food safety. The Sacramento natural foods cooperative purchases whatever limited amount of local spring mix is available to meet its commitment to supporting local producers (even though supply is erratic). Furthermore, it pays a 75-percent premium for local spring mix over the wholesale price for nonlocal bulk product; the producers use the cooperative as a residual market while they earn higher prices in direct markets.

Close relationships give producers in the intermediated supply chains some flexibility in setting prices independent of commodity market prices. Producers in the intermediated chains for blueberries and spring mix receive prices that are negotiated with the retailer and reflect production costs and direct market opportunities rather than prevailing market prices. Likewise, the Twin Cities beef aggregator pays a stable price for cattle that does not fluctuate with commodity beef prices. On the other hand, producer prices paid by the DC-area creamery are linked to commodity prices for organic milk, and prices are not decoupled from commodity markets in the Syracuse intermediated supply chain. This is not unexpected because the intermediary is a wholesaler that is selling apples, a major New York agricultural commodity, to a local school district.

In contrast to the mainstream chains, the intermediated chains have few strong linkages to national industry organizations and resources. Somewhat counter to expectations, collective organizations play a central role in only one of the intermediated supply chains. A natural foods cooperative that has made a strong commitment to supporting local growers is the intermediary

between producers and consumers in the Sacramento case. Collective organizations are involved to a lesser, though still significant, degree in two other intermediated cases. In the DC area, an organic milk marketing cooperative serves as the residual market for the dairy processor's surplus milk. In the Twin Cities, a cooperative warehouse handles the relatively small number of beef orders placed by local natural foods cooperatives.

The cases offer moderate evidence that the presence of other successful local food supply chains provides an infrastructure of knowledge and services that significantly benefits the intermediated supply chains. There are only a few significant linkages between the intermediated chains in the case studies and other successful local supply chains and local foods organizations. The intermediated chains in Sacramento and Portland are both led by retailers that emphasize local products, and so these chains may share some local sourcing infrastructure with chains for other products. The Twin Cities beef supply chain is closely linked with a meat processing firm that also processes for many direct market producers. The grass-fed beef company also uses distribution services developed and provided by a local natural foods cooperative warehouse that specializes primarily in produce, and the grass-fed beef company is beginning to use its transportation and distribution resources for other local products. Finally, the Syracuse produce wholesaler that plays a key role in the Syracuse farm-to-school program handles a wide variety of products for a diverse customer base.

Sales volume in intermediated chains represents only a small percentage of aggregate sales for the product category in each study area. Lack of year-round availability of local product limits intermediated supply chain sales volumes for blueberries in Portland and spring mix in Sacramento, but even in-season volumes in these chains are only a small fraction of aggregate sales across all retail and direct market outlets. Similarly, sales volumes in the intermediated case study chains for apples, beef, and fluid milk are small relative to overall demand. Fixed costs for compliance with regulatory and commercial operating standards do not currently impose significant constraints on volume in any of the intermediated cases. However, as in the direct market cases, local producers of spring mix in Sacramento and blueberries in Portland could face new food safety requirements that would be very costly for smaller producers. Producers in most of the mainstream supply chains have already implemented practices to meet these requirements.

Supply Chain Performance

In contrast to direct market supply chains, the intermediated structure does not guarantee producers a large share of retail revenue. Producers' shares of retail value in the intermediated cases net of marketing and processing costs range from 36 percent for the commodity-priced apples in Syracuse, to 37 and 39 percent for beef in the Twin Cities and milk in the DC area, to 46 and 50 percent for blueberries in Portland and spring mix in Sacramento (see fig. 2). In part, this reflects differences in the need for processing. However, it is also noteworthy that the distributor/aggregator in the Twin Cities beef intermediated case captures over a quarter of the total retail value. Finally, as indicated in the revenue allocation tables, revenues per unit received by producers in intermediated cases are often significantly higher than in main-

