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UNDERSTANDING LOCAL PRODUCE SOURCING BY RESTAURATEURS IN HOUSTON, TEXAS

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To Brooklyn Jump

UNDERSTANDING LOCAL PRODUCE SOURCING BY RESTAURATEURS IN HOUSTON,

TEXAS

by

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TEXAS

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As of 2017, Americans are spending more per year on eating out at restaurants and bars than on grocery shopping (Baer, 2016). While restaurateurs have a substantial amount of influence over what foods are served and ultimately consumed by their patrons, they have received little attention as target populations for understanding or changing behavior. Health interventions taking place in restaurants have focused on changing restaurant patron behavior rather than changing the behavior of the **restaurateur**, the individual who owns and or operates the restaurant.

Industrialization of food has been associated with a loss of biodiversity, environmental pollution, erosion, and over-use of fossil fuels. Conversely, local food systems are geographically localized, with consequently shorter distances between food production (i.e,. a farm or ranch) and consumption (i.e., restaurant food). Geographic localization has been associated with reduced nutrient degradation between harvesting and consumption, a lower environmental impact of both growing and transporting goods, and last but not least the potential to vitalize local economies through transactional exchanges with producers, such as local farmers (Christensen & O'Sulivan, 2015).

In 2007, the term ***locavore*** first appeared in the Oxford dictionary to describe one who consumes locally sourced goods such as those provided by local farmers (Shin, 2005). This dissertation was intended to add to literature on the role of locavores in addressing national and global food concerns , in particular, by examining locavore restaurateurs as agents of change in the movement of locally produced goods across a community. Increasingly more restaurants advertise supporting farmers and their communities as primary goals. This dissertation was guided by the assumption that this sub-culture of *locavore* chefs and restaurateurs is playing a critical role in addressing the individual and social concerns associated with a global industrialized food system.

This dissertation comprised three manuscripts, each contributing to the overall goal of this project to understand the determinants and features of restaurateur sourcing of local produce. In the first manuscript, we identified differences in sociodemographics, beliefs, and behaviors between restaurateurs who sourced produce directly from farmers (termed short food supply chain users) compared to those who did not have direct relationships with local farmers (termed long food supply chain users) in order to detect whether a specific set of characteristics, or restaurateur profile, was associated with sourcing directly from farmers. Importantly, we also evaluated the effectiveness of direct sourcing from local farmers by examining how it ultimately predicted overall level of local produce sourcing by restaurateurs. In the second manuscript, we utilized constructs from Social Network Theory to explore how competition and collaboration among restaurateurs were associated with local produce

sourcing. Specifically, we compared indices of restaurateur influence based on collaboration and competition (measured by the social network constructs of prominence and position) and then assessed their joint and separate effects on local produce sourcing using ordinal logistic regression to gain insights into how restaurateurs interact with one another in ways that can hinder or promote local sourcing. The last manuscript examined the role of local food distributors or middlepersons in brokering the relationships between farmers and restaurateurs. Specifically, we looked at how having relationships with distributors influenced the interconnectedness of farm and restaurant network members. In the last study, we recognized the likely role that group cohesion played in the flow of goods from farmer to restaurateur and explored whether distributors reinforced or compromised group cohesion. The specific research questions addressed were: How do short food supply chain users compare to those who only use long food supply chains? (Manuscript 1). What are the individual and network-level determinants of local sourcing? (Manuscripts 1 and 2). Lastly, how does participating in brokered relationships influence group cohesion and collective action of the network (Manuscript 3)?

The locavore movement was the focus of this dissertation, but is just one example of how restaurateurs can act as proponents, even leaders, for missions embraced by the communities in which they are situated. **This dissertation aimed to understand determinants and features of local produce sourcing among "locavore" restaurateurs in Houston, Texas.**

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"So much life is lived in restaurants, by workers and patrons alike, that it would be irresponsible to ignore what they say about us, as mirrors of our social wants and needs. "

- Danny Meyer (Freedman, 2016, p. xxiv)

The Restaurant

There are ancient precedents for what we may describe as a restaurant setting. Pompeiian remains conjure up a past of once thriving dining rooms upstairs from separate kitchen quarters, where guests dined on dormice, sea urchins, and giraffe (Jashemki & Meyer, 2002).   Amongst the earliest appearances of the word "restaurant," a 1708 entry in *Furetiere, Dictionnaire Universel* reads: [A] "Food or remedy that has the property of restoring lost strength to a sickly or tired individual." The establishments which served these "restaurants" were referred to as "Restaurants or Houses of Health" in the Tablettes de Renomee ou Almanach General d'indication (1773, in Spang, 2001). Those who had the skill of making these remedies, principally restorative broths such as boullions or consommés, were called Restaurateurs. In the sixth edition of Dictionnaire de l'academie Francaise (1835), a restaurateur is defined as "one who repairs or reestablishes. " Since its inception, a restaurant has thus been identified by its host, with patrons referring to the establishments as the "restaurateurs' rooms" (Spang, 2001). This dissertation recognizes restaurateurs as either owners or individuals who have an operating role in the studied restaurants.

A small number of historians have pieced together comprehensive histories of restaurants, tackling questions about the types of social interactions that restaurants made

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possible by the introduction of these semi-public, semi-private spaces distinct from the inns

or taverns that were also popular back then. Restaurants soon transitioned from places of

restoration, with menu choices restricted to bouillons, to forums for public politics and varied

social exchanges.   In The Structural Transformation of the Public Sphere, German political

philosopher Jurgen Habernas (Habermas, 1989) describes the creation of new types of

physical spaces that bring with them new forms of interaction, thinking, and behaving, unlike

what was previously known in "the market square, the church, or the royal court" (Spang,

2000, p. 84). While restaurants' small intimate tables and private rooms idolized the

individual, it also provided a venue for the exchange of ideas and discussion that turned it

into a new public sphere, specifically a civic public sphere, where most could be politically

active or otherwise civically engaged. Restaurants became places where "political banquets,

fashionable innovation and Enlightenment science, revolutionary zeal...and…medicinal

concoctions – overlap and intertwine," (Spang, 2000, p. 3) Spang (2000) contends that the

first restaurants were responses to culinary curiosity and scientific innovation, in addition to

the preoccupation with the pursuit of health amongst eighteenth-century Paris-based

urbanites.

Social Change and the Restaurant

Pursuit of health and delicious cuisine alike also began to break down socioeconomic

walls in Western Europe. Prior to the restaurant-fueled pursuit of health for all, cookbooks in

Europe had been written for particular socioeconomic audiences, catering to the bourgeoisie

opposed to the aristocratic Parisians. In 1758 famed French cookbook author Menon

published his La Cuisine et l'office de santé, translated to *Cuisine for Individual Health That*

Concerned All.   Whether the restaurant did more to unite or to segregate is a matter of perspective and context. Rather than drawing inspiration from the accessible diet of the lower class, restaurateurs were inspired by the cuisine of the Swiss villages detailed in Rosseau's 1760 and 1762 publications *Julie, ou la nouvelle Heloise and Emile* (Spang, 2001, p. 80).   Emile was the narrative's heroine who lived far from the city on fresh fruit and sweet creams. She embodied a pastoral way of life paradoxically revered by the patrons of an increasingly complex nouvelle cuisine. Thus menus of the 1770s in Western Europe began to serve dairy products, sweet concoctions, and fresh fruit in addition to the bouillons traditionally making up restaurant menus.   The restaurant introduced cookery as art, with its literary allusions and increasingly innovative use of ingredients, and a socialization of eating, into the marketplace.

Distinguishing Features of the Restaurant

Many of the features that characterize restaurants today originated early on in restaurant history. Early differentiators of restaurants from other dining establishments of the late eighteenth century included: the use of a menu, emphasizing the agency of its peruser; the rejection of rigid hours kept by innkeepers in favor of offering service at anytime the patron desires; and lavish, yet not intrusive, attention by restaurant staff.   All of this contributed to what Spang (2001) calls "the restaurant's logic of personal choice."   In a somewhat competing account of restaurant history, economist Nicholas Kiefer describes restaurants in Kaifeng, China during the 11th century, far earlier than their appearance in Paris (Nicholas, 2002). As in France, these establishments evolved from the taverns and inns that once catered to travelers into beacons for community dwellers who enjoyed

expressing their personal choice—of when and what to eat. The restaurant was a place where the individual mattered in an increasingly communal landscape. The unique features of the restaurant paved the path for other innovations that would continue to influence society even outside of the restaurant. For example, the printing of restaurant prices on menus and the standardization of these economic transactions far predated fixed pricing as a societal norm for many domains in Western Europe (Spang, 2001, p. 77).

Restaurants were also always "anti-calendrical" (Spang, 2001, p. 189), dismissing the notion of time and perpetuating an illusion of a seasonless world where ingredients were available anywhere year-round. The staunch resistance to abiding the seasonality of foods aligns well with today's globalized food system but made less sense in the eighteenth century culinary scene. The myth was perpetuated more because the menu was printed and used regardless of its accuracy than because goods were brought together from many different far-away places. The notion of anti-calendrical fare gained so much favor that few restaurateurs adopted the device invented in 1843 by Jean Antoine Arnaud that would allow menu items to be changed daily (Spang, 2001).

Restaurants in the U.S.

The establishment of the restaurant would soon come to be commonplace in the United States as well. In 1873, French writer Alexandre Dumas reported that the number of restaurants in San Francisco was second only to Paris's fleet of restaurateur rooms. With mass migrations to post-industrialization jobs, Philadelphia and New York were amongst the locales with the greatest demand for restaurants. In 1850, Philadelpia had 254, and New York had a little over one hundred. Less than two decades later, New York was home to five

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thousand restaurants. (Diamond, 2015). The ever-growing immigrant population residing in boarding houses and hotels took most of their meals from restaurants. Bankers and other businessmen commuting to jobs in the city from the suburbs also chose to dine away from home daily.

Industrialization of Food

In addition to supporting a populous of eager restaurant-goers from Philadephia to New York, the northeastern United States also housed the burgeoning business concepts and engineering prowess of refrigerated cars, first introduced by the Western Railroad of Massachusetts.   Butter, cheese, and meat were transported from New York City and Boston to western New York and Vermont, while meat and berries were transported from Chicago to the eastern states. Shipments of tomatoes, potatoes, peas, cabbage, onions, strawberries, and cherries arriving twice weekly were documented as early as 1867 (Diamond, 2015). By the end of the nineteenth century, at lest some kind of fresh produce was available year round in the United States as a result of improvements in refrigerated railway transportation.

The provision of options led to the perception of pan-seasonality and plentitude and would come to be regarded as a diversion tactic away from the quality of the foods. Similarly, the plethora of ethnic restaurants in the large United States cities supported by a diverse population generated the prioritization of quantity of choices even over authenticity. With demand for restaurants on the rise, businesses like restaurant and hotel chain Howard Johnson's responded to shortage of capital for creating new restaurants by franchising their name, model, and product.

The problem of assuring uniformity of food and quality across locations was then solved by relying on frozen foods. Foods were prepared and then frozen in centralized locations then sent out weekly to franchisees, an infrastructure that had already existed for the ice cream for which the Howard Johnson chain was first known (Freedman, 2016).

The type of restaurant that flourished depended on the social movements of the time. With the passage of Prohibition in 1919, posh restaurants that had economically subsisted on wine and liquor margins could no longer flourish. More accessible dining options emerged, including Automats, luncheonettes, roadside restaurants, and themed restaurants (These were the kinds of restaurants supported by the industrialized advances of sterilization, packaging, containment, and shipping (Freedman, 2016).

In what originated as the domestic science movement and later came to be known as home economics, a small group of females worked tirelessly to open cooking schools and publish magazines. These women quickly developed mutually beneficial relationships with food industry and the beginnings of agri-business in America. They opened the first American cooking school in Boston, the same city known for its rivalry with Cambridge for the distinction of being the city that least enjoyed food. The Boston cooking School professed and echoed the values of sobriety, strict training, and reason characterizing both industrialization and the domestic revolution

Automats were restaurants comprised of vending machines with read-made food. The first automat in the United States opened in 1902 in Philadephia; New York City opened its first in 1912 (Strauss, 2019).

(Shapiro, 2008, 47). Its instructors discouraged the plating of vegetables as they could not

easily be presented in aesthetically pleasing fashion. The late nineteenth century, Shapiro

observes, "was the era that made American cooking American, transforming a nation of

honest appetites into an obedient market for mashed potatoes." (Shapiro, 2009) Nevertheless,

even in this epoch, cooking could not be completely divorced from the restorative function of

food: One of the school's most well-known instructors, Mary Lincoln, defined cooking for

members of the World's Congress of Women at the Chicago World's Fair (1893) as the 'art

of preparing food for the nourishment of the human body' (Shapiro, 2008, p. 67).

With the combined tour de force of American business and the domestic science

movement came the threat of adulterated food. Dr. Harvey Wiley, head of the Chemical

Division at the United States Department of Agriculture, devoted much of his career to

uncovering harmful contaminations found in flour, spices, pickles, and baking powder in

hopes of penalizing the food industry on matters of food safety. The prevailing attitude of

the time espoused by the domestic scientists, however, was that the issue of food adulteration

and food safety was not an industrial problem, but an educational one. Women were to be

taught to shop more carefully, just as restaurant patrons are to be expected to order wisely. A

New England Kitchen Magazine excerpt of the time professed 'the practices which have

savored of dishonesty on the part of some dealers have had their origin through the ignorance

of the consumer' (Shapiro, 2008. P. 187). The negative repercussions of industrialization,

however, would not be completely dismissed. With the advent of refrigerated trucking and

decline in transportation costs after World War II, regional specializations became the norm.

Previously perishable goods could be transported across the country and even the globe at

low prices. Mono-cropping, where farms specialize in only a few fruits and vegetables

depending on their land and climate, began to characterize produce farming. Animal

products became factory farmed, while California and Florida took over fruit and tree nut production (TXP, 2013).   The consensus today is that industrialized farming practices have resulted in great loss of biodiversity, environmental pollution, erosion, and over-consumption of fossil fuels.   Food-borne illnesses quickly become multi-state outbreaks due to the rapid and widespread transport of goods (TXP, 2013).   Alternate food systems have emerged as a solution to procuring foodstuffs in ways that avoid the long-standing industrialized supply chain, inclusive of large-scale food manufacturing and intermediaries dedicated to processing, storage, and transportation.

Response to Industrialization

A food system is made up of all aspects of food production, distribution, and consumption -- from how food is grown or raised to how it is harvested or slaughtered, to the way food is processed and prepared for consumer purchase. A **local food system** is a food system that is geographically localized, with consequently shorter distances between food production (i.e., a farm or ranch) and consumption. In contrast to a globalized food system made possible by industrialization, farmers involved in local food systems usually focus on plant varietals that are more nutritious, can be harvested closer to peak ripeness due to shorter transit needs, and in many cases significantly less need to use antibiotics, hormones, pesticides, and herbicides that are common place in conventional farm products.   Perhaps most importantly, local food systems are concerned with the interconnectedness of environmental, social, and economic systems (Christensen, 2014). A common misconception is that "going local" is a return to old ways or an atavistic longing for the way things were.   In the United States, however, going local is not a return to former practices as

innovations in transportation and food storage coincided with the growth of restaurants as establishment across the country. What is not well known is that to be successful, new rather than old innovations in sourcing had to occur.

Established in 1959 in New York, the Four Seasons was dedicated to globally inspired dishes juxtaposed with a commitment to working within the rules of place and season. The restaurant had an herb garden, contracts with nearby farms for their produce, and menus declaring their greens being harvested daily. While these claims were true, they were also specialists in importation – grapes and peaches from Belgium, venison from Norway, oysters from England. The renowned James Beard was on the task force of assembling a menu and was relatively successful in advocating for primarily American ingredients. Rather than its attention to seasonality, however, the Four Seasons is better known as the birthplace of the "power lunch" where "deals were made, prestige reinforced, and relationships created and maintained" (Freedman, 2016, p. 327). Nevertheless, the mission of locally sourcing left its mark and is the hallmark of today's movement towards local food systems.

The Locavore Movement

Anthropologist Claude Fishler (1988) describes food as a central tenet of human identity. Specifically, the way in which groups of people eat determines the diversity, hierarchy, and organization of that group, and asserts simultaneously its oneness and the otherness of whoever eats differently (Fischler, 1988). Followers of the local food movement express their distinct oneness in a collaborative effort to build and participate in locally based food systems. In 2007, the term *locavore* first appeared in the Oxford

dictionary (Shin, 2005) to describe one who consumes locally sourced goods. The local food

movement reflects a confluence of motivations—followers may want to reduce the carbon

footprint of food and the long-distance transfer associated with greater greenhouse gas

emissions; may want to improve access to healthy food for low-income groups that a

cohesive community can support; and may endorse a desire to return to traditional ways of

farming by supporting local farmers as well as by gaining a better understanding of the

source of our food.   Some locavores are particularly motivated by the desire to offset the

financial struggles of the small family farms providing local foods to their communities

(Hashem et al., 2018).   The economic plight of small family farms classified as having a

farming occupation (26% of U.S. farms providing 11% of all value added by U.S.

agriculture) has been a topic of concern for policy makers, yet they receive less than 21% of

government subsidy payments (Wilde, 2013). One of the many challenges of increasing the

use of local goods is defining exactly what local means.

     While United States federal law defines local as within 400 miles (Congress, 2018,

P.L. 110-246, §6015), definitions of local differ from retailer to retailer and from place to

place based on agricultural resources of an area. **Farmers' markets**—municipally supported

communal spaces where farmers are allowed to sale their goods (typically for a fee)—in the

United States apply different distance standards as appropriate for their geographic location

and can vary from 50 miles to 900 miles. While difficult to uniformly define, what

constitutes local is nonetheless clearly in stark contrast to the global industrial food system

and its wide geographic reach. Socially negotiated meanings of what is local (i.e. Texan

versus the Houston community) also influence how it is defined. Because the farmers'

markets in Houston in which this study is set adhere to a definition of 150 miles, the current

study will adopt the 150 miles as the geographic parameter used to define local (*Urban harvest.*2019).

Although US restaurant history shows glimpses of locavorism, as in the ambitious pursuits of The Four Seasons and the 1930s branding programs like "Ohio Proud" or "Pick Tennessee Products," (Johnson, 2016) the "locavore" concepts touted today were first introduced in the 1970s by Alice Waters (Freedman, 2016). Waters' restaurant, Chez Panisse, expanded on notions of high quality and seasonality by narrowing in on what local really meant: defining fresh, natural, and therefore optimal food as small-scale, using non-industrial agricultural practices, and being of a specific season and location. Innovations in sourcing prioritized regional and local ingredients and decreased the need to import products. New ways of cooking native ingredients gave way to "new American" cuisine. In 2007, Chez Panisse's list of eight appetizers identified three farm sources. The practice of identifying partner farmers is now visible in countless restaurants across the United States, with their names spackled across menus or even put up on banners on the walls. (Freedman, 2016, P. 374) The contingency of Houston restaurateurs studied here have successfully increased sourcing of locally produced foods in three different ways: by purchasing goods from area farmers, placing orders with food distributors who in turn are entrusted to deliver from area farmers, and lastly by growing their own produce.

A Culinary Setting for Change

Home to over two million inhabitants, Houston boasts active non-profit organizations dedicated to the local food movement, as well as a following of chefs who attempt to source local foods for their restaurants. The mission of the Houston Food Policy Workgroup is to

cultivate a sustainable local food system that is accessible to all through education, collaboration, and communication. The Workgroup, recently renamed to the linguistically more systems-oriented "Houston Food System Collaborative" has created a food policy council for the Houston region and assigns volunteers to action groups committed to such goals as enabling farmers market customers to use foods stamps to buy local produce, or raising capital for area growers (Houston Tomorrow, 2013). The nearby metropolis of Austin is home to the Sustainable Food Center, whose mission is to strengthen the local food system through community efforts like programs designed to increase access to affordable local foods, or programs to provide direct connections between farmers and community spaces such as bringing producers and consumers to schools and farms. The Sustainable Food Center's farm-to-work program is an employee wellness program that links farmers to participating worksites, whereby local farmers have been delivering to the Greater Houston and Austin areas since 2007 (Sustainable Food Center, 2017).

Houston is home to several James Beard Award best Restaurateur winners, including Michael Cordua of Americas, Hugo Ortega of Backstreet Cafe and Hugos, Anita Jaisinghani of Pondicheri and Indika, and Robert Del Grande of Café Annie, Justin Yu of Oxheart and Theodore Rex, and Chris Shepherd of Underbelly. The menus of most of these restaurants proudly lay forth their Houston-area purveyors and their current helpings of locally sourced ingredients. Coltivare, with its own garden, was included in *Bon Appétit's* list of 50 new best restaurants in America (Bon Appetit, 2014). Restaurant patronage and sourcing decisions reflect changing consumer preferences and motivations to participate in alternative food movements. Many restaurants specifically advertise they support farmers and farm communities as a primary goal.

Restaurateurs as Gatekeepers

This project positions restaurateurs as **gatekeepers**, who act within a social system to make decisions that affect how, in this case, food gets from whom to whom (Lewin, 1943). Social psychologist Kurt Lewin first introduced the concept of gatekeeping in a study of Midwestern housewives and their ability to change their families' food consumption habits during World War II.   Lewin concluded: "food does not move by its own impetus. Entering or not entering a channel and moving from one section of a channel to another is affected by a 'gatekeeper.'" Important implications of Lewin's work included the realization that not all members of a household have equal weight in making decisions. While the theoretical concept of gatekeeping has been applied to many social issues such as control of information by Big Media, examples of its appropriate use within the food context from which it came are nowhere to be found. Very few investigative works have framed restaurateurs themselves as conduits for health behavior change, despite the need to regard restaurants as a viable intervention setting and to regard those who run them as important though often forgotten informants for social and personal behavior. The current project re-introduces this vital gatekeeper construct from sociology in order to understand local food sourcing in this setting, focusing on the locavore restaurateur.

Individual Action and the Local Food Movement

Prior literature demonstrates very few investigations into locavore values and behavior, with two notable exceptions, one a study of restaurant chefs conducted in 2017, and another an investigation of U.S. consumers in 2014. In the qualitative study of locavore

chefs in Alberta Canada, Nelson (2017) assessed constraints, skills, and motivations for local sourcing. The locavore chefs wanted to support their local economies by recruiting local farmers for produce sourcing. They were also likely to participate in causes such as community education (Nelson, 2017).

Shin (2005) examined the utility of an expanded Theory of Planned Behavior Model (TPB) in understanding local food purchasing among in a large sample (N=695) of U.S. consumers. The study found that motivation to conform to group norms predicted attitudes antecedent to local food purchasing. Intention was also positively influenced by perceived behavioral control and the subjective normalization of local food sourcing. In this sample, a primary channel for procuring local foods included community farmers' markets, the municipally supported communal spaces where farmers are allowed to sell their goods while consumers are able to interact face-to-face with them as they buy foodstuffs for their homes (or restaurants). Beginning in the 1980's, we began to see a farmers' market revival in the US, along with a re-evaluation of food consumption values. Current day patrons report farmers' markets as ways of promoting small farmers, and see them as viable alternatives to an industrialized food chain largely made up of marketing and distribution (Benedek, Ferto, & Molnar, 2018).

Community supported agriculture (CSA), another supply channel in increasing demand, is an arrangement whereby consumers often pay up front for weekly farm shares of in-season produce and other goods, with agreed upon times and places for designated delivery or pick-up of the shares. Participating in community supported agriculture often comes with an enhanced connection with the land, even if consumers do not physically go to the farm to pick up their goods (Liu 2017)— more central locations for pick-up are often part

of the arrangement.   Academic work on community supported agriculture has argued that the community aspects of participation are just as important or more so than is the food that is produced by them (Liu, 2017). Community supported agriculture participants may be motivated by need to reify and support the growth of local food (Saltmarsh et al 2011) or to protect small farms (Liu 2016).

Restaurateurs' sourcing decisions may be a medium for expressing values associated with food as well as community, just as consumer purchasing of local foods is typically a reflection of personal values placed on food and community. Participating in alternative food outlets such as community supported agriculture, shopping at farmers' markets, and eating locally grown foods constitute central activities of **food citizenship**. Food citizenship is a set of behaviors enacted by consumers that reflect their commitment to public and person health. Studied under various names, including agrarian, ecological, or food citizenship, recent studies have explored its role in providing solutions to the downfalls of agribusiness, improving personal self-care, and connecting consumers to agriculture (Jarsoz, 2008). Prior studies have explored its utility in closing the gap between attitudes towards local sourcing and actually enacting the behaviors leading to sourcing of locally produced foods (Shifen, Lawry, & Bhapput, 2017). Although the importance of food citizenship has been established, and alternative retail outlets for local foods are on the rise (Benedek, 2018), few studies have attempted to understand participation by either consumers or producers (farmers).   Benedek et al. (2018) found that farmers who use farmers' markets seek opportunities to interact directly with their customers, avoiding middlepersons. The lack of a middleperson is the hallmark of short food supply chains (SFSCs). Short food supply chains are one example of a **value-based supply chain**, or one that is driven by the goal of

enhancing the financial viability of small and midscale farmers (Christensen, 2014). SFSCs theoretically lead to greater returns for farmers and less mark-ups for consumers (Martinez et al., 2010). Though there is no standard definition of a SFSC, the resounding feature is the direct relationship between farmers and consumers (Martinez et al., 2010).

This study explores food citizenship behaviors and values related to local food, as predictors of SFSC usage, or directly sourcing from local farmers. We also assess how they may explain the level of local produce sourced. Because sourcing of local produce by restaurateurs is an individual behavior that is socially embedded, it is necessary to have a foundational understanding of how they are embedded within the larger network of interactions and relationships. We thus turn to theoretical approaches which investigate restaurateurs on both an individual and network level within the context of the local food social network operating in Houston, Texas.

Social Capital and Social Network Theory

Social network theory (SNT) is the framework used to understand the interactions between a set of social actors, or related individuals, within a domain of engagement (Robins, 2015). With a local food system comprised of many interconnected social actors, the focus on the relationships, or ties to use the vocabulary of SNT, between them, is imperative. While traditional research methods are oriented around exploration and analysis of individual actors, SNT emphasizes the importance of relationships and the resulting network structure. SNT contends that position within a network structure can influence collective outcomes (Grunspan, Wiggins, & Goodreau, 2014): an exmple of such an outcome is the flow of local foods from farmers to restaurateurs.

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The analytical techniques of SNT, social network analysis (SNA), measure the underlying structure of relationships within a community via special descriptive and predictive statistics but also via visual illustrations or network graphs or **sociograms**, that depict the patterns of relationships that connect individual actors (referred to as nodes). In this study, the actors are farmers and restaurateurs. **Ties** can be characterized as bidirectional (as in two restaurants working together), and thus *undirected,* or they can be *directed* as in the example of a farm that delivers foods to a restaurant (the restaurant does not deliver food to the farm). Ties can also be categorized as binary or valued. A binary tie is measured discretely as either absent (there is no relationship between two actors) or present (the relationship between two actors exists). Valued ties, on the other hand, provide more quantitative information about the relation as in the example of attributing a value to a sourcing tie that is equivalent to the frequency of produce delivery to the restaurateur from the farmer (Grunspan et al., 2014). All of these ties are decidedly characterized by the researcher—the ties are particular foci of interest to the researcher who thus ignores many other types of ties—and data collection is thus designed to capture relationships between social actors. As network researchers we create proxy variables that get at the aspects of relationships we want to study in greater detail. In this dissertation, we measured some specific kinds of relationships between farmers and restaurateurs and between restaurateurs.

A formalized study using SNA permits a more fine-grained investigation of the web of relationships among the parties of interests to the researchers. Social relations are particularly important in the context of markets that are likely to vary unpredictably due to external forces such as drought. Each tie or relationship is a potential source of information, actual foodstuffs, money, or labor. These connections determine and facilitate the flow of

food and other resources shared among individuals. The resulting norm of sharing determines the level of risk people are willing to take in growing or sourcing local foods, and contributes to group identity and to group cohesion (Baggio et al., 2016).   Social relations embedded within networks have been known as the "capital of the poor" (Baggio et al., 2016), for they permit access to resources even in times of stress.   Conversely, when cooperation among individuals is stressed, the repercussions for relations, for the surrounding landscape—both figurative and literal—and for people may be deleterious.

The relevance of social network methods to the study of food systems is gaining awareness.   Several studies have studied farm nodes to explain disease outbreaks in livestock (Dube, Ribble, Kelton, & McNab, 2011).   In a social network analysis of policy actors in Canada, 93 individuals involved in food insecurity policy were asked to name three individuals they considered policy entrepreneurs.   The study identified individuals with various types of and degrees of influence (i.e. connections) in order to shed light on the political landscape of food insecurity (McIntyre et al. 2018)—much as we aim to identify influential restaurateurs and illuminate the Houston local food social network. Similarly, a study examining visualizations of farmer seed networks identified farmers who are influential custodians and disseminators of seeds that cannot withstand the storage conditions of community seed banks or the larger-scale granaries (Coomes et al, 2015).   Sperling and McGuire (2010a) have estimated that over 80% of the world's planting material moves through such informal and under-recognized farmer seed networks. This makes the case that small, localized networks, such as small local food social networks driven by the local food movement, can have far-reaching effects on society at large.

