

Food Cart Economics

A Comprehensive Analysis of Portland's Street Food Market

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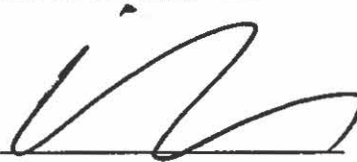
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FOOD CART ECONOMICS:
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STREET FOOD MARKET

Approved:



Professor Wes Wilson

Defined by an eclectic collection of food carts, the market for street food in Portland, Oregon experienced an explosive expansion from 2006 to 2011. I seek to understand why and how this growth occurred. My research identifies a unique combination of cultural, regulatory, and economic factors contributed to initial development and my econometric model of exit probability and robust firm-level dataset describe the characteristics of market growth. I interpret observed trends in the context of fundamental economic theories of industrial organization and market interaction, testing the applicability of theoretical microeconomic relationships in real-world scenarios.

To the best of all possible parents

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research

“There are few men among those who throng the restaurants who bother to suspect that he who first invented them must have been a genius and a profound observer of his fellows”

Introduction

Jean Anthelme Brillat-Savarin, in his revolutionary *Physiology of Taste* (1825), was among the first to recognize the cultural gravity of what was then a radical invention but today a regular institution—the restaurant. The conception of the restaurant in Paris in the late 1770’s helped open diners from aristocratic royal families to the ignoble working classes to a new way of life, centered upon one of man’s most vital organs: his stomach. Dining out allowed for the “impassioned, considered, and habitual preference for whatever pleases the taste;” the pursuit of life defined by the best of both the kitchen and the parlor (Brillat-Savarin, 1825).

Restaurants provided anyone who could afford at least a pint of beer consistent access to high quality, well-prepared food—not to mention the opportunity to rub elbows with other diners from up and down the socioeconomic ladder and across the political spectrum. Restaurants began in the salons of Paris’s finest hotels and catered to the city’s wealthiest families and most distinguished bourgeoisie. But there were also, from the outset, those that served the masses: “Some of the restaurateurs decided to try to wed good living to economy, and by their appealing to men of modest fortune, who are necessarily the most numerous, to assure themselves of the greatest number of patrons” (Brillat-Savarin, 1825). These restaurants, for the population of any large city across time and space, “are the solution of a seemingly insolvable problem: how to live well and at the same time moderately and even cheaply” (Brillat-Savarin, 1825).

Quality goods served in restaurants to proletarian customers were vital to the progression of Europe’s middle and working classes in the 18th and 19th centuries. Yet the appeal of such a plebeian meal continues in the United States today. The concept of

living well and dining richly while maintaining a relatively humble budget resonates in contemporary American society perhaps nowhere more strongly than in Portland, Oregon. As such, the true expression of Portland's current gastronomic atmosphere is not found in hotel bars or high-rise dining rooms. Instead, "food carts"—repurposed trailers, military kitchens, custom-built bicycles, and wooden sheds—line Portland's city blocks in a myriad of mismatched styles and colors. These carts represent the culmination of decades of local "love of high-quality food, creative entrepreneurship, and appreciation of good value" (Rodgers & Roy, 2010). They are the definitive culinary color of the city. Each food cart offers its own unique menu and dining experience: taco and *torta* trucks patrol the city; sandwich, sausage, soup, and sushi stalls stand side by side in downtown parking lots; falafel is served alongside *shawrma* to eager eaters at neighborhood "cart pods." These food carts, according to urban planners Rodgers and Roy (2010), "are the logical outgrowth of all [Portland's attributes]—a direct reflection of the city's personality."

Scope of Work

Portland's food carts are an integral part of the complete economic system defined by the city itself. Yet while food carts are often talked about, they are rarely studied. To remedy this, my central objective in this project is to complete a comprehensive analysis of Portland's street vendors—to understand their existence and operation as thoroughly as possible. For Portland's food carts, this is no small task; their market is dynamic, and its trends are complex.

Towards this objective, I undertake three discrete, though related tasks. First, I clarify why food carts thrive in Portland. Second, I describe certain important characteristics of their economic environment. Third, I ask how Portland food carts function in their market and explain why they operate as they do. With these objectives realized, we—both the reader and myself—will find ourselves equipped with a better understanding of food carts economics.

The products of my investigation are valuable information for the understanding and decision making of agents in this market, but there's a larger point. Economics is full of theoretical explanations of a host of phenomena: how markets are structured, how firms behave, and what drives basic human decisions have been explained on

classroom chalkboards for over a century. But when the lecture ends and we step onto the chaotic streets of the real world, well-behaved economic ideals fly out the window as we walk out the door and towards the nearest food cart. Or do they? An in-depth analysis of this market over time affords a rare opportunity to evaluate and understand the essence of many market mechanisms. Granted, this is not a market we are accustomed to thinking about in this context. Street food stalls are not Wall Street stocks. But it's a market nonetheless. And as we'll see, its study proffers insights into the applicability of economic theory to real world scenarios.

Origins

The above statement from Rodgers and Roy regarding Portland's food carts begs a question: what about the city's personality makes food carts such a logical product of its culture? Portland did by no means invent the food cart. The concept of street food has existed in the United States for decades and around the world for centuries. Moreover, Portland is by no means home to a street food scene as impressive as those of Singapore, a metropolis defined by its dazzling concentrations of street food hawkers (Gold, 2007); Bangkok, where entire city parks come alive with street food stalls almost nightly (Brunton, 2013); or Tokyo, where sushi stalls worthy of Michelin stars have thrived in subway stations (Gelb, 2012). So why Portland? And why food carts? From an economist's perspective, the answers to these questions lie on both the demand and supply sides of the market.

The Demand Curve

Markets grow when people demand more of a good or service. Without consumers to purchase what is being made, there is no rational motivation for a firm to produce a product. Accordingly, my analysis of Portland's penchant for street food begins on the demand side, with the longstanding cultural factors that have set the table for an individualized culinary explosion. Foremost among these cultural elements is, above all else, the city's enduring appreciation for good food and excellent dining. This sentiment begins with Portland native James Beard, heralded "the dean of American cookery" by the *New York Times* in 1954 and the "patron saint of American culinary

values” by contemporary scholars (Kamp, 2006). Beard’s impact on American gastronomy and society is undeniable. For Beard, culinary culture was inseparable from political culture; it was an equally integral aspect of art, entertainment, fashion, family, community, and society as a whole. Beginning in 1939 with the launch of his catering company and continuing until his death in 1985, Beard’s 30 published cookbooks, years of gastronomic writing, national television shows, and culinary product lines revolutionized the way in which America viewed its food. And with the foundation of a branch of his renowned culinary school in nearby Seaside, Beard ensured his impact would be felt with even greater intensity in his hometown.

Portlanders today have by no means forgotten about Beard. In 2013, four Portland chefs were nominated for his namesake award, America’s premier culinary prize (Tierney, 2013). Moreover, no fewer than 12 Portland restaurants are owned or operated by past James Beard award winners, to add to the 11 run by past nominees (Loftness, 2013).

Yet James Beard is not the sole figure in the history of Portland’s cultural gastronomy. Caprial Pence—who, by the age of 30, had cooked for The US Ambassador to the Soviet Union, the Sultan of Kuala Lumpur, and Julia Child—and her husband continued to advanced Portland’s gastronomic tradition in the 1990’s with their culinary television show and Westmoreland neighborhood restaurant (Pence, 2009). The couple’s cooking program was regarded by an executive of Oregon Public Broadcasting, one network that carried their show, as “‘ahead of their time,’ relying on local produce and seeing cooking as a social activity” (Sarasohn, 2009). Their restaurant, for its part, featured an innovative menu and a seating arrangement that helped “turn dining into a spectator sport,” establishing the precedent for proximity between diner and chef seen in many Portland restaurants today (Sarasohn 2009).

Pence’s vision of dining as a social event resonates with so-called “cartivores” (street food devotees) flocking to Portland food carts today. By their nature, food carts require patrons to gather in lines while food is prepared and crowd around their stoops while food is eaten. Often lacking private tables or personal bar stools, customers must instead stand on the street and wait for their meal, which “creates an opportunity to connect with other customers and passersby” (Rodgers & Roy, 2010). As planner

William Whyte noted, this clustering contributes to the vibrancy of a city: ““what attracts people most in an urban place is other people”” (Rodgers & Roy, 2010). And at the center of all this attention and social activity is the food cart.

A final foundational figure in Portland’s culinary culture is Michael Hebberoy, who founded Clarklewis restaurant alongside his wife Naomi in 2004. That year, the eatery was famously awarded “Restaurant of the Year” by *The Oregonian*, despite being open for only four months and having yet to complete construction on its space (Donahue, 2006). The restaurant pioneered Portland’s farm-to-table movement, now a national dining phenomenon. From its inception, Clarklewis has followed a radical business model: its head chef “never knows what he’ll be preparing until farmers arrive at the restaurant with the cream of their crop. Meat is butchered on-site, and servers spend 30 minutes taste-testing food each day before they present it to customers” (Weinberger, 2005).

As for its founder: “Hebberoy says his food philosophy is shaped by the [Do-It-Yourself] arts movement” (Donahue 2006). Although Hebberoy split from his restaurant (and his wife) in 2006, the tradition of personal creation has since been continued in Portland by its food carts: “to those familiar with Portland, the preponderance of food carts makes a great deal of sense. Innovative local visionaries have long encouraged the city’s quirky independent culture and creative entrepreneurial spirit” (Rodgers & Roy, 2010). Food carts perfectly represent the gastronomic expression of this independent culture and creative entrepreneurial spirit.

Coupled with an emphasis on high quality yet economically accessible products, these cultural factors have combined to form a unique dining culture found almost nowhere else in the nation or even the world. But other than the fact that Portlanders like to eat, there are further elements that have contributed to the meteoric rise in the city’s food cart vendors over the past several years.

Chief among these—especially during periods of economic recession—is the comparatively low unit price food cart menus afford. “Food carts allow those on a budget to continue to eat out economically” by offering prices consistently several dollars below restaurant listings (Chastain, 2010). Particularly for those intimately involved with local dining culture yet faced with shrinking disposable incomes as a

result of recession, food carts offer consumers “delicious and innovative grub...at a fraction of what they would have had to pay in a restaurant” (Lewis 2011).

Above and beyond the pleasure of eating a good meal for cheap, food carts offer certain cartivorous customers positive externalities¹ in consumption. A “warm glow” from involving one’s self in food cart culture, supporting local innovation, culinary exploration, and entrepreneurial economic activity can be felt from eating at the carts. For food carts, this warm glow stems from the sense of accessibility and community experience street food offers consumers: “It doesn’t matter how refined your palate is or how much you make—anyone gets to enjoy, for a few minutes at least, the feeling of being part of a larger community” (Lewis, 2011). This sentiment is characterized by food cart eating tours organized by local companies meant to connect the city’s best food carts with their enthusiastic consumers.

A final demand-side benefit of food cart dining is the advantage of “one-stop shopping” carts offer consumers. The clustering effects of many firms around the city have created cart pods, agglomerations of carts of all different types in central lots and parks. These pods collectively offer consumers an expanded menu beyond even what could be had at a restaurant, allowing individual consumers to suit specific preferences no matter their mood. Producer clustering encourages comparison-shopping, which attracts even more consumers. This in turn contributes to “the social aspect of food carts,” heightening the warm glow effects discussed above (Chastain, 2010). Clusters also add value to a food cart meal by providing basic dining accommodations such as tables, silverware, alcohol service, musical performances and entertainment, intra-diner interaction, and even fire pits and protection from the city’s often-wet weather.

In all, Portland’s food carts have benefitted from a mix of cultural factors emphasizing high quality eating but frugal spending; individual entrepreneurship but community involvement. This mix has fueled demand for street food, and suppliers have responded.

¹ A benefit or cost imposed on society outside of the marketplace (Samuelson & Nordhaus, 2005).

The Supply Curve

My analysis of factors on the supply side integral to the rise of food carts in Portland begins (contrary to many theories of supply side economics) with the government. Primarily, weak government regulation and relatively scant bureaucratic intervention in—or even attention to—the market in general has allowed food carts to establish themselves on sidewalks across Portland. Due to a business classification technicality in the city’s legal code that files all street food vendors as mobile units, they are exempt from complying with formal building code requirements usually reserved for restaurants operating on private property (City of Portland, 2007). Technically, food carts exist as mobile vehicles, classified as hitch trailers rather than food service centers, thus voiding the applicability of most building code provisions.