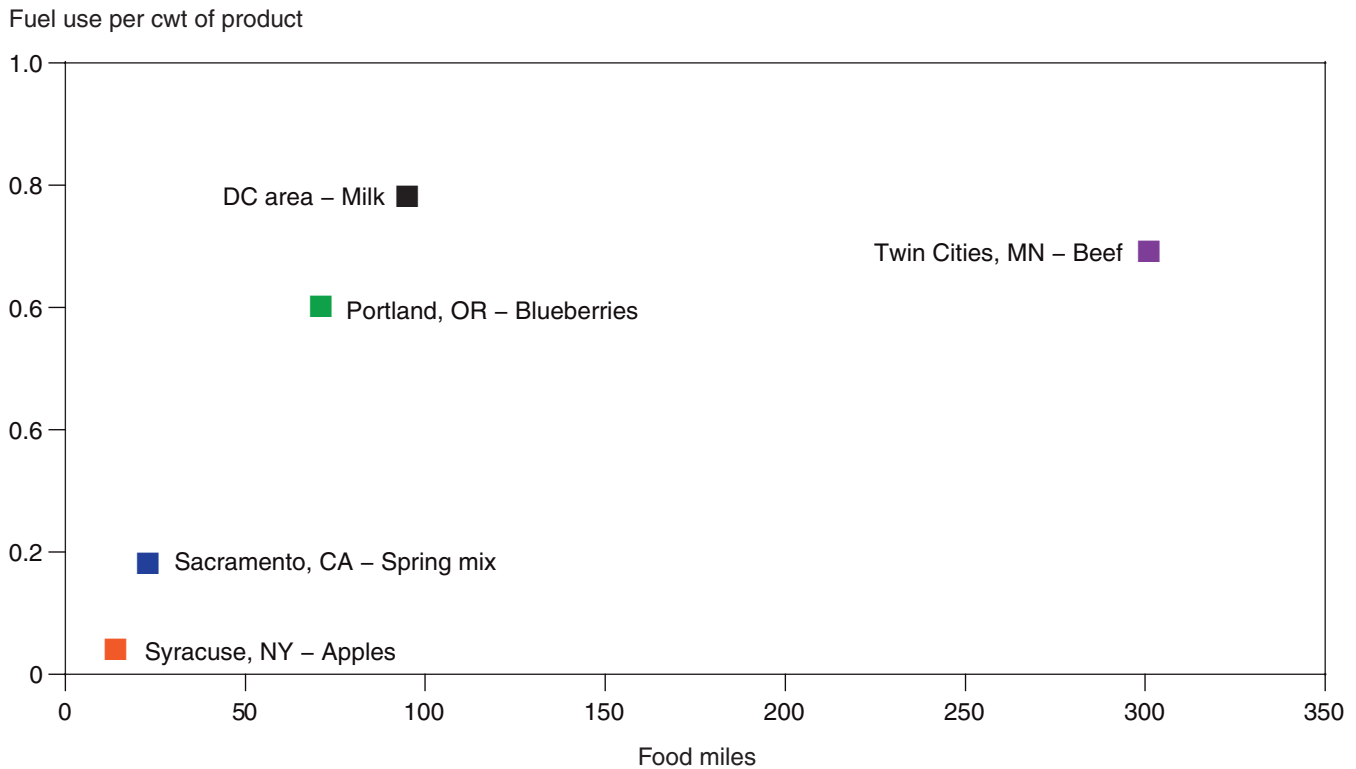
stream cases and are greater than in direct marketing cases for blueberries in Portland and milk in the DC area.

As in the direct market cases, nearly all the wage and business proprietor income generated in the intermediated chains is retained in the local economy. The Twin Cities grass-fed beef company is the only exception. It sources some cattle outside of the local production area, but all the beef is processed and distributed locally.