Towards Collective Action

SNT permits us to explore how individuals, here namely restaurateurs and farmers, work together, functioning as a network entity with a shared goal. The success of the local-food movement is dependent in part on the creation of a common vision to meet shared goals, and the reciprocity of relationships between individual social actors. The voluntary and intended action of a group trying to benefit from its shared interests and facing common obstacles to achieve a common goal is defined as collective action (Ostrom, 2000).

Collective Action and The Local Food Social Network

Like any socially embedded setting, restaurants reflect the physical, cultural, and political environments in which they are situated. As such, restaurants are places where direct relationships between buyer and seller may represent not only the economic welfare of a population, but the ecological concerns and values of individuals. These individuals must at the very least include farmers and restaurateurs who have a common mission—here local produce production and consumption—and work together to accomplish their common goal. Starr (2010) identified collective action of diverse sets of actors with a shared goal as what distinguishes local food as a social movement, rather than a market shift (Christensen, 2014). This dissertation operationalized collective action in several specific ways, all measured by the presence or absence of certain relationships between network members. Having this information about relationships between social actors then allowed us to determine the characteristics of the influential restaurateurs and farmers, the strength of collaborative and competitive ties, and ultimately the success of collective action towards local food sourcing.

Between farmer and restaurateur pairs, relationships measured included direct sourcing ties and indirect sourcing relationships where distributors connected the farmer to the restaurateur. We also measured relationships between the restaurateurs. Collaboration and competition networks are a dominant line of inquiry in social network studies where distribution of resources, here local produce, is an important outcome. Having a collective mission lends itself to information sharing and collaboration that is a feature of community progress (Ostrom 1999). However, population ecology proposes that organizations that rely on the same resources and share the same resource space promote competition. It is also logical that because of the pro-sharing norms that are characteristic of restaurateurs who source locally, sharing of resources will actually lead to relatively more collaboration within the constraints of agricultural and social capital resources. Yet opportunities for competition amongst restaurateurs arise from produce accessibility, vying for farm resources including knowledge of participatory farmers, and deployment of skills such as the creative adaptation of the daily menu to meet the demands of seasonal variation and of restaurant patrons. Examining these relationships and the overlap between competition and collaboration can provide telling insights about the role restaurateurs have in connecting with one another in ways that promote or hinder local food sourcing.

Formalized measurement of sourcing and competition/collaboration relationships are conducted with social network analysis in order to understand who is connected to whom, and what types of ties constitute these connections. Measured relationships (ties) then allow us to quantify the interconnectedness that in turn predicts the success of collective action amongst Houston restaurateurs.

Data Collection and Measurement

Socioecentric social network studies entail data collection from an entire bound and defined population of actors, going as far as to ask respondents to include any missing relational partners so that as complete a picture of the network as possible unfolds (Grunspan et al., 2014). This study, categorically sociocentric, collects data from both farmer and restaurateur nodes, as well as a small sample of distributor nodes. The nodes that they have in common become the means by which the network comes together, rather than just being isolated interviewees (i.e., egos) with their list of alters radiating out from them and connected to no one else when there are no overlapping names. This survey inquired about relationships existing over a pre-determined amount of time deemed sensible for the context of food procurement. In this case, that time frame was determined to be the previous year since this is enough time to have established sourcing patterns especially covering the varied foods available seasonally throughout the year. One year was also chosen so as to not be too challenging in terms of informant recall or for the informant referencing their records. The integration of dyads into network data were then used to derive network measures as well as actor or individual-level metrics.

Definitions of Network-Level Measures

Of the numerous network measures possible, the current study is concerned with a subset of social network constructs determined to be of interest in the study of Houston's LFSN. The specific application of these measures to each paper are detailed as appropriate after their definitions below:

Size: the number of farmers, restaurateurs, and distributors in the network

Density: the number of direct actual connections divided by all possible direct connections in a network (not including ego's tie to self). The greater the density, the more likely the community is to be a source of effective transmission of support, knowledge, and goods, and in general represents a more cohesive network (though it may also represent homogeneity of behaviors and lowered diversity of resources). Because the farmers and restaurateurs are tied economically by capitalistic ventures, it is appropriate to extend the assumptions of density from economics to our use of it here, whereby denser populations enhance the spread of knowledge and can thus heighten innovation (Goldin, 2014). This is particularly important in the locavore context as the key players actively work to change the conventional social, institutional, and economic arrangements that make up food sourcing. Analogous to the "capital of the poor," Martina and Sunley (2015) define regional economic resilience as the capacity of a local economy to withstand shocks or hardships of the more global market, economy, or the environment. Just one possible feature of a structure that is thus resilient, density is also often used to measure the overall connectedness of a network (Grunspan et al., 2014). We delve deeper into the concepts of density and cohesiveness of a group in Paper 3, where an algorithm (see **Core-Periphery**) is used to partition farmers/restaurateurs into one of two groups; those that belong to the most connected, cohesive region of the social network (these are said to be core); and those that belong to a group of lesser connected individuals (these are said to be peripheral). Because core members are also reasonably connected to periphery members (Rombach, 2014), core members can reach resources from the periphery or influence behavior in those that would otherwise not be amenable to network interventions.

Social interaction ties or edges: Defined by Tasi and Ghoshal (Chiu, Hsu, & Wang, 2006) as channels of information and resource flow, interactions can be comprised of various types of exchanges including sharing information, transactions where goods are bought and sold, or collaborative efforts such as hosting an event together.   Properties of ties such as frequency (number of interactions between two actors in a certain amount of time) and stability (the length of time a relationship has existed) are examples of properties that were assessed for this dissertation. In Manuscripts 1 and 3, we measure sourcing ties whereby produce flows from one network member to another. In Paper 1 we analyze a group of restaurateurs who source produce directly from farmer, while Paper 3 includes sourcing ties that connect farmers, restaurateurs, and distributors. Paper 2 is concerned with ties or relationships that represent being competitive (i.e. competing for farming resources) or collaborative (i.e. sharing information) and are measured in a sample of restaurateurs who are known locavores. Thus, this dissertation explores the connections between groups of network members *(sourcing ties)* as well as connectedness *(ties of collaboration, such as sharing information on local farm resources, and competition, such as competing for customers)* within the primary focal group, restaurateurs.

Dyad: A pair of network members connected to one another by some tie (See **Social interaction ties or edges)** form a network dyad. This study was concerned with restaurateurs connected to one another through ties of collaboration and competition as well as sourcing ties between farm-restaurateur dyads, including those mediated by a middleperson distributor.

Triad: any set of three nodes that are connected, as in the example of a farmer that has a sourcing tie to a distributor that then has a sourcing tie to a restaurateur (Kadushin, 2012, p.13).

Census: A count of relationships and between individuals in addition to their classifications as dyadic or triadic (dyad and triad census, respectively). Counting the number of dyads and triads in the network is a key step in network descriptives. A count of how many different triads exist in the network is presented in Manuscript 3, where we count and classify the instances where a farmer supplies produce to distributor, who in turn supplies it to a restaurateur.

Core-periphery: Segmentation of individuals in a social network into two partitions: the more interconnected, cohesive "core" and a lesser connected "periphery" (Kadushin, 2012, p.54).

Organizational-Level Measures

This dissertation takes into account actor-level measures of both the individuals consented to the study as well as the organizations, the farms and restaurants, they represent. These include exogenously defined characteristics such as organization age and size. A larger farm may have more capacity for production and greater ability to contract with a restaurateur customer, while smaller restaurants or those with fewer seatings per week may be better equipped to rely on a greater percentage of locally sourced goods. These restauranteurs may need to problem solve—for example, when availability/diversity of goods is not as expected—by changing menus often quickly. A restaurant that has been around for

a long time may have long-standing connections to produce supply channels that make it difficult to adapt to seasonal and variable relationships with small-scale local farmers.

Definitions of Actor-Level Measures

Age of the individual (farmer or restaurateur) is also of interest as a possible predictor of SFSC usage and level of local sourcing.   Martinez et al. (2010) found that farmers who sell directly to consumers like restaurateurs tend to be younger, more educated, and more concerned about the future of local foods in their communities than are those producers who do not form direct relationships with their customers. Other actor-level variables drawn from SNT that are often used to determine which individuals are most influential or which have a structural advantage over others in the network include:

Degree centrality: degree centrality refers to the total number of connections an individual restaurateur or farmer has. We further characterized degree centrality as **outdegree centrality** for farmers, measured by produce ties leaving the farm to restaurateurs and intermediaries, and **indegree centrality**, or produce ties entering a restaurant as restaurateurs choose to source local produce. Degree centrality allowed us to examine the level of equity in network participation (also termed network prominence) between individuals by presenting the degree distributions for farmers and restaurateurs. This helped us to answer questions like: Which farms provide the most produce to locavore restaurants? How many different farms are there from which restaurants source produce?

Betweenness centrality: the degree to which a **node** (here **distributor** nodes) lies

on unique paths between farmers and restaurateurs, acting as a **broker**. If distributors connect farms to restaurants that would otherwise not be connected, they can be interpreted as having high betweenness centrality (Grunspan et al., 2014).

Eigenvector centrality: Eigenvector centrality is a combined measure of each node's degree and the degrees of partner nodes (restaurateurs connected to the restaurateur for which we are calculating centrality). Eigenvector centrality is thus a measure of wider influence over the network and approximates the notion of being connected to popular actors.

Closeness centrality: Closeness centrality refers to the quality of being positioned close to others in the network, with lower closeness scores indicating enhanced ability to transmit information or other social capital through the network in fewer steps. We use a normalized version available in Gephi and other social network analysis software platforms that provide a value where higher scores indicate greater centrality, or a member being within reach of others within the network (Robbins 2015, p.183).

Core: The quality of being positioned in the network's more densely connected region, or its "core" partition (Kadushin, 2012, p.54).

Peripheral: The quality of being positioned in the networks less densely connected "periphery" region, where members are not connected to one another but may be connected to members of the core (Kadushin, 2012, p.55).

Assessing the distributions of these network characteristics is a key step in network descriptives. Combined, the actor-level and network-level indicators represent the social structure and behavior of the LFSN.

Public Health Significance

Sociologists refer to "third place" as a social setting separate from the two common adult settings of home (*first place*) and office or workplace (*second place)*. Third places are historically associated with sense of community, civic engagement, and community building activities (Jeffres, Bracken, Jian, & Casey, 2009). Restaurants, with their propensity to be gathering places for people, in addition to ideas, goods, and conversation, are a prime and virtually universal example of "third place." Over the past year, for the first time in recorded history, Americans spent more at bars, restaurants, and other eateries ($54.9 billion) than on groceries ($52.5 billion). In 2012, food away from home, including eating out at restaurants, comprised almost 50% of total food expenditure for the average household, compared to 25.9% in 1970 (USDA, 2018).

The number of calories Americans consume away from home increased from 18% in 1978 to 32% in 2008 (Wilde, 2013, p.74). These trends can be explained in part by an upward trend in mean income, accompanied by more discretionary income for dining out and an increased value of saving time in food preparation and cleanup (Wilde, 2013, p.105). Furthermore, with fewer people in the average U.S. household, dining out at restaurants has become more desirable. This is especially the case for women who have increased their participation in the labor force and drastically decreased time spent cooking at home (Wilde, 2013, p.105).

Previous studies have taken the stance that restaurant calories are higher in cholesterol, saturated fat, and sodium (Stewart, 2011). Thus, prior interventions have focused on decreasing restaurant outings or changing point of purchase (POP) behavior for

restaurant patrons (Krishnan et al., 2010). In fact, eating habit questionnaires include items that ask about "eating out" as a proxy for poor eating (Segal-Isaacson, Wylie-Rosett, & Gans, 2004). While it is not always the case that dining out equates to poor dietary choices, if prevalence of eating out continues to increase, public health programming should be designed to positively change restaurateur behavior, not just the behavior of restaurant-goers, in order to effect systemic change and lift some of the burden of change from the end-consumer. This would be especially powerful in situations where restaurant goers are resistant to making changes in choices or are not yet contemplating the need to do so.

Less than 30 community-based restaurant interventions have been conducted in the United States for the purpose of increasing healthy eating in the environmental setting that is the restaurant. Investigators have utilized strategies like provision of point-of-purchase information (POP), where menu options that were healthier were highlighted; promotions and communication, and use of print or other media on banners, tables, etc. to showcase healthier choices; and rarely, actually modifying the menus to add healthy options (Espino et al., 2015). Studies designed for the restaurant setting have had highly specific targets, such as calorie labeling, to change consumer behavior that would likely trickle up to the restaurateur. The 2010 Affordable Care Act mandated that chain restaurants with 20 or more locations post calorie information on all menus by May of 2018 (Federal register. 2014;79:71155). In a systematic review of the eighteen restaurant-based intervention studies deployed to assess the impact of calorie labeling, none of the eighteen used questionnaires or interviews to further assess the influence of the restaurateur's behavior and personal characteristics on the success of the initiatives. Rather, all evaluated change in customer behavior based on labeling in the restaurant (Bleich, 2017). The under-exploration of

restaurants as behavior change settings, and restaurateurs as agents of change, has led to a great paucity of information with which these settings can be fostered as places for personal and public health promotion.

The network framework was used to understand restaurateur sourcing of local produce because individual restaurateur behavior is embedded within a social system, and thus is only amenable to change when considering both the individual social actors, here restaurateurs, farmers, and *middleperson* distributors, and how they are connected within a network. In order to develop and implement interventions targeting the relationships associated with local produce sourcing, researchers need to understand how individual-level and network-level characteristics can influence said change.

A burgeoning body of literature demonstrates how participating in local food systems provides opportunities for engaging in food procurement as well as avenues for building capacity to build trust, sense of community, and to promote social connections between food system players (WHO, 1986).   Use of social network data to understand how to influence or change behavior in order to achieve a community-level outcome is an increasingly recognized avenue of social network theory-based studies. Armed with this dissertation's findings, initiatives designed to facilitate local produce sourcing can specifically target social processes that lay on the causal pathway to behavior. For example, the dissertation's studies identify which restaurateurs and farmers are most influential within the network. These restaurateurs and farmers can be recruited for community-based participatory research aimed to diffuse local sourcing behaviors throughout the greater community.   Interventions can be designed within groups, for example for the purpose of increasing collaboration by sharing information about resources, with other restaurateurs. Interventions can also be designed

with the goal of increasing partnerships between farmers, restaurateurs, and even middlepersons. The outcome of such programs would be a widening of the network boundary as more farmers and restaurateurs are added to the LFSN.

As this dissertation culminates in an analysis of what network structure features predict failure versus success of collective action, interventions targeted at changing the current relationships can target "weak spots" so as to maximize the success of collective action. For example, initiatives should be designed to educate the community about possible sources of farm goods and how to build relationships with network members to better access and utilize local foods, contributing to the economic vitality of community farmers and locavore restaurateurs, and ultimately countering the negative repercussions of industrialized food practices .

Objectives such as these beg follow-up questions: Will changing network structure increase local produce sourcing?; Will increases in local produce sourcing benefit social actors involved? In the context of the local food community, the social network methods employed here pave a path for an informative and in-depth analysis that would not be possible without such a systems-oriented approach. As the ultimate intent is to implement programs to help with relationship building and local sourcing goals of the community, the social network perspective provides a way to not only design, but also to monitor and evaluate the effectiveness of such programs (Valente, 2010).

The current study contends that individual actor attributes combine with social structure to determine the success of the LFSN, with far-reaching implications for how restaurateurs can be treated as gatekeepers for positive change. This is the first series of

locavore restaurateur studies utilizing the framework of social network theory, laying the groundwork for future research.

Focus on Produce

The focus on produce in this dissertation is a choice informed by the public health significance of a diet predominantly based on fruits and vegetables. Specifically, the 2015-2020 U.S. Dietary Guidelines for Americans recommend an intake of 2 1⁄2 cups of vegetables and 2 cups of fruits per day (DeSalvo, Olson, & Casavle, 2016). It is also a socially and ecologically charged point of emphasis; seasonality is primarily a concern for fruits and vegetables as they require specific climate, time to grow, and labor to be harvested. Fruit and vegetable farmers receive almost none of the subsidy payments made to U.S. farms by the government, though the fruit and vegetable industry accounts for almost 25% of the value added in U.S. agriculture (Wilde, 2013, p.32). Fruits and vegetables epitomize the features of local as bound to time and place. Unlike the less perishable grains and oilseeds, for which one could make the case that regional specialization and long-distance distribution is an efficient choice, fruits and vegetables contain a significant amount of water weight and lose their nutrient quality over a matter of hours let alone days (Wilde, 2013). This makes transportation more costly and highlights the favorability of short-distance sourcing. Biologists have studied the problem of nutrient degradation with the concept of post-harvest heath, measuring change in as short as four hour intervals in nutrients like the anti-carcinogenic and anti-microbial glucosinolate in supermarket sourced cabbage. Goodspeed and Braam (2013) found that light training that mimicks the exposure to light prior to harvesting could be used to reduce glucosinolate loss in the specific case of supermarket

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cabbage. Similar light training interventions have been successful in restoring lettuce, spinach, zucchini, sweet potatoes, and carrots, to their pre-harvesting conditions. Perhaps a more far-reaching strategy would be to minimize nutrient degradation by building relationships with area farmers to reduce time and transit needed post harvesting.

Specific Aims and Hypotheses

This dissertation is comprised of three manuscripts, each contributing to the overall goal of this project: to understand the determinants and features of restaurateur sourcing of local produce.

The specific aims and hypotheses are as follows:

Aim 1. To determine if there are differences in terms of sociodemograhics, beliefs, and behaviors between restaurateurs who source produce directly from farmers (SC: Short chain) compared to those who do not (LC: Long Chan).

> Hypothesis 1a. SC restaurateurs will be younger than LC restaurateurs. Younger
>
> restaurateurs will be more future oriented and eager to source directly from farmers
>
> and less constrained by long-standing industrial practices.
>
> Hypothesis 1b. *Job Age*. SC restaurateurs will have less job age than do LC
>
> restaurateurs. Restaurateurs who have been in their current role for longer will tend
>
> to have more solidified relationships and expend less energy on building new
>
> relationships and depend less on SFSC vendors.

Hypothesis 1c. *Food Citizenship* SC restaurateurs will score higher in food citizenship behaviors than LC restaurateurs. Restaurateurs who engage in more food citizenship behaviors (i.e., shop at farmer's markets, participate in community supported agriculture, etc.) will purchase more produce from SFS chains.

Hypothesis 1d. *Future Expectations* SC restaurateurs will score higher in future expectations for sourcing locally when compared to LC restaurateurs.

Hypothesis 1e. *Identification with local food mission* SC restaurateurs will score higher in identification with the local food mission when compared to LC restaurateurs.

Hypothesis 1f. *Trust in farmers*   SC restaurateurs will report more trust in farmers to provide locally sourced produce when compared to LC restaurateurs.

Hypothesis 1g. *Perceived Cost of Communication* SC restaurateurs will score lower in communication as a barrier when compared to LC restaurateurs.

Hypothesis 1h. *Perceived Economic Cost*   SC restaurateurs will score lower in perceived economic cost of working directly with farmers when compared to LC restaurateurs.

Hypothesis 1j: *Restaurant Size* SC restaurants will be smaller than LC restaurants. Restaurants that are smaller in terms of fewer people served per day will be able to better utilize changing farm goods and rely more readily on SFS chains.

Hypothesis 1j: *Restaurant Age* SC restaurant age will be less than LC restaurant age. Restaurants that have been operating for longer are less likely to have evolving menus in order to keep up with seasonality and supply changes.

Hypothesis 1k: *Percentage of Produce from Distributor* SC restaurants will source

less produce via distributors as compared to LC restaurants.   Sourcing produce from

distributors is likely to negatively influence purchasing of produce directly from

farmers.

Aim 2. To evaluate how short food supply chain (SFSC) usage predicts the degree of local

produce sourcing by restaurateurs.

Hypothesis 2a. *Percentage of Produce from Distributor*   Restaurateurs who source

less produce from a distributor (as a function of percentage of total incoming

produce) will report a greater level of local produce sourced. SC restaurateurs have

established connections with local farmers, theoretically leading to less sourcing from

distributors.

Hypothesis 2b. *Number of farms*   The greater the number of farms restaurateurs

source from regularly (monthly or more), the more local produce (by percentage of all

produce) the restaurateur will source.

Hypothesis 2c. *Frequency of produce exchange*   Restaurateurs who report greater

number of monthly produce exchanges (frequency of sourcing ties) will report a

higher level of local produce sourced.

Aim 3. To evaluate how network influence (using network constructs of prominence and

position) based on collaboration and competition amongst restaurateurs predict local produce

sourcing.

Hypothesis 3a. Competition with other restaurateurs in the community will

positively influence local produce sourcing.

Hypothesis 3b. Collaboration with other restaurateurs in the community will positively influence local produce sourcing.

Hypothesis 3c. Greater network influence (measured by prominence and position) in the community of restaurateurs will positively influence local produce sourcing, regardless of collaboration/competitiveness.

Aim 4. To assess the separate and joint effects of competition and collaboration on local produce sourcing by Houston restaurateurs.

Hypothesis 4a. Restaurateurs who are both competitive and collaborative will source more local produce compared to those who are only competitive or only collaborative (measured by network construct of overlap).

Aim 5. To assess whether brokerage of the farm-restaurateur relationship by food distributors positively influences an individualized metric of group cohesion (coreness).

Hypothesis 5a. Farmers and restaurateurs with more direct connections (connections not mediated by a distributor) are more likely to be positioned in the network's more cohesive core rather than its periphery.

Hypothesis 5b. Farmers and restaurateurs with more connections via a distributor in closed triads, where each player is aware of the other, are more likely to be positioned in the network's more cohesive core rather than its periphery.

Hypothesis 5c. Farmers and restaurateurs with more connections via a distributor in open triads, where not all players are aware of the others, are more likely to be positioned in the network's less cohesive periphery rather than its core.

In the first manuscript, we answer the specific research question: How do short food supply chain (SFSC) users compare to those who only use long chains? What are the individual determinants of local sourcing ? We identify differences in sociodemographics, beliefs, and behaviors between restaurateurs who source produce directly from farmers compared to those who do not have direct relationships with local farmers. We also evaluate how direct sourcing from local farmers predicts overall level of local produce sourcing by restaurateurs as compared to sourcing local produce from indirect means, namely food distributors.

In the second manuscript, we continue to explore individual-level determinants of local sourcing but also assess what network-level characteristics predict local sourcing. We utilize constructs from SNT to explore how competition and collaboration among restaurateurs were associated with local produce sourcing. Specifically, we compare indices of restaurateur influence (measured by the social network constructs of prominence and position) based on collaboration and competition and then assessed their joint and separate effects on local produce sourcing using ordinal logistic regression.

The last manuscript examines the role of local food distributors in brokering the relationships between farmers and restaurateurs. The specific research question addressed is how does participating in brokered relationships influence group cohesion and collective action of the network? Specifically, we look at how having relationships with distributors influenced the interconnectedness of farm/restaurant network members as measured by core/periphery modeling.

Title of Journal Article: Identifying Predictors of Houston Restaurateur Participation in Short Food Supply Chains (SFSC) and Level of Local Produce Sourcing
Proposed Journal: Agriculture and Human Values

Abstract

Background. Geographic localization of food production and consumption has been associated with reduced nutrient degradation between harvesting and consumption, a lower environmental impact of both growing and transporting goods, and last but not least the potential to vitalize local economies through direct transactional exchanges with local farmers (Christensen & O'Sulivan, 2015). Sourcing directly from local farmers shortens the supply chain, providing an alternative to the longer chains that more prominently characterize a globalized food system. Short food supply chains (SFSC) encompass a range of configurations whereby food producers and consumers are connected by a short distance and by few (or no) intermediaries, such as food distributors. The current paper explores direct produce sourcing in the context of the *locavore* movement among Houston restaurateurs, where users of SFSC chains are classified as short chain (SC) restaurateurs. Very few researchers have attempted to identify what determines SFSC usage among restauranteurs. The purpose of this study is twofold: 1) to identify the factors that influence restaurateurs to source local produce via SFSCs rather than the conventional long food supply chains (LC restaurateurs) and 2) explain the impact of SFSC use on local produce sourcing.

Methods. Quantitative data was obtained through questionnaires designed for the study and administered by the researcher using the framework of egocentric network analysis. Information was collected from restaurateurs (n=47) about the absence or presence of sourcing relationships from all possible farmers, in addition to both restaurant and restaurateur demographics, general produce sourcing patterns, and the following independent variables: food citizenship behaviors; future expectations to source locally; identification with the local food movement; trust in farmers; perceived cost of communication; and the perceived economic cost of sourcing locally. To explain the impact of SFSC use, we looked at two proxy variables related to SFSC use - the number of farm sources of produce and the frequency of local produce exchanges, in addition to the percentage of produce sourced from a distributor. Data were analyzed using regression models in STATA.

Results. Thirty (64%) restaurateurs were SFSC users and thus fell in to the SC group. Most restaurants fell into the smaller size categories, except for the large number of SC restaurants that served between 101 and 200 people per day (26% of the sample). The majority of respondents were male (72%). Restaurants in both supply chain categories utilized distributors specializing in local foods, 41% in the long chain (LC) group and 43% in the SC group. Six (20%) restaurateurs fell into the 1-25% local sourcing category, 13 (43%) reported sourcing 26-50% locally, and 11 (37%) sourced more than 50% local produce. Future expectations, or the intent to engage in the local food community, predicted SFSC usage but was negatively associated with the level of local produce sourced (OR=0.07, 95% CI 0.006 - 0.643). Meanwhile, identification with local was positively associated with level of local sourcing (OR=2.63, 95% CI 1.06, 6.49).   As hypothesized, users of SFSCs exhibit more food citizenship behaviors, endorse greater identification with the local food

movement, and perceive that the economic costs do not overwhelm the benefits and feasibility of working with farmers. They also source significantly less produce from distributors. Among SC restaurateurs, identification with local is statistically associated with level of local sourcing (OR=2.62, 95% CI: 0.1.063, 6.486), while future expectations is a negative predictor of level of local sourcing (OR=0.07, 95% CI:0.007, 0.643). The measures related to SFSC use, number of farms and frequency of produce exchange, did not impact the level of local sourcing.

Conclusion. Restaurateur profiles need to be better understood if short food supply chains (SFSC) are to be promoted as a way to increase local produce sourcing. For restaurateurs who do not use SFSCs, interventions can be designed around food citizenship behaviors and education on the benefits of the local food movement. Educational initiatives may be used to weigh such benefits against perceived and real costs of local food sourcing. Because there was a statistically significant difference in use of distributors to source produce between SC and LC restaurateurs, but not within SC restaurateurs across levels of produce sourcing, future research is needed to determine the role food distributors play in the sourcing of local produce specifically.

"Fresh produce was about to be reborn as the symbol of a far-reaching food revolution…a fundamental shift in the way Americans think about what they eat…Small, labor-intensive farms, long the victims of an economic structure designed to benefit the gigantic factory farms of American corporate agriculture, have gained a crucial support system." – Laura Shapiro (Perfection Salad, 1986, PP. 228-229)

Background

Industrialization of food has been associated with a great loss of biodiversity, environmental pollution, erosion, and over-consumption of fossil fuels (Cannella, 2014) and numerous intermediaries, including storage facilities and retail outlets, along the supply chain from production to consumption (Christensen & O'Sulivan, 2015). Conversely, local food systems are geographically localized, with consequently shorter distances between food production (i.e., a farm or ranch) and consumption (Canella, 2014). Geographic localization has been associated with reduced nutrient degradation between harvesting and consumption, a lower environmental impact of both cultivating and transporting goods, and last but not least, the potential to vitalize local economies through transactional exchanges with producers, namely local farmers (Canella, 2014).

In 2007, the term *locavore* first appeared in the Oxford dictionary (Shin, 2005) to describe one who consumes locally sourced goods such as those provided by local farmers. While Federal law defines local as within 400 miles (Congress, 2008) definitions of local vary among organizations, as well as retailers. Farmers' Markets, municipally supported communal spaces where farmers are allowed to sell their goods, usually for a fee, apply different standards as appropriate for their geographic location. While difficult to uniformly define, what constitutes local is clearly in stark contrast from the global industrial food system and its wide geographic reach. Because the farmers' markets in Houston in which this study is set adhere to a definition of 150 miles, the current study will adopt this geographic parameter to define local.

This study is intended to add to the paucity of literature concerning the role of a specific group of locavores, locavore restaurateurs. This study positions restaurateurs as **gatekeepers**, who act within a social system to make decisions that affect how, in this case food, gets from whom to whom (Lewin, 1943). Social psychologist Kurt Lewin first introduced the concept of gatekeeping in a study of Midwestern housewives and their ability to change their families' food consumption habits during World War II (Lewin, 1943). Lewin concluded: "food does not move by its own impetus. Entering or not entering a channel and moving from one section of a channel to another is affected by a 'gatekeeper.'" Important implications of Lewin's work included the realization that not all members of a household have equal weight in making decisions. While the theoretical concept of gatekeeping has been applied to many social issues such as control of information by Big Media, examples of its appropriate use within the food context from which it came are nowhere to be found. Few investigative works have framed restaurateurs themselves as conduits for health behavior change, despite the need to regard restaurants as a viable intervention setting and those who run them as important and often forgotten informants for social and personal behavior. The current project re-introduces this vital construct from sociology in order to understand local food sourcing in this setting, beginning with the locavore restaurateur.