To address this gaping regulation void, the City of Portland’s Bureau of Development Services (BDS) has crafted an official policy action for food carts operating on private property in the city: “ignore them” (Rodgers & Roy, 2010). Even former Portland mayor Sam Adams has acknowledged his office’s relatively *laissez-faire* response to street food vending: “we have worked really hard to stay the hell out of the way,” he told the *Toronto Sun* in an interview (Peat, 2013).

Health code obligations, on the other hand, are still stringently applied to food carts. However, instead of seeking out restaurant spaces and equipment built specifically for food service operation, food cart owners and operators are left to mold the details of their production process to comply with established regulations. Such a system may require owners to cart their daily minimum 75 gallons of water for cooking cleaning to their cart by hand every day, for example, but these tradeoffs are implicit in the food cart model (Multnomah County Environmental Health Department, 2012).

Although the County Health Department remains strict in its food service policies, it has little ability to actually control the operation of carts complying with its vending laws. This office is left to the Bureau of Development Services, which has added to the culture of regulatory indifference with its building code violation enforcement policy: “in most instances, the bureau begins investigating a code violation when a citizen reports a potential violation” (Portland BDS, 2014). In all, since voluntary reporting of violations is a prerequisite for regulatory action, and since food

carts are overwhelmingly well received with Portland citizens, significant regulation of any sort has been largely absent from the food cart market.

Even if wary citizens did begin to raise issue with food cart operations, city planners have little incentive to restrict market functionality. “From an urban design perspective, food carts enrich the urban environment by increasing foot traffic, activating parking lots and streetscapes” (Chastain, 2010). This is a function unique to street vendors operating directly on sidewalks and between public spaces, in contrast to firms residing in buildings more removed from public lots and walkways. Property owners in the city—chief among them surface parking lot management companies—have recognized the benefits of these street vendors operating on their land, and have encouraged food carts to set up shop as they please. One parking lot management company has calculated that a cart operating on its property “could generate about 50% more revenue than a parked car” (Rodgers & Roy, 2010). Furthermore, empirical evidence from around the city points to enhanced economic activity centered upon food cart pods: “According to an *Oregonian* article, a business owner near a new cluster of food carts on Hawthorne Blvd. acknowledged that the carts have increased his business” (Kapell et al., 2010).

One of the most important results of the City’s hands-off approach to regulation for the market as a whole is its effect on the costs associated with running a food cart. Free from building code regulation, cart owners are saved from the considerable initial capital investments in items such as large kitchen hoods, fire extinguisher systems, and stringent waste disposal infrastructure normally required to legally run a food service enterprise. As a result, fixed costs² as well as sunk costs³ are reduced to levels appreciably lower than those seen in the restaurant industry. This makes opening a food cart “a way of easing into being in business without too much financial risk,” as Addy Bittner, principal of Addy’s Sandwich Bar, explained (Rodgers & Roy, 2010).

² “The cost that does not vary with the quantity produced” (O’Sullivan & Sheffrin, 2005).

³ “An expenditure that has already been made and cannot be recovered. Once the firm incurs this cost, it cannot be avoided by shutting down” (O’Sullivan & Sheffrin, 2005).

Like fixed costs, small-scale food carts face dramatically reduced variable costs⁴ across the board compared to restaurants. Retail rent is a prime example of this effect. Chastain (2010) estimates the average food cart pays around \$2.50 per square foot in rent a month, in contrast to the \$15-\$50 per square foot monthly rent asked for restaurant spaces listed for lease on Portland's retail Internet sites. Reduced spending on silverware, dishwashing, laundry, and raw food inputs are all additional tenets of the food cart business model. Furthermore, it is unnecessary for carts to hire the numerous employees indispensable to a full-service restaurant. Often, cart owners themselves are one of only two or three employees at a cart; it is also not uncommon for a cart to be operated completely by its owner.

Such spare supervision has made operating a food cart a relatively simple, low-risk, and inexpensive business venture. Yet food cart culture is attractive to suppliers for other reasons as well. For cooks, the opportunity to innovate freely as the sole master of a kitchen is an appealing proposition. And because food trucks operate on a smaller scale than do restaurants, their entrepreneurial operators have more time and money available to devote to crafting and honing new recipes, sourcing the best local ingredients, and establishing relationships with the farmers, butchers, and bakers that constitute their supply chain (Lewis, 2011). Moreover, by their very nature, carts solve one of the great dilemmas of restaurant cooking: “if you cook, you don't get to interact with customers; if you work at the front, you don't get to cook.” Cart chefs, conversely, experience both aspects of this tradeoff. In short, “food carts are a cook's dream” (Rodgers & Roy, 2010).

Behind the Curves

Collectively, official indifference, attractive business incentives, and a distinctive culture of creativity and individualism define supply-side determinants of Portland's food cart explosion. Suddenly, it seems, supply has met demand, and I have reached an equilibrium in my analysis of Portland's food cart market.

But it's not always that straightforward. No market analysis would be complete without an investigation of the factors “behind the curves” of demand and supply; that

⁴ “A cost that varies with the quantity produced” (O'Sullivan & Sheffrin, 2005).

is, the economic climate in which market exchanges are conducted. For many industries evolving in the first two decades of the 21st century, it's a cold world. Business cycle downturns and recent recession have devastated most market growth in the 2000's. But bigger business busts have actually been a boon for Portland's fledgling food cart industry. "Especially during the recession, the surge in new food carts over the past [five] years has provided a way for those who may have otherwise been unemployed to start a business or at least earn some income." Food carts "can provide flexible jobs and entrepreneurial opportunities for people who want to set their own hours and agenda, with start-up and operating costs that are not too daunting" (Chastain, 2010).

This is an especially enticing option for many of the unemployed chefs and kitchen staff, recent culinary school graduates, and small-scale entrepreneurs that comprise much of Portland's corps of street food suppliers. For the same reason that low cost meals entice consumers, low cost business ventures attract suppliers in a period marked by reduced consumer spending and little economic growth. As a result of their low start-up and operating costs and opportunities for self-employment, "hundreds of immigrants, chefs, and first-time business owners have turned to food carts as recession-busting businesses" (Burningham, 2010).

Overall, demand-side factors such as an appreciation of culinary quality, emphasis on individual entrepreneurship, and a sentiment of community involvement have mixed with loose regulation, strong business incentives, and ample opportunities for complete cooking freedom in the midst of an economic recession. The result is a market completely unique to Portland. "What makes Portland's street food scene so distinctive—and appealing—is the way vendors continually push the genre's traditional boundaries, to the point that entire food cart villages have laid down roots and offer increasingly sophisticated and varied cuisine" (Rodgers & Roy, 2010). Food carts have become completely embedded in the cultural and commercial fabric of the city itself, and in the process created a new gastronomic and economic paradigm for spending, eating, and living well.

Figures

Thus far, I have taken a preliminary step in expanding the (growing) body of literature on street food with an investigation of the phenomenon of food carts in Portland. But I can go further. It's obvious the market for street food is simmering with activity. But how exactly have Portland's food carts grown up? Grounded by my new understanding of the foundational factors for food carts in Portland, I now illustrate how street food has progressed across the city over time. Through a series of geographic and numeric charts, I describe trends in Portland's food cart market. Data for this investigation span a sample of over 700 food carts from 2006 to 2011, and were gathered from the Multnomah County Health Department as business license listings. In the course of this analysis, I will explore where food carts locate across the city, what exactly they produce, and how their numbers have grown over time. This will complete a basic depiction of the recent state of Portland's street food market.

Growth

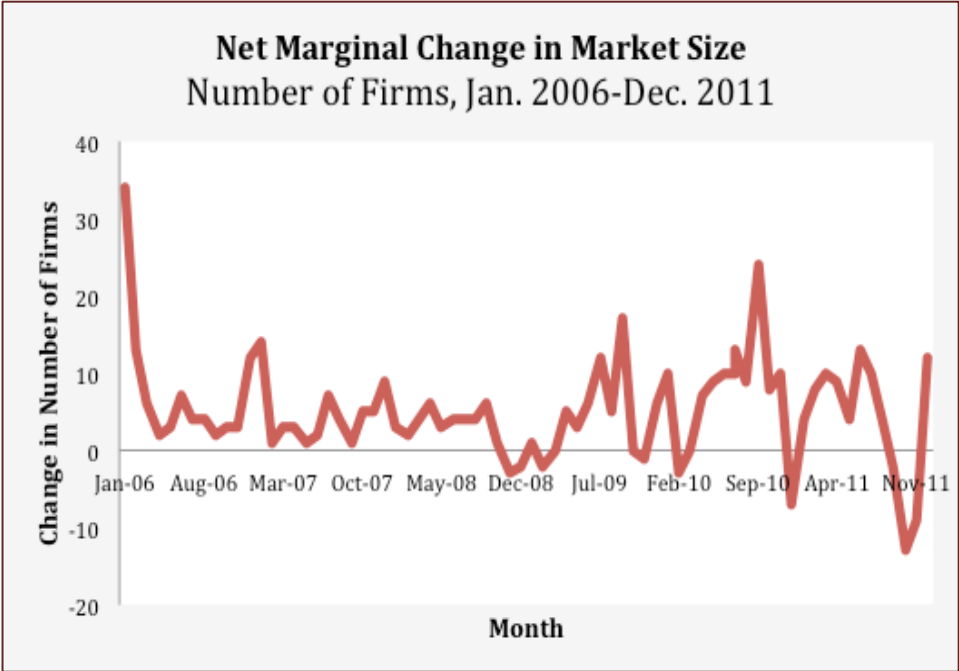
The logical starting point in my quest to describes patterns in Portland's food cart market is its trend of growth over time. Figure 1 below plots this growth, revealing a fairly constant, linear growth progression from 2006 to 2011. Projections of market size only consider firms that have entered the market later than December of 2005; any food carts already operating prior to that date were not included in sample data charted below. Over the six years considered, almost 400 food carts joined the market and were still producing at the end of the sample. Nearly another 300 entered and exited in just over half a decade. While the extent to which the Portland's street food market grew is remarkable, note that Figure 1 does indicate a sustained contraction in the rate of market growth in the middle of the sample, which corresponds to the height of an economic recession in late 2008 through 2009.

Figure 1



Further, Figure 2 displays market activity by monthly marginal changes in market size. Nearly all periods considered saw gains in numbers of suppliers—with the exception of late 2011, at which point comparatively many incumbent firms exited. However, by 2011, the market had grown considerably (as evidenced by Figure 1), and these contractions were quickly followed by further entry, and are inconsistent with an overall trend of expansion.

Figure 2



Geography

Now that the size of Portland’s food cart market growth is clear, the next step is to examine its geographic shape. Figures 3 through 8 project annual maps of Portland overlaid with simple symbols representing individual food carts. The import of these images is in the time series they represent. Taken together, these figures illustrate not only the magnitude of Portland’s food cart market growth, but also the location of some of the city’s most popular points of production. These figures divulge the popularity of Portland’s central business district (located in the core of the city to the Southwest) amongst street vendors across virtually every year sampled. However, towards the end of the study, food carts can be seen spreading themselves almost everywhere in the city.

All maps are projected using the common North American Datum 1983 HARN geographic coordinate system to allow for easy manipulation of multiple datasets projected under several different systems. Street, river, and Metro area boundaries were sourced from Oregon Metro’s RLIS Live database, which was accessed through the University of Oregon’s data share initiative. Food cart data were geo-located with latitude and longitude points, then transformed into the NAD 1983 HARN. Metro’s RLIS layers were initially projected using a state plane system with units of distance in

feet, and thus required conversion into a coordinate system of decimal degrees to mesh with the food carts' latitude-longitude delineation. This resulted in minor distortion of base layers, but given the relatively fine scale of these maps, distortions are by and large inconsequential.