Food miles traveled in the intermediated chains range from a low of 13 miles for Syracuse apples to a high of 300 miles for Twin Cities beef, but fuel efficiency varies greatly across these cases (fig. 5). Food miles for intermediated chains are consistently lower than those for mainstream counterparts and are also the lowest across the three supply chains for the Sacramento spring mix and Syracuse apple case studies. Fuel use per 100 pounds of product ranges from 0.04 gal/cwt for apples in Syracuse (attributable to large loads with a short distance), to 0.18 gal/cwt for spring mix in Sacramento, to 0.60 gal/cwt for blueberries in Portland and 0.69 gal/cwt for beef in the Twin Cities, to 0.78 gal/cwt for milk in the DC area.

The intermediated chain has the lowest fuel use per 100 pounds of product in three case study locations (Syracuse, Sacramento, and the Twin Cities). This suggests that transportation efficiencies can be realized by pairing larger load sizes made possible by higher product volumes or shipping through

Figure 5
Food miles and fuel use in intermediated cases, by product-place combination



Source: USDA, Economic Research Service calculations based on case interviews. See tables 2, 4, 6, 8, and 10 for additional notes.

mainstream distribution centers with the shorter transportation distances associated with local products. Co-op Partners Warehouse, the nonmainstream distribution center used for some product in the Twin Cities grass-fed beef case, also offers opportunities for efficiency gains with lower product volumes.

Finally, like retailers in the mainstream cases, retailers in intermediated supply chains contribute to social capital by being visible participants in a range of community activities. The natural foods cooperative that leads the intermediated spring mix chain in Sacramento has an extensive community support program, as does the retailer in the intermediated case for blueberries in Portland. The school district in Syracuse has a nutrition education program for its students, as well as a promotion program for locally grown produce. Intermediated supply chain participants have also contributed to social capital in other ways. For example, the DC-area milk producer has fostered relationships with nearby residents as it transitions to organic production. In the Twin Cities case, the entrepreneur who founded the grass-fed beef company in the Twin Cities case is reaching out to sustainable poultry producers to share business expertise and distribution infrastructure. Similarly, the meat processor in the Twin Cities case has been active in providing educational programs for direct market livestock producers, not only in Minnesota and the surrounding States but also in other parts of the country.

Key Lessons

The fundamental structure of mainstream supply chains—characterized by distribution centers that receive product from many suppliers and efficiently distribute a wide array of products to supermarkets that offer consumers convenience and variety—is effective and highly adaptive. Mainstream supply chains keep distribution costs low and economize on transportation fuel use through scale economies and use of information technology. This structure can accommodate local products if they can be supplied in adequate volumes.

Producers who sell direct to consumers are highly diversified in the products they sell and the supply chains they use. Those who are successful deliver genuine value to their customers in the form of high-quality products and meaningful personal relationships. After netting out significant labor and transportation costs associated with direct marketing, the direct marketers in the case studies receive substantial price premiums. However, they operate in low-volume markets where price premiums can disappear if the balance between supply and demand is upset.

Intermediated supply chains are highly diverse. They have the potential to play an important role by aggregating local products such that they can be processed, distributed, and/or marketed in volumes large enough to provide size economies. They also offer significant opportunities for innovation and for “scaling up” the availability of local foods. Intermediated chains in the case studies were initiated by retailers, foodservice operators, or entrepreneurs. While these chains can be initiated by groups of producers, none of the intermediated chains in the case studies was producer-led.

Key Findings, Policy Issues, and Questions for Future Research

This report presents a coordinated series of case studies focused on two research questions about supply chains for local food products:

- What factors influence the structure and size of local food supply chains?
- How do local food supply chains compare with mainstream supply chains for key dimensions of economic, environmental, and social performance?

The case studies indicate the great variety of ways that food products can move from farmer to consumer. They also reveal more nuanced supply chain relationships than are commonly recognized in the public discourse on local foods. Five key findings emerge from the descriptions of structure, size, and performance of local food supply chains in these case studies:

- Local food products move through all three types of supply chains (mainstream, direct market, and intermediated), but the presence of intermediaries makes it difficult to establish and maintain a strong connection for consumers to where, by whom, and how their food was produced.
- Local food supply chains currently account for a very small percentage of consumer demand in each of the five product-place combinations in these case studies.
- Successful enterprises in local food supply chains vary greatly in size and competitive position in the marketplace.
- Farms engaged in direct marketing maintain a diverse portfolio of market outlets and business models.
- Product aggregation to reduce per unit costs is an important determinant of transportation fuel efficiency and can outweigh differences in proximity to the consumer.