In a study of locavore chefs in Canada, Nelson (2017) found that locavore restaurateurs were likely to participate in causes such as community education and wanted to support their local economies by recruiting local farmers for produce sourcing. This study is guided by the assumption that this sub-culture of restaurateurs is playing a critical role in addressing the individual and social concerns associated with a global industrialized food

system (Nelson, 2017). It is thus imperative to understand local sourcing decisions among locavore restaurateurs.

Using a Theory of Planned Behavior model, Shin (2014) found that motivation to conform to group norms predicted attitudes antecedent to local food purchasing.   Behavior that corresponds to the values espoused by locavores has been studied under various names, including agrarian, ecological, or food citizenship. Prior work has explored the role of food citizenship in providing solutions to the negative consequences of industrialized agriculture, improving personal self-care (Jarsoz, 2008), and benefiting society as a (Visit Houston, 2019).   In addition to measuring food citizenship behaviors, we assess the intent to act on those behaviors in the future, also informed by Shin's application of TPB (Shin, 2005). While TPB's perceived behavioral control has also been applied to local food purchasing, we merge this construct with perceived barriers based on Shin's findings: Two likely factors that may adversely affect restaurateurs' perceptions of how feasible local sourcing is are: perceived cost of communication (with farmers or other sources) and perceived monetary cost of the local foods. We posit that restaurateurs' sourcing decisions are a medium for expressing values associated with food as well as community. As such, restaurants are places where the relationships between buyers and sellers, whether local or not, both reflect and impact the participants' economic welfare, ecological concerns, and personal values.

Like any socially embedded setting, restaurants reflect the physical, cultural, and political environments in which they are situated. The different sets of values that are shared or not shared among participant groups work their way into everyday behaviors and shape the current food system.   Together, restaurateurs and farmers make up key players in the local food movement. We frame their participation in the movement by collective action, or

the voluntary and intended action of a group trying to benefit from its shared interest to achieve a common goal (Ostrom, 2000), in this case local sourcing by restaurateurs.

We therefore assess the extent to which restaurateurs source farmers directly from local farmers, as these direct relationships, and subsequent lack of intermediaries such as food distributors, are the theoretical hallmark of local sourcing. Because the supply chain from production to consumption is shortened in direct relationships between restaurateurs and farm sources, we refer to the utilization of farm sources without an intermediary as use of short food supply chains (SFSCs).

Short Food Supply Chains

SFSCs encompass a range of configurations whereby food producers and consumers are connected by a short distance and by few (or no) intermediaries, such as food distributors or wholesale marketplaces. The current paper examines the case of directly sourcing produce from geographically localized farms as encouraged by the locavore movement that has found considerable elective participation by some Houston restaurateurs. SFSCs theoretically lead to greater returns for farmers and less mark-ups for consumers (Martinez et al., 2010).

Very few researchers have attempted to identify what determines SFSC usage by both restaurateurs as consumers and farmers as producers. SFSC is one possible example of individuals united by collective action- with great potential to influence local food sourcing (and production) under the shared mission of increasing local foods in their community. The paper's analyses present SFSC usage as the first dependent variable and one that is antecedent to the ultimate dependent variable: level of local food sourcing. The purpose of

this study is thus twofold: 1) to identify the factors that influence restaurateurs to source local produce via SFSCs and 2) explain the impact of SFSC use on local produce sourcing.

Methods
Design Overview

The cross-sectional study was conducted in Houston, Texas. The study questionnaire was administered to restauranteurs by the researcher to collect information about the absence or presence of local sourcing relationships from all possible farmers. Sourcing relationships were the primary unit of analysis and were classified as direct if they existed only between a farm and restaurateur pair and indirect if produce was not sourced from a direct farm connection (i.e., via a distributor). We classified restaurants as using SC (short chain) if they regularly source produce, defined as monthly or more, from one or more farms within 150 miles of Houston. If they did not meet these criteria they fell into the LC (long chain) category. For the subset of SC restaurateurs, we evaluated the impact of SFSC use on level of local sourcing.

Sampling

Purposive sampling methods conducted prior to recruitment sampled a population of potentially eligible restaurateurs in Houston. Contrary to probability sampling, in which the investigator begins with the total population and then subdivides it into smaller, variably representative, groups based on accessible data, this non-probability sampling method does not result in a sample but rather constructs a population (Suri, 2011). Every attempt was made to identify the *total* population of eligible participants, here restaurateurs who identify as participants in a local food movement.

We created an initial sampling frame by compiling publicly available lists of locavore restaurants and the farms that source produce to them so that respondents could reference the list of local farms during the interviews. The initial screening sources for the restaurants included known websites such as *GoTexan.org, Local Local*, a registry for locally sourcing restaurants and their vendors, *local harvest.org*, Yelp pages, and individual Farmer's Market websites from Houston and its surrounding suburban areas. Selecting eligible participants required eligibility screening at both the organizational (restaurant) level and the individual participant level. The restaurants had to meet the following inclusion criteria: statement of local food sourcing on either web, print, or in-house media; physical address in Houston, Texas; establishment lifespan of six months or more; and an available respondent with authority over purchasing or sourcing decisions who has held this post for six or more months, executes the orders themselves or who was responsible for delegating this to others. Because of the difference in networking needs and behaviors of restaurants who source local only from their own gardens, these restaurateurs were excluded even though by a strict definition they are locally sourced. A local restaurateur and farmer were each interviewed and helped to edit the final lists of potential restaurants and possible farm sources prior to commencing recruitment.

While sampling frames included a farm population and a restaurant population, the farmers were not interviewed for the current study. Rather, the list of eligible farms, including 76 identified area farms that were currently active or had been in the past year, was used in the interview to generate the set of response options. Inclusion criteria for the farms included: a physical address within 150 miles of the city of Houston, Texas; establishment lifespan of six months or more and had to produce fruits and/or vegetables.

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Screening

Selecting eligible participants required eligibility screening at both the organizational (restaurant) level and the individual participant level. The restaurants had to meet the following inclusion criteria: statement of local food sourcing on either web, print, or in-house media; physical address in Houston, Texas; establishment lifespan of six months or more; and an available respondent with authority over sourcing decisions who held this post for six or more months. Because of the difference in networking needs and behaviors of restaurants who source local only from their own gardens, these restaurants were excluded. All potentially eligible study participants (n=74 restaurants) were approached in person or over the phone and asked to undergo additional screening to ensure eligibility. In-person meetings were scheduled for formal screening and consenting. The final sample consisted of N=47 restaurateurs.

Instrumentation and Data Collection

The questionnaire developed for the study collected data from restaurateurs about the absence or presence of sourcing relationships from all possible farmers, within the local food community: Produce originated either from farms located within 150 miles of Houston from distributors who themselves sourced from those farms. The sampling frame list of farmers was used to aid restaurateurs as they answered questions about whether or not they sourced produce from each of the farmers.

The questionnaire also collected both restaurant and restaurateur demographics, general produce sourcing patterns, as well as measuring beliefs related to working with both

farmers and distributors for sourcing locally.   Respondents were not offered incentives to

participate other than a report prepared with non-identifying summary findings of the study.

Permission to conduct the research was obtained from the University of Texas School of

Public Health's Institutional Review Board (**HSC-SPH-17-1034)**.

Measures

The questionnaires assessed SFSC usage, level of local produce sourced from local

farms, and included items measuring behavior and beliefs that are potential determinants of

both SFSC usage and the level of local produce sourcing by Houston restaurateurs. The

potential determinants of SFSC were also compared between SC and LC groups to construct

restaurateur profiles and identify significant differences between restaurateur types. For the

subset of SC restaurateurs, proxy variables that quantify SFSC usage were measured to

explain the impact of SFSC use on level of local sourcing.

Predictors

We created six continuous measure scales to measure the following constructs

hypothesized to differentiate SC from LC users and to predict SFSC use:

Food citizenship is a set of behaviors enacted by consumers that reflect their commitment to

public and person health (Shifen et al., 2017)and is operationalized in this study as the

behavioral engagement in the local food community as measured by shopping at farmers'

markets; hosting educational workshops; and having a CSA share for personal or restaurant

use. *Future expectations* was defined as the intent to engage in the local food community,

whereby respondents indicated they were planning on enacting the food citizenship behaviors

measured and likewise included measures for plans to shop at a farmers' market, host

educational workshops, and purchase a CSA share for either personal or restaurant use. We assessed *motivation/identification with the local food movement* with six different items designed to measure how compelled the respondent is to be active in the local food community and alignment with local produce sourcing goals. For example, respondents rated their level of agreement with the statement "Working with local farmers builds my sense of community. It is a goal of mine to work with local farmers." *Trust in farmers* was measured by a single item where respondents rated their level of agreement with the statement: "I trust local famers to work with me." We measured two hypothesized barriers to local sourcing; perceived cost of communication and perceived economic cost.   The scales are summarized in Table 1.1.

While these determinants contribute to the understanding of locavore behaviors on an individual level, the actual relationships between restaurateurs and farmers are also critical units of analysis.   As respondents provided the names of all regular farm sources, the *number of farms* restaurateurs source from directly were tabulated and retained as a continuous variable.   For each nominated farm source, respondents were asked to write in a frequency (times per month). These responses were then abstracted and summed to represent the continuous variable *total frequency* of monthly produce exchanges from local farms.

Outcomes

SFSC usage was a dichotomous outcome variable measured by self-report of restaurateurs about their sourcing practices. The SC designation was assigned to restaurateurs who sourced produce once a month or more from at least one local farm. Otherwise, they were classified as LC.

Level of local food sourcing was measured via self-report by a question asking how much of the produce served at the restaurant was locally sourced. Response options were ordinal (0%, 1-24%, 25-50%, 51-75%, and More than 75%). Due to the small number of restaurateurs in the "more than 75%" category, it was collapsed with the "51-75" category to create a new category for "More than 50%."

We assessed percentage of produce sourced via a distributor with sliding scale items in the assessment, where respondents could indicate an approximate percentage along a continuum from 0 to 100%. Specifically, separate slider scales measured percentage of *local produce* via distributors, and percentage of *non-local produce* via distributors. The resulting sum of these two items rendered the value for the *percentage of produce via distributor* continuous variable

Covariates

The questionnaire collected basic demographics, including gender (male or female), restaurateur age, and length of time in months the respondent was employed in his current role. There were two categorical restaurant-level demographic variables: Restaurant size, measured in seatings per day, with possible response options of "under 50;"" between 50-100;" "between 101-200," and "Over 200; " and restaurant age, with possible response categories: less than 1 year, between 1 and 4 years, between 5 and 9 years, and 10 or more years. The measures of interest in constructing restaurateur profiles included restaurant age and size, and restaurateur age, in addition to the percentage of produce sourced from distributors. The determinants of SFSC usage described above (perceived economic cost of local produce, food citizenship behaviors, future expectations, motivation/identification with

the local food movement, trust in local farmers, and perceived cost of communication) are included as possible covariates for the local sourcing outcome.

Statistical Analysis

Descriptive analysis addressed sociodemographic characteristics and differences across SFSC usage groups. Restaurateur profiles were constructed by non-parametric rank sum tests (Kruskal-Wallis) of continuous measures and Fisher's exact tests for categorical variables. In order to confirm correlations and assess the independent effects of predictor variables, a binary logistic regression model of SFSC usage, our first dependent variable, followed the non-parametric tests of difference.

For the subset of SFSC users we then used the number of farms and frequency independent variables to evaluate the influence of SFSC use on level of local produce sourcing, our second dependent variable, with ordinal logistic regression. The assumption of proportional odds was not violated, as confirmed by the omodel test.

All analyses were conducted using STATA 14.1 at a significance level of 0.05 (College Station, Texas).

Results
The Participants

The original sampling frame included 74 potential restaurateurs. Of those, nineteen were ineligible: Four of them did not claim to source local foods of any kind and thus did not identify as locavore; eleven restaurants did not have someone on site who had the authority to make decisions regarding form where to source foods; and four restaurants had available respondents with sourcing authority who were in this role for less than six months.

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Eight restaurateurs refused to participate. Out of 47 consented restaurateurs, 30 of them met the criteria for SFSC usage and were classified as SC, while 17 fell into the LC category. Most of the 47 restaurants fell into the smaller size categories, except for the large number of SC restaurants that served between 101 and 200 people per day (26% of the sample). The majority of restaurateurs were male (72%).

Out of the list of 76 farms, restaurateurs identified 16 farms from which they sourced local produce. Farm characteristics such as size, distance from Houston, and growing practices, are detailed in Table 1.2. Importantly, restaurants in both supply chain categories utilized distributors specializing in local foods, 41% in the LC group and 43% in the SC group. There were a total of four identified local-food specialty distributors; 2 used by 1 restaurateur each; 1 used by 8, and another used by 14 restaurateurs. Because of such distributor relationships, both groups also exhibited some local food sourcing, though much less so in the LC group; 25% compared to 100% in the SC group (p<.0001).

Constructing Restaurateur Profiles

As hypothesized, users of SFSCs had significantly higher food citizenship scores, endorsed significantly greater motivation/identification with the local food movement, perceived the economic costs do not overwhelm the benefits and feasibility of working with farmers, and used significantly less produce sourced from distributors as a percentage of their total produce inputs. There were no significant differences between groups on restaurateur age, job age, trust in farmers, or cost of communication.

Predicting SFSC usage

Future expectations and the percentage of produce from distributors were both estimated to be perfect predictors of SFSC usage and therefore left out of the final model. Trust in farmers had to be removed from the model due to multicollinearity, leading to failure of the model estimations. The overall model with remaining predictors (Table 1.5), was significant ($p<0.001$), and confirmed observed associations between SFSC usage and perceived economic cost (OR=9.64, 95% CI: 2.01, 46.06), and SFSC usage and food citizenship (OR=3.39, 95% CI: 1.00, 11.41)

Predicting local produce sourcing

Results of the descriptive analyses in the subset of restaurateurs classified as SC in are presented in Tables 1.6 and 1.7. The overall model using ordinal logistic regression was statistically significant ($p<0.0001$). SFSC usage, number of farms sourced from and the frequency of produce exchanges did not significantly predict level of local sourcing. Motivation/Identification with local was statistically associated with level of local sourcing (OR=2.62, 95% CI: 0.1.063, 6.486), while future expectations was a negative predictor of level of local sourcing (OR=0.07, 95% CI:0.007, 0.643). The predictors that were significant for SFSC usage (perceived economic cost and food citizenship), in addition to cost of communication and trust in farmers, were not associated with level of local sourcing

Discussion

Constructing restaurateur profiles

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In this study, we identified factors that may typify restaurateurs into one of two categories: short food supply chain users (SC) and long chain users (LC). The restaurateur profiles provide an initial understanding of how to tailor interventions to increase use of SFSCs and locally sourced produce. For restaurateurs who do not use SFSCs, interventions can be designed around food citizenship behaviors and education on the benefits of the local food movement. Educational initiatives may be used to weigh such benefits against perceived and real costs of local food sourcing. Because there was a statistically significant difference in use of distributors to source produce between SC and LC restaurateurs, but not within SC restaurateurs across levels of produce sourcing, future research is needed to determine the role food distributors play in the sourcing of local produce specifically. As SC users source local produce to varied degrees, we sought to identify determinants of level of local produce sourcing in this subset of restaurateurs. Results of both sets of analysis provide meaningful insight on how to increase local food sourcing in a community with an established and growing local food movement.

Predicting SFSC usage

As hypothesized, food citizenship behaviors were greater in SC compared to LC restaurateurs. They also self-reported greater motivation and motivation/identification with the local food movement and perceived the economic costs did not outweigh the benefits. Although the use of distributors specializing in local did not significantly differ between SFSC usage groups, the SC group reported significantly less produce sourced from distributors as a percentage of their total produce inputs. Although statistically different between SC and LC groups, the percentage of produce sourced from distributors did not vary

across groups within the SC group as a function of level of local produce sourced. This is surprising given that 62% and 45% of those that sourced 26-50% and more than 50% of their produce locally, respectively, reported regularly sourcing some produce from distributors specializing in local foods. This implies that produce sourcing via a distributor is an important distinguishing feature of SC versus LC restaurateurs, but does not predict level of local produce sourcing for the group of SC restaurateurs. While this study was focused on direct sourcing, future research should explore the impact of distributors on increasing local produce sourcing via indirect supply channels.

Predicting local produce sourcing

While predictive of SFSC usage, perceived economic cost and food citizenship did not predict level of local sourcing. Future expectations for local had significant associations with both outcomes, but in opposite directions: As hypothesized, future expectations was a positive predictor of SFSC usage. Contrary to our hypothesis, future expectations negatively predicted level of local sourcing. It may be that the restaurateurs who felt they had little room for improvement and were doing everything they could to source locally would exhibit lower future expectations scores. Thus an overall negative association with level of local sourcing is indicative of an upper threshold of progress: Restaurateurs who fall in the middle to low end of local sourcing may be those most eager to increase local sourcing.

While perceived economic cost has been cited as a deterrent to local food sourcing (Shin 2014), the results are telling in that within SC group, perceived economic cost is not a significant predictor of the amount of local produce sourced. This suggests that once a restaurateur decides to source locally, perceived cost barriers previously important no longer

hold true. Future work should look at whether this has to do with cost-saving strategies of locavore restaurateurs or a misperception of local produce costs.

Because of null findings in ordinal logistic regression with respect to restaurateur age, jog age, trust in farmers, and communication as a barrier, we could not confirm our remaining hypotheses about SFSC usage. Future research should explore whether or not these differences exist in larger populations of restaurateurs. In a surprising null finding, the number of farms sourced from and the frequency of produce exchanges, did not significantly predict level of local sourcing. It may be that established connections with fewer farmers is more predictive of how feasible it is for a restaurateur to source local produce, or that distributors or well versed restaurateurs maximize efficiency by reducing the number of deliveries from local farms. More studies need to look at the role of both farmers and restaurateurs and their various interactions in order to more comprehensively understand the local food social network and how it works along both SFSCs as well as longer food supply chains such as that created by the introduction of intermediaries (e.g. distributors).

Limitations and future directions

This study had several limitations. The sample size, though reflective of the relatively small locavore community of restaurateurs within Houston, was small and limited our statistical power. Having a control group of non-locavore restaurateurs may better inform researchers in designing restaurateur-facing interventions. Although we conceptualize SFSC usage as a dichotomous variable, it is not a discrete measure as LC users are also sometimes users of SFSCs, and SC users also use long chain supply channels such as distributors. Dichotomizing SFSC usage may have led to a loss of information that can be explored with

continuous measures of SFSC usage in future studies. There are also lesser utilized, but still important, sources of local produce left out of the current study that merit future exploration, including wholesale marketplace and grocery stores.   Although informed by prior literature and behavioral theory, the items used to measure the determinants of behavior did not come from validated metrics and exhibited low, though not unacceptable, internal consistency as measured by Cronbach's alpha (See Table 1.1). This may have been another artifact of small sample size. Validating instruments for this under-studied population can provide critical information that can be used in future studies for understanding restaurateur behavior and evaluating interventions designed to change it.

Conducting in-person interviews across Houston restaurants revealed that quite disparate roles were charged with sourcing decisions across restaurants. In some, sourcing was handled by roles likely to be influenced by food quality, taste, and search of novel ingredients (i.e.. sous chefs, executive chefs), while others prioritized monetary cost and logistics (i.e., front of house management, kitchen management). One respondent held the job aptly named "procurement manager."   Most restaurants did not recognize sourcing as an entire job in itself, however, and finding the best-fitting respondent at each restaurant was a challenge. In many of the interviews, respondents enlisted the help of others at the restaurant to provide us with accurate responses. These findings contribute to an understanding of sourcing behavior and even suggest a whole avenue for future research needed to determine what features of sourcing roles are most conducive to reaching sourcing goals. Though the study was designed so that findings would useful to other locavore communities, external validity in terms of restaurateurs in general is low. This population of restaurateurs does not provide a representative sample of Houston restaurateurs or restaurants in Houston. While

there are over 10,000 restaurants in Houston, at most 55 restaurants could be considered eligible for this study at the time it was conducted (Visit Houston, 2019). Rather than representing the over 70 cuisine types, this population spanned 10, five of which could be classified as American (New American, Southern, Seafood, Cajun, and Traditional American). Locavore restaurants were located in twelve of the 178 zipcodes across Houston.

As we included only restaurateurs who identified with the local movement, the differences between groups and across levels of local sourcing are likely to be much smaller than in the larger population of restaurateurs. However, this population was of interest to study for that very reason, as they were likely to have formed opinions and beliefs about local sourcing.   Having self-identified with the locavore movement, this sample of restaurateurs are likely to be informed about the agricultural resources available to them. However, it also became clear during the assessments that knowledge of local farms was low even amongst restaurateurs who professed locavore advocacy. One participant shared, "*This study makes me realize the difference between what we say we do and what we actually do. I see local sourcing as a challenge and one we can be doing much better at.*"   More research is needed to compare perceived and actual availability of resources and to educate communities on the farm resources available to them.   Another major limitation is the exclusion of restaurants that did not have an individual on site who had decision making authority over sourcing. This eliminated several full-service restaurant chains that actually have implemented local sourcing strategies. With restaurant chains on the rise, many have favored purchasing homogenous inputs form large supplier organizations rather than from farm sources (Wilde, 2013). With an increasing presence across the country, the sub-set of

chains that have found alternative strategies are an important target for subsequent research as they may guide others towards improvements in sourcing.

The findings of this study urge us to proceed beyond understanding individual restaurateur behavior, setting the scene for further analyses of the network's social processes. Specifically, what farmers sell to which restaurateurs and why? Other social processes such as collaboration (i.e., sharing information), competition, friendship ties, etc. may explain how resources, both tangible and not, are distributed amongst the restaurateurs in a community's local food network.

Conclusions

The results of the SFSC usage model provide insights as to what characterizes restaurateurs who choose short food supply chains, providing guidance on how to design interventions for those who have yet to source local produce from area farmers. Namely, restaurateurs who do not use SFSCs practice fewer food citizenship behaviors, report higher perceived costs of local sourcing, and rely more on distributors for sourcing produce. Although there are distinguishing features for restaurateurs in the subset of SC users, the same characteristics have different associations with the actual level of local produce sourcing. Restaurateurs who source the most local produce are those that most identify with the local food movement. Further research is needed to explore ways to increase identification among restaurateurs with the local food movement, in particular, education about the benefits of local sourcing and how to use community venues, such as farmers markets, to build direct relationships with farmers.

Table 1.1. Operational and conceptual definitions of scales with example items

Operational definition of measure	Conceptual definition of measure	Number of Items (Cronbach's apha)	Example Items	Response options (Scoring)
Food citizenship [a]	Behavioral engagement in the local food community	4 (0.58)	Do you shop at a farmer's market once a month or more? (yes, occasionally, in the past, in the future, no)	Yes (1); Occasionally (0); In the past (0); in the future (0); No (0)
Future expectations [a]	Planning on becoming more engaged in food citizenship behaviors	4 (0.56)	Will you host educational workshops at your restaurant in the future?	Yes (1); No (0)
Motivation/Identification with local food movement [a]	Feeling compelled to be active in the local food community	6 (0.61)	Working with local farmers builds my sense of community. It is a goal of mine to work with local farmers.	Strongly Agree (2); Agree (1); Not Sure (0); Disagree (0); Strongly Disagree (0)[b]
Trust in farmers	Trust in farmers to support sourcing goals	1	I trust local farmers to work with me.	Strongly Agree (2); Agree (1); Not Sure (0); Disagree (0); Strongly Disagree (0)[b]
Perceived cost of communication	Communication as a perceived barrier	1	The amount of communication needed to work with farmers is too challenging. (strongly disagree, disagree, not sure, agree, strongly agree)	Strongly Agree (0); Agree (0); Not Sure (0); Disagree (1); Strongly Disagree (2)[b]
Perceived economic cost[a]	Monetary cost as a perceived barrier	1	It is too expensive to source local produce	Strongly Agree (-2); Agree (-1); Not Sure (0); Disagree (1); Strongly Disagree (2)[b]

Notes: [a] Denotes more than one item was used, in which case scale scores were computed by summing all items for the measure. [b] Due to no responses, categories were collapsed.

Table 1.2. Characteristics of farmers connected to Houston locavore restaurateurs, N=16

Age of farmer (years)	Age of farm (years)	Size (acres)	Growing practices [a]	Distance from Houston (miles)
70	10 or more	70	Certified organic	66
55	10 or more	100	Conventional	31
56	10 or more	100	Certified organic	78
31	1-4	1.25	Organic	0
70	10 or more	22	Conventional	26
30	10 or more	500	Certified organic	64
	10 or more	170	Organic	63
48	10 or more	180	Certified organic	148
	10 or more		Conventional	139
45	10 or more	27	Organic	114
66	10 or more	21	Organic	60
32	1-4	288	Sustainable	32
28	5-9	3	Sustainable	0
30	1-4	0.25	Sustainable	42
60	10 or more	162	Sustainable	55
47	10 or more	10	Sustainable	50

Note: [a] Growing practices were self-reported designations by farmers

Table 1.3. Descriptive statistics for categorical variables for all restaurateurs, N=47

Variable	LC	SC	*p-value*
N	17	30	
Restaurant size (seatings per day)			0.6821
Under 50	2	1	
50-100	1	3	
101-200	4	12	
Over 200	10	14	
Restaurant age (years)			0.3582
Less than 1	2	1	
1-4	7	9	
5-9	3	11	
10 or more	5	9	
Price			0.9647
$	1	4	
$$	13	19	
$$$	3	7	
Gender			0.2314
Female	7	6	
Male	10	24	
Number of distributors specializing in local			0.9592
0	10	17	
1	6	12	
2	1	1	

Table 1.4. Means and standard deviations for continuous measures for all restaurateurs, N=47

Variable	SC	LC	p-value
N	30	17	
	Mean (SD)	Mean (SD)	
Restaurateur (in years)	33.97 (8.29)	37.26 (9.28)	0.1565
Job age (in months)	36.97 (28.79)	46.59	0.2069
Food citizenship	0.97 (0.56)	0.5 (0.82)	**0.0132**
Future Expectations	0.57 (0.77)	0 (0)	**0.0268**
Motivation/identification with local	6.63 (1.56)	5.75 (1.44)	0.0837
Trust in farmers	1.2 (0.41)	1 (0.37)	0.2993
Perceived cost of communication	0.7 (0.47)	0.56 (0.51)	0.4466
Perceived economic cost	-.2 (1.45)	-.8125 (1.33)	0.1234
% Produce from Distributor	50.17 (25.17)	92.81 (10.64)	**0.0001**

Table 1.5. Determinants of SFSC usage in Houston restaurateur sample, N=47

Variable	SFSC Usage***
	Adjusted OR (95% CI)
Food citizenship behaviors	3.39 (1.009, 11.405)*
Motivation/identification with local	1.069 (0.585, 1.596)
Perceived economic cost	1.41 (0.88, 2.82)
Perceived cost of communication	2.791 (0.371, 20.997)
Restaurateur age	0.878 (0.585, 1.956)
Job age	1.01 (0.992, 1.032)
Restaurant size[a]	0.908 (0.268, 4.403)
Ref (Under 200 seatings per day)	--
200 seatings or more per day	0.12 (0.12, 1.23)
Restaurant age[a]	
Ref (4 years or less)	--
5-9 years	0.86 (0.96, 7.581)

10 or more years   0.87 (0.005, 1.617)

Notes: The overall model was significant.; *p<.05, ***p<0.001. [a] Due to small bin sizes, restaurant size and age groups were collapsed into two and three categories, respectively.

Table 1.6. Descriptive statistics for categorical measures for locally sourcing restaurateurs, n=30

Variable	1-25%	26-50%	Over 50%	p-value
N	6	13	11	
Restaurant size (seatings per day)				**0.021**
Under 50	0	1	0	
50-100	1	2	2	
101-200	4	0	6	
Over 200	1	10	3	
Restaurant age (years)				0.069
Less than 1	0	1	0	
1-4	3	1	5	
5-9	3	4	4	
10 or more	0	7	2	
Price				0.140
$	2	0	2	
$$	3	11	5	
$$$	1	2	4	
Gender				0.603
Female	2	3	1	
Male	4	10	10	
Number of distributors specializing in local				**0.043**
0	6	5	6	
1	0	8	4	
2	0	0	1	

Table 1.7. Descriptive statistics for locally sourcing restaurateurs, n=30

Variable	1-25%	25-50%	50-100%	p-value
N	6	13	11	
	Mean (SD)	Mean (SD)	Mean (SD)	
Restaurateur (in years)	29.83 (2.71)	36.08 (11.49)	33.73 (4.63)	0.2030
Job age (in months)	37 (21.27)	38 (31.59)	35.73 (31.26)	0.8536
Food citizenship	0.5 (0.55)	1 (0.41)	1.18 (0.60)	0.05
Future Expectations	1.33 (1.03)	0.46 (0.52)	0.27 (0.65)	0.05
Motivation/identification with local	5.17 (0.41)	6.92 (1.75)	7.09 (1.30)	**0.02**
Trust in farmers	1.67 (0.52)	1.08 (0.28)	1.09 (0.30)	**0.007**
Perceived cost of communication	0.67 (0.52)	0.77 (0.44)	0.64 (0.50)	0.27
Perceived economic cost	-1.17 (1.33)	0.38 (1.19)	-.36 (1.57)	0.08
% Produce from Distributor	69.17 (27.64)	48.85 (19.70)	41.36 (26.18)	0.08
Number of farms	2.5 (1.52)	3.08 (1.26)	3.27 (2.61)	0.67
Frequency of produce exchange (per month) from local farms	6.67 (5.32)	11 (4.10)	11 (9.57)	0.17

Table 1.8. Determinants of local produce sourcing in Houston restaurateur sample, n=30

Variable	Level of local sourcing**
	Adjusted OR (95% CI)
Percentage of produce from distributors	0.99 (0.941, 1.045)
Number of farms	1.68 (0.423, 6.698)
Frequency of produce exchange (per month) from local farms	0.81 (0.547, 1.204)
Food citizenship behaviors	4.56 (0.582, 35.803)
Future expectations	0.07 (0.007, 0.643)*

Motivation/identification with local	2.62 (1.063, 6.486)*
Trust in farmers	0.711 (0.023, 22.051)
Perceived economic cost	1.28 (0.086, 1.89)
Perceived cost of communication	0.742 (0.080, 6.860)

Note: The overall model was significant: *p<.05, **p<.01.