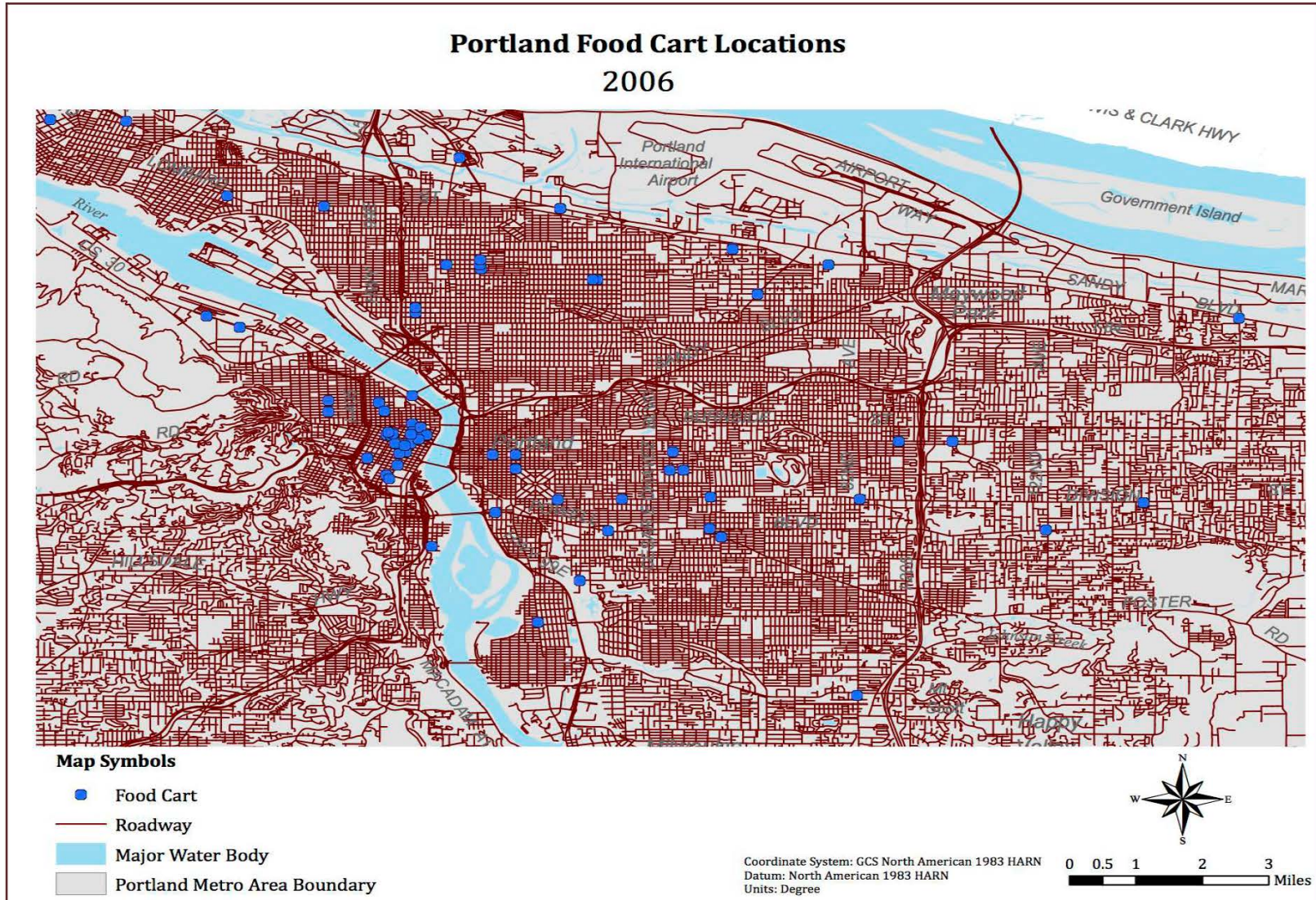


Figure 3

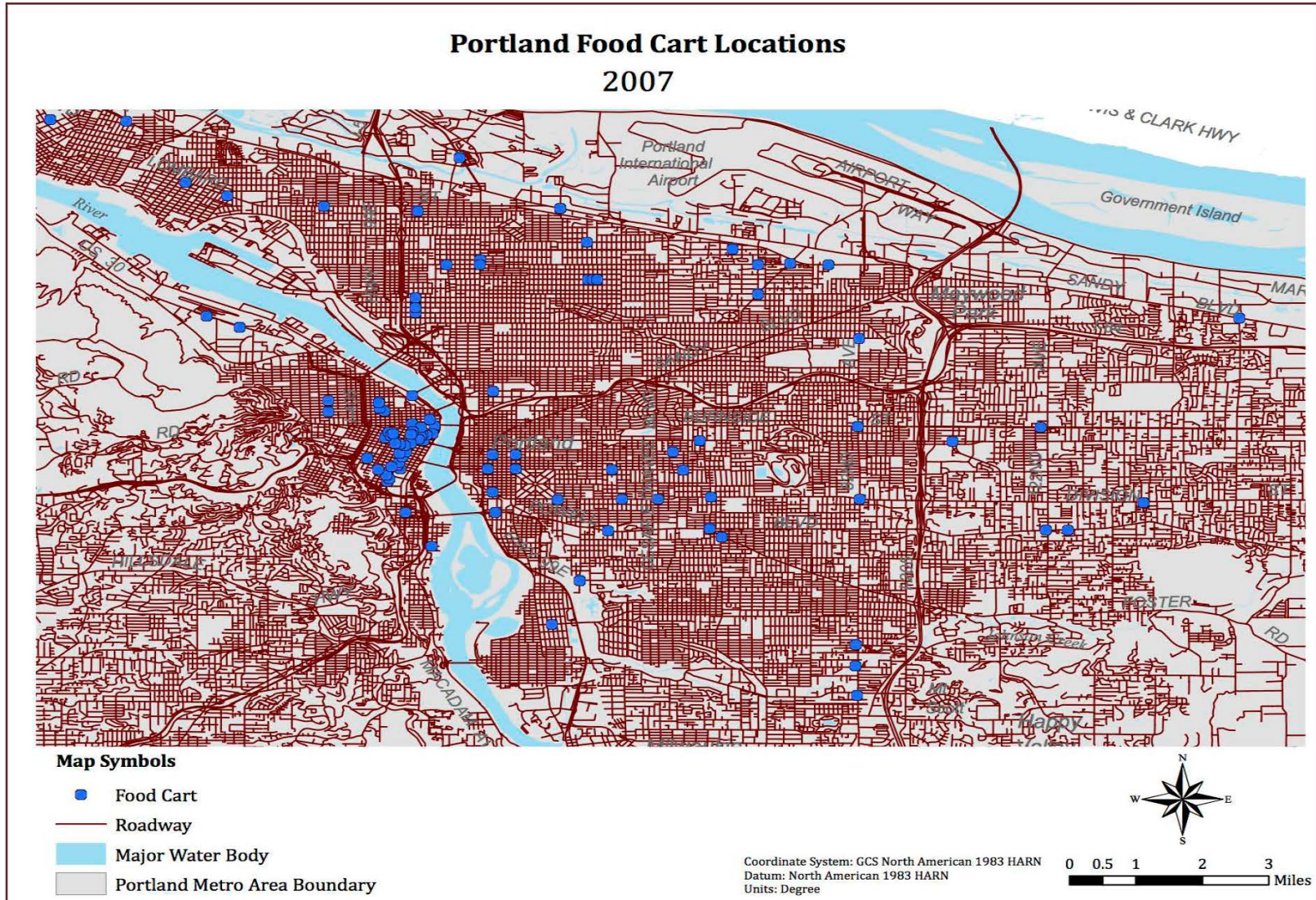
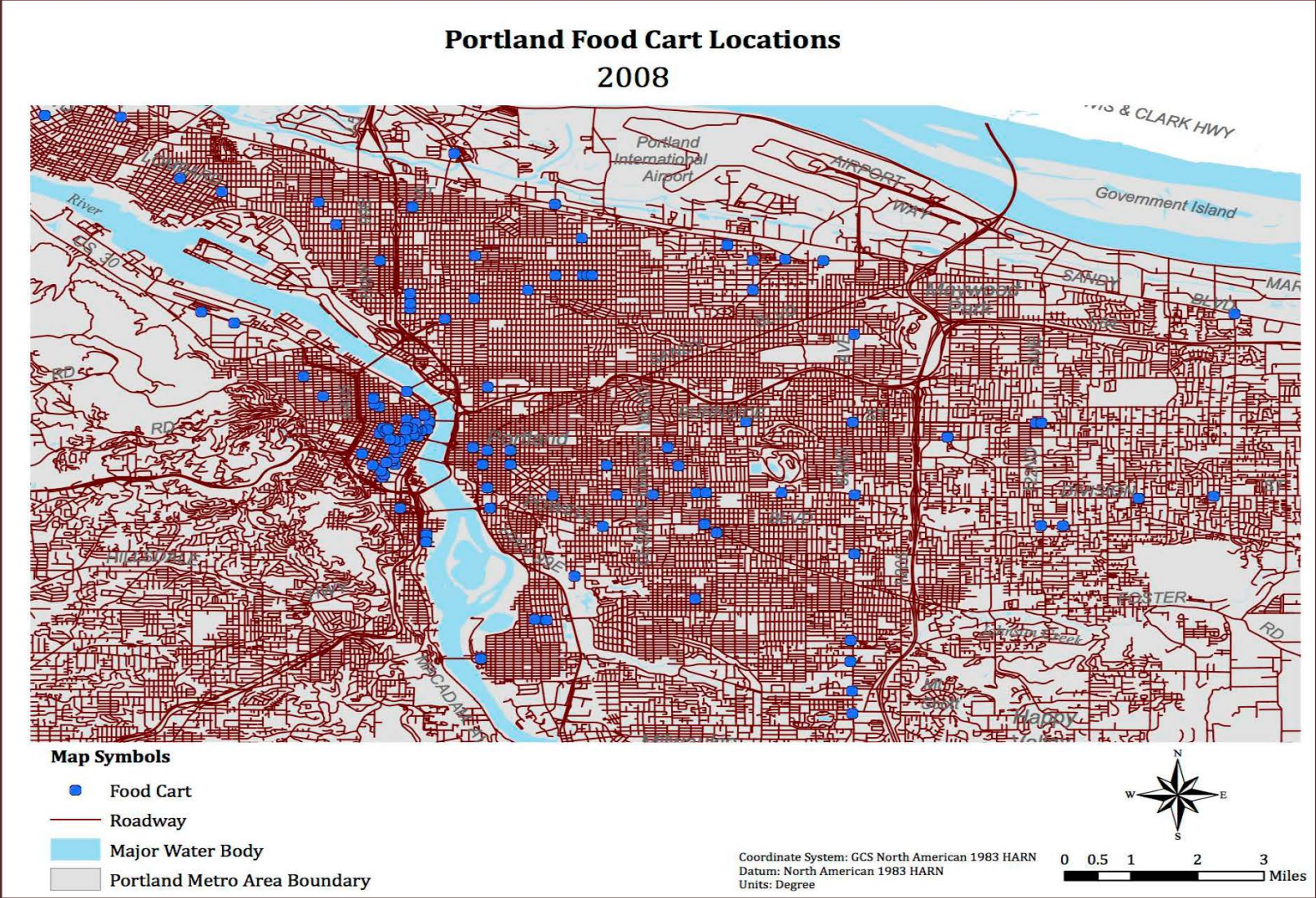