These findings are derived from a series of specific questions about the structure, size, and performance of local food supply chains. This section summarizes key findings and conclusions for each of these questions. It is important to note that the 15 cases may not capture the full range of supply chain configurations for products in local or mainstream supply chains in each location. The cases provide rich detail about specific situations and point to general conclusions, but they may not be the basis for definitive acceptance or rejections of those conclusions.

Supply Chain Structure

Supply chain structure refers to the configuration of processes, participants, and product flows as a product moves from the producer to the consumer. It is commonly perceived that, in contrast to mainstream supply chains, local food supply chains convey detailed information about where and by whom products were produced and have relatively few segments that are often linked by trading partner relationships characterized by high degrees of trust and information sharing.

Direct market supply chains consistently offer consumers detailed information about where, by whom, and how the product was produced, but the addition of intermediaries to the supply chain makes it more difficult to convey this information. All the direct market chains provide consumers an opportunity to “know their farmer,” though in some farmers market settings this information may be readily available only to those who ask for it. The intermediated chains, however, generally provide less information on the identity of the producer. Instead, it is common for these chains to provide detailed information on how the product was produced and where it was packed or processed. In only one case—blueberries in Portland, OR—was the farm of origin identified at the point of purchase. Finally, while mainstream supply chains often provide information at the point of purchase on how products were produced, none of the case study chains identifies the farm of origin or the place of production in terms more specific than a State name.

Durable relationships between supply chain partners—characterized by a high degree of trust, information sharing, and decision sharing over time—are important in all three types of supply chains. Trading partner relationships that are more personal and trust based tend to emerge when two parties exhibit strong mutual interdependence or when one partner depends on another in a unique way. Counter to common perceptions, such relationships are very evident in mainstream supply chains, most notably in linkages between the processor and retailer in the mainstream beef case in the Twin Cities, between grower-packer-shippers and the retailer in the mainstream apple case in Syracuse, and between the distributor and retailer in the Sacramento spring mix case. These relationships are also common in the intermediated supply chains, as exemplified by the close working relationship between the aggregator and processor in the grass-fed beef chain and between the farmer and creamery in the intermediated case for milk in the DC area. Such relationships are less central in the direct market supply-chain cases. However, the producer-processor linkage and the meat CSA in the Twin Cities grass-fed beef case are both examples of durable relationships with high levels of trust and close communication.

Prices received by producers are consistently decoupled from commodity prices in both the direct market and intermediated case study supply chains. The only exceptions are for apples in New York, where the State’s strong position in the national apple industry exerts a substantial influence on prices in both the direct and intermediated chains, and for the intermediated milk supply chains in the DC area, where milk suppliers receive prices linked to organic commodity prices. In contrast, prices paid to producers in all the mainstream case study supply chains are directly linked to national or global commodity prices.

Collective organizations, especially farmers markets and consumer cooperatives, can play significant roles in both direct and intermediated supply chains. Farmers markets create regularly occurring, temporary marketplaces that provide direct market producers access to many potential customers. The direct market producers in four of the five study areas have taken advantage of these contacts to diversify their marketing activities into other channels such as CSAs, buying clubs, restaurant sales, and home delivery. Consumer cooperatives play key roles in two of the intermediated chains, most notably in the spring mix chain in Sacramento. None of the five intermediated chains

in this study was built around a producer-led cooperative or collective organization, but this does occur in many examples elsewhere. The findings demonstrate that collective organizations often play significant, though not necessarily central, roles in the development of local food supply chains.