Figure 1.1. Consort diagram of screened and consented restaurateurs
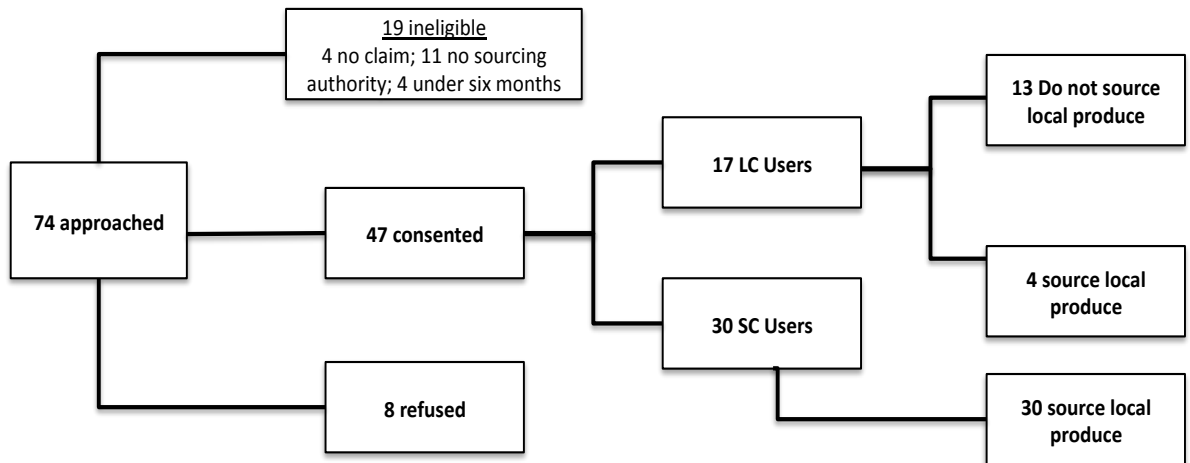
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Title of Journal Article: The Collaborative Edge: Competition and collaboration in local sourcing in Houston's food scene
Proposed Journal: Food, Culture, and Society: An International Journal of Multidisciplinary Research
Abstract

Background. The locavore movement in restaurants across the metropolis of Houston meets the definition of cluster set forth by Piertrobellia and Stevenson (2011), whereby numerous co-located restaurateurs interact in both competitive marketplaces and collaboration in terms of sharing information and resources. Because empirically observed ties (prominence) between restaurateurs enables us to visualize a network, it may be that certain members are at a structural advantage according to "where" in the network they are in relation to all others (position).   Known as measures of prominence and positioning, these social network constructs are conceptually overlapping but computationally distinct (Everett and Borgatti, 2005) .   Thus we utilized measures for both prominence and position in order to understand the patterns of competition and collaboration. The purpose of this study was to explore the competitive and collaborative relationships Houston locavore restaurateurs have with one another and to assess how these relationships predict local produce sourcing.

Methods. Questionnaires were developed for the study and administered by the researcher to collect information from restaurateurs about the absence or presence of competition and collaboration relationships with all other locavore restaurateurs in Houston. Restaurateurs self-reported level of local produce sourcing. Relational data abstracted from the surveys were used to compute measures of prominence (degree centrality) and position (eigenvector,

closeness, and Betweenness centrality) in Gephi, a network visualizing and statistics software, in addition to network descriptives of overall connectedness, including overlap and density. Because position in the restaurateur network was based on both ties of collaboration and competition, network position measures for the entire collaboration-competition network were entered into logistic regression models as independent variables. We utilized separate prominence measures for competition and collaboration in order to determine their independent and joint effects on local produce sourcing.

Results. Most of the N=30 locavore restaurateurs were under 40 years old (89%) and male (76.67%). While over 90% of the restaurants were over a year old, most restaurateurs had been employed in the current sourcing role for under a year (83%). There were 315 ties of competition, and 320 collaboration ties. The mean overlap between competition and collaboration was 36%, where 100% overlap occurred if every collaboration edge co-occurred with a competition edge. Network densities were similar for competition and collaboration networks, 0.315 and 0.316, respectively. Density of the overall competition-collaboration network was 0.73, where the number of reported connections ranged from 0 to 133. There were no associations between prominence or position, collaboration, or competition, and level of local food sourcing. Though there was overlap between competition and collaboration, they were not significantly correlated. Betweenness centralization was significantly higher in the collaboration network than the competition network ($p<0.05$). On the other hand, eigenvector centrality was significantly higher in the competition network ($p<.0001$).

Conclusion. Exploring centrality across measures and across relationship types reveal different key players because there are different social underlying social processes captured

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in competitive and collaborative relationships. While findings do not explain how competition, collaboration, and restaurateur influence predict local sourcing, they do provide insights on how restaurateurs interact with one another. Network positioning suggests that more collaborative restaurateurs also desire to control flow of information between other network members. Restaurateurs who are more competitive tend to interact with one another; thus competition breeds more competition. Future studies should explore whether there is an optimal balance of competition and collaboration that is positively associated with outcomes such as local produce sourcing and building a locavore movement.   Findings on individual prominence and position may tell us who in the network acts as a leader or pioneer for the local food movement. Restaurateurs who are most influential in the network can role model local sourcing behavior and diffuse resources such as knowledge about local farmers to effect positive change in local food sourcing.

Background

Locavore Context

In 2007, the term *locavore* first appeared in the Oxford dictionary (Shin, 2005) to describe one who consumes locally sourced goods such as those provided by local farmers. A contingency of Houston restaurateurs -- chefs or operators of restaurants -- has successfully increased sourcing of locally produced foods in several ways. Some purchase goods directly from area farmers, while others place orders with food distributors who in turn are entrusted to deliver from area farmers. Additionally, some grow their own produce or use a combination of all three strategies. The locavore movement in restaurants across the metropolis of Houston meets the definition of cluster, whereby numerous co-located restaurateurs interact in both competitive marketplaces and collaborate with one another (Pietrobelli & Stevenson, 2011). Opportunities for competition arise from produce accessibility, vying for farm resources including knowledge of participatory farmers, and variability in locavore chef skills, such as the creative adaptation of the daily menu to meet the demands of seasonal variation. Conversely, having a collective mission has also created a pattern of information sharing and collaboration amongst restaurateurs. Collaboration is a feature of community progress, but its positive influence is maximized when an optimal balance with competition is achieved (Ostrom, 2000).

Population ecology proposes that organizations that rely on the same resources and share the same resource space promote competition even among individuals with common goals (Ostram, 2000). Examining relationships that represent competition and collaboration

among restaurateurs can provide telling insights about how restaurateurs behave in relation to one another and how interconnected the network is. This study is designed to uncover the extent of these relationships and explore how the resulting interconnectedness of restaurateurs influences local sourcing. The long-term objective is to inform system-level interventions to encourage partnerships among restaurateurs and set the stage for a LFSN that will continue to thrive so as to increase the production and consumption of local produce.

Relationships created by interacting collaboratively or competitively are examples of social interaction ties, as defined by Chiu, Hsu, and Wang (2006), as channels of information or other resources flow. Formalized measurement of these ties using a Social Network Theory framework allow for further investigation of a cluster or network's connectedness. This can help us to understand who is connected to whom, and how the competition/collaboration ties affect network outcomes like local sourcing.

Social Network Theory

Social Network Theory (SNT) is the framework used to understand the interactions between a set of related social actors (Robins, 2018, P.18). Two broad categories of hypotheses are found in social network theory: hypotheses aimed at understanding the influences of relational ties in a given community (i.e., restaurateurs who share resources from the same farm), and hypotheses that consider how the structure of these ties shape outcomes at an individual, organizational, or population level (i.e., how density predicts local food sourcing). While traditional research methods are oriented around exploration and analysis of individual actors, SNT emphasizes the importance of relationships and the resulting network structure. SNT contends that network positions and structure create social

influences that are important factors in the causal chain to shared outcomes, such as the shared mission to provide locally sourced foods to the restaurant patron community (Grunspan et al., 2014).

Social relations such as competition/collaboration ties are particularly important in the context of unreliable market sectors, whereby each tie is potentially a source of information that can lead to economic transactions and the flow of goods (here, produce). These human-landscape connections determine and facilitate the flow of food and other social capital resources among groups. Once termed the moral economy, this norm of sharing determines level of risk people are willing to take in growing or sourcing local foods, and contributes to group identity and to group cohesion (Baggio et al., 2016). Poetically, social relations embedded within networks have been known as the "capital of the poor" (Baggio et al., 2016), for they permit access to resources even in times of stress. Conversely, when cooperation among network members (nodes in SNT) is stressed, the repercussions on relations, the surrounding landscape, both figurative and literal, and the effects on people may be deleterious.

The current study uses the SNT framework to identify key restaurateurs in Houston's LFSN and examine their interconnectedness through the lens of their competition and collaboration ties. This will tell us who in the network acts as a leader or pioneer for the local food movement; specifically who is more collaborative, competitive, or both. We use social network methods to derive individual-level measures of the influence (prominence) of each restaurateur on all others in the network. Additionally, because empirically observed ties between restaurateurs enables us to visualize a network, it may be that certain members are at a structural advantage according to "where" in the network they are in relation to all

others (position). Known as measures of prominence and positioning, these social network

constructs are conceptually overlapping but computationally distinct. Findings can inform the

underlying patterns of interactions, both competitive and collaborative, for the network

(Everett and Borgatti, 2005).

Measures of Prominence

The extent of an individual's influence in the network is often measured by degree

centrality, or the number of direct connections (ties) an individual has (Everett & Borgatti,

2005). Because the current study assesses the network structures through two interrelated but

distinct lenses, competition and collaboration, the resulting overall network can be thought of

as a multiplex network, or a network composed of different types of ties.   The multiplex

network is also composed of two complete networks in themselves that are examined here

independently – the competition network and the collaboration network. As our frame of

reference here is restaurateurs who are disclosing relationships of collaboration or

competition with others in the network, the ties have a direction: outdegree centrality refers

to the number of ties directed *by a* restaurateur to others and is the focus here, while indegree

centrality refers to the number of ties directed *to a* restaurateur by all others.   Degree

centrality is equivalent to the sum of outdegree and indegree centrality (Robins, 2008).

While the conventional approach for calculating degree centrality is to count the number of

ties observed, some investigators have attached differential values to ties, either to represent

a true magnitude (for example a frequency for that tie), or to give a ranking (i.e., a purported

importance). We adopt the latter method in this study, specifically modeling a weighting

scheme after that developed by Wright and Ridder (Bright & Ritter, 2015). The rationale for

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weighting ties stems from the theoretical variance in their importance. The result is a

weighted version of outdegree centrality we use to measure prominence in the networks of

collaboration and competition.

Measures of Positioning

SNA is also concerned with the effects of a network's structure. While quantity of

relationships observed determine an individual restaurateur's prominence, the network

structure determines his/her position within the network – where he/she sits in relation to

others.   Other measures of centrality are derived from position within the visual

representation of the network structure of restaurateurs: Eigenvector centrality is a combined

measure of each restaurateur's degree and the degrees of all connected restaurateurs.

Eigenvector centrality is thus a measure of wider influence over the network and

approximates the notion of popularity. Closeness centrality refers to the quality of being

positioned close to others in the network, with lower closeness scores indicating enhanced

ability to transmit information or other social capital through the network. Computationally,

it is the measure of how close a node (a restaurateur in this case) is to all other restaurateurs

in the network.   When individuals have a high amount of connectivity to others, some may

either knowingly or unknowingly connect others in the network to each other. This last

feature is measured by betweenness. Betweenness centrality counts the number of times a

restaurateur appears on the shortest path between two other restaurateurs, and is often cited

as a measure of bridging or brokering the relationships between nodes. The correlations

between these measures are in themselves potentially meaningful (Everett & Borgatti, 2005).

For example, those who tend to connect unconnected network members will score high in

both degree centrality and Betweenness centrality. While the presence of prominent players can help to diffuse information and other resources needed for a restaurateur to reach common goals such as local sourcing, those with disproportionate influence can negatively affect the network. Examples of potentially deleterious outcomes would be restaurateurs who are unwilling to share information or who compete for the same farmers to the point that other farm sources of produce go unnoticed; what social network practitioners have termed clannish behaviors (Burt, 2004). The ultimate goal of the study is to explore how social network findings based on collaboration and competition relationships (ties) can further our understanding of local produce sourcing. Specifically, we evaluate how network influence based on prominence and position predicts local sourcing, in addition to how competition and collaboration independently and jointly predict local sourcing. Though there are no a priori hypotheses about how prominence versus position will predict level of local sourcing, we hypothesize that greater influence by either network measure type will predict local sourcing. We also hypothesize that both competition and collaboration positively predict local sourcing, and finally that those with more overlap between competition and collaboration (Hypothesis 4a) will source more local produce.

Methods
Study Design and Recruitment

The current study employed a cross-sectional design and was conducted in Houston, Texas using the framework of egocentric network analysis, where information was collected from restaurateurs about the absence or presence of relationships with every other restaurateur in the network (n=30). We will refer to this network as Houston's local food

social network (LFSN). This network is comprised of : restaurateurs who identify as sourcing locally and were confirmed during in-person screening to source local produce specifically; the farmers that provide local produce to them; and distributors who specialize in providing local produce to restaurants. The analyses in this paper, however, include only the restaurateur subgroup of the LFSN.

An initial restaurateur sampling frame was created by compiling publicly available lists of "locavore" restaurants. The initial screening sources included known websites such as *Local Local*, a registry for locally sourcing restaurants and their vendors, *local harvest.org*, Yelp pages, and individual Farmer's Market websites from Houston and its surrounding suburban areas. To ensure all locavore restaurants were included, participants were asked to provide names of any missing from the list. This resulted in the addition of four restaurants, two of which met the eligibility for local sourcing and were added to the questionnaires early enough to minimize missing data (after the third interview). All potentially eligible study participants (n=74) were approached in person or over the phone and asked to undergo additional screening to ensure eligibility.   In-person meetings were scheduled for formal screening and consenting.

Selecting eligible participants required eligibility screening at both the organizational (restaurant) level and the individual participant level. The restaurants had to meet the following inclusion criteria: statement of local food sourcing on either web, print, or in-house media; physical address in Houston, Texas; establishment lifespan of six months or more; and an available respondent with authority over purchasing or sourcing decisions who has held this post for six or more months, executes the orders themself or who was responsible for delegating this to others. Lastly, they had to source two or more non-herb produce items

at any given time from local farms, defined as farms within 150 miles of Houston. For the choice of two for the minimum number of produce items criterion , pre-test interviews with local experts, including a restaurateur and farmer, helped confirm our eligibility requirements (Thomas Garcia Pratts, 2017). Because of the difference in networking needs and behaviors of restaurants who source local only from their own gardens, these restaurateurs were excluded even though by a strict definition they are locally sourced. The questionnaire designed for this study assessed collaboration and competition with other restaurateurs and collected both restaurant and restaurateur demographics. The questionnaire was orally administered by the researcher. Respondents were not offered incentives to participate other than a fact sheet prepared with non-identifying summary findings of the study. Permission to conduct the research was obtained from the University of Texas School of Public Health's Institutional Review Board (**HSC-SPH-17-1034).**

Measures
Outcome Variable

A single question assessed how much of the produce served at the restaurant was locally sourced, our dependent outcome variable. Response options were ordinal (0%, 1-24%, 25-50%, 51-75%, and More than 75%). Due to the small number of restaurateurs in the "more than 75%" category, we collapsed it with the "51-75" category to create a new category for "More than 50%."

Relationships (Ties)

We utilized the social network framework to create the section of the survey specific to identifying collaboration and competition patterns between all possible restaurateur-pairs.

Restaurateur respondents answered "yes" or "no" to six different questions assessing

collaboration (3 items) and competition (3).   The competition and collaboration networks are

therefore multiplex in that there are different types of ties between competing or

collaborating restaurateurs. We coded responses of "yes" with a value of one; We coded

responses of "no" with a value of zero, indicated the absence of a relationship (See Table

2.1).   Each question was repeated in reference to each other restaurateur so that each

assessment amounted to six questions multiplied by a factor of 29 other participants (174

total items). While values of zero and one were used in unweighted measures of competition

and collaboration, we also assigned a specific value to each of the competition/collaboration

relationships to compute weighted measures of competition and collaboration. The value of

each relationship type was based on the relative intensity of interaction in terms of

networking one's own resources (of time and energy, knowledge, or support). On the low

end of the continuum, a score indicated passive interaction most likely not requiring

substantial, intentional, or face-to-face interaction.   On the other end, a score of three was

indicative of face-to-face and involved interaction likely to comprise of greater resource

flow. Because weighting schemes were identical for both edge types, the overall "weight" of

competition could be compared to the overall "weight" of collaboration as the potential

contribution from either competition and collaboration. Both measures amount to a

maximum of six points per restaurateur per set of responses. Thus, the sums of both

unweighted and weighted relationship values yielded two unweighted outdegree centrality

measures (one each for competition and collaboration) and two weighted outdegree centrality

measures. These corresponded to the number of reported competitive/collaborative

relationships with others in the network with and without taking into effect the relative importance of the relationship.

Restaurateur Demographics

For each restaurateur, we collected basic demographics such as age, gender, and length of time in the current restaurant role. The survey also assessed demographics related to the restaurant, including zip code, length of time the restaurant had been open, and its size, as measured by seatings per day.

Network Construction

All network construction was completed using Gephi,9.2, a software platform for network visualizations and statistical analyses. We derived network-level information used for network construction from the relationship data above. This network-level data consisted of the restaurateur who disclosed the relationship; the restaurateur with which the relationship was reported; and the value, both unweighted and weighted, of the relationship. We constructed four separate networks; a weighted and unweighted network for collaboration and a weighted and unweighted network for competition. We then combined the weighted collaboration and competition relationships in order to construct a fifth network, the competition-collaboration network. Although we conducted descriptive analyses of position measures for the separate competition and collaboration networks, the observed interactions between restaurateurs that ultimately determine their position in the network is represented by the competition-collaboration network. Because this network included all relationships regardless of type, we used this one to derive measures of network

positioning measures hypothesized to predict level of local sourcing. Table 2.2. summarizes the definition, computation, and corresponding measures for each network.

Network Measures

For each network, we computed the network prominence variables of interest: Eigenvector centrality, outdegree centrality, closeness, and betweenness centrality.   Degree centrality as computed by Gephi is computationally identical to the unweighted collaboration edges, and becomes weighted in the weighted version by entering the values to override the default weight of 1. Gephi was also used to compute basic network descriptives, including density of each of the networks; the number of all direct actual connections divided by all possible direct connections in the network. Density is a measure of overall connectedness as networks that are more dense are more likely to efficiently move knowledge and practices from one node to another (Grunspan et al., 2014).

Lastly, in order to explore the interaction (or lack thereof) between collaboration and competition we computed a measure of overlap between the constructs of competition and collaboration by taking the quotient of co-existing edges and the number of total edges between each restaurateur pair.

Statistical analysis

Competition and collaboration networks were compared with Wilcoxon signed-rank test for matched pairs, with descriptive statistics reported in Table 2.3.   To evaluate the independent and combined effects of centrality measures on level of local food sourcing we used ordinal logistic regression, where centrality measures were independent variables and

level of local produce sourced was the dependent variable. The concept of interaction

between collaboration and competition is represented by the interaction term between the

collaboration and competition outdegree scores. Additionally, we created a variable *Overlap*

categorizing restaurateurs into those who only report competitive relationships, those who

report collaborative ones only, and those who report both types. The resulting input into the

regression model was intended to test our last hypothesis; those that report both competition

and collaboration source more local produce than those who are only collaborative or only

competitive. The assumption of proportional odds was not violated, as confirmed by the

omodel test. All analyses were conducted using STATA 14.1 (College Station, Texas) with

significance set at p<0.05.

Results

Participants (Node Summary)

Each network constructed included the same total number of restaurateurs, resulting

in a network size of 30. Most restaurateurs were under 40 years old (89%) and male

(76.67%). While over 90% of the restaurants were over a year old, most restaurateurs had

been employed in the current sourcing role for under a year (83%). Locavore restaurants

were located in twelve of the 178 zipcodes across Houston.

Network Summary

There were 315 ties of competition, and 320 collaboration ties. Two actors had no

ties, while 21 had both types. The mean overlap between attribute types ranged from 0 to

100 %, with a mean of 36%, where 100% overlap occurred if every collaboration edge co-

occurred with a competition edge, and vise versa. While weighting changes the value of the Outdegrees, it does not change the number of connections between restaurateurs or their structural positions within the network. Thus, weighting had no influence on network density or other centrality measures based on position. Network densities were similar for competition and collaboration networks, 0.315 and 0.316, respectively. Density of the overall competition-collaboration network was 0.73, where outdegree centrality or the number of reported connections ranged from 0 to 133. All means and standard deviations are presented in 2.4. Betweenness centralization was significantly higher in the collaboration network than in the competition network (p<0.05). On the other hand, eigenvector centralization was significantly higher in the competition network (p<.0001).

Network Visualizations

Two of the constructed networks are shown in Figure 2.1, one representing the unweighted collaboration network and the other comprising the unweighted competition network. The structure of the weighted networks if shown would be identical, but the thickness of the lines would vary depending on the values of the edges.

Figure 2.1. Competition and collaboration networks of Houston locavore restaurateurs, N=30
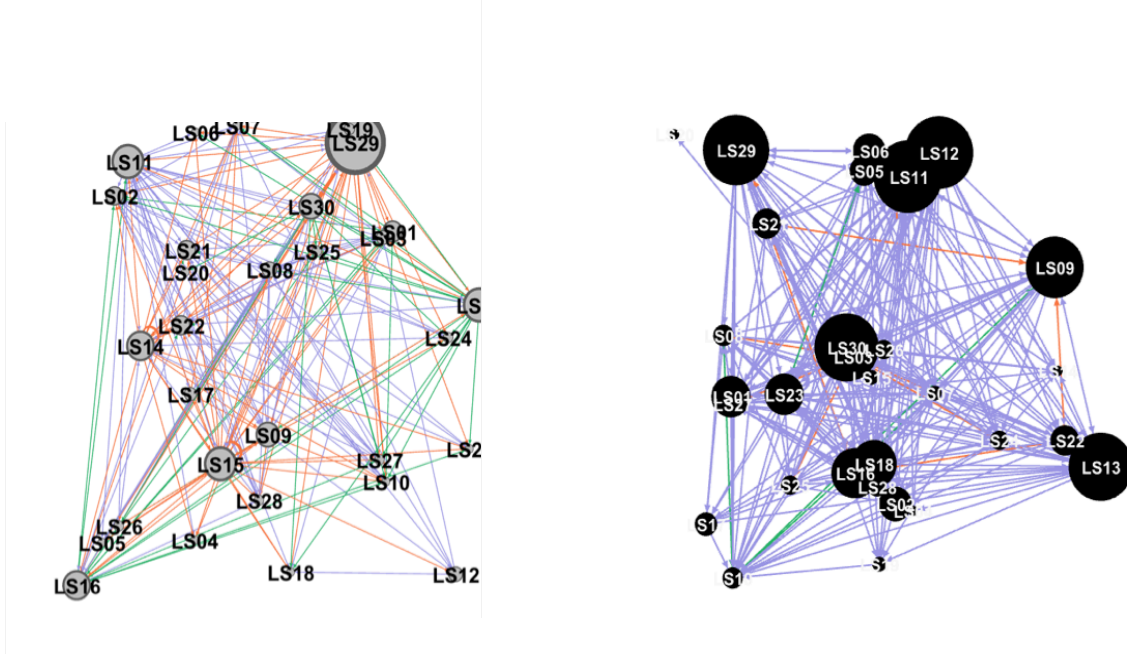
Notes: Left: Competition Network; Right: Collaboration Network: Nodes sized by outdegree. Competition Network Key: purple: competing for customers; green: competing for farm resources; orange: competing in the movement; Collaboration Network Key: orange: share information; purple: collaborators in movement; green: work together on events

Influence on Local Sourcing

The summary of continuous network prominence and position measures is reported below for each of the 3 levels of local produce sourcing (Table 2.5). Across levels of sourcing, competitive weighted outdegree centrality increased significantly (p<0.05) as per ksuskal Wallis tests. The number of restaurateurs who fell into the category of having both collaborative and competitive links did not differ significantly across groups (66%, 54%, 73% respectively) although the proportion of restaurateurs with both types of relationships was greatest for those who source the most local produce. The descriptive results further

confirmed the need for logistic regressions with both competition and collaboration outcentrality indices and the network positioning variables that represent the entirety of the collaboration-competition interaction network. The final model was not statistically significant. While we could not confirm our hypotheses, there are some noteworthy findings. Non-parametric tests and correlations of network centrality indices do not provide preliminary support for the positive influence of the overlap between collaboration and competition, but rather suggest competition may predict local food sourcing over collaboration as competition outdegree centrality increased as a function of level of local food sourcing (See Table 2.5).

Discussion

In this study, we used self-reported data on relationships of collaboration and competition amongst restaurateurs to determine each restaurateurs' level of influence. Measures were based on both position within the network and level of participation and computed with the guidelines of SNA. Findings suggest that competition and collaboration have distinct, yet interrelated effects on the roles restaurateurs play in the network. Roughly equivalent densities across competition/collaboration networks suggest that Houston restaurateurs are just as connected by competitive relationships as they are by collaborative interactions. Future studies can explore whether this balance is beneficial for social progress or if tilting the balance would benefit the overall network. While neither competition nor collaboration predicted success in local sourcing, patterns in the individual networks and the high amount of overlap suggest an interconnected group of individuals. Public health programmers can target a sub-group of restaurateurs identified as being most influential and

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measure change across the network. Understanding these social processes therefore may facilitate cost-effective program implementation with far-reaching results.

Weighted out-degree of restaurateurs for each network provides an especially useful tool for intervention and program design, as programmers can be armed with findings about who is most likely to share information, work with others, or covet information. Future research can identify what individual-level attributes predict that a restaurateur will be more competitive, collaborative, or otherwise connected to others in his/her network.

Position-based centrality measures provide a more fine-grained view of network connectedness than density as we are able to compare connectedness across individuals with each measure, Eigenvector, closeness, and betweenness.   Notably, greater mean centrality (Eigenvector-ly speaking) in the competition network could be explained by the contagious and reciprocal nature of competition.   Restaurateurs who report competitive ties are more likely to be connected to others who also report competitive ties. Collaboration encourages more connectivity and is prevalent among restaurateurs who wish to widen their span of influence, consistent with the greater scores of betweenness, where a restaurateur connects two others, in the collaboration network. Future studies should examine the reciprocity of ties (restaurateur "a" shares information with restaurateur "b," who also shares with restaurateur "a") and additional predictors of both local sourcing and other network outcomes of interest.

The complex interplays between competition and collaboration illuminate critical pathways that can predict the success or failure of a shared mission such as local food sourcing. Future work is needed to assess the relationships between centrality measures and other outcomes of a local food movement beyond level of local sourcing. For instance, how

many farmers are connected to the restaurateur population and how does this affect flow of local foods? How often does collaboration in the form of sharing information about farm resources lead to actual sourcing ties? Are collaboration and competition ties stable over time, or do they change substantially over time? Follow-up studies can examine these same networks with a longitudinal design and with the assumption that the network is dynamic rather than static.

The current study has several methodologically unique features. The construction of unique items for each attribute represent a nuanced reflection of the ways in which restaurateurs may actively compete and collaborate, rather than making the assumption that these are mutually exclusive behaviors. In the latter scenario, competition could be measured by the absence of collaboration. Rather, this study was designed to capture data on meaningful operationalizations of both collaboration and competition for the specific community that is the Houston locavore restaurateur network.

Limitations

There are several noteworthy limitations to the study. The sample assessed is small and subject to statistical errors characteristic of small samples. Although there was no missing data for the N=30 restaurateurs, if all eight restaurateurs who refused to participate in the study were eligible, this would mean we constructed networks with 85% of the actual restaurateurs involved. Missing network members could result in an observed structure that is quite different from the real-world social network it is attempting to capture. Another limitation is that the independence of observations assumption required of logistic regression is almost implicitly violated: The restaurateurs are an interdependent and intertwined set of

actors, many of whom work within close proximity to one another. Geographic proximity, not included in this analysis, is likely to influence the relationships observed, as it is easier to collaborate or compete with a neighbor.