Figure 4

Figure 5



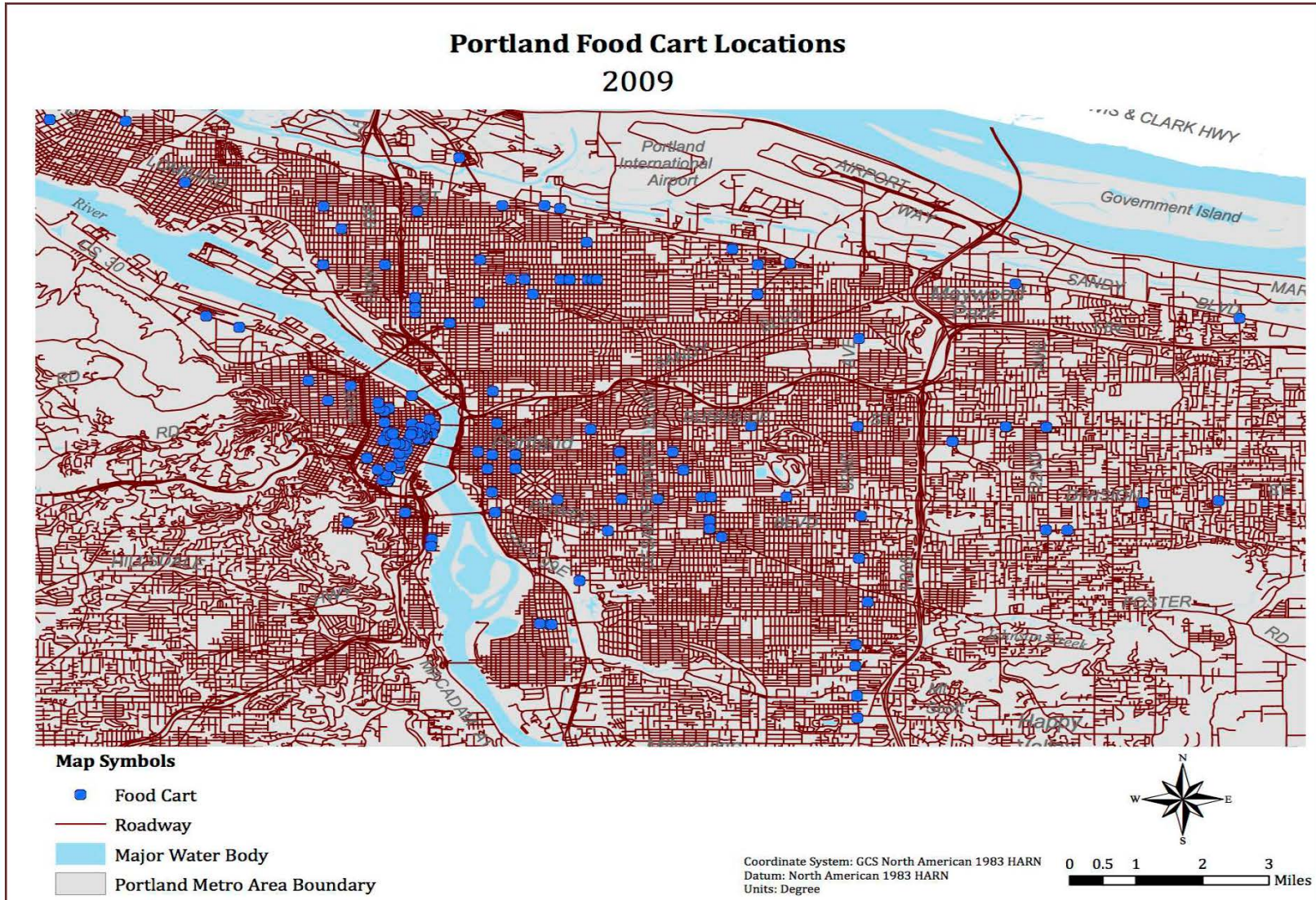


Figure 6

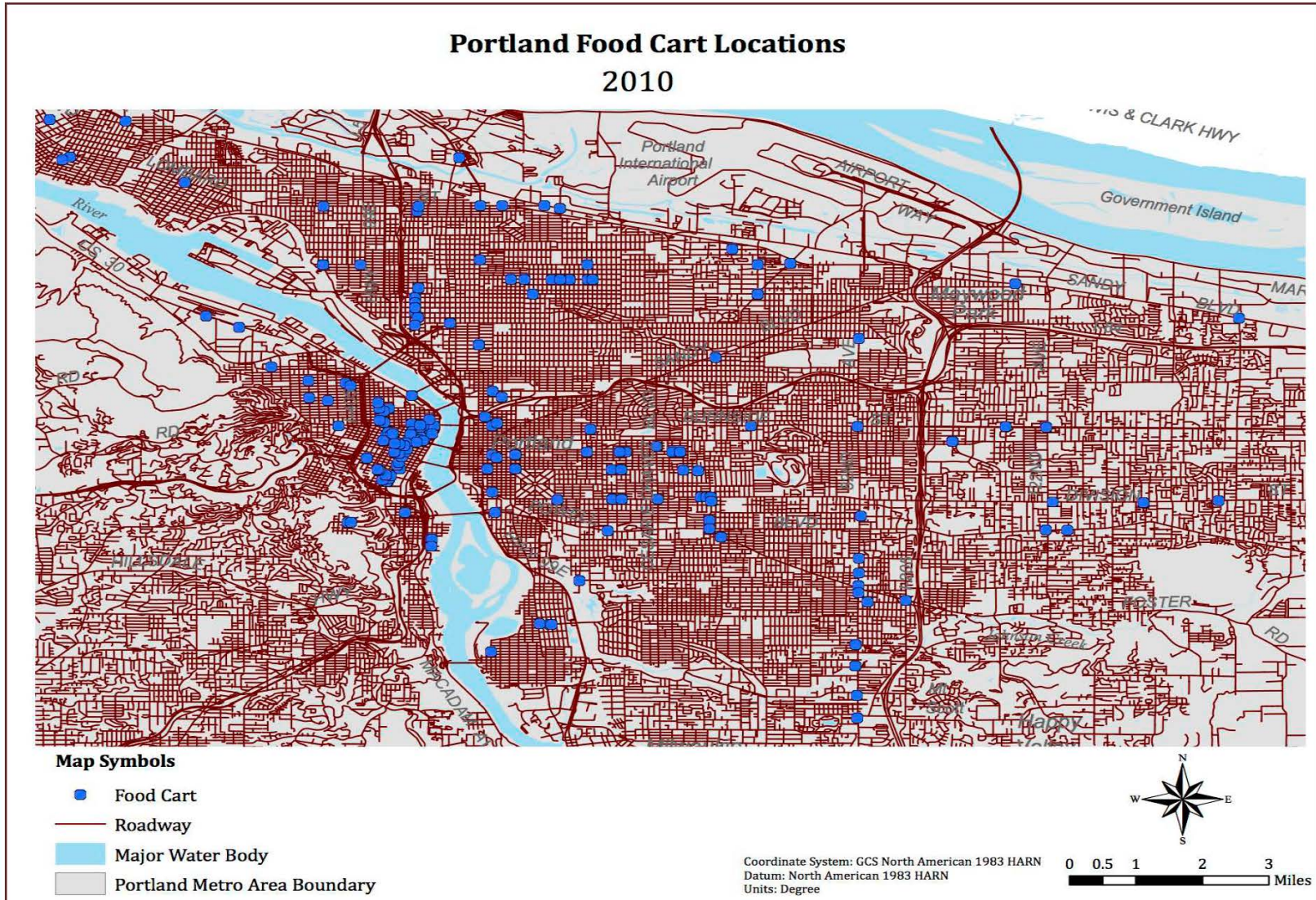


Figure 7

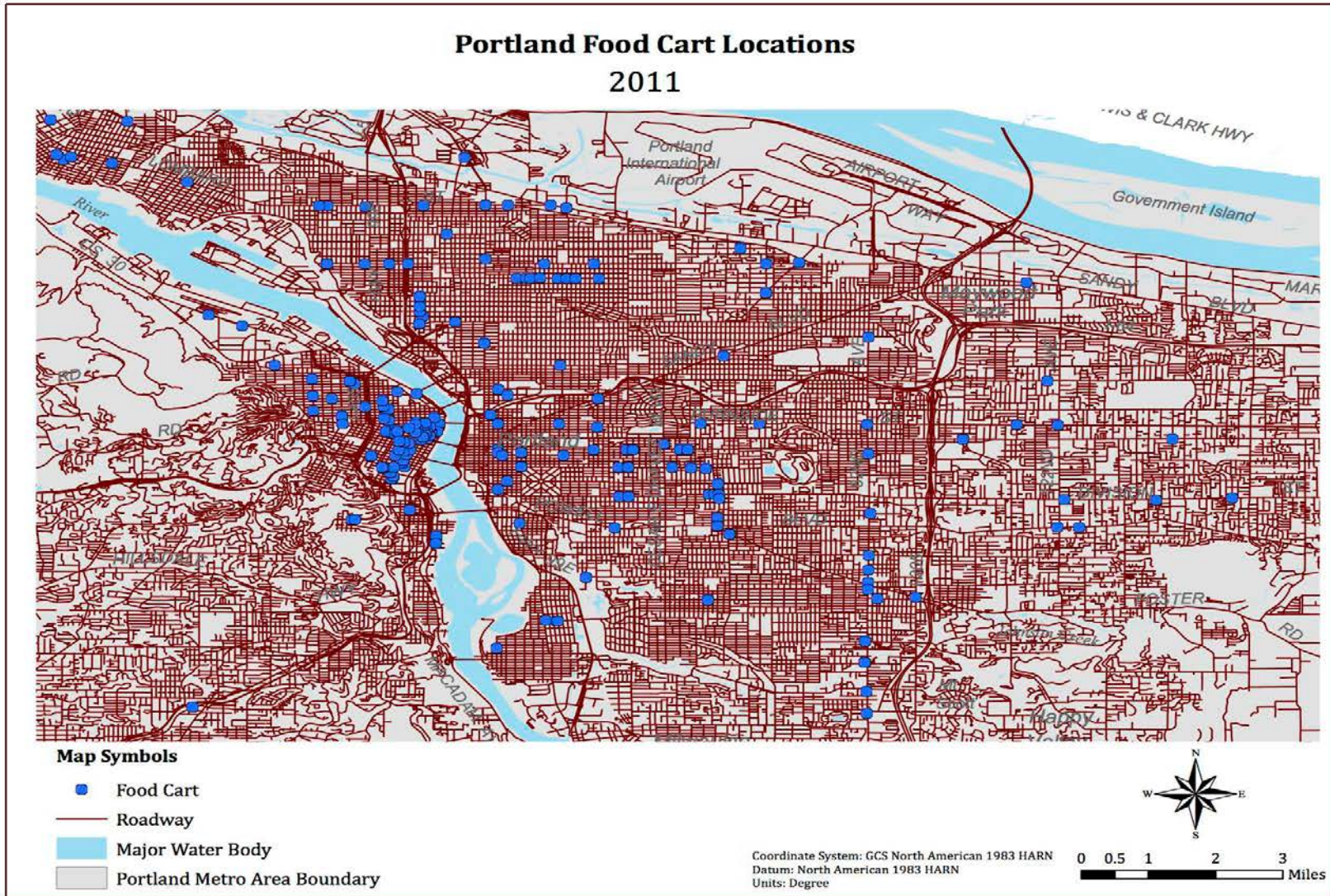


Figure 8

Groups

With an overview of magnitude and direction complete, I now examine certain intricacies of market activity. One relevant feature of Portland's street food market is its cart pod clusters. Figures 9 through 14 illustrate changes in the characteristics of some of these pods over time. The first of these gives nominal counts of total firms entered into the market, broken out by numbers of isolated and clustered firms. Carts are considered clustered if they collocate alongside at least two other firms, while isolated carts are those that operate away from other firms. Figure 10 shows percentage changes in numbers of clustered and isolated carts over the years. Immediately obvious from these first figures is the dominance of clustering beginning in 2010. Interestingly, this coincides with the end of the period of decline in the rate of overall market growth discussed in Figure 1 above. One explanation of this phenomenon could be the saturation of the market beginning in 2010—with so many food carts already operating around the city, new entrants had no option but to locate near others in choice locations that previously might have been empty niches.

Figure 11 illustrates total number of carts exited by clustered and isolated firm, and Figure 12 gives the ratio of clustered to isolated exitors over time. Contrasting trends in entry and exit, there is a lag between the dominance of clustered entrants and that of clustered exitors compared to isolated firms. Market entrants began to join pods in larger numbers than not at the beginning of 2010, but more firms do not begin to exit these clusters than isolated pods until much later in 2010 and into 2011. Additionally, the initial disparity between isolated and clustered exitors is much larger than for entrants, suggesting that, early in the sample, food carts in pods fared better than their isolated competitors. While both entry and exit rates increase exponentially over time, exit began to outpace entry towards the end of the sample.