Presence of a strong industry that distributes nationally or internationally does not necessarily help create an infrastructure of knowledge and services that facilitates the development of local food supply chains. California, New York, and Oregon are among the top producing States for the products studied in each of these locations. There is little evidence, however, that either the intermediated or direct market supply chains in these areas are closely linked to or have benefited from the infrastructure created by the strong production sector located within or close to the local production area. The direct market and intermediated supply chains in Syracuse are the one possible exception to this because they do link to larger grower-packer-shippers and take advantage of knowledge about and facilities for cold storage of apples.

To date, few of the intermediated supply chains have benefited significantly from the infrastructure of knowledge and services created by the presence of other successful local food supply chains and local food organizations. Local foods infrastructures, such as farmers markets and Web directories, are important for direct market producers. However, only in the case of the grass-fed beef company in the Twin Cities—which has been linked since inception to an established meat processor that supports other local meat suppliers—did an intermediated chain rely significantly on previously established supply chain infrastructures. This may be attributable to the fact that many of the local food supply chains in this study have actually been innovators. Looking forward, both the DC-area-milk direct marketing firm and the intermediated grass-based beef company in the Twin Cities area are using their supply chain infrastructure to distribute complementary local products from other producers.

Supply Chain Size

Supply chain size refers to aggregate sales volume as a percentage of total sales for a product category. The common perception is that local supply chains will be smaller and that limited access to processing and distribution, public regulations and commercial business policies, and a lack of year-round supply hinder growth prospects for local products.

Aggregate direct market and intermediated supply chains account for a very small portion of total demand for each product-place combination. Study procedures did not allow for accurate estimation of aggregate product flows through all direct market, intermediated, or even mainstream supply chains. Nevertheless, the rough estimates of aggregate product flows that could be made suggest that volumes of product sold by all direct market and intermediated chain vendors represent only a very small portion of aggregate product consumption in an area.

Access to and costs associated with processing and distribution services are not currently limiting the size of the direct market and intermediated supply chains. Access to processing is critical in the direct and intermediated chains

for both beef and milk, but in all of these cases producers or aggregators have stable relationships with processors and some capability to expand or own their own processing facilities. In each of these cases, however, processing costs per unit of product are estimated to be well above those for processors in mainstream chains. Access to processing is less critical in the three fresh fruit and vegetable chains, though growers in each have made investments in appropriately sized packing facilities.

Distribution services are handled internally by direct market producers and require considerable resources in each of the direct market case studies; for example, producers spend considerable time packing, driving, and selling at farmers markets. Distribution costs per unit of product also tend to be high in intermediated chains, relative to those in mainstream chains. As demand for local food products grows in an area, processing and distribution bottlenecks may emerge, and intermediated chains may need to grow product volumes to the point where they are large enough to gain size economies by distributing through mainstream distribution centers.

Fixed costs for compliance with regulatory and operating standards (public or private) are not currently viewed as a major constraint on the ability of low-volume local food products to use mainstream supply chains. Key participants in both direct market and intermediated chains consistently stated that they view existing food safety regulations and commercial operating standards as an understandable cost of doing business. Concerns, however, were expressed about the potential adverse effects of mandatory certification for compliance with Good Agricultural Practices and about the challenges posed by a national animal identification system. It is also noteworthy that regulatory and commercial standards may pose significant problems for transforming a direct market supply chain into an intermediated chain, since direct market producers are sometimes exempt from some standards.

Lack of year-round availability imposes some limits on market opportunities for local fresh produce products. Year-round product availability is a key attribute for all five of the mainstream supply chains. For seasonal products, such as blueberries, mainstream retailers seamlessly switch suppliers over the course of the year or work with distributors who can source from multiple locations. In the intermediated chains for blueberries and spring mix, retailers are willing to source from local growers when product is available. In these cases, inability to provide product year round is not a significant barrier but does restrict the volume of sales. Seasonal availability is not a problem for beef and milk, which are produced year round, or for apples, which can be stored effectively. Finally, in direct market chains, consumers appear very willing to buy from producers when they have product and buy elsewhere when they do not.