The explication of variables may pose some problems for interpretation as well. The relative weights placed on each tie were somewhat arbitrary and subject to assumptions not tested here. Furthermore only local *produce* sourcing was assessed when many source local livestock, eggs, etc. Much of the information sharing, etc. may be between restaurateurs who share non-produce farming resources. However, the questionnaires emphasized the focus on produce and participants were asked to carefully consider the questions with reference to the survey's definition of local produce. Lastly, the outcome variable, the level of local sourcing, is not only dependent on restaurateurs but also on the restaurateur-farmer relationships comprising the larger local food network. This study presents just one piece of the greater puzzle.

Conclusions

Greater betweenness centrality scores in the collaboration network may be reflective of mediating roles more collaborative restaurateurs play in connecting others who are less connected. This may also reflect a desire to control flow of information between other network members. The observed difference in eigenvector centrality, on the other hand, indicates that restaurateurs are competitive with restaurateurs who are themselves more competitive. Thus, competition breeds more competition. Because network members identified as "key" by centrality measures were different dependent on the type of relationship assessed (competition or collaboration) as well as the specific centrality measure in question, it is important to consider that whether or not a restaurateur is influential is contextual. Some are more collaborative, while others tend to compete, and still others relate to others in the network both competitively and collaboratively. Exploring centrality across measures and across relationship types may reveal different key players because there are different underlying social processes we attempted to measure with social network indices.

Table 2.1. Item Description and Maximum Values for Weighted and Unweighted Relationships (Ties)

Item Description		Unweighted Value	Weighted Value
Collaboration Relationship			
Information sharing	Do you collaborate with this restaurant by sharing information?	1	3
Joint Events	Have you collaborated with any restaurants in the past year on certain events?	1	2
Identification as a collaborator	Do you consider this restaurant a collaborator in the local food movement?	1	1
Combined Collaboration Score		3	6
Competition Relationship			
For farm resources	Do you regard this restaurant as a competitor for farming /farmer resources (i.e., relationships with farmers)	1	3
For customers	Do you regard this restaurant as a competitor for customers?	1	2
Identification as a competitor	Do you consider this restaurant a competitor in the local food movement?	1	1
Combined Competition Score		3	6

Table 2.2. Summary of social network measures utilized and explanation of their application in study

Measures of Prominence			
	Definition	Computation	Network(s)
Collaboration out-degree centrality	The number of restaurateurs nominated as collaborators	The sum of the individual products of assigned weight value and the count of each collaboration tie type: number of restaurateurs nominated as collaborators of tie value 1 (1) + number of restaurateurs nominated as collaborators of edge value 2(2) + the number of restaurateurs nominated as collaborators of tie value 3(3)	Collaboration network
Competition out-degree centrality	The number of restaurateurs nominated as competitors	The sum of the individual products of assigned weight value and the count of each competition type	Competition network
Total Out-degree centrality	The number of restaurateurs nominated for any edge type	The sum of all edges nominated by the restaurateur	Collaboration-competition network
Measures of Position			
	Definition	Computation	Network(s)
Eigenvector centrality	Measure of wider influence over the network based on being connected to more prominent nodes	Combines restaurateur's degree with degrees of all connected nodes	All networks
Closeness centrality	Connectivity to others by closeness	Computationally, it is the measure of how close a node (a restaurateur in this case) is to all other restaurateurs in the network.

Though raw scores of closeness are calculated by | All networks |

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		the reciprocal of the sum of all distances from a node to all others, we use a normalized version available in Gephi and other social network analysis platforms that provide a value where higher scores indicate greater centrality, or a member being within reach of others within the network (Robbins 2015, p.183).	
Betweenness centrality	Connectivity by linking others	The number of times a restaurateur lies on a path between two others	All networks
Density	Overall measure of connectedness	The number of observed ties between restaurateurs pairs divided by the number of all possible edges between restaurateur pairs	All networks

Table 2.3. Summary of demographic characteristics of Houston locavore restaurateurs, N=30

	N	%
Age		
20-30	11	36.67%
31-40	16	53.33
41-50	1	3.33%
51-60	1	3.33%
Over 60	1	3.33%
Gender		
Male	23	76.67%
Female	7	23.33%
Time in job		
Under 1 year	25	83.33%
1-2 years	3	10.00%
3-4 years	2	6.67%
Over 4 years	0	0
Restaurant Age		
Under 1 year	2	6.67%
1-4 years	10	33.33%
5-9 years	9	30.00%
10 or more years	9	30.00%
Restaurant size		
Under 50 seatings per day	1	3.33%
50-100 seatings per day	3	10.00%
101-200 seatings per day	11	36.67%
Over 200 seatings per day	15	50.00%

Table 2.4. Descriptive statistics for network prominence and position variables for competition , collaboration, and competition-collaboration networks

	Competition		Collaboration		Competition-Collaboration Network	
	Mean	SD	Mean	SD	Mean	SD
Position						
Eigenvector ***	0.51	0.22	0.33	0.25	0.36	0.23
Closeness	0.48	0.33	0.49	0.26	0.60	0.24
Betweennesss*	13.33	26.41	29.03	56.53	18.3	27.89
Prominence						
Unweighted outdegree	10.5	13.38	10.67	9.28	21.17	20.15
Weighted outdegree	19.97	25.4	13.53	10.79	33.5	33.43
Overlap	Mean=36.5% (SD 29%) (Ranged from 0 to 100%)					

Note: *p<.05, ***p<0.001.

Table 2.5. Descriptive statistics for network prominence and position across levels of local produce sourcing

	1-25%		26-50%		More than 50%	
	Mean	(SD)	Mean	(SD)	Mean	SD
N	6		13		11	
Prominence						
Competition outdegree *	12.17	(8.85)	8.84	(9.28)	19.82	(12.13)
Collaboration outdegree	20.5	(7.93)	8.91	(10.79)	33.91	(33.70)
Position						
Eigenvector	0.38	(0.24)	0.36	(0.21)	0.33	(0.25)
Closeness	0.52	(0.25)	0.58	(0.20)	0.34	(0.25)
Betweenness	17.95	(34.34)	11.13	(23.65)	26.97	(29.03)

Note: *p<.05

Table 2.6. Network determinants of local produce sourcing in Houston restaurateur sample, N=30

Network Measure	OR (95% CI)
Eigenvector Centrality	044 (0.001, 20.21)
Closeness Centrality	1.42 (0.14, 40.14)
Betweenness Centrality	1.01 (0.98, 1.06)
Competition Outdegree	0.98 (0.87, 1.10)
Collaboration Outdegree	0.91 (0..81, 1.01)
Interaction term	1.004 (0.99, 1.007)
Overlap	
Ref (competition edges only only)	---
Collaboration edges only	0.09 (0.004, 2.256)
Both collaboration and competition edges	0.200 (0.13, 3.17)

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Title of Journal Article: Examining the role of local food distributors through the lens of core-periphery structure in a network of restaurateurs and farmers in Houston, Texas
Proposed Journal: Agriculture and Human Values
Abstract

Background. Social network theory contends that geographic proximity is not sufficient

cause for the existence of social capital (Borgatti 2015). Rather, social capital arises from

the patterns of connections or relationships that create the underlying structure of the

network. Relationships are particularly important in the context of unreliable market sectors,

where they are a potential source of information that can lead to economic transactions and

the flow of goods. This study is focused on the direct and indirect flow of produce goods

from farmers to restaurateurs.   We use social network analysis (SNA) methods to describe

the relationship capital and flow of local produce in Houston, Texas.   The network structure

revealed could be critical for understanding how group cohesion and connectedness could be

determined by the varied relationships found between local food movement key players and

the middlemen that sometimes connect them.

Methods. We followed the recommendation by Bodin and Prell (2011) that SNA should

proceed in three levels: the binary metaphorical approach, the descriptive approach, and the

structurally explicit approach. In the first level, the *binary metaphorical approach, we*

determined if network connections between different farms, restaurants, and distributors are

absent or present. In the second level we described the relationships found. The number and

classification of these sourcing relationships (ties) were the primary target of network

descriptives and analysis. Specifically, we conducted a census of network dyads (farmer-

restaurateur pairs) and triads (farmers and restaurateurs connected via distributors). Triads were classified as open or closed, where triads were closed if the restaurateur knew which farm was the source of produce delivered by the distributor. In the third stage, we applied structural analysis to compute social network indices representing different aspects of connectedness. These included metrics based on the number and magnitude of incoming and outgoing produce ties. For restaurateurs we were interested in incoming produce from both farmers and distributors (in-degree centrality). For farmers we measured the number of outgoing produce ties (out-degree centrality). Betweenness centrality computed for distributors was measured by how many times a distributor fell on the path between farmer and restaurateur. We also accounted for the frequency of produce exchanges by computing a weighted version of in and out-degree centrality based on the monthly total of produce exchanges (Grunspan et al., 2014). The structurally explicit approach culminated in core-peripheral modeling. The core –periphery procedure yields a density matrix for within and between subsets of network members in order to partition farmers/restaurateurs into the more densely connected "core," or the less connected "periphery." Core/periphery designation was then entered into a logistic regression as our dependent variable. Core-periphery modeling enabled us to address our specific research questions: Are core and peripheral members the same in terms of participation in triads? What are the properties of individuals associated with the core that distinguish them from members of the periphery? We interviewed restaurateurs, farmers, and distributors between February and April 2018 and conducted social network data analyses using Gephi and UCINET, as well as STATA for statistical tests.

Results. N=35 restaurateurs nominated 17 farms and 4 distributors. Fourteen farms and all but one distributor consented to the study. Seven of the 14 consented farms used distributors to connect to restaurateurs; while 17 (36%) of restaurateurs used distributors to connect to farms. While roughly half of the restaurateurs were found in the core of the local food network, only three of the farmers connected to the locavore restaurateur sub-group remained in the core while the remaining 14 were peripheral. The overall logistic regression model was significant (p<.009) and indicated significant and positive associations between both dyad count and network member coreness and closed triad count and network member coreness (ORs: 3.19 and 3.39, respectively). There was no statistically significant association observed between coreness and weighted degree, or between coreness and open triad count. Supplementary analysis of betweenness centrality for the distributors revealed two with betweenness centrality of 1, 1 with betweenness centrality of 8, and one with a score of 28.

Conclusion. Distributors were influential to the network as they added sourcing ties and even introduced farm and restaurant members to the network. However, using distributors to connect to other network members only appears to be positively associated with group cohesion and coreness in the case of triadic closure. It is apparent also by the range in betweenness centrality and in network visualizations that not all distributors influence the network in the same way. Meanwhile, having more direct relationships with farmers/restaurateurs significantly predicted coreness, regardless of the frequency of produce exchanges made through those relationships.

Background

Distributors are usually involved in storing, processing, and transporting food destined for grocery and retail. Farmers selling to distributors may increase their ability to connect with and deliver to restaurant customers. For example, contracting with a distributor may provide a link that otherwise could not exist due to transportation or labor shortage, or a communication barrier between farm and restaurant, and may even increase the stability and frequency of ties that existed before a broker was introduced to the pair. Austin-born distribution company Farm-to-Table, LLC, was founded to bridge the gap between area farmers and food retailers. In 2009, the company began purchasing produce from local farms to sell to restaurants. While the local food system is replete of challenges, including drought, freeze, and other environmental factors that can damage crop yields, Farm-to-Table's founder asserts that providing a channel from farmer to customer is the greatest challenge (Cabral, Hervey, Manescu, & Starich, 2013). Distribution companies such as Farm-to-Table, which now also serves Houston, act as brokers in the LFSN, theoretically creating ties where ties would otherwise not exist, termed ***structural holes*** by SNT. This study questions this assumption, and investigates ties that exist between farms and restaurants with and without these *middlemen.*

Structural holes theory (Burt, 2004) emphasizes the importance of brokerage roles some actors may have in a social network. If there are a substantial number of structural holes in an organization, there will also be many brokerage opportunities (de Nooy, Mrvar, & Batagelj, 2011). A broker acts as an intermediary between two unlinked actors and can facilitate transfer of goods or movement of social capital from one to the other. Structural

hole literature has described two common brokerage strategies: ***tertius gaudens***, *or the third who enjoys,* where the broker coordinates between two parties not intending to link to one another, sometimes exploiting that disconnect, or ***tertius iungens***, *or the third who joins,* where the broker facilitates a tie that is already present.   Thus a broker can also increase personal power and even hoard information or control social capital for self-interested reasons.   If actor A is connected to Actor C only through Actor B, then Actor B is in an advantageous position to be be ble to mediate between them and even profit from that mediation.   Furthermore, if a "third" player is necessary for a network in order for actors to be connected, it may be that the entire network is vulnerable and these third players have disproportionate control over the social capital of a network (de Nooy et al., 2011).   Because of the financial constraints farmers face when selling wholesale and indirectly, it may be that such bridging connections, quantified in SNA as **betweenness centrality**, may be isolating farms or restaurants from the larger network and actually limit some ties.   Betweenness centrality measures the number of times an individual or entity, in this case a food distributor, connects other network members and as a result has control over the flow of information or goods between them (Robins, 2015, p. 183).

Context

In 2007, the term ***locavore*** first appeared in the Oxford dictionary (Shin, 2005) to describe one who consumes locally sourced goods such as those provided by local farmers. The locavore movement in restaurants across the metropolis of Houston, Texas demonstrates the emblematic features of collective action: the voluntary and intentional action of a group of individuals working together toward a common goal (Ostrom, 2000) (here increasing

consumption of locally grown produce); the recognition that each individual co-exists in a community of people who face common challenges (i.e., agricultural diversity; climate constraints, etc.); and group valuation of expectations and social norms regarding the shared goal (here, what is actually meant by local and why it matters). The current study is concerned with local produce specifically, as defined by production and consumption occurring in a geographically localized setting. Consequently, the time between harvesting by farmers and use by restaurateurs can span days or even hours. Houston's largest farmer's markets have agreed on the standard of 150 miles as a reasonable standard for what is to be considered local, as compared to the federal parameter of 400 miles (TXP, 2013).

Houston restaurateurs have successfully increased restaurant sourcing of local produce in three different ways: by purchasing goods from area farmers, placing orders with food distributors who in turn are entrusted to deliver from area farmers, and lastly from growing their own. As sourcing produce locally gains popularity amongst restaurateurs, a growing challenge is creating and maintaining relationships with area farmers. Thus relationship building and the consequential quality of being connected is a key feature required of collective action. Indeed, relationship capital, or the patterns of interactions in which individuals are embedded, can explain whether or not collective action succeeds.

Social network theory contends that geographic proximity is not sufficient cause for the existence of this social capital (Borgatti, 2015). Rather, social capital arises from the patterns of connections or relationships that create the underlying structure of the network. Relationships are particularly important in the context of unreliable market sectors, where they are a potential source of information that can lead to economic transactions and the flow of goods. This study is focused on the direct and indirect flow of produce goods from farmers

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to restaurateurs. We use social network analysis (SNA) methods to describe the relationship capital and flow of local produce within local food social network (LFSN) in Houston, Texas. The network structure revealed could be critical in understanding how group cohesion and collective action are determined by the varied relationships between local food movement key players and the middlemen that sometimes connect them.

Social Network Framework

Restaurateurs and farmers make up the two key types of social actors in Houston's local food social network (LFSN) (*nodes* in SNA). Observing and measuring the resulting sourcing relationships (ties) between nodes allows for a systematic investigation of the network structure. We define sourcing ties measured throughout the study as produce that originates from a farm and procured by a restaurateur for use in his or her restaurant. We can state that the network is constructed by the patterns of connectedness of its members based on sourcing ties. Investigating network structure can help us understand who is connected to whom. In this case this tells us what restaurateur sources produce goods from what farmer(s). We can also assess the level of connectedness and group cohesion of the overall network. Network-level measures such as density are also critical descriptors: Density is a measure of overall connectedness of the network. Networks that are more dense are more likely to efficiently move knowledge and practices from one network member to another (Grunspan et al., 2014) .

We delve deeper into the concepts of density and cohesiveness of a group by partitioning farmers/restaurateurs into one of two groups; those that belong to the most

connected, cohesive region of the social network (these are said to be core); and those that belong to a group of lesser connected individuals (these are said to be peripheral). Because core members are also reasonably connected to periphery members (Rombach, 2014), core members can reach resources from the periphery or influence behavior in those that would otherwise not be amenable to network interventions. The implication is that the core is composed of a cohesive subgroup of individuals who will exert greater influence on the network (Borgatti & Everett, 2000).

Core/periphery structure has been imagined across fields of inquiry; from economics (Krugman, 1998), to studies of organization (Faulkner, 1987), to research on collective action (Alba & Moore, 1978) to understanding network proximity among monkeys (Corradino, 1990) and even more recently in the understanding of creative influences in the Hollywood film industry (Cattani & Ferriani, 2008). Core nodes are both well connected to one another in addition to being connected to peripheral nodes, while peripheral nodes are neither well connected amongst each other or to core nodes (Rombach, 2014). Because actors in the core are able to coordinate resources and actions, being positioned within the core confers a structural advantage in exchange relationships over those positioned in the periphery. It is more likely that a node will be positioned in the core if it has a greater number of connections to other core nodes or has stronger connections (weighted degree) computed here by the frequency of monthly produce exchanges. Prior social network studies have demonstrated that neither is sufficient, however, to predict coreness (Rombach, 2014).

Because a third category of social actors has undertaken the role of connecting consumers (restaurateurs) to producers (farmers), this paper emphasizes the effects of indirect connections on the network as well. Distributors may act as mediators between

otherwise non-interacting or disconnected actors, even brining otherwise periphery farmers/restaurateurs into the core. In this case, distributors can act as leaders and help to diffuse behaviors that support the shared mission. On the other hand, distributors may create entry barriers to the more cohesive core or to the network as a whole.

After partitioning farmers/restaurateurs into subgroups based on their position in either the most densely connected or least densely connected region of the network, we then examined the association of distributor relationships on partition (core or periphery) membership.   Our research questions were: Are core and peripheral members the same in terms of having sourcing relationships (ties) with distributors? What are the properties of individuals associated with the core that distinguish them from members of the periphery?

While a direct relationship between a farmer-restaurateur pair appears as a network dyad, the indirect scenario appears as a triad; where a distributor connects to both the farm and restaurateur so that they are connected via the intermediate distributor node. Distribution companies act as brokers in the LFSN, theoretically creating ties where ties would otherwise not exist, gaps termed *structural holes* by SNT. This study questions this assumption, and investigates ties and connectedness between farms and restaurants with and without these *middlemen.*

Structural Hole Theory

Structural Hole Theory (Burt, 2004) emphasizes the importance of brokerage roles some actors may have in a social network.   If there are a substantial number of structural holes in an organization, there will also be many brokerage opportunities (de Nooy et al., 2011).   Literature has documented two common brokerage strategies:

tertius gaudens, or the third who enjoys, where the broker coordinates between two parties

not intending to link to one another; and **tertius iungens**, *or the third who joins,* where the

broker facilitates a tie that is already present.   The former strategy is a feature of bridging

ties, where a farmer and restaurateur who would otherwise not be connected are linked such

that produce exchange can now occur between the two. Bridging ties in communities can

engender a heightened capacity to organize in the interest of common goals and against

shared challenges (Granovetter 1983). A bridging broker may also increase personal power

and even hoard information or control social capital for self-interested reasons.   If actor A is

connected to Actor C only through Actor B, then Actor B is in an advantageous position of

being able to mediate between them and even profit from that mediation.   Furthermore, if a

"third" player is necessary for a network in order for actors to be connected, it may be that

the entire network is vulnerable and these third players have disproportional control over the

social capital of a network (de Nooy et al., 2011). One example of the *third who enjoys* is

investigated in Tania Salerno's study of Cargill's extensive information sharing platform:

Agricultural traders have access to information not provided to financial actors. She

demonstrates how much of their profits result from unique access to food suppliers and to

information regarding food stocks that are then used to hedge and speculate on price

movements (Salerno, 2017).   Many economists have equated this brokered information

sharing as insider trading.   Thus it may be that brokers are isolating nodes from the larger

network and actually limit some ties.   On the other hand, when a broker connects

unconnected people, collective action is made more feasible than in a community made up of

separate cohesive groups of individuals (Burt, 1994).

While both types of brokerage ties have a place in community coalitions, we posit that triadic closure, or the knowledge of each other actor in the network, must be present in order to positively influence group cohesion and density. We assess the influence of triadic closure by comparing observed direct and brokered sourcing relationships between members of a more densely connected subgroup of farmers /restaurateurs (the core) and farmers/restaurateurs in a less connected subgroup of the network (the periphery).

Levels of Analysis
The current study follows the recommendation by Bodin and Prell (Bodin & Prell, 2011) that SNA should proceed in three levels: the binary metaphorical approach, the descriptive approach, and the structurally explicit approach. In the first level, the *binary metaphorical approach, we* determine if network connections between different farms, restaurants, and distributors are absent or present. Thus, we will begin by constructing the LFSN, rendering visualizations of the sourcing ties present (and absent) between farmers and restaurateurs.   The second level, or the descriptive approach, is then used to describe the relationships found. The number and classification of these sourcing relationships (ties) were the primary target of network descriptives and analysis. Triadic analysis, also found in the toolbox of applied SNT, makes possible the dissection of triad sets as their own units of analysis, beginning with a census of observed triads matching each of the configurations illustrated in Figure 3.1.   While farmer-restaurateur pairs constituted network dyads (equivalent to a null or empty triad); farmer to distributor to restaurateur triples had two sub-classifications: open triads and closed triads. In the current paper, a closed triad refers to a scenario whereby a restaurateur knew and identified the farm source of produce that was then delivered to him/her by the distributor. An open triad, on the other hand, occurred when a

restaurateur reported a relationship with a distributor but did not know the farm that is the source of local produce. Because we interviewed restaurateurs, farmers, and distributors, we were able to empirically measure each of the triad configurations.

Figure 3.1. Triad configurations measured by triad census of farmer, restaurateur, and distributor triples
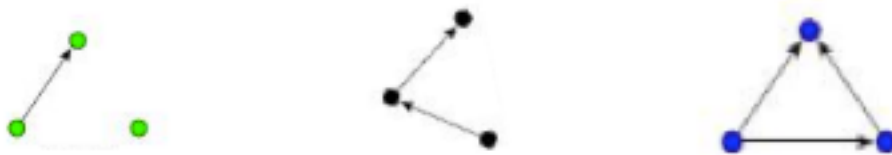
Notes: Adapted from illustration by Holland and Leinghardt (1975). From left to right: a null or empty triad (dyad); open triad; and closed triad. Arrows reflect the direction of reported ties; Each triad configuration is rotated so that the apex "node" is the restaurateur

In the third stage, we applied structural analysis to further describe measures of each actor's prominence in the network as well as position. Specifically, social network indices representing different aspects of connectedness were computed, both for the individual farmers and restaurateurs, and for the network as a whole. Individual-level parameters informed by SNT include metrics based on incoming and outgoing produce ties. For restaurateurs we are interested in incoming produce from both farmers and distributors (in-degree centrality). For farmers we measured the number of outgoing produce ties (out-degree centrality).   We also accounted for the frequency of produce exchanges by computing a weighted version of in and out-degree centrality based on the monthly total of produce exchanges (Grunspan et al., 2014). This permitted us to identify key players both in number

of connections (i.e., a restaurateur who receives produce once a week from each of five farmers) and in the magnitude of these connections (i.e., a restaurateur who receives produce five times a week from two farmers).

While network visualizations of the sourcing ties between farmers and restaurateurs (and distributors that sometimes broker these ties) are informative, they may not reveal if an apparent cohesive subgroup of individuals exists within the LFSN. The structurally explicit approach culminates in core-peripheral modeling. The core-periphery procedure available in UCINET attempts to partition individual members into groups based on the density of ties. The core –periphery procedure yields a density matrix for within and between subsets of network members, here consisting of four subsets: Core farmers; peripheral farmers; core restaurateurs; and peripheral restaurateurs. Core-periphery modeling enabled us to address our specific research questions: Are core and peripheral members the same in terms of participation in triads? What are the properties of individuals associated with the core that distinguish them from members of the periphery?

In a supplemental analysis, we measured distributor brokerage using betweenness centrality, or the number of times a distributor falls on the path between a farmer and restauratuer (Borgatti, 2005). Betweenness centrality can be interpreted as an indicator of how much control over the flow of information or goods a network member has (Robins, 2015, p. 183).

The analyses that follow describe the effects of distributors on relational structure of the network to ultimately answer such questions as: Do they innovate and connect others who would otherwise not be connected; or do they control the flow of resources, via their betweenness centrality, to the detriment of network cohesion? Cohesion is an important

feature of social networks if collective action is to be successful, as the more everyone knows and interacts with everyone else in the network, the more there will be group solidarity (Borgatti & Everett, 2000). By this line of reasoning, triadic closure reflects group cohesion, convergence of expectations, and action that is indeed collective.   While it is argued that increasing the density of brokering and bridging ties leads to a resilient core-periphery structure of a network (Rombach, 2014), we also choose not to take this assumption for granted. This study will determine whether or not triadic relationships are sufficient enough contributors to network member "coreness" to really set them apart from the less connected periphery.

Recruitment and Survey Instrumentation
Sampling

The current study employed a cross-sectional design conducted in Houston, Texas. Purposive sampling methods conducted prior to recruitment sampled a population of potentially eligible farmers and restaurateurs.   Contrary to probability sampling, in which the investigator begins with the total population and then subdivides it into smaller, variably representative, groups based on accessible data, this non-probability sampling method does not result in a sample but rather constructs a population (Suri, 2011).   Every attempt is made here to identify the *total* population of eligible participants. This critical process makes social network indices such as density possible, as computation of density is dependent on all possible connections as well as those that are empirically observed.

We created initial restaurateur and farmer sampling frames by compiling publicly available lists of "locavore" restaurants and the farms that source produce to them. The

initial screening sources included known websites such as *GoTexan.org, Local Local*, a registry for locally sourcing restaurants and their vendors, *local harvest.org*, Yelp pages, and individual Farmer's Market websites from Houston and its surrounding suburban areas.   A local restaurateur and farmer were each interviewed and helped to edit the final lists of potential network participants prior to commencing recruitment. The possible population sampling frame included 74 restaurants and 51 farms.   All potentially eligible study participants were approached in person or over the phone and asked to undergo additional screening to ensure eligibility.   In-person meetings were scheduled for formal screening and consenting between January 2018 and April 2018.

Screening

Selecting eligible participants required eligibility screening at both the organizational (restaurant) level and the individual participant level. The restaurants had to meet the following inclusion criteria: statement of local food sourcing on either web, print, or in-house media; physical address in Houston, Texas; establishment lifespan of six months or more; and lastly for each restaurant there had to be an available respondent (the restaurateur in this study) with authority over sourcing decisions. In order to be eligible for inclusion in the study, the restaurateur with authority over sourcing had to have been in his or her role for six or more months. Restaurateurs included in the current study's analysis met the criteria of sourcing produce at least monthly from a local farm and having two local produce items at any given time throughout the year. Because of the difference in networking needs and behaviors of restaurateurs who source local only from their own gardens, these restaurants were excluded even though by a strict definition they are locally sourced. Inclusion criteria

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for farms included: having a physical address within 150 miles of the city of Houston, Texas; establishment lifespan of six months or more; an available respondent with knowledge of out-flows and farm retail policies (the farmer in this study), and production of fruits and or/vegetables. Farms with only herbs, sprouts, or flowers were not included. The set of eligible restaurants and farms together define the boundary of the network. If distributors connect these two players, they are also considered part of the network in the current study.

Data Collection

To further ensure all locavore restaurants and farms were included, participants were asked to provide names of any missing from the list. Allowing respondents to enter names of missing nodes helps to maximize breath of data collection as well as the personal relevance of the questionnaire so that each actor's specific structural community is represented in the final analyses (Grunspan et al., 2014). While we approached all restaurateurs in order to screen them for eligibility, farmers were only approached for interview if nominated by one or more restaurateurs as a source of local produce. Nominated farmers were assessed to confirm the relationships with restaurateurs and report any missing links. Additionally, we interviewed distributors if named by either farm or restaurateur nodes. In addition to their utility in recruitment, the lists of names were used in developing survey instruments, as farmers were asked about their exchange ties with each of the restaurateurs, and restaurateurs were asked if they received produce from each of the farmers. Having names available for respondents to reference eased the difficulty of recollecting all potential connected nodes as participants could choose names from the reference lists. Both lists were utilized in the distributor-facing survey instrument. Any additions provided by respondents were

formalized by editing the survey prior to the next assessment administration. Farmers

provided three additional restaurants; restaurants added two farms to the original list; and

distributors added one farm.   Each of the three surveys (farmer, restaurateur, and distributor-

facing) were made available via the online survey platform Qualtrics in case the respondent

preferred electronic assessment. When possible, however, the surveys were completed

directly after in-person consenting with the Researcher in order to maximize response rate.