Figure 9

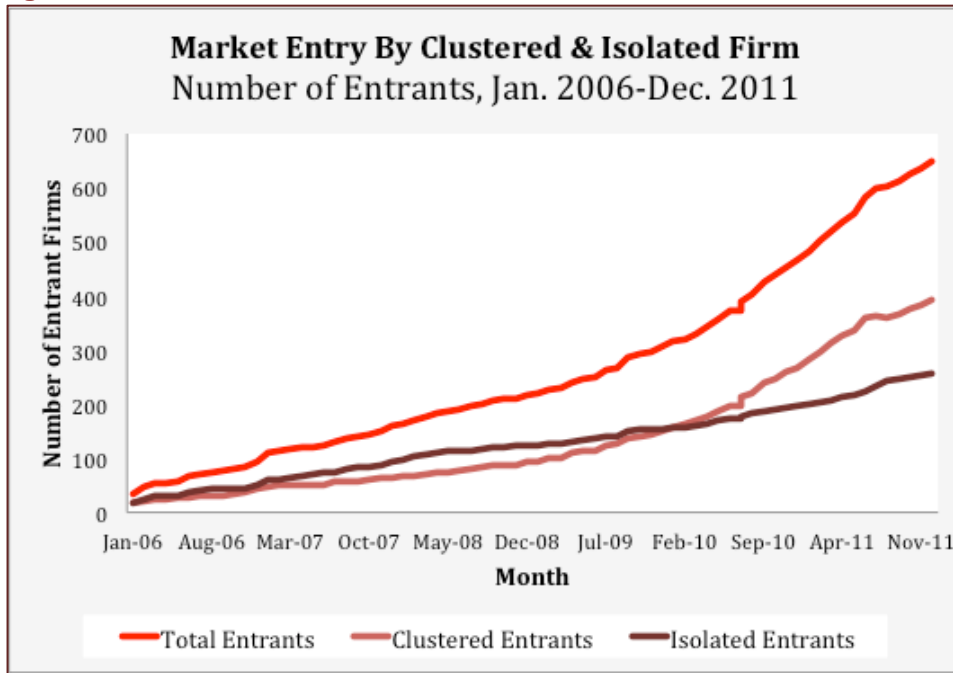


Figure 10

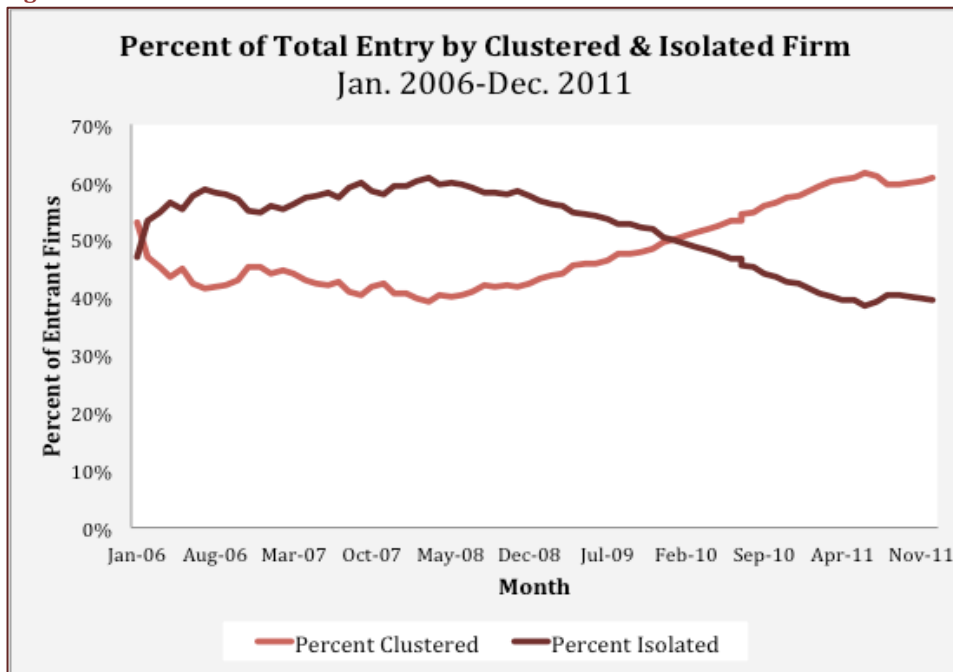


Figure 11

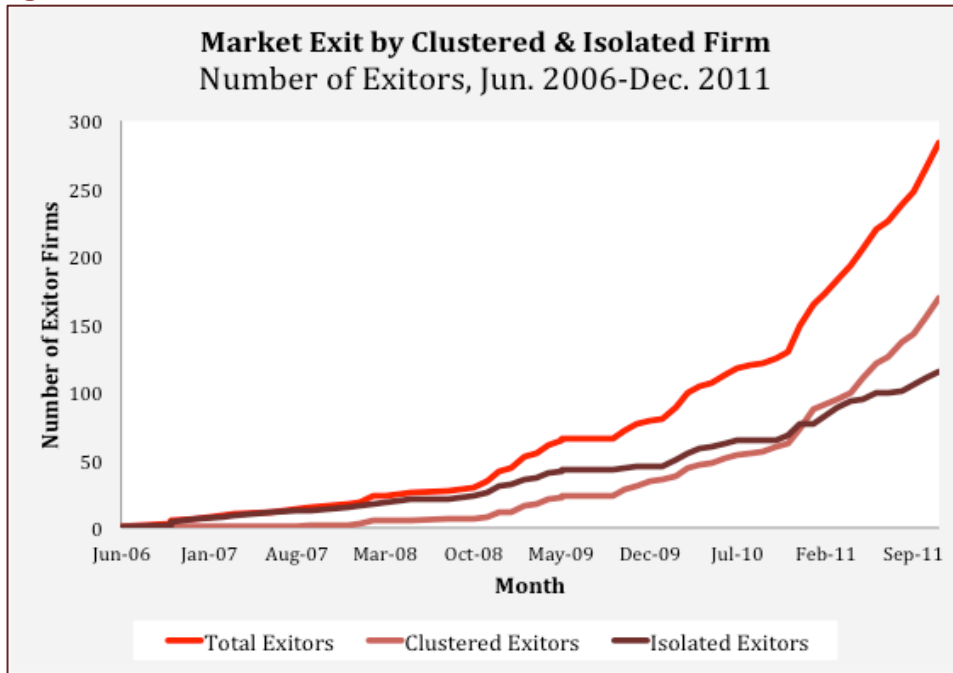
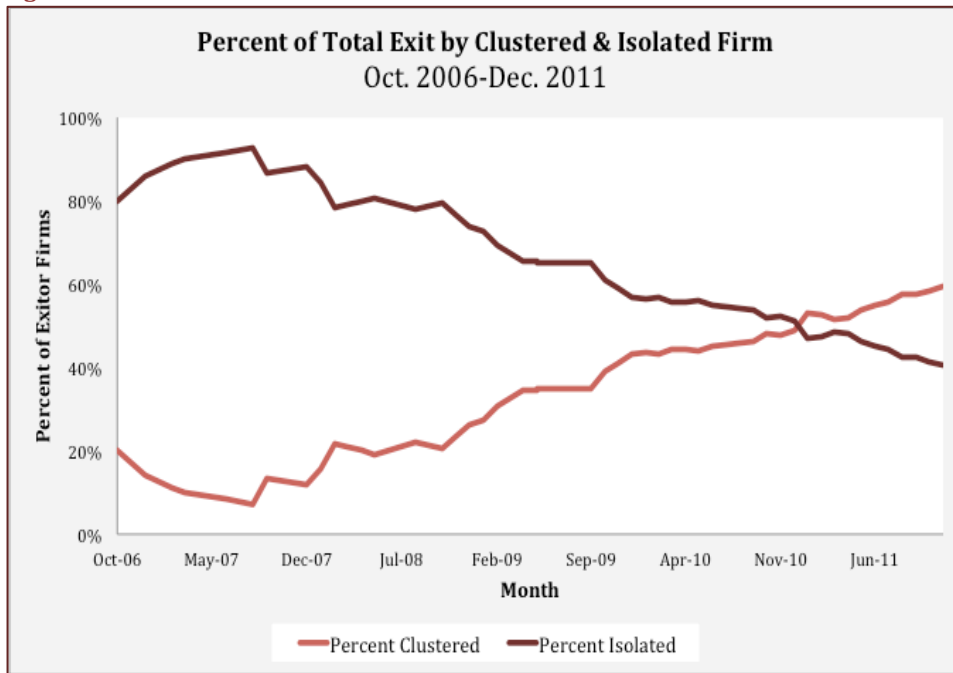


Figure 12



Further, Figures 13 and 14 illustrate changes in size of some of Portland’s most popular pods in its Southwest and Southeast locations. Immediately obvious in these images is the degree to which central business district pods in the Southwest area are much larger than their counterparts located in residential and small-scale commercial neighborhoods in the Southeast. For example, Portland’s largest cart pod, on Alder Street in Southwest, held over 50 firms in 2011, while Good Food Here, the largest pod in the Southeast, reached 14 firms in 2011. This is below the average for all pods in Southwest. Figure 15 identifies the locations of these and other pods around the city.