Growth of direct market sales is most likely to be achieved through entry of new producers, while intermediated chains are more likely to grow through internal expansion. There appear to be limits on the efficient size for direct market operations. These limits stem from lack of specialization and difficulty in achieving size economies, and they make expansion of the aggregate volume of direct market sales more likely through the addition of new vendors rather than significant growth by existing vendors. On the other hand, intermediated chains that adopt a model of aggregating product

from several producers, such as the Twin Cities grass-fed beef company, can realize significant economies of size in transportation and distribution as product volume increases. Growth through internal expansion is more attractive in these cases.

Supply Chain Performance

Advocates have suggested that expanded local food systems can improve supply chain performance along a number of dimensions. Evidence suggests that local supply chains perform differently than mainstream supply chains, although there are also differences among types of local supply chains.

Producers in local food supply chains tend to receive higher revenues per unit and retain a larger share of the retail price. However, producers in most local supply chains (and all of the direct-market chains) assume greater responsibility for the supply chain functions (e.g., processing, distribution, and marketing). These functions can be costly. For example, the direct market supply chain producer in Minnesota also incurs slaughter and processing costs paid to a third party (16 percent of the retail price) and distribution and marketing costs.

Whether or not producers are financially better off in local supply chains depends on the volume of sales, the size of the price premium they receive, and the degree to which they can perform additional supply chain functions cost effectively. For nearly all of the local supply chains, revenues per unit retained by producers, net of marketing costs, are significantly higher in local supply chains than in mainstream chains. This is observed even when the product does not command a retail price premium (e.g., direct marketed apples in Syracuse and beef in the Twin Cities).

Retail price premiums are difficult to maintain when “local” is the only differentiating characteristic. However, significant premiums are observed for additional product or service characteristics. One of these characteristics may be related to producers’ direct interaction with customers. Retail prices were higher in all but two of the direct marketing cases: apples in Syracuse and beef in the Twin Cities.

Almost all of the wage and business proprietor income generated in the local food supply chains (direct and intermediated) accrues within their respective local areas. In addition, mainstream supply chains also contribute a large share of wages and income (between 50 and 100 percent) to the local economy. This is due to the fact that most supply chain functions tend to be performed locally even though the product may be sourced from outside the local area. In all locations, mainstream retail distribution services are performed within the local area, and, in some cases, production, processing, and packaging occur locally.

Food miles in the local food supply chains are lower than in the mainstream cases, but fuel use per unit of product varies across locations and products. Transportation fuel use depends on many factors, including distance traveled, load sizes, vehicle type and efficiency, and logistics management. In some cases (e.g., spring mix and apples), the longer distances traveled in the mainstream supply chain outweigh the larger volumes per load, yielding less

fuel efficiency. In other cases, such as the beef study, aggregation of product in the mainstream partially offsets the effect of greater food miles traveled. Local food supply chains where product travels much shorter distances may be more efficient per unit of product delivered even when load sizes are smaller. This suggests that when food miles are small, product aggregation to achieve large load sizes and logistical efficiencies can yield highly fuel-efficient distribution systems.

Local food supply chains tend to place more emphasis on social capital creation and civic engagement, although results vary widely across supply chain types and locations. Some local supply chains support interactions between supply chain segments that are different from traditional anonymous market transactions often found in the mainstream supply chains. These interactions may create a sense of community that supports social capital creation. Examples include direct market chains where producers sell in farmers markets or through buying clubs as in the Twin Cities, MN, or the retail cooperative in Sacramento, CA, that maintains a commitment to purchasing from local farmers. Other local supply chains may use traditional retail marketing or alternative marketing outlets (e.g., home delivery) that do not support interactions between producers and consumers. Social capital creation and civic engagement in mainstream chains focuses on communitywide charitable efforts rather than on fostering connections between consumers and producers.