The survey thus designed collected information for the binary metaphorical level of

analysis, asking restaurateurs about whether or not they received produce monthly or more

from every possible farm in the network either directly or via a distributor. This question

stem was posed alongside the list of all possible farms:

"Please list all farms from which you receive regularly deliveries, meaning once a month or

more: "

Not only was each participant asked to list each source (for restaurateur questionnaires) or

recipient (for farmer questionnaires) of produce, but each entry was followed by an item

asking about route, with two possible response options, "direct" and "via distributor." Farm

names or number identifiers found on the reference list could be used to ease respondent

burden. For each entry, the survey prompted the respondent to write in a frequency for each

reported exchange.

Thus, these questions allowed for abstraction of an exchange-resource flow value for

each possible dyad pair (and triad set when applicable).   A separate question asked

respondents to list distributors regularly used for local produce and all entries were screened

and approached for study participation. Relationships with distributors were likewise

assessed in the farmer survey with a section of the survey where respondents listed the names

of any distributor, how long they had been using them, and whether the destination was

restaurants; grocery stores; or other, followed by a more detailed section listing out each

possible restaurant. Respondents marked with an "X" or like indication to confirm the

following statement: "You regularly provide produce to this restaurant (at least once per

month)." Other items included:

- How often? Response options were 1-2 times, 3-4 times, and 5 or more times per month, and
- Route: Response options were direct and via distributor

  Lastly, the distributor survey required inputs of both farmers and restaurateurs:

Items included:

- Restaurant Name
- Local Farm Name
- "How often do you deliver produce from here, not including herbs or microgreens?"

Data Abstraction

As both farmer and restaurateur nodes were interviewed extensively about ties with

one another, we imputed any missing ties using reciprocity. We therefore considered a

sourcing tie as observed if either the restaurateur or farmer reported it. Thus the collected

data represents all measured observations, or lack thereof, of relational ties x $_{ij}$ among the

pairs of nodes. Sourcing ties were entered into formatted columns of data referred to as edge

lists, where columns represent the farm (or distributor) sender I, the restaurateur (or

distributor) receiver j, and the value of the edge being the frequency of exchange x_{ij} .

Edgelists were used to import data into the social network software packages used (Gephi

and UCINET). The questionnaires also assessed basic demographics, such as gender and

organizational (farm or restaurant) size.   Respondents were not offered incentives to

participate other than a fact sheet prepared with non-identifying summary findings of the

study.   Permission to conduct the research was obtained from the University of Texas School

of Public Health's Institutional Review Board (**HSC-SPH-17-1034)**.

Measures and Procedures

From the binary metaphorical approach we derived the network boundary: this

consisted of total eligible restaurateurs, all produce farmers in the 150 mile radius, and lastly

any nominated distributors who may act as brokers in the network.   Brokerage was further

assessed in the descriptive approach of triadic analysis.   Procedurally, this consisted of

counting and categorizing each instance of an indirect edge between farmer and restaurateur,

tabulating the frequency for triad configuration types i-iii. Triad configuration type i is

equivalent to a direct dyadic edge and was tabulated here to provide a comprehensive picture

of triad participation (or lack thereof) across farm and restaurant nodes. This census allowed

us to explore the participation of each farmer and restaurateur in triadic relationships.

In the structurally explicit level of analysis, we computed individual and network-

level measures of activity or participation in the network and consequential structural

connectedness. The operationalizations and metrics are described in Table 3.1. Because we

treat the LFSN as a two-mode network, where mode types are restaurateurs or farmers, we

summarized findings by mode type when appropriate. The connectedness indices were

computed with GEPHI-9.2.   We then used the core-periphery formulation in UCINET to

partition network members into a core of more connected and central actors and a periphery

of less connected, less integral network players (Borgatti & Everett, 2000). Using the results

of this procedure to label each farmer/restaurateur as belonging to the "core" or "periphery,"

we retained the designation for each participant as a discrete dichotomous outcome variable

for a logistic regression. Network descriptives were repeated to further understand the group

cohesion measures for the periphery partition as well as the core partition (See Table 3.2)

The predictors for the regression included the triad participation scores for each of the

configuration types: no triad; closed triad, and open triad. Importantly, weighted degree was

also included in regression models in order to adjust for any effects on core centrality.

Statistical analyses were conducted using STATA 14.1 (College Station, TX).

Results

We present findings for each level of analysis below.

The Binary Metaphorical Approach: Defining the Network Boundary

   74 restaurants were approached for possible inclusion. 19 were not eligible (See

Figure 1.1), and eight refused to participate. Twelve of the restaurateur respondents reported

no local sourcing via direct or indirect links and were therefore removed from the analyses in

order to accurately represent the LFSN. The final network boundary spanned thirty-five

restaurateurs and fifty-one farms, in addition to four distributors as named by both farmers

and restaurateurs in completed surveys. Of the four distributors, three were located and

consented to the study. Of the fifty-one farms, sixteen were nominated by restaurateurs, and

one was nominated by a distributor. Thus, seventeen farmers were approached for inclusion.

While three farmers refused, the potential for missing data was minimized by imputing both

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the implicitly reciprocal ties from both distributor and restaurateur assessments. The final

Houston LFSN node set included ninety individuals with varying degrees of connectedness

to one another.

The Descriptive Approach

Figure 3.4 illustrates the connectedness of the network as it depicts both direct and

indirect paths between farmers and restaurateurs. Direct and indirect ties are then removed in

turn to provide a visual of the prominence of both dyads and triads in the observed network.

The triads, or indirect paths linking farmers and restaurateurs are highlighted in Figure 3.5

for each of the four distributors observed. Seven of the farms had indirect connections to

restaurants, while seventeen of the restaurateurs (36%) used distributors to connect to farms.

In both groups, two nodes only had indirect ties and would not have been connected in the

network at all if not for the distributor intermediary. Triadic census formally quantified each

of the triad participation configurations. The configuration type summary findings are

reported alongside network descriptives in Table 3.3. The distribution of degrees are

presented separately for farmers and restaurateurs in Figures 3.2 and 3.3, as they represent

two distinct types of individuals in the network.

The Structurally Explicit Approach

Centrality measures across individuals in the farmer and restaurateur groups, in

addition to the two-mode density indices, are summarized in Table 3.2. Supplementary

analysis of betweenness centrality for the distributors ranged from 1 to 28, with two

distributors having a disproportionate number of connections going through them compared

to the other two (betweenness centrality of 8 and 28 compared to 1 for the other two),

consistent with the visual depictions in Figure 3.5. The function of the distributors in adding network members to the boundary and in increasing the degree centrality and weight of produce exchange across the network is apparent, however, in the inclusion of these indirect paths. While one farmer is added to the network, two farms and two restaurants increased their number of connections (unweighted degree) by four or more (farms F01 and NIF22, and restaurants LS20 and LS28). 13 restaurants gained one degree, 4 gained 2 degrees, and 2 gained 3 degrees, for an average gain for the entire node set of 0.58 degrees. 2 farms gained 1 degree, 2 gained 2 degrees, one gained 4, one gained 7, and one gained 10 degrees. The average gain for the farm node set was 0.53 degrees.

To further understand the impact of these added tie "benefits," core/periphery modeling ensued, treating the four distributors as both restaurateur and farmer nodes as the procedure recognizes two, rather than three, distinct mode types. This makes conceptual sense as distributors act as both receivers of produce like restaurateurs, and senders of produce like farmers. In order to understand the relative coreness of farmer and restaurateur nodes with respect to triad participation, nodes with no connections were removed from the social network and regression analysis. 34 farmers had no dyadic or triadic connections (isolates) and were removed from the Edgelist prior to importing into UCINET. The node sample size for the Core/peripheral and regression model included 35 restaurants; 17 farmers; and 4 distributors, henceforth referred to as Houston's local food subnetwork. Gender of the respondent and organizational size were entered into the model in order to control for the effects of these demographic characteristics (see Table 3.4).

While roughly half of the restaurateurs (18 compared to 17) were found in the core of the local food subnetwork, only 3 farmers remained in the core while the remaining 14 were

peripheral. Figure 3.6 displays the core-periphery structure of connected LFSN members. The overall binomial logistic regression model was significant (p<.009) and indicated significant and positive associations between both dyad count and network member coreness and closed triad count and network member coreness (adjusted ORs: 3.19 and 3.39, respectively). There was no significant association observed between coreness and weighted degree, or between coreness and open triad count.

Discussion

Farmers and restaurateurs with more direct connections were more likely to comprise the more interconnected core of the network (Hypothesis 5a). Those with more connections to eachother through distributors were also more likely to be in the more connected core if and only if all individuals were aware of the sourcing ties (Hypothesis 5b). Hypothesis 5c, that those with connections through distributors but were not aware of the farm source, could not be confirmed in this study.   It is of interest to further explore the summary characteristics of core versus peripheral members. There was a large observed difference were in the average number of direct connections (dyad counts) between core and periphery farmers (13.33 compared to 3).   A seemingly smaller difference, but one with significant influence on the network, the closed triad count for core restaurateurs was 1.28 compared to 0.06 for periphery restaurants. Lastly, the open triad counts between core and periphery farmers was substantially larger, 4.33 compared to 0.35 relationships reported. These descriptives imply that even though open triads were not positively associated with network connectedness, they may serve a purpose for farmers specifically, who may benefit from the ability of distributors to widen their restaurateur-reach.

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Compared to the low density of the entire network (0.05), the density of the core-periphery network was higher than that of the entire network as this calculation was done after removing farmers/restaurateurs with no connections.   One output of the core-periphery procedure is a density matrix, whereby the core is the high-density block, and the periphery is the low-density block with low density of connections (ties) with one another as well as with members of the core. Because we conducted two-mode core-periphery modeling, our density matrix yielded four densities, reported in Table 3.2. The density of ties between periphery restaurateurs and periphery farmers was greater than the density of ties between both core restaurateurs and peripheral farmers, and core farmers and peripheral restaurateurs. This suggests that the periphery block, or the interactions between periphery members, may be more crucial to the flow of resources in the overall network than are the interactions between core and periphery members.   While many social network methods involve treating networks with two types of actors as if they were of the same type, our findings show how using two-mode procedures are a strength of this study.

The surprisingly low density of the network, both the complete and core-periphery networks, suggests the need to evaluate the capacity for greater connectedness between farmers and restaurateurs. The results also present useful findings about the existing connections between actor types. Further investigations can provide insights on why periphery members may tend to connect to one another rather than to core members. Relatively high average out-degree for connected farmers (5.71) despite a small n is indicative of a trend toward structural equivalence – where restaurateurs share information about their suppliers and are likely to source produce through similar channels. In the ideal case of triadic closure, the distributor introduces a new link that contributes to a denser core

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as well as bridging ties to peripheral actors, which is important as the periphery likely contains resources as well.

Distributors introduce two new restaurants to the network as well as two new farmers, changing the network boundary itself by adding 4 nodes to the connected network of actors. In addition to expanding the network boundary, distributors also increased the number of sourcing relationships (ties) reported by farmers and restaurateurs. Of the 124 farm-restaurateur sourcing pairs, 19 would not exist without a distributor. More often than connecting components or subgroups of the network, distributors are connected to either nodes that are connected via geodesics as well or, to a lesser extent, to pendant nodes – in this case pendants represent a slight widening of the network boundary as compared to what is measured by the more core-network members. Even though few in number, pendant nodes represent a real, "edible" contribution to the local food movement.

A key implication of the supplemental analyses on brokerage is that not all distributors affect the network in the same way, although we can say that in general all centrality measures increase once distributors are introduced into the network. Thus, distributors do contribute somewhat to the flow of goods in the network. However, the current findings call for more investigations into the effect of transparency and reciprocity if triads are to continue to be an important part of the network tie census. Additionally, more research is needed as to what characteristics about distributors may predict the nature and structure of their sourcing relationships with farmers/restaurateurs. Examples of characteristics to investigate further include the distributor's market (i.e., large-scale food retail, restaurants only), whether or not they pick-up from local farms or just accept deliveries, and what safety standards and certifications they require of partnering farms.

The current study has several noteworthy limitations. Foremost, the independence of observations assumption required of logistic regression is almost implicitly violated as we begin with an interdependent and intertwined set of actors. A social network technique, exponential random graph models, presents useful analog to logistic regression. Exponential random graph models are statistical models where specific structural configurations are tested.   Software programs use simulation techniques to determine if the network structure is statistically significant than that expected by chance. They have been used to examine networks composed of k-triangles, equivalent to the closed triad configuration we observed, and two-path configurations, which in this case would be one where a farmer and restaurateur are connected to the same node (a distributor). Attributes can then be added to the models to test for commonalities between actors. Although analogous to logistic regression, a key difference is that they presume network dependencies (Robins, 2015, p.194).

We are also limited by methodological choices. It may also be that partitioning the network into two groups – a more densely connected core and a less connected periphery, is not an ideal representation of the LFSN. It is possible that partitioning the network into three groups, for example, can reveal individuals in an intermediate layer that play a vital role in connecting members of the periphery with members of the core. Future research can utilize partitioning to evaluate how other positions, besides core and periphery, can influence network outcomes. Nevertheless, the techniques of core-periphery segmentation enable us to visualize asymmetries in the network relationships. As the local food movement is one of great social change, and network polarization is fundamental to social change (Kadushin, 2012) the study of such asymmetries is worthwhile.

The cross-sectional design employed can erroneously lead us to conclude that restaurateurs in the core will stay in the core; and those that are less connected will remain that way. In reality, who is influential evolves just as the relationships themselves change over time. Without longitudinal data, we are left without an understanding of how much (or how little) time needs to elapse before the network structure is dramatically different than what we observed. The cross-sectional nature of the data is particularly problematic for the interpretation of findings regarding the role of distributors as brokers. For example, brokerage has been shown to be crucial for the flow of knowledge over a structural hole when clusters have previously been isolated, and is less productive where a network is already rich in diverse knowledge and connectivity (Burt, 2004). In the former scenario, a broker can increase flow of goods, make knowledge more accessible, and create network cohesion by creating ties of collaboration. In the latter example, a broker can create a bottleneck for transfer of goods and information from farm to restaurant and discourage ties from forming, even breaking new ones by offering interceptions whereby restaurants can use another node, via their brokerage services, at lower cost (de Nooy et al., 2011).

USDA agricultural economist Jim Barham describes "soft infrastructure," in contrast to the "hard infrastructure" elements of delivery trucks and processing facilities, as the individuals who know all the actors in network and who can connect them. Barham explains, "They don't have a truck, they aren't the farmer or the chef, they are under the radar, but they are actually the ones that make this all happen (Ross, 2017)." The power of these "match-making" individuals to either coordinate or control resources, both social and material, can be explained by social network methods. At its inception, local food distributor Farm-to-Table provided both hard and soft infrastructures for the local food community. A

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systematic review of brokerage roles concluded that short-term advantages of brokerage will translate to long-term benefits only when the social structure is relatively static (Alba & Moore, 1978), a word that can hardly characterize any local food movement. Rather, relationships making up the local food network form, break, and evolve over time. In a real-world scenario where networks are not measured in static points of time, open triads can be closed as the farmer and restaurateur eventually get introduced to one another and begin to interact directly, and the network consequently expands (Granovetter, 1985). The systematic closure of triads over time has been associated with a denser core, or a central component of mutually connected nodes, and greater ability to access resources efficiently (Boyd, 2010). More research is needed to determine the short- and long-term consequences of brokerage in the local food context. The current study is limited by not framing the investigation and analyses also in the theoretical perspectives economics. Future work situated within the frameworks of economics and specifically regional economic systems can further explore the role of distributors who may have market power over both consumers (i.e., restaurateurs) and suppliers (i.e., farmers). Research questions to address include: Do distributors, specializing in local or otherwise, suppress the price of imported supplies below their competitive market price? Do distributors sell at prices far exceeding the marginal cost of goods?

The current study shows the value of using social network analysis to understand network structure of seemingly dyadic farmer-restaurateur relationships and how various network-level metrics can be applied to evaluate the influence of distributors within a network. Overall, the findings provide a useful platform for future studies designed to evaluate more specific network characteristics such as differences in size of produce shipments or in types of produce comprising brokered sourcing ties. Insights can also be

used to develop interventions targeting farmers, restaurateurs, and even distributors who wish to have more connections within their local food communities.

Conclusions

Distributors were influential to the network as they added sourcing ties and even introduced farm and restaurant members who were otherwise not part of the network. However, using distributors to connect to other network members only appears to be positively associated with group cohesion and coreness of locavore restaurateurs and their partner farmers in the case of triadic closure.   We could not, however, prove that farmers and restaurateurs connected via a distributor in open triads were more likely to be positioned in the network periphery.   It is apparent also by the range in Betweenness centrality and in network visualizations that not all distributors influence the network in the same way. As hypothesized, having direct relationships (sourcing ties) was the best predictor of how connected a farmer or restaurateur was in the network.

Table 3.1. Individual and network-level measures of connectedness

Individual level	
Measure	Definition and Computation
In-degree centrality (restaurateurs only)	The number of farmers providing produce regularly to this restaurateur
Weighted in-degree centrality (restaurateurs only)	The number of times per month restaurateurs receive produce from farmers (directly or indirectly)
Out-degree centrality (farmers only)	The number of restaurants receiving produce regularly form this farmer
Weighted out-degree centrality (farmers only)	The number of times per month farmers send produce to restaurateurs (directly or indirectly)
Betweenness centrality (distributors only)	The number of occasions farmers provide produce to this distributor to then deliver to a restaurateur
Network level	
Density, computed for two mode	Overall connectedness of the network; the number of direct actual connections divided by all possible direct connections in the network of farmers and restaurateurs; number of ties divided by n*m, where n is no. of rows (restaurateurs) and m is no. of cols (farmers) in matrix.

Table 3.2. Descriptive statistics for farmers and restaurateurs in Houston's local food social network (N=51 farmers, 35 restaurateurs) and in core-periphery network (N=17 farmers, 35 restaurateurs)

	Entire Network (N=86)		Core Periphery Network (N=52)			
			Core Members		Periphery Members	
	Farms	Restaurants	Farms	Restaurants	Farms	Restaurants
Number of Nodes	51	35	3	18	14	17
Unweighted Degree Centrality						
Min Degree	0	1	17	1	1	1
Max Degree	17	11	17	11	17	3
Average Degree	6.44	3.23	17	4.61	4.43	1.76
(SD)	(6.43)	(2.10)	0	2.01	(4.32)	(0.83)
Weighted Degree Centrality						
Min Weighted	2	2	53	4	2	2

Degree					
Max Weighted Degree	58	46	58	46	55	15
Weighted Average	22	10.69	56.33	15.5	14.64	5.59
(SD)	(20.25)	(8.53)	(2.89)	(9.08)	(13.17)	(3.66)
Triadic Census[a]						
Mean (Min, Max)						
Dyads	4.59 (0, 17)	2.26 (0, 10)	13.33 (10,17)	3.83 (1,10)	3 (0,11)	1.41 (0,3)
Closed triads	0.65 (0,6)	0.66 (0, 3)	0.33 (0,1)	1.28 (0,3)	0.71 (0,6)	0.06 (0,1)
Open triads	0.88 (0, 7)	0.31 (0, 1)	4.33 (1,7)	0.28 (0,1)	0.14 (0,1)	0.35 (0,1)
			0.709[d]	0.186[d]	0.145[d]	0.059[d]
Network Density	0.0517[b]		0.149[c]			

Notes: [a] Farm N=17, [b] 2-mode density for entire network, N=86, [c] 2-mode density for sub-network used for core-periphery modeling, N=52 (removing 34 farmer isolates), [d] Density matrix results from two-mode core-periphery procedure in UCINET in order from left to right: core restaurateurs with core farmers, periphery restaurateurs with periphery farmers; core restaurateurs with periphery farmers; and periphery restaurateurs with periphery farmers

Table 3.3. Demographic characteristics of Houston's locavore network of farmers (n=17) and restaurateurs (n=35)

	Farmers		Restaurateurs	
	N	(%)	N	(%)
Gender				
Male	15	88	28	80
Female	2	12	7	20
Organizational size				
Under 150 acres	9	53	-	-
150-300 acres	5	24	-	-
300-450 acres	1	6	-	-
Over 450 acres	2	12	-	-
Under 50 seatings per day	-	-	1	3
50-100 seatings per day	-	-	3	9
101-200 seatings per day	-	-	13	37
Over 200 seatings per day	-	-	18	51

Table 3.4. Network determinants of coreness in sample of Houston locavore restaurateurs and farmers, N=52

Variable	Coreness **			
	Unadjusted OR	95%CI	Adjusted OR[a]	95%CI
Dyads (no triad)	3.52*	(1.14, 9.02)	3.19*	(1.16, 8.75)
Open triads	2.67	(0.55, 10.73)	3.08	(1.11, 8.54)
Closed triads	3.17*	(1.31, 7.67)	3.39*	(0.80, 13.46)
weighted degree	0.78	(0.02,0.42)	0.8	(0.62, 1.04)

Notes: *p<.05, **p<.005, [a]Model controlled for gender and organizational size

Figure 3.2. Weighted prominence in terms of out-degrees for farmers in Houston's local food social network, based on monthly produce exchange
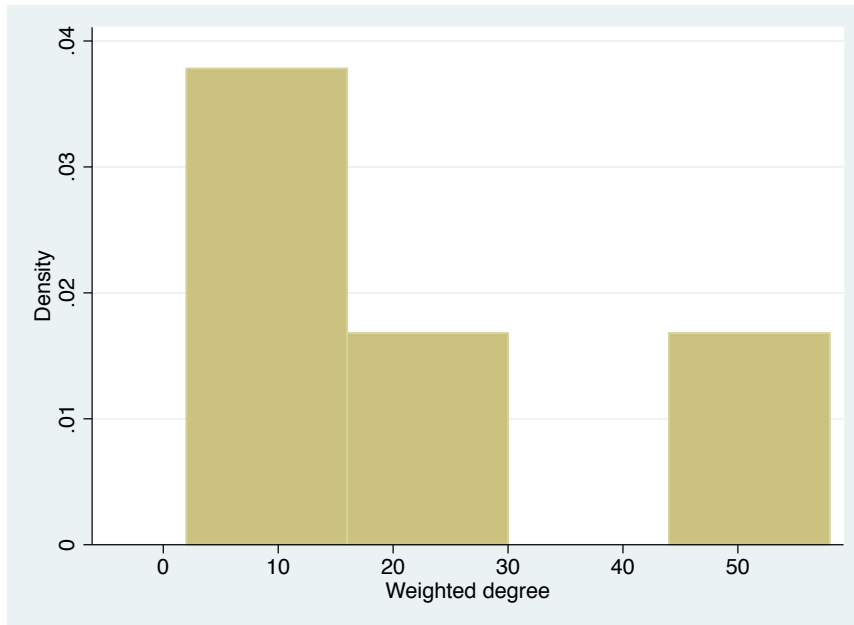
Figure 3.3. Weighted prominence in terms of in-degrees for restaurateurs in Houston's local food social network, based on monthly produce exchange, n=35
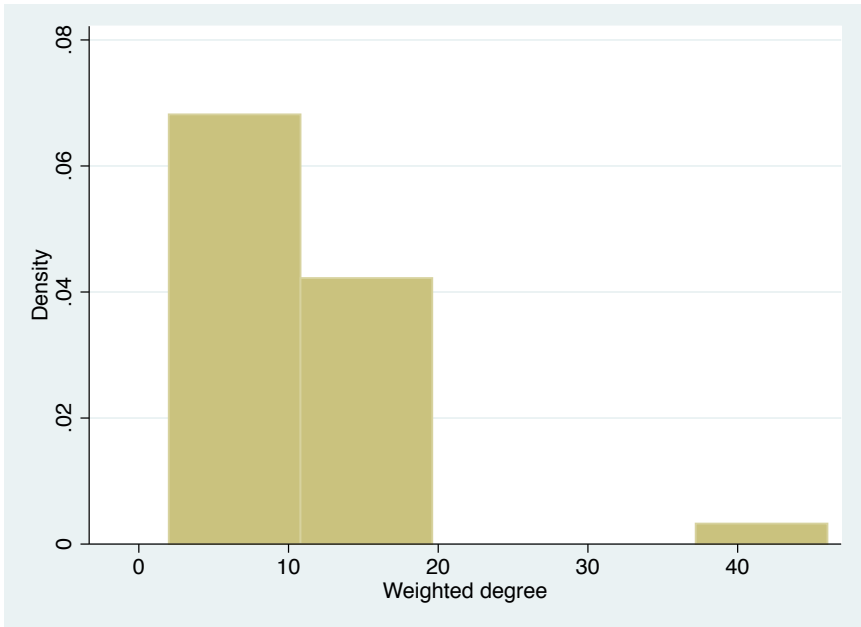
Figure 3.4. Comprehensive local food network shown with both direct and indirect relationships (ties) removed

Complete Network

Indirect ties removed

Direct ties removed

134
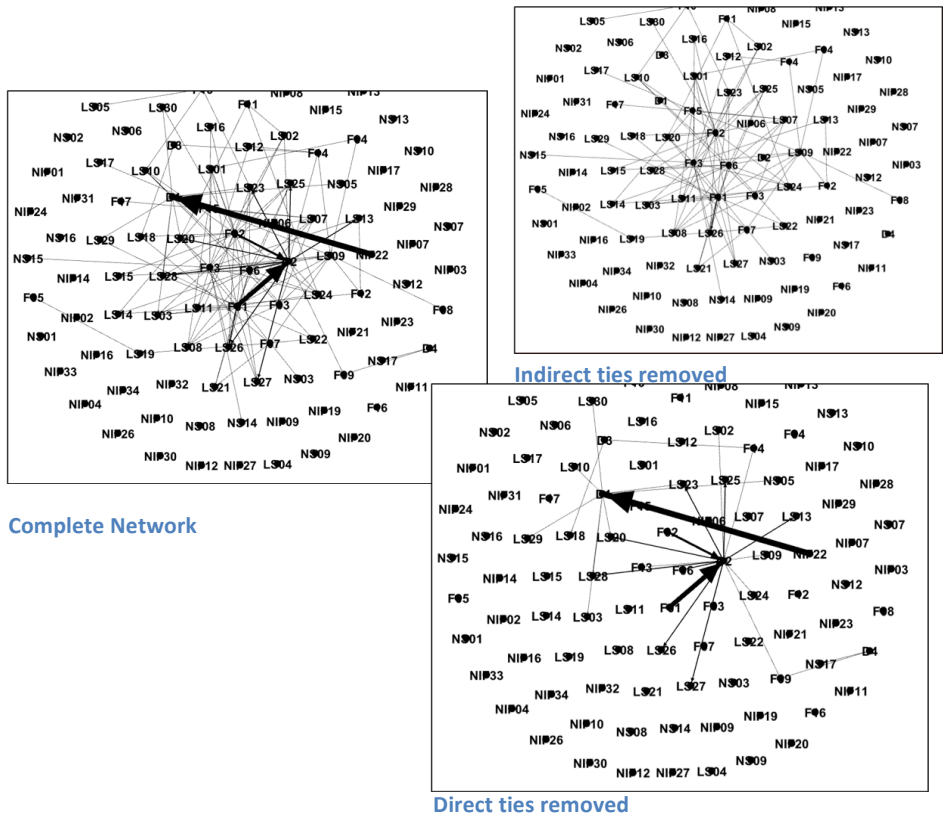
Figure 3.5. Produce sourcing ties via distributor intermediaries [a]
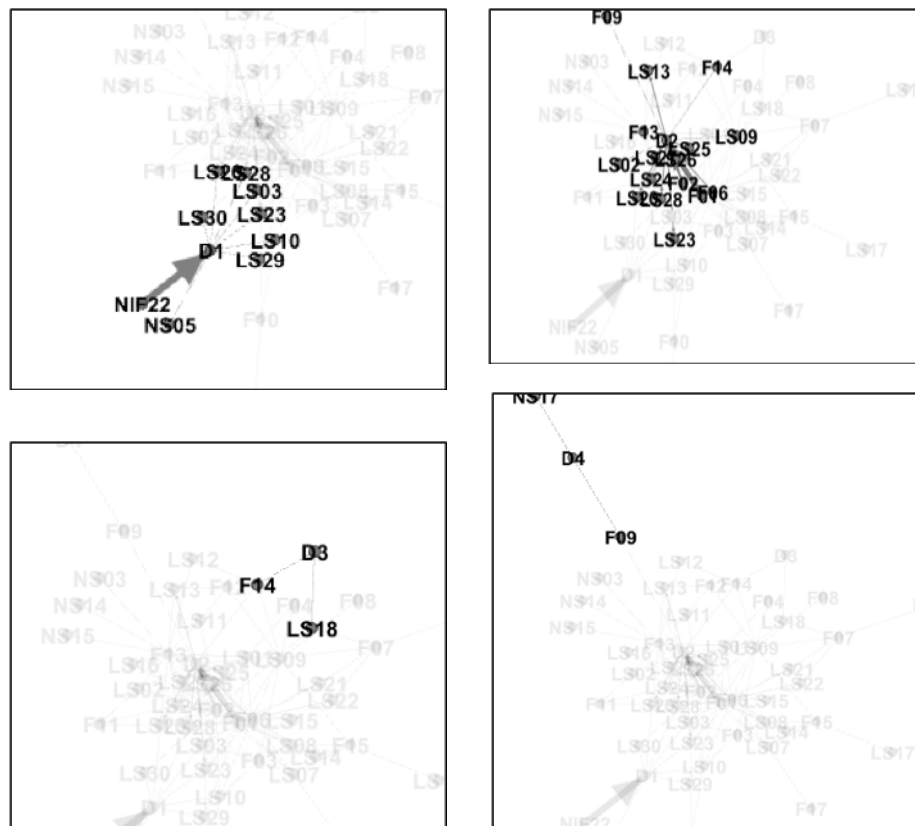
Notes: [a] Distributors arranged from top left to bottom right: D1, D2, D3, D4; Farmers and restaurateurs un-connected to the distributor are grayed out to emphasize connections made via distributor

Figure 3.6. Core-periphery structure of local food social network, N=52
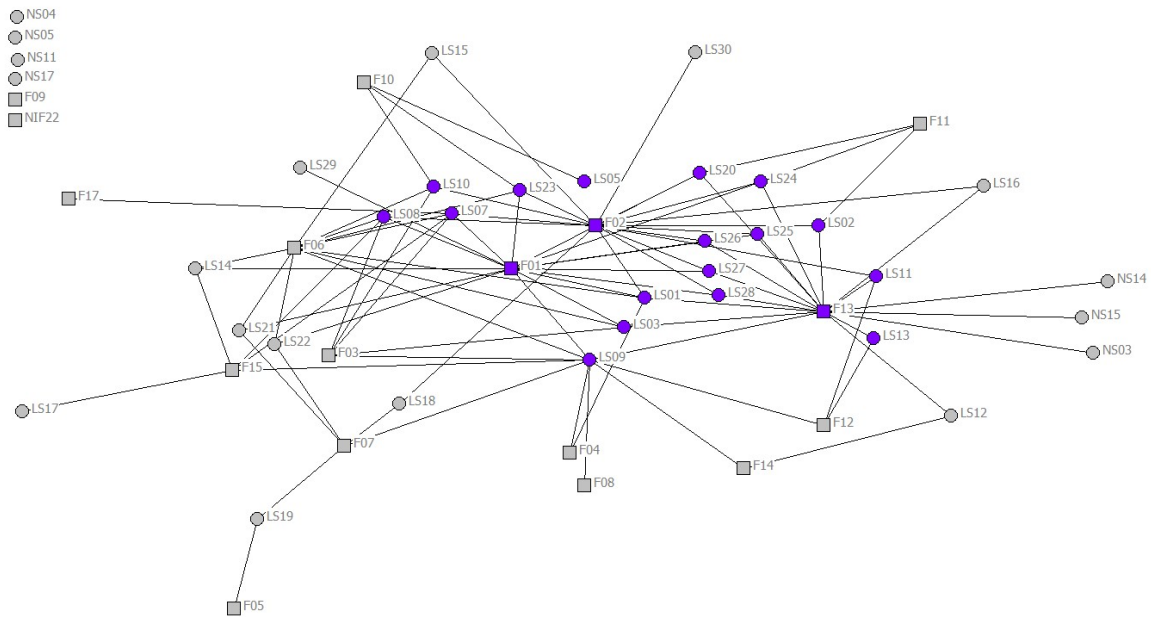
Notes: Purple denotes densely interconnected "core," while gray nodes are those that are peripheral to the network according to core/periphery partitioning; Circles represent restaurateurs while squares represent farms; Nodes to the left are those that are connected to the network only via distributors (distributor ties not pictured to simplify visualization of core and peripheral farms/restaurateurs); N=34 isolates with no connections to the network were removed prior to modeling procedure

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CONCLUSION

"An animated interest in, discussion of, and academic respectability accorded to food has arrived. "

- Paul Freedman (Freedman, 2016, P. 409)

This dissertation is composed of three papers with the collective goal of understanding local produce sourcing by Houston restaurateurs. We collected individual-level data on restaurateurs and utilized the social network framework to derive individual-level measures of the connectedness to measure how embedded each player is in the local food network. In the first manuscript, we identified differences in sociodemographics, beliefs, and behaviors between restaurateurs who source produce directly from farmers compared to those who do not have direct relationships with local farmers. Our results showed that restaurateurs who sourced local produce directly engaged in more food citizenship behaviors such as attending farmers markets; endorsed greater identification with the local food movement; and perceived the benefits outweighed the economic costs of local sourcing. In this subset of restaurateurs, neither the number of farms from which restaurateurs sourced nor the monthly frequency of produce received from local farms were associated with total level of local produce sourced. However, identification with the local food mission was significantly and positively associated with level of local produce sourcing.