Figure 13

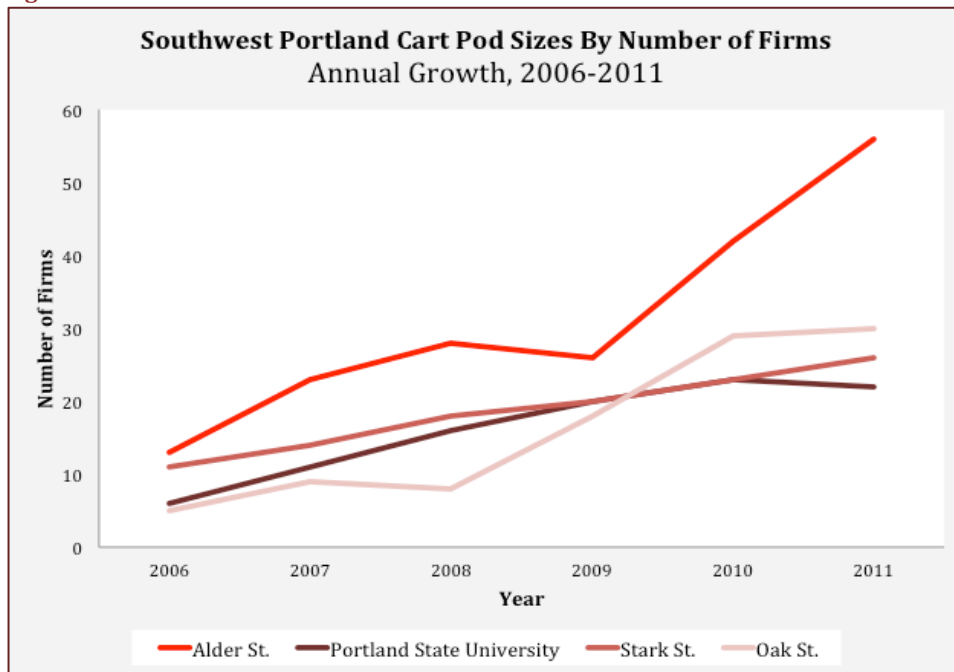


Figure 14

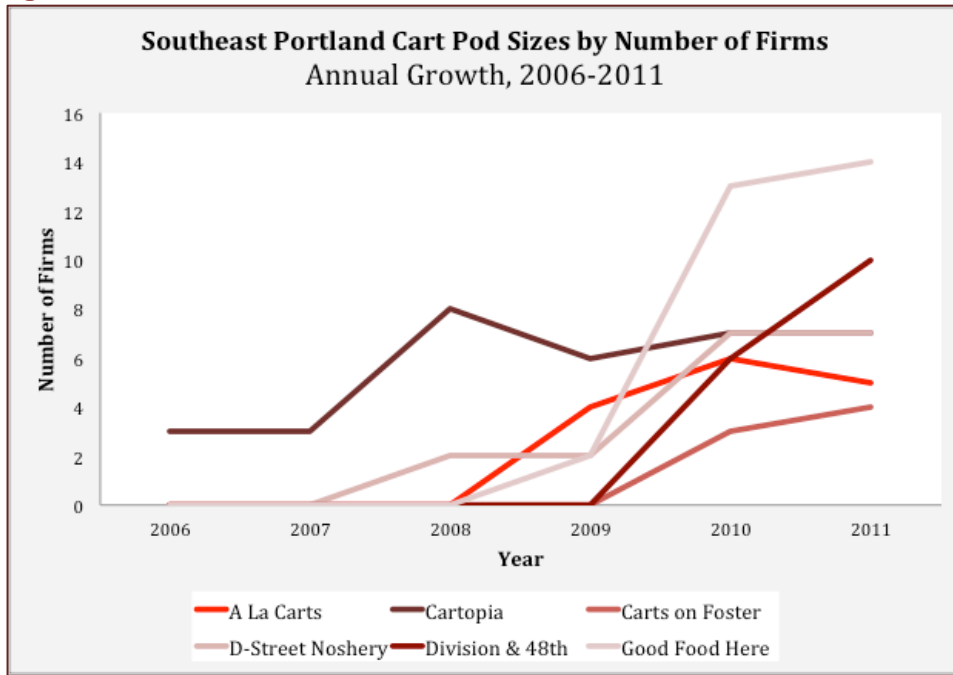
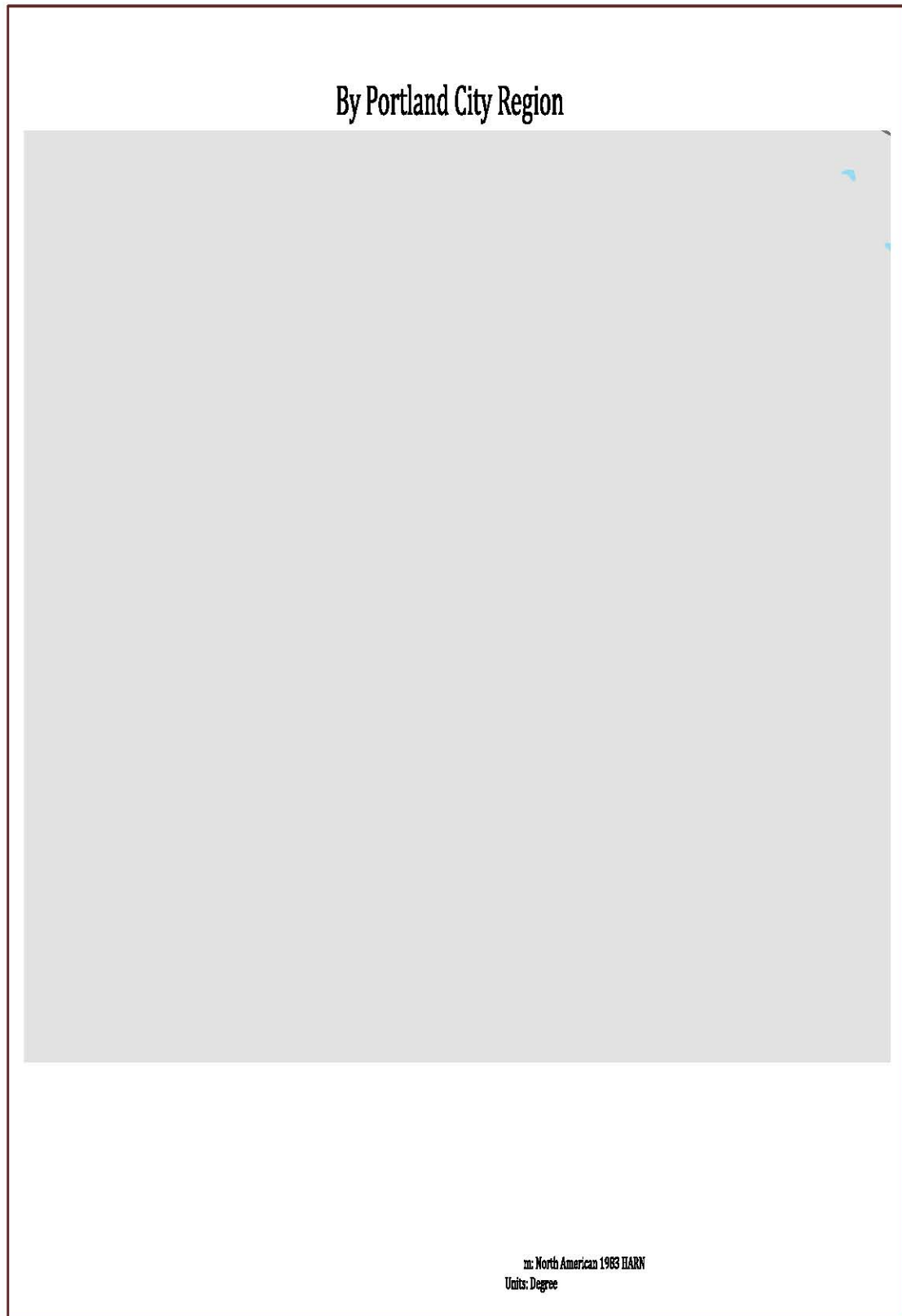


Figure 15



Goods

Another angle from which to examine trends in market growth is by product type. The exact style of meal offered by a given food cart is an important aspect of its operation as a market agent. As such, Figure 15 divides market size over time by major food group offered. Figure 16 displays food types by percentage of the market held by producers of each type. American, Latin, and Asian meals are most popular among producers, although the numbers of food carts offering Latin meals declined significantly after 2009, while American and Asian producers expanded their rank after this period of recession. The exact definition of each product type and its implications for firm survival will be addressed in the formal discussion of the conceptual model used later in this study.

Figure 16

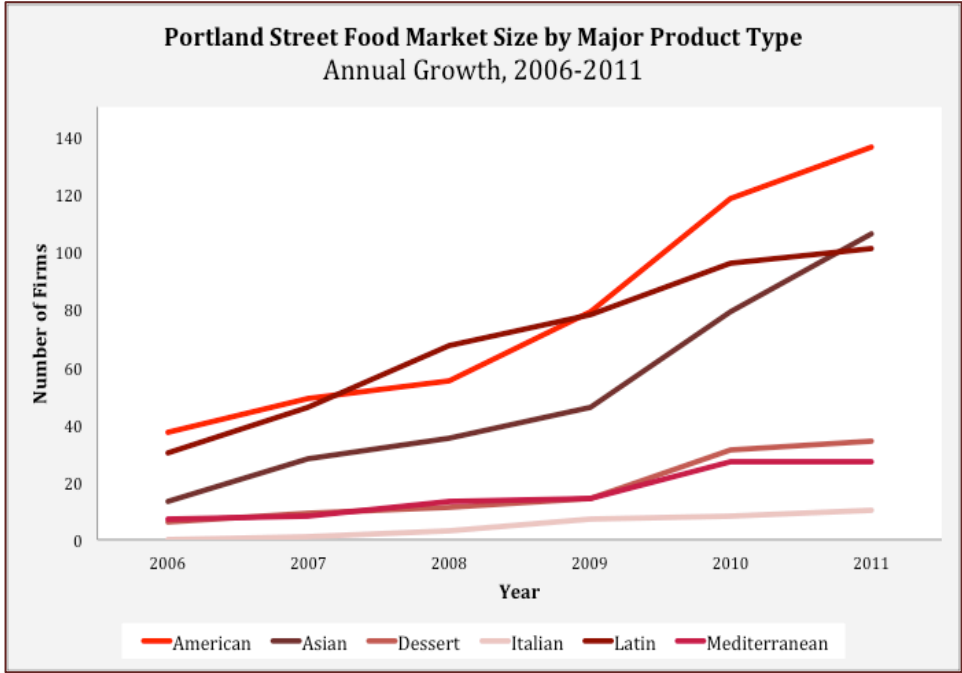
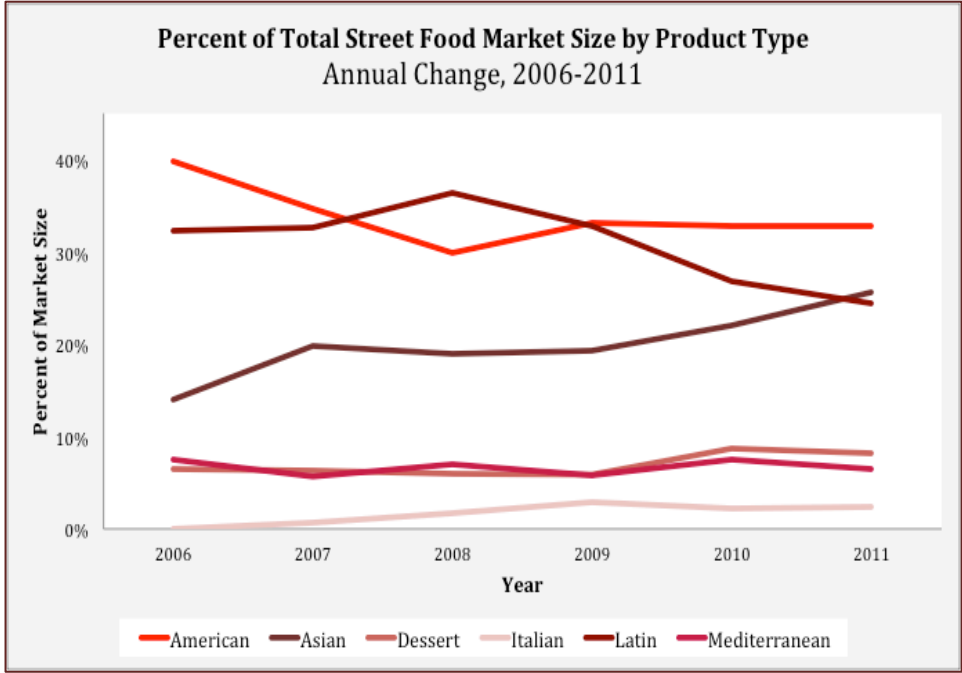


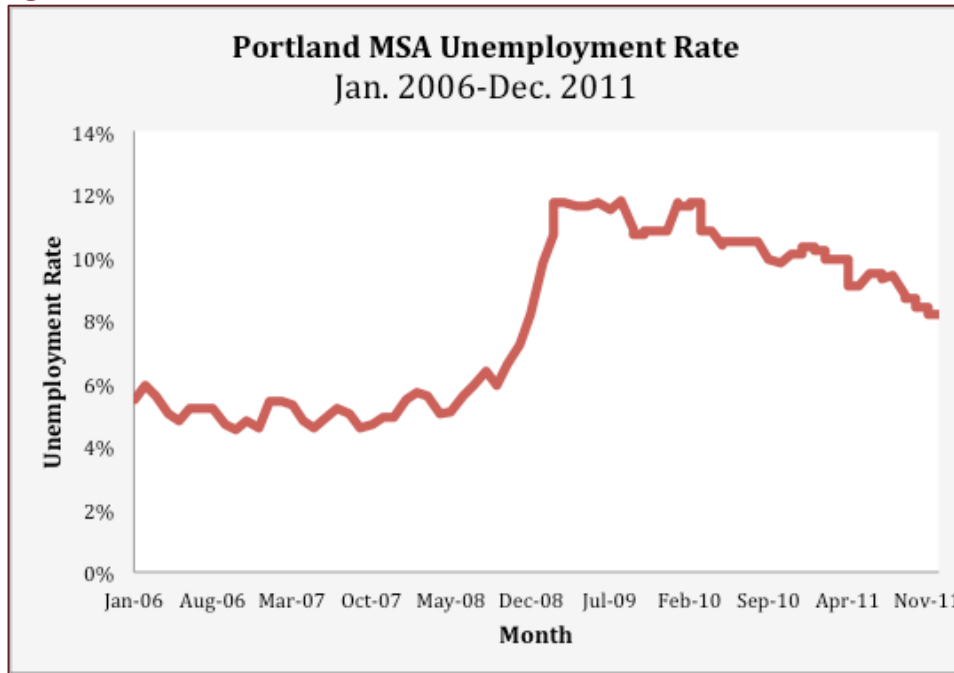
Figure 17



Economic Trends

Finally, in addition to firm movements, it is useful to understand trends in economic variables considered in the study period. The most interesting of these is the monthly unemployment rate for the Portland-Vancouver-Hillsboro metropolitan statistical area (MSA), illustrated by Figure 17. As with trends in food cart market growth, unemployment rates experienced a significant shock in 2009. Other economic factors such as population and per capita personal income rates for the City of Portland remained relatively constant over the six years studied, and thus are not graphed.

Figure 18



To this point, considerable gains towards the goal of complete comprehension of Portland’s street food market have been made. I have expounded the market’s origins, and described its size and shape. Yet there is still more to be done. Given the popularity of food carts among Portlanders and their ability to influence the development of the city’s holistic economic network, it is useful to understand the forces that dictate economic activity in the street food market.

This process begins with a review of selections from prior economic literature regarding how firms and markets in general operate. After establishing a basic conception of market structure and performance, I further augment my study of Portland’s food carts with a survey of some of the specific features of that market itself.