Case Study Interactions With Public Policies

Each of the 15 supply chain cases exhibits some interaction with laws and regulations that govern the production, distribution, and sales of food. An emerging trend is observed in these case studies toward compliance with voluntary food safety programs and third-party certification of agricultural and handling practices required by retailers. In the mainstream blueberry and spring mix supply chains, growers must participate in compliance programs (Oregon's Good Agricultural/Handling Practices program and California's Leafy Greens Marketing Agreement, respectively). Under these programs, growers must show compliance with a variety of practices meant to reduce the likelihood of product contamination.

The producers in the local supply chains for blueberries and spring mix currently do not participate in these voluntary programs, although they generally recognize that retailers—and perhaps consumers—increasingly demand compliance with some third-party standards. Adopting practices to achieve compliance can be costly, particularly for smaller enterprises. For example, one study indicates that compliance with the California Leafy Greens Marketing Agreement may double a producer's food safety costs, and the per acre costs of compliance would be significantly higher for smaller producers (Hardesty and Kusunose, 2009).⁶¹

It is less clear how compliance costs are related to farm structure independent of farm size. Several farms that participate in the local supply chains are highly diversified in terms of both product mix and market outlets. The structure of compliance costs may be different for a diversified farm than for a similarly sized farm that is more specialized.

⁶¹Only information about whether a producer was subject to compliance with third-party standards was gathered in each case. Analysis of the adoption and costs of specific practices by producers was beyond the scope of the report.

Several cases also highlight increasing interest in product traceability. For livestock, efforts to develop a national animal identification system have raised concerns among smaller operations about the costs of compliance, including recordkeeping. Implementation of an animal identification system is currently voluntary. It is unclear whether producers in local food supply chains would be affected differently by a mandatory program.

Other product supply chains that involve multiple producers at different production and marketing stages have developed a range of systems to aid in product traceability. Although not transparent to the consumer, blueberry packages in the mainstream case can be traced to a specific farm and harvest date. Similarly, beef in the mainstream case can be traced at any stage of processing to a single producer. In this case, traceability practices (and their costs) were adopted by the packer, rather than at the farm level.

Future expansion of local food supply chains may involve public programs to assist new and expanding enterprises. USDA administers several grant and loan-guarantee programs that potentially support local food supply chains, but their applicability for these cases depends on each enterprise's role in the supply chain, expansion needs, and program eligibility rules. For example, a meat processor may be eligible to receive a loan that is guaranteed by USDA under the Business and Industry Loan Guarantee Program, but not a grant for business development under the Value Added Producer Grant (Merrigan, 2009). None of the grant programs provides funding for buildings and equipment, although such assets are often critical to developing or revitalizing a region's agricultural processing infrastructure. Further, these programs prioritize certain geographic areas (e.g., underserved communities) or types of farmers (e.g., beginning farmers). These requirements may improve access for enterprises that meet program priorities but could limit access for some enterprises in local food supply chains.

Priorities for Future Research

The case studies that underlie this report are part of a growing foundation of research that can be the basis for longer term studies on local food systems. This study identified three important topics for future research that were beyond the scope of this project.

First, an important question raised in this research is that of the sensitivity of local product prices to changes in supply. Some of the products sold through the direct market and intermediated supply chains described in this report command significant price premiums over prices in the mainstream chains. However, product volumes in these markets are small, and prices may fall significantly if supplies grow faster than demands. The understanding of the opportunities for expansion of local food supply chains could benefit from additional research on product attributes, sales volumes, prices, and the sustainability of price premiums for products sold locally.

Second, fuel use was examined in this study only for the transportation segments of the supply chain cases. Future research would benefit from an expanded focus on differences in fuel and energy use in all supply chain segments, and a comparison of relative environmental impacts across supply chains.

Third, relative to mainstream chains, the local supply chains studied in this report appear to retain a greater share of wages, income, and farm revenues within local areas. Differences in supply chain linkages, retail prices, and input costs between supply chain types may determine the relative impacts of consumer spending in the local economy. Of particular interest is the role of supply chain structure in determining the number and types of jobs that local supply chains may create relative to mainstream chains.

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