In the second manuscript, we utilized constructs from SNT to explore how competition and collaboration among restaurateurs were associated with local produce sourcing. While neither were statistically significant predictors of level of local sourcing, findings suggest that the more competitive relationships restaurateurs report with others, the more they source local produce. This was visible in a trend toward greater scores in competition across level of local sourcing. The last manuscript examined the role of local food distributors in brokering the relationships between farmers and restaurateurs. Specifically, we looked at how having relationships with distributors influenced the interconnectedness of farm/restaurant network members. We determined which farmers/restaurateurs were most interconnected based on density of relationships. We constructed visuals of the LFSN--network maps consisting of both farmers and restaurateurs—to uncover the patterns of direct relationships between farms and restaurateurs as well as indirect connections (i.e., those that were mediated by a distributor). We then identified predictors of whether or not an individual farmer/restaurateur would be positioned in the most cohesive, connected, and thus collectively active region of the network (the network core versus its periphery). The network structure revealed that having more direct relationships increased the likelihood that restaurateurs would be embedded in the most connected region of the network, while having relationships with farmers via distributor middlemen was only conditionally associated with connectedness--in order to benefit from the distributor mediating the relationship, all players had to be aware of the relationship (as measured by the social network construct of triadic closure).

Our findings point to the utility of relationship building interventions designed to target restaurateurs who are both connected to farmers and local food distributors and those

who are not yet connected. At the individual level, it is important to understand the behaviors (i.e., food citizenship) and values (i.e., identifying with the local mission) as they are positively associated with local produce sourcing. As recognized by SNT, it is also imperative to include other social players if community-level change is desired. Thus interventions need to simultaneously target local farmers and even distributors who specialize in local produce. Interventions can also be designed in the framework of social network to intervene on the actual relationships between players. The success of initiatives can then be evaluated by the changing prevalence and structure of the relationships of interest over time.

This dissertation was limited by sample size and the selection of a very specific locavore restaurateur group that may not be representative of either restaurateurs in general, or locavore groups in other communities.   Insights thus far can inform other researchers in the study of more representative target populations. These initial findings also contribute to the measurement of restaurateur-specific variables (i.e., identification with local) that can lead to more refined tools to be validated in diverse populations, including locavores in general and more diverse populations of locavore restaurateurs.

Each paper emphasized the role of the restaurateur within the wider social network, as we collected data and analyzed results from the perspective of the restaurateur.   However, understanding the attitudes and behaviors of the Houston area local farms may be more informative for public health programming. Each of the farms interviewed for this study in addition to those found to be potential, but not reported, sources of produce for Houston restaurateurs falls into the small "family farms" category of the USDA's farm typology. Family farms made up 18% of the agricultural value added in 2010.

This farm type has been characterized by innovations in farming organically and in supporting local food systems (Wilde, 2013, p.17). Meanwhile, a very small portion of United States consumers' food dollars go toward farmers: For every dollar spent on food spending in 2010, 10.1 cents went to farms and agriculture, while 34 cents went to foodservice industry, including restaurants (Johnson, 2016). Future studies should emphasize the motivations and obstacles for farmers who choose whether or not to work with restaurateurs or other food retail outlets.

Lastly, while integral to the success of local food systems, the focus on produce was arguably both too specific and too general. There is a need for research inputs on relationships formed in the raising and consumption of livestock and production of non-produce crops as they constitute a large portion of local, national, and global food systems. Future work should assess the flow of specific types of produce that translate to ingredients found in restaurants. As it is increasingly necessary to change the ways in which we cook if we are to start with readily available ingredients, it would also be a worthwhile avenue of research to create and validate cooking technique instruments emphasizing the use of seasonal, accessible ingredients. We do see this trend in books of New American cuisine, with titles such as "How to Cook Everything," (Bittman, 2018) and "The Farm Cooking School: Techniques and Recipes that Celebrate the Seasons" (Knauer & Wiseman, 2017).

Given the increasingly negative state of affairs with industrialized food systems, more attention is needed in small-scale community efforts that can in turn have positive repercussions on society at large. Recent community studies literature provides several plausible explanations for movements such as the local food movement within in a community. While some reflect on community as a nostalgic response to the uncertainty

and chaos of contemporary life (Kuecker, Nadarajah, & Mulligan, 2010), others have framed community as "networked approaches to maintaining a sense of 'local' and 'connectedness' within an increasingly impersonal and globalizing world (Liu,2017)." This project reflects on the socially negotiated meanings of local and its socioeconomic manifestations in a specific community, as is appropriate for the study of a community-driven movement with possible global repercussions. This dissertation also urges us to re-conceive restaurants as sites for both individual and social regeneration, as they were intended in their inception.

APPENDICES

Appendix A: Institutional Review Board Approval Letter (HSC-SPH-17-1034)

![UTHealth logo] **UTHealth** ™
The University of Texas
Health Science Center at Houston

Committee for the Protection of Human Subjects
6410 Fannin Street, Suite 1100
Houston, Texas 77030

Robin Haddad
UT-H - SPH - Ctr Health Prom & Prev Resrch

December 08, 2017

<u>HSC-SPH-17-1034</u> - *Understanding local food uptake by Restaurateurs: A Cross-Sectional Social Network Analysis in Two Interconnected Cities*

The above named project is determined to qualify for exempt status according to 45 CFR 46.101(b)

CATEGORY #2 *: Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:*

a. information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; AND ,

b. any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

CHANGES: Should you choose to make any changes to the protocol that would involve the inclusion of human subjects or identified data from humans, please submit the change via iRIS to the Committee for the Protection of Human Subjects for review.

INFORMED CONSENT DETERMINATION:
Signed Informed Consent Required

INFORMED CONSENT: When Informed consent is required, it must be obtained by the PI or designee(s), using the format and procedures approved by the CPHS. The PI is responsible to instruct the designee in the methods approved by the CPHS for the consent process. The individual obtaining informed consent must also sign the consent document. <u>Please note that only copies of the stamped approved informed consent form can be used when obtaining consent.</u>

HEALTH INSURANCE PORTABILITY and ACCOUNTABILITY ACT (HIPAA):
Exempt from HIPAA

STUDY CLOSURES: Upon completion of your project, submission of a study closure report is required. The study closure report should be submitted once all data has been collected and analyzed.

Appendix B: Screening Tool

RESTAURATEUR SCREENER

Pre-Screener

DATE:

1. Name of restaurant:

2. Source for initial local claim:
    - ❐ Restaurant Menu
    - ❐ Restaurant signage or banners
    - ❐ Restaurant website
    - ❐ Other website (Yelp, blog, etc.)
    - ❐ Magazine or journal article
    - ❐ Online newspaper
    - ❐ Other: _____

3. Is the restaurant located within the city limits of Houston?
    - ❐ Yes
    - ❐ No

4. Has the restaurant been operational for six months or more?
    - ❐ Yes
    - ❐ No

Initial Screen (over phone) Skip if screening in person unless respondent not yet known

DATE:

5. Does the restaurant claim to use two or more locally sourced produce goods (excluding herbs and microgreens) at any given time?
    - ❐ Yes
    - ❐ No
6. Is there someone with sourcing authority available who has had this responsibility for six months or more?
    - ❐ Yes *(Proceed with inquiry of interest to consent)*
    - ❐ No

Final Screen (in person)

DATE:

2. What does locally sourced mean to you?

3. If the definition of local was within 150 miles of the city, how many <u>fruit/vegetable items, not including herbs and microgreens,</u> do you have from local farmers at any given time (either directly from them or from distributors where you have asked that they be local)?   *Need to ask clarifying questions, like :*

- Can you name a few you have now?
- How do you know that they are local if from a distributor?
- Think of a month where it might be hard to find local seasonal ingredients…

If 2 or more > offer LS survey
If less than 2 > offer NS survey

4. If eligible for this study, would you like to participate?
    ❒ Yes
    ❒ No

** Consenting Procedure**

1. What is your preferred method of completing the assessment?

2. Can we schedule a time for the assessment?

FARMER SCREENER

Pre-Screener
DATE:
1. Name of farm:
2. Source for initial finding:
    ❒ First-hand knowledge
    ❒ Local local registry
    ❒ Local Harvest.org
    ❒ Other website (Yelp, blog, etc.)
    ❒ Restaurant menu or advertisement
    ❒ Farmer's Market
    ❒ Restaurant Participant Survey Response
    ❒ Other: _____
3. Is the farm located within 150 miles of Houston ?

❐ Yes
❐ No

4. Has the farm been operational for six months or more?
    ❐ Yes
    ❐ No

Initial Screen (over phone or in person)

DATE:

5. Does the farm grow fruits and/or vegetables (not including herbs or microgreens)?
    ❐ Yes
    ❐ No
6. Is there someone with vending authority available who has had this responsibility for six months or more?
    ❐ Yes
    ❐ No

Final Screen (in person)

DATE:

7. If eligible for this study, would you like to participate?
    ❐ Yes
    ❐ No

** Consenting Procedure**
1. What is your preferred method of completing the assessment?

2. Can we schedule a time for the assessment?

DISTRIBUTION COMPANY SCREENER

Pre-Screener
DATE:

7. Name of Company:

8. Source(s) for distribution partner claim:

9. Does the company list restaurant clients publicly?
    ❐ Yes _____
    ❐ No

10. Does the company list vendor/farmer clients publicly?
    ❐ Yes _____

❐ No

Final Screen

DATE:

1. What does locally sourced mean to you?

2. If the definition of local was within 150 miles of the city, how many <u>fruit/vegetable vendors</u> do you have at any given time (either directly from them or from distributors where you have asked that they be local)?

3. How many different restaurants in the city of Houston do you regularly deliver these goods or other items like eggs, dairy, milk, etc. to?

4. If eligible for this study, would you like to participate?
   ❐ Yes
   ❐ No

** Consenting Procedure**

3. What is your preferred method of completing the assessment?

4. Can we schedule a time for the assessment?

RESTAURATEURS ARE NEEDED FOR RESEARCH STUDY

- We are conducting research to find out:

  - How restaurants support their community's food system
  - What types of relationships exist between restaurants and farms, and restaurants and distributors

- A brief survey will let us know if you are eligible for participation in the study. Regardless of the result, your time and help on this project are very important and very much appreciated.

- If eligible, you will be asked to complete a questionnaire that should take between 30 and 60 minutes to complete.

- **ALL** responses are completely confidential. NO individual responses will be shared with anyone including research collaborators.

- Summary results, however, may be available to you if you would like to see them at the conclusion of the project. Again, no individual participants' responses will be identifiable or sharable. All summary data that are not confidential can be provided to you upon request.

- The questionnaire can be given to you at your place of work, e-mailed to you, or mailed to an address of your choosing.
- For any questions or concerns, please contact the Principal Investigator of the study:

Robin Jump
Phone: 713-725-9862; email: robin.haddad@uth.tmc.edu

FARMERS ARE NEEDED FOR RESEARCH STUDY

- We are conducting research to find out:

    o How farms support their community's food system
    o What types of relationships exist between farms and entities like restaurants and distributors

- A brief survey will let us know if you are eligible for participation in the study. Regardless of the result, your time and help on this project are very important and very much appreciated.

- If eligible, you will be asked to complete a questionnaire that should take between 30 and 60 minutes to complete.

- **ALL** responses are completely confidential. NO individual responses will be shared with anyone including research collaborators.

- Summary results, however, may be available to you if you would like to see them at the conclusion of the project. Again, no individual participants' responses will be identifiable or sharable. All summary data that are not confidential can be provided to you upon request.

- The questionnaire can be given to you at your place of work, e-mailed to you, or mailed to an address of your choosing.

- For any questions or concerns, please contact the Principal Investigator of the study:

Robin Jump
Phone: 713-725-9862; email: robin.haddad@uth.tmc.edu

Feel free to pass along contact information to others you may know who would like to participate.

HOUSTON-AREA PRODUCE DISTRIBUTORS ARE NEEDED FOR RESEARCH STUDY

- We are conducting research to find out:

  o How distributors support their community's food system

- A brief survey will let us know if you are eligible for participation in the study. Regardless of the result, your time and help on this project are very important and very much appreciated.

- If eligible, you will be asked to complete a questionnaire that should take between 20 and 30 minutes to complete.

- **ALL** responses are completely confidential. NO individual responses will be shared with anyone including research collaborators.

- Summary results, however, may be available to you if you would like to see them at the conclusion of the project. Again, no individual participants' responses will be identifiable or sharable. All summary data that are not confidential can be provided to you upon request.

- The questionnaire can be given to you at your place of work, e-mailed to you, or mailed to an address of your choosing.

- For any questions or concerns, please contact the Principal Investigator of the study:

Robin Jump
Phone: 713-725-9862; email: robin.haddad@uth.tmc.edu

Feel free to pass along contact information to others you may know who would like to participate.

Consent to Participate in Research for Local Food Systems

Understanding local food uptake

INVITATION TO TAKE PART

You are asked to participate in a research study called, "Understanding local food uptake" conducted by Robin Jump, of the University of Texas Health Science Center at Houston. For this research project, she will be called the Principal Investigator or PI. Your decision to take part is voluntary. You may refuse to take part or choose to stop taking part, at any time. You may refuse to answer any questions asked or written on any forms. This research project (HSC-SPH-17-1034) has been reviewed by the Committee for the Protection of Human Subjects (CPHS) of the University of Texas Health Science Center at Houston.

PURPOSE OF THE STUDY

This project will look at how farmers and restaurants interact in cities where agricultural factors may either enable or hinder restaurant patrons to consume locally sourced goods. Specifically, Robin Jump will interview restaurateurs and farmers to find out about patterns in where restaurant foods come from. The primary aim of the research is to better understand the relationships between farmers and restaurateurs and what are some of the barriers and contributors to using local farm goods in restaurants.

PROCEDURES

If you volunteer to participate in this research, you will be asked to do the following:

1. Complete a questionnaire, anticipated to take about one-half hour, during which Robin Jump will be available to answer any questions you may have. This is a one-time assessment and you may schedule this at a time that is best for you within one month of providing your consent to participate. You will be contacted for reminders to take the survey no more than five times as necessary and helpful to you but you can contact the investigator at any time. You may have to recall some information about transactions you have had, including regular purchases, special orders, and you can refer to your records as needed. Some of the questions invite you to give your opinions and any thoughts you may have on specific challenges you may have. Your name will not be stored as data is collected, but rather you will be given a unique number to identify you and protect the confidentiality of your responses. After the end of the project, no later than December 2018, all physical copies of questionnaires will be destroyed. De-identified and electronic data will be stored in a password-protected computer.

POTENTIAL BENEFITS

You may receive no direct benefit from being in the study; however, your taking part may help public health practitioners and those committed to local food systems to understand how they can better support both restaurants and farms. Additionally, collective results of the study may be shared with you if desired at the time of completion, while all possible measures will be taken to ensure your confidentially and that of other respondents.

POTENTIAL RISKS

This project is not intended to provoke any physical, mental or emotional discomfort. However, you may choose to share sensitive and confidential information on the questionnaires. You may also get tired of answering the questions or find the questionnaire to take too long. You do not have to answer any questions you do not want to answer. All efforts will be made to protect your confidentiality however the collective results could be used to infer findings are true for individuals when this may not be the case.

COSTS, REIMBURSEMENT AND COMPENSATION
There should be no costs to participating in this study. If questionnaires are mailed to you, you will receive pre-paid return envelopes.

CONFIDENTIALITY

Please understand that your feedback will be reviewed but without the use of personal identifiers.   You will not be personally identified in any reports or publications that may result from this study. These materials will be destroyed when the research project ends.

PARTICIPATION AND WITHDRAWAL

Your decision to take part is voluntary. You may decide to stop taking part in the study at any time. Additionally, you may also refuse to answer any questions you do not want to answer.

IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about this research, please contact:
Robin Jump, phone: 713-725-9862
Robin.haddad@uth.tmc.edu

Appendix E: Restaurateur Questionnaire

PREFACE: BASIC DEMOGRAPHICS

Your Name:

_____

Date of Completion: _____

How old are you?   _____

What is your gender?   _____

What is your ethnicity?   _____

I. ABOUT YOUR RESTAURANT

The following questions ask for basic information about you and your restaurant

    1. What is the name of your restaurant?

_____

Where are you located? Please provide multiple addresses if you have more than one location, regardless of what your role is at other locations:

_____

    Street address is sufficient

_____

    Street address is sufficient

_____

    Street address is sufficient

    3. What type of business entity are you organized as?

        ○ Limited Liability Corporation (LLC)
        ○ Non-profit

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- Limited Partnership (LP)
- Sole Proprietorship
- Other: _____
- None

4. Are you a subsidiary or part of a larger business entity?   Yes / No   If so, which one?   _____

5.   How old is your organization in years?

- Less than one year
- 1-4 years
- 5-9 years
- 10 or more years

6.   How many customers do you have per day (on average throughout the week)?

- Under 50
- 50-100
- 101-200
- Over 200

7. What is your job title and primary role?

_____

8. How long have you been in this role?

_____

9. What types of social media platforms does your restaurant use?   *Please select all that apply.*

- Facebook page
- Twitter
- Company website
- Yelp
- Foursquare
- Youtube
- Instagram
- Pinterest
- Google + Page
- Other(s):

  _____

10. What does "Your community" mean to you?

_____

11. Which of the following is closest to your idea of community?

   o   My neighborhood
   o   My city
   o   My county
   o   My state
   o   My region

12. What does local mean to you?

_____

13. Which of the following is closest to your idea of local?

   o   Within 10 miles
   o   Within 100 miles
   o   Within 300 miles
   o   Within my state
   o   Within 600 miles

II. Revenue & Sales

The following questions ask about your funding sources and the typical types of payment and fee structures you typically use.

2. Please indicate the percentage of *initial* funding that came from each of the following sources: *You can write in approximate percentages or place an "X" or checkmark in the corresponding box.*

Funding Source	0%	1-25%	26-50%	51-75%	76-100%
Revenue					
Private Equity					
Public Loans					
Private Loans					
Online Loans (i.e., Square)					
Personal Gifts					
Crowdfunding Gifts (i.e., Kickstarter)					

3. Please indicate the percentage of your ongoing funding that comes from each of the following sources: *You can write in approximate percentages or place an "X" or checkmark in the corresponding box.*

Funding Source	0%	1-25%	26-50%	51-75%	76-100%
Revenue					
Private grants					
Public grants					
Charity					
Other:_____ *(Please write in)*					
Other:_____ *(Please write in)*					
Other:_____ *(Please write in)*					

I.   **PARTNERSHIPS IN YOUR COMMUNTIY**

1. The first column in this table lists some partnerships you may know of or be involved with. Place an "X" or check mark in the column with the response that is most true for each of the partnership options. There are some additional questions in the "Yes" column that may apply to you.

IN THE QUESTIONS BELOW, "REGULARLY" MEANS ONCE A MONTH OR MORE

	YES	OCCASSIONALLY	IN THE PAST	PLAN ON IN THE FUTURE	NO
HAVE A BOOTH AT FARM STANDS (I.E., LOCAL FARMERS MARKETS)	**IF YES, WHERE ?** _____ _____ _____				
OPERATE ANY EDUCATIONAL WORKSHOPS AT YOUR RESTAURANT	**IF YES, CAN YOU LIST THEM ?** _____ _____ _____				
PERSONAL CSA MEMBRSHIP					
PROFESSOINAL CSA MEMBERSHIP					

OTHER	IF YES, CAN YOU LIST THEM ?				
	_____ _____ _____ _____				

2. For any items that you indicated were true in the "past", can you explain why they are no longer true?

_____

_____

3. Do you attend a farmer's market regularly as a customer, once monthly or more? (Yes/No)

While there are many definitions of local, for the purpose of this questionnaire, "local" refers to food that is grown and harvested within 150 miles of Houston. All questions going forward are related to this definition of the word local.

4. *If you do not currently use a distributor for locally sourced foods of any kind, please SKIP to next question.*

Please use the table below to list out any major distribution partners you <u>currently</u> have <u>FOR LOCAL FOODS</u> (IN this case please consider local within 150 miles of your city) and place a check mark or an "X" in the box under the corresponding columns to mark which items these distributors help you acquire.

Name of Local-food distributor	Local Fruits & Vegetables	Local Milk	Local Eggs	Local Other Dairy	Local Livestock	Local Grains	When using this distributor, I choose the vendors/suppliers on an ongoing basis.			
							n/a	Never (they choose for me)	Some-times	Always
Distributor 1: _____										
Distributor 2: _____										
Distributor 3: _____										
Distributor 4: _____										

5. What are the most important factors you consider when making decisions about what foods to purchase? From the following options, please rank the 3 that are most important to you, with 1 being the most important and 3 being the third most important.

List of Qualities
- ■ Availability
- ■ Shelf-life
- ■ Consistency
- ■ Cost
- ■ Freshness
- ■ Local
- ■ Organic
- ■ New/Exotic ingredients
- ■ Other:_____(Please write in)

RANKING	QUALITY
1 (Most Important)	
2	
3 (Third Most Important)	

6. If cost and availability were not a factor in your decision making about what foods to purchase, which of the following is *MOST* true for you?

○ I prefer to purchase organic foods.

○ I prefer to purchase local foods.

○ I prefer to purchase both organic and local foods.

○ I prefer to purchase whatever is in highest demand by my customers.

○ I prefer to not be restricted to either organic or local foods.

7. How responsible do you feel *personally* for what ingredients are used in your restaurant?

○ Not responsible at all

○ Somewhat responsible

○ Responsible

○ Very Responsible

8. How responsible do you feel as a group (restaurateurs in general) for what ingredients are used in restaurants in general?

○ Not responsible at all

○ Somewhat responsible

○ Responsible

○ Very Responsible

9. How confident do you feel *personally* that you *can* purchase **local** ingredients for your restaurant?

○ Not confident at all

○ Somewhat Confident

○ Confident

○ Very Confident

10. How confident are you that restaurateurs as a group *can* find **local** ingredients for use in restaurants in general?

○ Not confident at all

○ Somewhat Confident

○ Confident

○ Very Confident

11. Please use the table below to indicate your level of agreement with the following statements.

	Disagree	Somewhat Agree	Agree	Not Sure	Haven't thought about it or NA
I have access to local farmers in my community.					
Working with local farmers builds my sense of community.					
It is a goal of mine to work with local farmers.					
I trust local farmers to work with me.					
	Disagree	Somewhat Agree	Agree	Not Sure	Haven't thought about it or NA
I would like to work with farmers in my community more.					
It is financially good for my business to work with local farmers.					
It is economically feasible for me to work with local farmers.					
Local farm goods are too expensive					
Farmers reach out to me.					
I should reach out to more farms in my community.					
More farms should reach out					

	Disagree	Somewhat Agree	Agree	Not Sure	Haven't thought about it or NA
to me.					
I would like to place small regular orders to farms.					
I would like to place large regular orders to farms.					
I would still like to order from farms even if sporadic.					
I would prefer to buy wholesale from farms.					
Negotiating prices at time of purchase is okay with me for farm goods.					
I prefer to pay per unit prices for farm goods.					
I would like to pre-order / pre-pay produce from local farms.					
I would like to have a local farm contract grow for me.					
	Disagree	Somewhat Agree	Agree	Not Sure	Haven't thought about it or NA
Finding enough produce locally is too challenging for me to use predominantly local ingredients.					
The amount of communication needed to work with farmers is too challenging					
Partnering with farmers is important to me					

12. For each of the following categories of foods, please indicate the percentage of locally sourced foods you generally purchase for your restaurant. Remember, local for the purpose of this survey means the food is raised and harvested within 150 miles of Houston.

Eggs
None or minimal
1-24%
25-50%
51-75%
More than 75%

Milk
None or minimal
1-24%
25-50%
51-75%
More than 75%

Other Dairy
None or minimal
1-24%
25-50%
51-75%
More than 75%

Livestock
None or minimal
1-24%
25-50%
51-75%
More than 75%

Grains
None or minimal
1-24%
25-50%
51-75%
More than 75%

Fruits & Vegetables
None or minimal
1-24%
25-50%
51-75%
More than 75%

13.   For each category presented below, please indicate how much of your total fruit and vegetable ingredients come from each of the listed sources by placing an X along the line from 0% to 100% . *Note this includes local and non local Items.*

Estimated percentage of All (local/not local) Fruits & Vegetables, excluding herbs and microgreens		

Non-local farms via a distributor (including nearby farms like Covey Rise)	0%	50%	100%

Local farms via a distributor			
	0%	50%	100%

Wholesale marketplace (i.e., Restaurant Depot; Costco)	0%	50%	100%

Supermarket (Not including Costco)			
	0%	50%	100%

Farmer's Market (not including Canino market)			
	0%	50%	100%

Canino Market			
	0%	50%	100%

CSA arrangement			
	0%	50%	100%

Restaurant Garden (grow your own)			
	0%	50%	100%

Direct connections with local farms			
	0%	50%	100%

Direct connections with non-local farms (including nearby farms like Covey Rise)	0%	50%	100%

Other:			
_____	0%	50%	100%

Other:			
_____	0%	50%	100%

Other:

| | 0% | 50% | 100% |

IV. YOUR NETWORK

The farms in your area are listed in the Reference Sheet provided. The following questions ask about your ordering patterns for various farm goods over the past year from these farms, whether you received farm goods via distributor or directly from the farm, which may include farm-operated distribution.