Literature

To effectively study any model of market organization, it is first necessary to understand what a market actually is. Broadly, a market is any arrangement that allows people to exchange things. Markets are delimited by two factors: their product and their geography (O’Sullivan & Sheffrin, 2005). Depending on the good in question, different markets can have vastly different geographies. For street food meals, the product is

relatively widely defined, while the geography is relatively localized: although there are hundreds of different dining experiences offered by equally numerous food carts all over Portland, each cart has only one specific location in which its services can be contracted. As soon as a consumer purchases a meal, he consumes it, and cannot generally transfer it to another party or location.

Microeconomics and Product Markets

The specifics of market demand and supply are also largely variable—goods can be produced by anywhere from one to over one hundred suppliers in a single geographic region, and each type of market carries its own unique benefits and drawbacks for both producers and consumers. There are two theoretical arrangements relevant to my analysis of Portland’s food carts. The first of these is the most basic model of market organization: that of the perfectly competitive market. Perfect competition is characterized by supply from numerous small firms, all of which produce a relatively homogenous good. None of these firms are dominant enough to control the price of that good, and must instead accept the price determined by the mechanism of voluntary exchange on the market as its selling point. All of these firms, it is assumed, attempt to maximize their profits by varying the quantity of goods they produce (Samuelson & Nordhaus, 2005).

In a competitive market, firms’ profitability and output decisions are ruled by their costs of production. Firms will find it in their best interests to operate in the short run as long as the price they receives for their goods is above the variable cost required for that firm to produce the good. Over long periods of time in the market, a competitive firm will only continue to produce if market price is at least equal to its average total cost of production (Samuelson & Nordhaus, 2005).

However, perfect competition is rarely observed in real-world markets. More realistic is the model of imperfect competition, wherein individual firms are able, to a certain degree at least, to control the price of their goods. Economists denote this ability as a firm’s market power: the degree to which a firm is able to increase its price above

its marginal cost⁵ and thereby influence the price of goods on the market (O’Sullivan & Sheffrin, 2005). This power awards positive economic profits to firms that succeed in controlling their price. In imperfectly competitive markets, numerous firms produce, but goods can be differentiated, which is one way firms can control their price. Imperfect competitors may also garner market power through their internal economies of scale in production.⁶ Often, restaurant meals are used as a real-world example of an imperfectly competitive market (O’Sullivan & Sheffrin, 2005). It stands to reason, therefore, that food carts may also follow imperfectly competitive trends, although I hypothesize food cart market patterns lean closer to perfect competition than do restaurants, as a result of cost structures previously discussed.

These are two brief summaries of two broad types of economic markets necessary for the complete analysis of any market. But beyond typical structure, microeconomic theories also explain some of the specifics of how agents in these markets perform, relate, and produce. Generally, there are two ways by which to model how all market agents interact, each driven by a distinct set of underlying assumptions. The first of these, the neoclassical, is more or less straightforward. The second, of strategic interaction, can get complicated. It’s probably better to start simple.

Neoclassical Organization

Neoclassical models of industrial organization “emphasize that technological factors, such as economies of scale” determine entry and exit (Bresnahan & Reiss, 1987). Under the neoclassical model, explaining how many firms exist in a market in the long run or how much market power is held by one firm over another is a matter of analyzing the degree to which expensive machinery or sophisticated technology are necessary inputs in a firm’s process of producing goods in that market. The more particular or costly production factors are, the more prohibitive entry is for new firms, and the more concentrated market power becomes in the hands of only a small number

⁵ “The additional cost resulting from a small increase in some activity” (O’Sullivan & Sheffrin, 2005)

⁶ “A situation in which an increase in the quantity produced decreases the long run average cost of production” (O’Sullivan & Sheffrin, 2005)

of large firms operating in the market at a given time (Dunne, Roberts & Samuelson, 1988).

This is because with technological and size advantages come reductions in average costs due to internal scale economies. Further, more technical firms can recover their fixed costs more quickly, providing incentive to remain in a market longer. Stigler (1968) sums up these gains as “cost advantages.” Importantly, a given firm only realizes its cost advantages in the long run (Carlton, 2005); that is, only after operating for several years⁷ and adjusting its production function to optimize performance can a firm truly establish economies of scale in production.

Strategic Interaction

However, there is more to market organization than fundamental technological advantages. Especially given that firms can only truly capitalize upon their technical leads in the long run, immediate success in the market must be determined by other factors. Unfortunately for many producers, however, firms have relatively little control over their fates in the short and medium run. New entrants into any established market generally lack market power, and have no choice but to operate based upon untested production functions, founded only on their principals’ best estimations of what will lead to survival for a firm and what will not. More so than inherent cost advantages or actual observation and analysis of performance, expectations of profit (and loss) are the determining factor in decisions regarding production decisions in a market in the short run.

Firms operating this way forecast their expected revenues and costs as a function of a bundle of characteristics describing the performance of their individual operation and the market in which it functions (Blonigen, Liebman & Wilson, 2013). These expectations are conditioned by the potential entrant’s knowledge that their predicted profits are dependent upon the entry and exit decisions of their competitors (Bresnahan & Reiss, 1990). Thus, the context for these strategic models is one of dynamic adjustments by firms over multiple periods of time: considering the actions and payoff

⁷ Firms reach their long run state of production once they have had sufficient time in the market so as to be able to adjust any and all parts of their production function, should they see fit (O’Sullivan & Sheffrin, 2005).

it expects for its competitors, each firm makes decisions to enter, produce, or exit each period based upon the payoff it expects from its actions (Bresnahan & Reiss, 1990). As stated by Moorthy (1985), “the essence of competition is interdependence.

Interdependence means the consequences to a firm of taking action depends not just on that firm’s action, but also what actions its competitors take.” In this view of a market, firms can earn positive profits and develop market power not only by establishing prohibitive cost advantages, but also by strategically deciding how much of a good they will produce.

To construct concrete models of strategic interaction between firms in a market, economists have started playing games. Beginning with von Neumann and Morgenstern (1944), game theory has been used to model economic behavior as a “systematic way to understand the behavior of players in situations where their fortunes are interdependent” (Brandenburger & Nalebuff, 1995). Strategic games can be assembled for and applied to almost any observable market structure. In models of exit, game theory is most often used to illustrate the actions of firms preparing to leave a declining industry. Osborne (2000) illustrates theoretically that in this type of market, larger firms with greater points of minimum efficient scale⁸ will exit first, while smaller firms will be able to survive in the market longer because losses incurred at low quantities produced are lower compared to their larger competitors.

Complications and Simplifications

Of course, a host of factors influence the strategic decisions made by firms in any game theoretical archetype, and attempting to model the interactions of agents in an economy can get complicated quickly. Errors in estimation of measured variables and inability to observe certain characteristics of individual decisions arise and increase exponentially as models become more sophisticated, as Bresnahan and Reiss (1990) note in their empirical investigation of qualitative-choice games.

To simplify these intricate games, it is necessary to take a step back—way back—from the complex nature of market moves and view the market for what it is: a device for the exchange of one thing for another. In short run periods of exchange, firms

⁸ The quantity of output at which economies of scale are exhausted (O’Sullivan & Sheffrin, 2005)

compete with each other for profit based upon prices offered and quantities produced. Certain firms may earn positive profits based upon the structure of the market, while others may see negative returns. Depending on these profits or losses, some firms will be forced to exit the market, while others will continue to produce. Examining a market this way is useful. It affords the ability to capture some of the complex determinants of market structure through our observation of entry or exit decisions. Dunne et al. (2009) take this approach, observing that, in the short run, factors such as product differentiation, geographic segmentation of markets, and the intensity of competition (among others) influence a given firm's fortunes.

Long run market structure can be simplified through a similar method. Again following Dunne et al. (2009), it is assumed that the number of firms in the market is determined endogenously by the collective entry or exit decisions made by the group of firms that constitute the market. Firms will enter if they expect profit in the long run, but will exit if their long run profits fall below zero (Blonigen, Liebman & Wilson, 2013). Entry and exit decisions over time are observable, and provide a basis for interpretations of how a market works in both its short and long run periods. The key aspect of this type of market analysis is that, as Bresnahan and Reiss (1990) state, "these models presume that we do not observe entrants' revenues or costs. Instead, we draw inferences about firms' unobservable profits from threshold conditions that describe [firms'] strategies." Therefore, based upon the strategic choices of firms in any given period of time in a market, it is possible to draw conclusions as to that firm's long run expectations of profit or loss.

Industrial Dynamics

It is understood that firms operate on a dynamic, interactive basis. It follows that their markets are equally active. Indeed, "driven by environmental forces and innovation, industries evolve through prototypical phases of a lifecycle and undergo irreversible transformations in their competitive dynamics, organizational diversity, and structures" (Agarwal, Sarkar & Echambadi, 2002). The importance of this dynamism is tantamount to entry, exit, and survival. Immediately following the establishment of a product market, opportunities for profit are abundant, but uncertainty reigns supreme. All firms, as noted above, face untested production functions and unproven

technologies immediately following their entry. This uncertainty is heightened considerably for new firms in new markets; not only are their principals unsure of the specifics of their own production, but they lack the luxury of observing the experiences of similar firms, and have virtually no empirical basis for their business decisions. In this formative stage, production is limited to products of “relatively primitive design manufactured on relatively unspecialized machinery” (Agarwal & Audretsch, 2001). But as the market develops, more profit-seeking firms enter, reducing the return to early innovation and forcing the refinement and standardization of the product; sustained periods of such entry saturates the market and diminishes many opportunities for short run profit (Mueller, 1972). Eventually, many incumbent firms exit as they exhaust all potential for profit from their activity in the market, and the market approaches its long run equilibrium number of firms and amount of profit. These final numbers are variable across markets, but generally, competitive markets are characterized by lots of firms and little profit; monopolistic or oligopolistic markets take the inverse.

Agglomeration

The above discussion presented general methods for thinking about and modeling the organization of almost any market for nearly any good. With these fundamentals informing further inquiry, I now turn to certain specific aspects of industrial structure pertinent to Portland’s food carts.

The first of these food cart features has to do with the locational decisions of firms. When a new firm chooses to enter a market, it has two basic choices: it can locate in close proximity to other similar firms, or it can locate in an isolated niche. This is a substantial decision because of its implications for the firm’s ability to exploit certain scale economies. The economies of scale in production central to neoclassical models of market structure are completely internal to the firm; each producer can lower its production costs only as it increases output by improving its technology or expanding the size of its operation. However, there is another method by which to garner economies of scale in production: through the collaboration of multiple firms in the same market. While perhaps counterintuitive at first brush, the concept of several similar firms producing in the same market—competitors—allying parts of their production process is in fact such a key tenet of economic activity in any market that it

has been referred to as “the black box that justifies the very existence of cities” (Duranton & Puga, 2003).

By joining a cluster, firms can take advantage of the beneficial forces that cause firms to agglomerate—agglomerative economies. These include labor market pooling and matching,⁹ intermediate input sharing,¹⁰ and knowledge spillovers,¹¹ all of which contribute to increases in efficiency in production and therefore scale economies. However, physical presence in a cluster is vital for the exploitation of these advantages; any production gains to be had as a result of clustering are highly localized, fading after only a few miles or less (Rosenthal & Strange, 2001). Additionally, “there is evidence that knowledge spillovers are more important for industries with small, competitive firms” (O’Sullivan, 2009). Street food in Portland is a perfect example of this type of market.

Yet agglomeration is by no means a guarantor of economic profit. O’Sullivan (2009) demonstrates theoretically that, as the number of firms in a cluster increases, average profits of firms across the cluster at first rapidly increase, then decrease exponentially. This is a result of the nature of firms’ total cost function, which is shown to first decrease as the number of agglomerated firms increases, but then increase rapidly. The increase in total costs is the consequence of increased labor costs for firms in very large clusters, which are driven by greater competition for skilled labor among clustered firms. It seems, therefore, that too much of a good thing can force firms to fail.

Location

Besides the bivariate option of agglomeration or isolation, locational decisions have another, more varied dimension. Firms can also elect where within a geographic market they choose to operate. This decision is motivated by the collection of attributes a specific location can potentially proffer producers. The advantages of one site’s

⁹ Agglomerations facilitate more efficient exchange of skilled workers between firms in a cluster (O’Sullivan, 2009).