*For identifying farms, you can use either the name of the farm or the number identifier from the Reference Sheet.

Your answers will help us understand communication and relationships across various groups in the community. Remember, your answers are strictly confidential.

1. Please list any farms from which you regularly, once a month or more, get other items, i.e., eggs, dairy, milk, pork, beef) using the table below:

Farm	Product Purchased	Distribution Route		How often?
		Direct	Distributor	
Other farms not listed:				

2. Please list all farms from which you have purchased fruits and vegetables at least twice over the past year, not including those listed above

| Farm | Product Purchased | Distribution Route | |

		Direct	Distributor	How often?
Other farms not listed:				

3. Please list any farms if you have worked together for any events or specific projects in the previous year and also in the last five years.
Past year:

Last 5 years:

Are there farms above with which you used to purchase from but no longer do? If so, can you list them and explain why?

5.. Do you share information with other restaurants about your local food providers or have you in the past year?   Do you have any specific ones in mind?   If so, can you list them below and explain?

6. Have you collaborated with any restaurants in the past year on certain events? If so, please list below.

IV. **LAST SECTION!**

1. What are some reasons you like to work with farmers?

2. What are some reasons you DO NOT like to work with farmers?

3. What are some reasons you would NOT or do not like to work with distributors for local food sourcing specifically?

4. What are some reasons you WOULD like or do like to work with distributors for local food sourcing specifically?

THANK YOU FOR ALL YOUR EFFORTS AND

PARTICIPATION IN THIS SURVEY!

Appendix F: Addendums to Questionnaires for Local-Sourcing Restaurateurs

Please use the table below to indicate how you typically order and pay for produce from local farmers. Local here means food grown within 150 miles.

Typical payment contracts used	Not Applicable – I do not use this method	Almost always or always	Sometimes	Almost Never or Never
Payment forward arrangements (i.e., as in CSAs paid upfront)				
Per unit purchases (i.e., per bushel)				
Wholesale purchases (i.e., per crate)				
Negotiate prices at time of purchase				
Pay upon delivery of goods				
Regular invoicing/payment schedule separate from delivery				
Place orders regularly (at least once monthly)				
Place orders as needed				
Place orders in person to farmer				
Place orders via a distributor but I pick suppliers				
Place orders via a distributor but they pick suppliers				
Place orders via farmer's phone/website				
Pick up at farm				
Pick up at farmer's market or other meeting place				
Have farmer deliver to restaurant				
Accept delivery through distributor (not farm owned)				

Please list all farms from which you receive regularly deliveries of *fruits and vegetables*, meaning once a month or more:

Farm	Product Purchased	Distribution Route		How often?
		Direct	Distributor	
Other farms not listed:				

	Do you regard this restaurant as a competitor for customers?		Do you regard this restaurant as a competitor for farming /farmer resources (i.e., relationships with farmers)		Do you collaborate with this restaurant by sharing information?		Do you consider this restaurant a collaborator in the local food movement?		Do you consider this restaurant a competitor in the local food movement?	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
(Each restaurant that could have										

(Each restaurant that could have been in the study sample was listed below)										
Other: _____										
Other: _____										
Other: _____										

Appendix G: Questionnaire for Farmers

I.   ABOUT YOUR FARM

The following questions ask for basic information about you and your farm.

PREFACE: BASIC DEMOGRAPHICS

Your Name:

_____

Date of Completion: _____

How old are you? _____

What is your gender? _____

What is your ethnicity? _____

1. What is the name of your farm(s)?

_____

2. Where are you located? Please provide multiple addresses if you have more than one location:

_____
Street address City   State   Zip Code

_____
Street address City   State   Zip Code

3. What type of business entity are you organized as?

- o Limited Liability Corporation (LLC)
- o Non-profit

  o Limited Partnership (LP)
  o Sole Proprietorship
  o Other: _____
  o None

4. Are you a subsidiary or part of a larger business entity? Yes / No If so, which one? _____

5. How old is your organization in years?
  o Less than one year
  o 1-4 years
  o 5-9 years
  o 10 or more years

6. How big is your farm? *Please list sizes separately if you have multiple locations*

location 1: _____Acres

location 2: _____Acres

location 3: _____Acres

7. What is your job title and primary role?

_____

8. How long have you been in this role?

_____

9. Which label(s) most accurately describes your farm? *Check all that apply.*

  o Conventional
  o Sustainable practices
  o Natural growing practices
  o Organic practices
  o Certified natural grower
  o Certified organic grower
  o Certified transitional grower
  o Other: _____

10. What does "Your community" mean to you ?

_____

11. Which of the following is closest to your idea of community?

  o My neighborhood
  o My city
  o My county
  o My state
  o My region

12. What does local mean to you?

  _____

13. Which of the following is closest to your idea of local?

  o Within 10 miles
  o Within 100 miles
  o Within 300 miles
  o Within my state
  o Within 600 miles

II.   REVENUE & SALES

The following questions ask about your funding sources and the typical types of payment and fee structures you both prefer and typically use.

4. Please indicate the percentage of *initial* funding that came from each of the following sources: *You can write in approximate percentages or place an "X" or checkmark in the corresponding box.*

Funding Source	0%	1-25%	26-50%	51-75%	76-100%
Revenue					
Private grants					
Public grants					
Private Equity					
Public Loans					
Private Loans					
Online Loans (i.e., Square)					
Personal Gifts					
Crowdfunding Gifts (i.e., Kickstarter)					

2. Please indicate the percentage of your ongoing funding that comes from each of the following sources: *You can write in approximate percentages or place an "X" or checkmark in the corresponding box.*

Funding Source	0%	1-25%	26-50%	51-75%	76-100%
Revenue					
Private grants					
Public grants					
Charity					
Other:_____ *(Please write in)*					
Other:_____ *(Please write in)*					
Other:_____ *(Please write in)*					

3. Please use the table below to indicate how you *typically* charge your customers (whoever your primary customers might be).

Typical payment contracts used	Most or all of the time	Often	Sometimes	Rarely	Never
Payment forward arrangements (i.e., as in CSAs paid upfront)					
Per unit sales to customers (i.e., per bushel)					
Wholesale pricing (i.e., per crate)					
Fixed Fees (do not change from day to day or customer to customer within a season)					
Flexible/negotiable fees					
Collect payment upon delivery of goods					
Regular invoicing/payment schedule separate from delivery					
Other:_____ *(Please write in)*					

4. . Please use the table below to indicate how you *typically* charge your **restaurant** customers. ***Please skip if this does not apply to you.***

Typical payment contracts used	Most or all of the time	Often	Sometimes	Rarely	Never
Payment forward arrangements (i.e., as in CSAs paid upfront)					
Per unit sales to customers (i.e., per bushel)					
Wholesale pricing (i.e., per crate)					
Fixed Fees (do not change from day to day or customer to customer within a season)					
Flexible/negotiable fees					
Collect payment upon delivery of goods					
Regular invoicing/payment schedule seapate from delivery					
Other:_____ *(Please write in)*					

While there are many definitions of local, for the purpose of this questionnaire, "local" refers to within 150 miles of Houston. All questions going forward are related to this definition of the word local.

III.   PARTNERSHIPS IN YOUR COMMUNTIY

1. The first column in this table lists some partnerships you may know of or be involved with. Place an "X" or check mark in the column with the response that is most true for each of the partnership options. There are some additional questions in the "Yes" column that may apply to you.

*In the questions below, when the word "REGULARLY" appears this means once a month or more

	YES	OCCASSIONALLY	IN THE PAST	PLAN ON IN THE FUTURE	NO
PARTICIPANT IN THE FARM TO WORK PROGRAM					
PARTICIPANT IN THE FARM SCHOOL PROGRAM					
HAVE A BOOTH AT FARM STANDS (I.E., LOCAL FARMERS MARKETS)	**IF YES, WHERE ?** _____ _____ _____ _____ _____				
OPERATE ANY EDUCATIONAL WORKSHOPS ON YOUR FARM (I.E., GARDENING CLASS FOR SCHOOLCHIDLREN)	**IF YES, CAN YOU LIST THEM ?** _____ _____ _____ _____ _____				
CSA SHARES					
REGULARLY* (MONTHLY OR MORE) SUPPLY TO RESTAURANTS IN AUSTIN					
REGULARLY* (MONTHLY OR MORE) SUPPLY TO RESTAURANTS					

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IN HOUSTON					
REGULARLY* **(MONTHLY OR MORE)SUPPLY TO GROCERY STORES IN AUSTIN (INCLUDING FOOD HUBS)**					
REGULARLY* **(MONTHLY OR MORE)SUPPLY TO GROCERY STORES IN HOUSTON**					
REGULARLY * **(MONTHLY OR MORE) USE A DISTRIBUTOR**					

2. For any items that you indicated were true in the "past", can you explain why you no longer do this?

_____

3. Are any of your CSA customers restaurateurs?

- o *Not applicable – I do not have a CSA*
- o Yes
- o No
- o Not Sure

4. Are any of your Farmers' Markets customers restaurateurs?

- o *Not applicable – I do not have a stand at a Farmers Market*
- o Yes
- o No
- o Not Sure

5a. If you do not currently use a distributor, please SKIP this question.

Please use the table below to list out any major distribution partners you currently have and place a check mark or an "X" in the box under the corresponding columns to mark which items these distributors help you deliver.   If applicable, please fill in the corresponding bubbles to indicate to where distributors deliver your goods, where

R=to Restaurants
G=to Grocery stores, including food hubs or convenient stores
O=To Other Places

If completing electronically, you can type in the letter if that if your word processor does not allow you to fill in the bubble.   Thank you!

Name of distributor	No. Months	Fruits & Vegetables	Milk	Eggs	Other Dairy	Livestock	Grains
EXAMPLE: *FARM TO YOU*	*6 months*	X		X			
Destination:		○ G ● R ○ O	○ G ○ R ○ O	○ G ▭ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O
Distributor 1: _____							
Destination:		○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O
Distributor 2: _____							
Destination:		○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O
Distributor 3: _____ *Destination:*							
		○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O	○ G ○ R ○ O

5b. Are you always informed of where your produce goes? (Yes / No) If so, how?
_____

6. If you have not provided any goods to restaurants in HOUSTON over the last year, please SKIP this section.

Some of the restaurants in your area are listed below. For each one, please use the columns to indicate if "Yes" you have provided *produce* to this restaurant at least <u>twice in the past year</u>, and also if you do at <u>least once per month</u>, and if you do this directly or via a distributor by circling the best answer choice.

Your answers will help us understand communication and relationships across various groups in the community. Remember, your answers are strictly confidential

RESTAURANT	At least *twice in the past year,* you have provided **fruits /vegetables** to this restaurant	You *regularly* provide food to this restaurant (**at least once per month**)			*If applicable,* for how long (in months) has this been true?	You used to deliver to but no longer do.	You currently regularly *(monthly or more)* provide non-produce items. If so, Please list. (i.e., pork, eggs, milk)
		HOW OFTEN? *(IN TIMES PER MONTH)*	*DIRECT*	*VIA DISTRIBUTOR*			
Example: Cuba Café	X	❏ *1-2* ❏ *3-4* ❏ *5 OR MORE*	X		*6 MONTHS*		*EGGS*
(EACH RESTAURANT WAS LISTED IN ROWS BELOW)		❏ *1-2* ❏ *3-4* ❏ *5 OR MORE*					

7. When you *directly* deliver your goods, which of the following is your primary method?

- o I don't use this method, but use a distributor instead.
- o Restaurants pick up from my farm.
- o Restaurants pick up from a pre-determined location besides my farm (i.e., Market)
- o I or an employee delivers using personal vehicles.
- o I or an employee delivers using business vehicles.
- o My farm has a refrigerated delivery truck used for distribution.
- o Other: _____

8. Are there any restaurants above or others not mentioned that you have worked with for special events in the last five years?

9. For any restaurants that you **used** to provide to but no longer do, can you briefly state why?

IV. LAST SECTION!

a. Please use the table below to indicate your level of agreement with the following statements.

	Disagree	Somewhat Agree	Agree	Not Sure	Haven't thought about it or NA
I have access to restaurateurs in my community interested in purchasing my goods.					
Working with restaurants builds my sense of community.					
It is a goal of mine to work with restaurants.					
I trust local restaurants to work with me.					
I trust distributions companies to work with me to find restaurant customers.					
I would like to work with restaurateurs in my community more.					
I would like to work with distribution companies more.					
It is financially good for my business to work with restaurants.					
It is financially good for my business to work with distributors.					
I reach out to restaurants in my community.					

I reach out to distribution companies.					
Restaurants reach out to me.					
Distribution companies reach out to me.					
I should reach out to more restaurants in my community.					
More restaurants should reach out to me.					
I would like small regular orders from restaurants.					
I would like large regular orders from restaurants.					
I would still like orders from restaurants even if they are sporadic.					
I would offer wholesale prices to restaurants.					
Negotiating prices at time of purchase is okay with me for my restaurant customers.					
I prefer restaurants pay per unit prices.					
I would like restaurants to pre-order / pre-pay produce.					
I would like to contract grow for restaurants.					
Growing enough produce is too challenging for me to have restaurant customers.					
The amount of communication needed to work with restaurant customers is too challenging					

Partnering with restaurants is important to me					
Partnering with restaurants would take away from my other customers.					
When working with distributors, I know where they take my goods.					
I would like distributors to pre-order/pre-pay produce					
I would like to contract grow for distributors					
I would like to work with distributors for regular orders					
I would like to work with distributors for occasional orders					

2.   What are some reasons you do not or would NOT like to work with restaurants?

_____

3. What are some reasons you do like to or WOULD like to work with restaurants?

_____

4. What are some reasons you do not or would NOT like to work with distributors?

_____

5. What are some reasons you do like to or WOULD like to work with distributors?

_____

6. Do you collaborate with other farms by taking their goods to sell along with your own? If so, can you list any you have worked with in the past year:

_____
___

THANK YOU FOR ALL YOUR EFFORTS AND

PARTICIPATION IN THIS SURVEY!

Appendix H: Questionnaire for Distributors

I.   **ABOUT YOUR COMPANY**

The following questions ask for basic information about you and your company.

    PREFACE: BASIC DEMOGRAPHICS

    Your Name:

    _____

    Date of Completion: _____

    How old are you?   _____

    What is your gender?   _____

    What is your ethnicity?   _____

1. What is the name of your company?

_____

2.   Where do you deliver to?

_____

3.   How old is your organization in years?
   - o   Less than one year
   - o   1-4 years
   - o   5-9 years
   - o   10 or more years

4.   What is your job title and primary role?

_____

5.   How long have you been in this role?

_____

6a. Please use the table below to indicate how you *typically* charge your restaurant customers.

Typical payment contracts used	Most or all of the time	Often	Sometimes	Rarely	Never
Per unit sales to customers (i.e., per bushel)					
Wholesale pricing (i.e., per crate)					
Fixed Fees that might change from season to season					
Fixed fees that might change from week to week within a season					
Flexible/negotiable fees					
Collect payment upon delivery of goods					
Regular invoicing/payment schedule separate from delivery					
Other:_____ *(Please write in)*					

6b. Please use the table below to indicate how you *typically* pay your farmers/suppliers.

Typical payment contracts used	Most or all of the time	Often	Sometimes	Rarely	Never
Per unit purchases (i.e., per bushel)					
Wholesale purchases (i.e., per crate)					
Fixed Fees that might change from season to season					
Fixed fees that might change from week to week					
Flexible/negotiable fees					
Pay upon receipt of goods					
Regular invoicing/payment schedule separate from delivery					

	Always	Most of the time	Sometimes	Rarely	Never	Not Sure
Other:_____ *(Please write in)*						

7. Which of the following are true for you?   In each statement, "customers" refers to restaurant customers, while "suppliers" are the farms or growers from which the food comes.

	Always	Most of the time	Sometimes	Rarely	Never	Not Sure
My customers rely on my company to find the suppliers for their goods.						
My customers choose their goods depending on what suppliers I have available at the time.						
Customers order based on their preferred supplier.						
Customers order based on their ingredient needs regardless of supplier.						
The customers know which vendors have which goods because I post this information on their order forms.						
The customers can see which vendors they have ordered from on their receipts/invoices.						
Customers can ask me or my company directly if they want to know where their goods came from.						

Customers often do ask me or my company which vendors their goods came from.						
Some of my suppliers collect farm goods from other farms for me to pick up.						
My vendors/suppliers do know which restaurant customers order their goods.						

7b. If you answered "yes" to the last statement above, how do how do vendors know which restaurant customers get their goods?

- o   Not applicable
- o   Word of Mouth
- o   Written or printed statement or summary provided to Vendor/supplier
- o   Other: _____

8. Please use the table below to indicate your level of agreement with the following statements.

	Disagree	Somewhat Agree	Agree	Not Sure	Haven't thought about it or NA
I would like to work with restaurateurs in the Houston community more.					
I would like to work with farmers in the Houston community more.					
I reach out to restaurants in Houston.					
I reach out to farmers in the Houston area.					
Houston Restaurants reach out to me.					

Houston-area farmers reach out to me.					

9. What are some reasons you do like to or would like to work with **local** farmers?

_____

10. What are some reasons you do not or would not like to work with **local** farmers?

II.   Houston Restaurants and Farms

While there are many definitions of local, for the purpose of this questionnaire, "local" refers to within 150 miles of Houston. All questions going forward are related to this definition of the word local.

Please refer to the **Farm Reference Sheet** provided.   These are farms from which you might deliver food to Houston-area restaurants, some of which are listed in the **Restaurant Reference Sheet** provided.

1. Do you currently deliver foods from any of these farms or others within 150 miles to Houston-area restaurants or have you in the last year?

> o   Yes; farms listed here
> o   Yes; farms not listed: *Please write in:*
>   _____
> o   No

If you do not currently deliver foods from any Houston-area growers from within 150 miles to Houston restaurants, you are done with the survey now. Thank you so much for your time!! Otherwise, please complete the last section under Question 2. Thank you!

__2. For each Houston restaurant, please list the names of the restaurants below and use the tables to answer a few questions about each one. Please write in any names that are not listed in the Reference Sheet__

Restaurant Name (or Ref No from the Restaurant Reference Sheet)	Local Farm Name (or Ref No from the Farm Reference Sheet)	How often do you deliver produce from here, not including herbs or microgreens?	Other Products delivered *monthly or more*?
		❒ LESS THAN ONCE A MONTH ❒ 1-2 TIMES/ MONTH ❒ 3-4 TIMES/MONTH ❒ 5+ TIMES/MONTH	❒ EGGS ❒ MILK ❒ OTHER DAIRY ❒ LIVESTOCK ❒ GRAINS
		❒ LESS THAN ONCE A MONTH ❒ 1-2 TIMES/ MONTH ❒ 3-4 TIMES/MONTH ❒ 5+ TIMES/MONTH	❒ EGGS ❒ MILK ❒ OTHER DAIRY ❒ LIVESTOCK ❒ GRAINS
		❒ LESS THAN ONCE A MONTH ❒ 1-2 TIMES/ MONTH ❒ 3-4 TIMES/MONTH ❒ 5+ TIMES/MONTH	❒ EGGS ❒ MILK ❒ OTHER DAIRY ❒ LIVESTOCK ❒ GRAINS

Please use as many rows per restaurant as needed to answer the questions below.   Thank you.

THANK YOU FOR ALL YOUR EFFORTS AND

PARTICIPATION IN THIS SURVEY!

Appendix I: Example Reference Sheet (Houston area farmers)

Ref No.	Name	Ref No.	Name	Ref NO.	Name	Ref No.	Name
F01	105 Market	F21	Hard Times Farm	F41	Piccis Farm	F61	Tecolote Farm
F02	Absolutely Organic 3R C Farm	F22	Helderman's Farm	F42	Pine Valley Produce	F62	Two Happy Children Farm
F03	All we need farm	F23	Hippychick's Gardens	F43	Plant if Forward @ University of St Thomas	F63	Utopia Acquaponics
F04	Animal Farm	F24	Indian Hills Farm	F44	Plant it Forward Farms @ Braeswood Church	F64	Wild Sky Farm
F05	Atkinson Farms	F25	Johnson's Backyard Garden	F45	Plant it Forward Westbury Community Garden	F65	Winfield Farm
F06	Blessing Falls	F26	Kearley Seeds & pepper	F46	Pomona Farms	F66	Wood Duck Farm
F07	Blessington Farms	F27	Kitchen Pride	F47	R& J Farms	F67	Peas farm
F08	Blue Bird Farm	F28	Last Organic Outpost	F48	Rotten Roots Farm	F68	Ellis farm
F09	Celestine Gardens	F29	Laughing frog Farm	F49	RRR Farm	F69	Moss Family farms
F10	Cellar Farms	F30	Little Om Farm	F50	Sand Creek Farm	F70	Edmonds farms
F11	Connor's Microgreens	F31	Loam Agronomics	F51	Sand Holler Farm	F71	Glos Gardens
F12	D& M Farms	F32	Lund Produce Co. Branchgrove Farms	F52	Skinny Lane Farm	F72	Fallow Creek Farm
F13	Dewberry Farm	F33	More Hart Farm	F53	Sown & Grown	F73	Looper Farm
F14	Eden's Cove	F34	Nawara	F54	Star Seed Farm	F74	Lori's Garden
F15	Eureka Acres Urban Farm	F35	New Harvester Farm	F55	Stegesaurus Farm/3R C Farm	F75	The Egg Lady
F16	Farm Goods	F36	None-Such Farm	F56	Sugar Hill Farm	F76	Whirlaway Farm & Garden
F17	Finca Tres Robles	F37	Onion Creek Farm	F57	Sullivan's Happy Heart Family Farm	F77	*Write in:*
F18	Friendly Pastures	F38	Pea's Farm	F58	Sunfood Farm	F78	*Write in:*
F19	Fruitful hill	F39	Peach Creek Farm	F59	Sustainable Harvesters	F79	*Write in:*
F20	Gundermann Acres	F40	Phoenix Farm	F60	Sutter's Woods Organic Farm	F80	*Write in:*

Appendix J: Glossary of Terms

Please note: All definitions are adapted for this study and must be interpreted in the context of the specific population and research interests enclosed.

Alters: the nodes to which the focal nodes, or egos, are directly connected

Betweenness centrality: the degree to which a **node** (here **distributor** nodes) lies on paths between other nodes, acting as a **bridge** or **broker**.

Bridge: actors who exist as members of sub-networks within the network, connecting otherwise isolated **nodes**, usually associated with coordination of resources mutual gain of both actors

Broker: a network actor that acts as an intermediary between unlinked actors and can facilitate transfer of goods or movement of information, knowledge, and other forms of **social capital**, sometimes motivated by personal gain and associated with the hoarding of information for self-interested reasons.

Census: A count of relationships and between individuals in addition to their classifications as dyadic or triadic (dyad and triad census, respectively). Counting the number of dyads and triads in the network is a key step in network descriptives.

Certified naturally grown: label for farm goods that signifies no use of synthetic herbicides, pesticides, fertilizers, or genetically modified organisms.

Certified organic: label for farm goods signifying no use of pesticides, chemical fertilizers, dyes, growth hormones, or antibiotics and prohibiting any genetic engineering, animal cloning, sewage sludge use, or synthetic food processing aids and ingredients obtained only after a minimum of three years of meeting organic standards

Certified transitional: label for farm goods grown on land that is in the process of becoming organically certified

Closeness centrality: Closeness centrality refers to the quality of being positioned close to others in the network, with lower closeness scores indicating enhanced ability to transmit information or other social capital through the network.

Conventional: label assigned to farm goods that are produced with synthetic chemicals or genetically modified organisms and without restrictions on use of synthetic processing methods and pesticides, antibiotics, fertilizers, and hormones

Community supported agriculture (CSA): a framework for connecting farmers to consumers within a **local food social network** where consumers can subscribe to the harvest

ahead of time, possibly a risk-sharing strategy as CSA members often pay ahead in exchange for future harvests

Core: The quality of being positioned in the network's more densely connected region, or its "core" partition

Core-periphery: Segmentation of individuals in a social network into two partitions: the more interconnected, cohesive "core" and a lesser connected "periphery"

Degree centrality: degree centrality refers to the total number of connections a node has, which can be further characterized as **indegree** and **outdegree**, or social interaction ties pointing away from an actor (i.e., goods leaving a farm) and toward an actor (i.e., goods entering a restaurant), respectively, or merely as degrees if the tie is indicative of a reciprocal relationship

Density: the number of direct actual connections divided by all possible direct connections in a network.

Distributors: A company or business whose purpose is to deliver ingredients from their source to retail customers like restaurants and grocery stores.

Dyad: A pair of actors or nodes and the ties that exist between them

Egos: the focal node or actor of interest in a social network

Egocentric: from the perspective of individuals or nodes called **egos** who are sampled and asked about their relationships with others, relational partners called **alters**

Edge: link, tie, or interaction between network nodes

Edgelist: two-column matrix with each row identifying a pair of actors for a specific relation

Eigenvector centrality: Eigenvector centrality is a combined measure of each node's degree and the degrees of partner nodes (restaurateurs connected to the restaurateur for which we are calculating centrality). Eigenvector centrality is thus a measure of wider influence over the network and approximates the notion of popularity.

Farmer: An individual who represents a farm entity that grows fruits and/or vegetables with one or more locations within 150 miles of Austin and/or Houston who is able to make decisions about the marketing and dissemination of farm goods.

Farmers' markets, municipally supported communal spaces where farmers are allowed to sell their goods, usually for a fee, apply different standards as appropriate for their geographic location.

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Food citizenship: a set of behaviors enacted by consumers that reflect their commitment to public and person health

Gatekeepers: individuals and entities who act within a social system to make decisions that affect how, in this case food, gets from whom to whom; in social network theory a gatekeeper is an actor who controls the flow of information from one node to another

Local food movement: is a food system that is geographically localized, with consequently shorter distances between food production and consumption.

Local food social network: the system of at least potentially interconnected players in a geographically localized setting made up of food producers (farmers), consumers (restaurateurs), and the distribution channels between them

Localwashing: a spin off of green-washing, whereby a perception of environmentally-friendliness is promoted with the intent to deceive or exaggerate the "green" qualities of the service/product of interest, localwashing is the promotion of locally-friendly, with occasional clarifications such as locally-*made,* locally-*sold,* locally-*grown.*

Locavore: one who consumes locally sourced goods such as those provided by local farmers

Multiplex: a multi-layered network, where layers represent different types of interactions between network nodes as in real-world examples where nodes are likely to interact in multiple ways

Multivariate exponential random graph models (ERGMs): analogous to logistic regression for dyadic data, ERGMs are representations of the processes and tie formation of a network structure created by comparing observed networks to randomly generated networks and assessing likelihood of fit. Statistics used to generate ERGMs include number of ties and nodal attributes like position and size.

Network structure: a system consisting of entities of interest (**nodes**) and the interactions (**edges**) between them

Niche overlap: sharing of resources, including social capital and environmental variables

Nodes: entities or players of interest in the network, also known as actors

Peripheral: The quality of being positioned in the networks less densely connected "periphery" region, where members are not connected to one another but may be connected to members of the core

Restaurant: A place of business where patrons sit down and pay for meals (breakfast, lunch, and/or dinner) cooked and prepared for them (this study excludes similar culinary establishments like juice bars, bakeries, ice cream shops, etc.)

Restaurateur: An individual who owns or manages, or otherwise represents a restaurant with one or more locations in the city of Houston and who is able to make decisions about the sourcing and purchasing of ingredients.

Resource-relation layers: the composite data collected about the actual inflow or outflow of farm goods to restaurants and the types of ties that exist between nodes, of the same type and of different types

Size: the number of nodes in the network (here nodes are actors who could be farmers, restaurateurs, or distributors)

Social capital: the sum of the actual and potential resources embedded within a network of relationships possessed by individuals and social units

Social network analysis: the process of investigating social structures made up of **nodes** and **ties** that is comprised of various graphing, mapping, and measurement techniques informed by **social network theory**

Social network indicators: metrics used to characterize the nodes (actor-level) and the interrelations (network-level) between them that constitute the network of interest

Social network theory: the study of the social relationships between people within a system of interest where relationships or relations are viewed in terms of individual units (**nodes**) who interact via **ties** or **edges;** often used to study **social capital**

Sociocentric: from the perspective of an entire bound and defined population of actors

Sociograms: a graphic representation of links or ties a node has, eventually plotting the structure of interpersonal relationships of a network

Sociomatrix: tabular matrix depicting relational data or the interconnections between nodes observed via data collection

Structural holes: unconnected parts or gaps between entities in a social system or network who have shared resources to information

Sustainable: label ascribed to farming practice that integrates components designed to enhance a community's environmental, economic, and social health, often framed as organic farming practices that seek to improve the health of the land and society in the long term

Ties/edges: relationships or connections or interactions between nodes in a social network, also known as links

Tertius gaudens: *the third who enjoys, circumstance* where a broker coordinates between two parties not intending to link to one another, sometimes exploiting that disconnect

Tertius iungen:*, the third who joins,* where the broker facilitates a tie that is already present

Triad census: count of relations of interest across all possible triples or triads.

Triad: a sub-set of three nodes and the possible links among them

Value-based supply chain: a supply chain that is driven by the goal of enhancing the financial viability of small and midscale farmers

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