¹⁰ Intermediate inputs are goods one firm produces that another uses as an input in the production of another good, such as a button-making machine used by a dressmaking firm. Dividing the cost of a button-making machine among several small firms in a cluster can significantly reduce average costs for all firms (O’Sullivan, 2009).

¹¹ “Sharing knowledge [about production techniques and market characteristics] among firms in an industry” (O’Sullivan, 2009).

characteristics to a firm are themselves dependent upon the characteristics of the firm itself, and logically, firms will attempt to locate where they expect profits to be maximized (Carlton, 1983). The characteristics at issue here are the nature of a firm's production process and the structure of its total cost function.

Connor and Schiek (1997) use the food manufacturing industry to identify firms of three unique cost structures that affect positional decisions. The first of these are supply-oriented firms, for which the most costly aspect of production is the procurement of intermediate goods. For these firms, fresh fruits and vegetables, meats, or seafood capture the majority share of production costs. Once these inputs are obtained, however, production is relatively simple and costless. A second category of cost structure is that of the demand-oriented firm. Here, actual production and distribution of products dominates production costs, while raw input costs are relatively reduced. For food carts, this type of firm is one that prepares elaborate meals with many ingredients and complex production processes. Finally, footloose firms are dominated by neither input nor manufacturing costs, but strike a balance between the two.

Supply-oriented firms have been found to favor locations near their input suppliers and sources of low-cost labor, while demand-oriented firms tend to locate near demand markets and transportation systems. Footloose firms, unsurprisingly, are indifferent between locations (Henderson & McNamara, 2000). Generally, access to existing transportation, infrastructure, and labor and demand markets have been found to influence firm location decisions within a market; various firms require varying proximities to each of these amenities (Vesecky & Lins, 1995).

Product Differentiation

A final important factor in Portland's food cart market is the differentiation of its product into discrete, recognizable types of goods, if not even individual brands. In effect, this makes each firm a monopolist or oligopolist in the production of a specific type of good (O'Sullivan & Sheffrin, 2005). As Smith (1956) explains, this is a significant power; it encourages consumers to develop loyalties to certain brands or categories of goods that they will—on average—purchase over other goods. Loyalty from consumers allows firms to mark up prices above what would be offered if all products were homogenous. If all goods produced were identical, consumers would

have no preference between brands and simply purchase the cheapest version of the good they could find. However, when products become differentiated, consumers become willing to pay more than the homogenous-good price as a result of their affinity to a certain brand (O'Sullivan & Sheffrin, 2005). With marked-up prices come nonzero profits and a degree of market power; with market power comes an increased chance of survival in a market (Shaked & Sutton, 1982).

Empirically, Rosen (1974) determines product differentiation is an important element of market price in competitive markets, while Stavins (1995) finds heterogeneity between firms and their products to be an important determinant of exit for firms producing different models of the same good. Finally, Chatterjee & Cooper (1993) prove product differentiation intensifies competition for accumulated capital among firms in markets responsive to exit and entry.

The implications for agents on both sides of markets in which products are differentiated can be modeled in various ways; perhaps the most common of these are linear models of aggregate demand for differentiated products. Under the Bowley model, for example, the number of varieties of product offered in the market increases as a function of the number of firms in a market, which in turn causes overall consumer surplus¹² to increase as the market grows (Martin, 2002). While estimation of a model of this type depends upon the (infeasible) observation of market prices and quantities sold, its basic tenements prove a useful guide to understanding the structure of a market with many firms and many product varieties.

Intermission

Thus far, I have investigated the origins of supply and demand in Portland's vibrant street food market, described trends in that market, and studied economic theories of industrial organization. I am now in a position to apply this newfound knowledge of industrial economics to food carts in Portland. To this end, I'll turn to the process of econometrics.

¹² "The difference between a consumer's willingness to pay for a product and the price he or she pays for the product" (O'Sullivan & Sheffrin, 2005).

empirics

Descriptive statistics of structure and theoretical explanations of growth are informative and essential to the complete comprehension of any market. However, the performance of firms in a market can only truly be understood by direct empirical observation of their functionality. Therefore, heuristic inspection and analysis is the only way to absolutely determine which factors influence individual firm outcomes and the effect of these elements on those firms.

For Portland food carts, such an analysis begins with a seemingly simple query: can I determine what makes for a successful food cart? To answer this question, I will let the carts speak for themselves. I use firm-level data gathered from the Multnomah County Health Department to predict how these carts perform as agents of economic production over their time in the market. Specifically, I will estimate the probability that a given food cart will exit the market over a period of six years between 2006 and 2011. The results of this econometric estimation process will yield insights into the complex and dynamic relationships between food carts, their customers, and their city.

To accomplish this evaluation, I will operate in three discrete, though again related, stages. First, I develop conceptual and empirical models of exit from Portland's food cart market. This will define the relationships between individual firms' market outcomes and the factors that predict their survival. Second, I estimate the effect of various firm and industry characteristics on food cart exit outcomes. Finally, I interpret these estimations to reach conclusions regarding the factors that encourage certain food carts to survive while others fail.

Conceptual Model

The model presented in the following section is derived in large part from my prior theoretical research into urban and industrial economics and my historical study of Portland's food carts. It is well established by previous investigations that the survival of a given firm in a certain market is dependent upon a bundle of characteristics

describing both the firm and the market. Furthermore, prior studies have found several different methods of varying complexity by which to model the effects of these characteristics on firm exit, entry, and survival decisions, as discussed previously.

These models all begin with the same grounding assumption: that firms act rationally—that is, logically consider the costs and benefits of their actions—when making decisions regarding their participation in a market. From this assumption, it follows that a firm will exit if and when it is no longer profitable to operate in the market, or when its principals realize it will never become profitable.

This is the basis of the food cart survival model. I know firms will exit if they are not profitable, and thus can craft a set of hypotheses regarding what contributes to a firm's profitability (or lack thereof). That is, I will create a version of reality that I think best explains actual profitability of Portland's food carts. In my model, I'll say that a firm's location, agglomeration, and product type decisions matter for its ability to avoid exit. So does its lifespan in the market. Information about the market as a whole, such as how many people can feasibly buy food from street vendors, how much money those people have, and how many of those people have jobs, also matters.

The profitability of a given Portland food cart at a certain point in time can be formally expressed by Equation 1, derived from Blonigen, Liebman & Wilson (2013):

Equation 1

$$\pi_{fmt} = \beta x_{fmt} + \varepsilon_{fmt}$$

Here, π represents the long run profits of a food cart. These profits are not observed, but if a firm exits the market, it is assumed they have fallen below zero. Importantly, the period in which a firm exits is observable. Since I assume its owners act rationally, I can say this is also the point at which that firm has earned negative economic profit. In this model, x represents a matrix of variables that explain the firm's long run profits. The bundle of deterministic factors described by x can be broken down into an index of individual firm characteristics (f) and an index of market characteristics (m). The estimation coefficient (β) on the matrix of explanatory variables will be calculated from data inputted into the model, and will convey information regarding the effect of changes in the deterministic components on the long run profits of a given food cart. Equation 1 also includes a stochastic piece (ε) that

captures errors in explaining the true nature of the observed relationship between profits and the deterministic matrix with an estimated model. Importantly, all variables in this model contain a time component (t), allowing for estimation of this model in any given time period.

Considering this definition of a firm's profits, and with the understanding that firms will exit the market in the period in which they cannot operate as profitable enterprises, I can express exit as a probability. In any given period for which a firm operates in the market, there is a chance that it will be forced to exit because it does not earn enough profit to justify remaining in the market. As such, the probability that a firm will exit the market in a given period can be modeled as follows:

Equation 2

$$\Pr(Exit)_{fmt} = \Pr(\beta x_{fmt} + \varepsilon_{fmt} < 0)$$

Equation 2 represents exit probability as conditional upon pre-exit characteristics of the firm and geographic market. The dependent variable ($\Pr(Exit)_{fmt}$) is binary, taking a value of one if a given firm exits the market in any period considered in the sample, and zero if the firm remains in the market for the duration of the sample (until at least January 2012). When the model is estimated, predicted probabilities will fall along a range between zero and one. Yet before estimating this model and determining how variables indices influence the probability of exit from this market, it is useful to understand the composition of these indices of explanatory variables, thus far characterized only by x .

Firm-Level Index

The first catalog of explanatory variable that affects firm survival in Portland's food cart market is that most directly related to the functionality of the firm itself. These variables can be expressed as a function of Z , which will serve as a representative for all explanatory variables expounded in this section:

Equation 3

$$Z = \beta_1 + \beta_2 Pod + \beta_3 Location + \beta_4 Type + \beta_5 Lifespan + \beta_6 Lifespan^2 + \varepsilon$$

From Equation 3, it can be seen that three discrete firm characteristics influence the probability of exit. The former two of these pertain to the locational decisions of a firm. The first, Pod , is a dummy variable that indicates whether or not a firm has chosen to

locate itself within a cluster as opposed to locating isolated from other firms. The features and advantages to firms of these pods have been discussed previously. It is assumed food cart principals are fully aware of the payoffs to their enterprises from locating within a pod, and rationally weigh those benefits against the costs of locating within a pod. Implicit in this locational analysis is the comparison between expected benefits of locating within a pod and the benefits a given cart might receive from isolation the cart foregoes when it elects to locate in a pod.

Similarly, carts can consciously choose a certain location within the geographic market itself for their operation, represented by *Location* above. To capture these geographic considerations, the City of Portland can be divided into five discrete regions,¹³ into one of which a given food cart may place itself upon entry. Each region may provide certain benefits to a food cart operating within its borders. For example, carts located in the Southwest portion of the city can exploit potentially high demand from consumers for quick, low-price food cart meals in the central business district and its high concentration of other firms and laborers. Alternatively, food carts operating in primarily residential neighborhoods in the Northeast region of the city may take advantage of potential demand for food cart services from families consistently seeking high quality yet inexpensive meals for an entire household. Geographic regions are rounded out by the upscale mixed-use district in the Northwest, residential and commercial areas in the Southeast, and big-box retail, industrial, and comparatively low-end residential areas in the North part of the city.

Each geographic region presents unique benefits and costs for food carts, such as land rental rates, other variable production costs, and differences in consumer preferences. These costs and benefits are by no means unilateral for all food carts, but vary based upon individual carts' production processes and the nature of their business, as illustrated by Carlton (1983). Certain carts may also choose not to define a specific location for themselves, but rather remain mobile and travel to different regions of the city by the day or week, thus attempting to capture demand from all across the city. In the estimation of the *Location* variable, each region is assigned a discrete indicator,

¹³ Refer to Figure 15 on page 26 for an illustration of these regions.

each of which will reveal the effect of locating within that specific region on the probability that a firm will exit the market.

Another determinant held within the index of firm variables is *Type*, which indicates the product variety offered by a given food cart. Although its product—food—defines Portland’s food cart market, actual services offered by carts across the city are quite heterogeneous. As previously discussed, Portland food carts are, at least in part, popular for their ability to satisfy a wide range of consumer preferences across a variety of service levels. Product differentiation is also a potential avenue to market power, making the type of good offered by each cart important for its ultimate success. Moreover, Portland’s food cart market is one characterized by many firms, and is thus responsive to exit and entry decisions (Dunne et al., 2009). Following Chatterjee & Cooper (1993), this indicates that differentiation of products is an avenue by which to earn positive profits. As such, it is hypothesized that product type is an important determinant of a firm’s ability to survive without exiting the market in the long run.

However, many singular food carts lack the ability to establish significant individualized brand loyalties for themselves. Instead, they may only differentiate simply; that is, firms differentiate their products into broad varietal cohorts rather than specific brands. This affords carts some amount of inimitability compared to others, while simultaneously allowing firms of parallel types to free-ride on the reputations of those similar to themselves. Thus, several different food carts can generally meet consumer preferences or loyalties for certain product varieties through their differentiated products without necessarily establishing themselves as the sole producer of a single product type. Each product type subset may carry its own implications for the survival rates of producers of that specific type.

More than any other, Portland’s carts serve “American” food: familiar sandwiches, hamburgers, barbeque, hot dogs, cheesesteaks, and related plates. Similarly numerous among food cart producers are those serving dishes categorized as “Asian.” These include Japanese bento boxes and Korean bibimbap, Thai phad ki mao and Indian curry, and other analogous dishes. Also represented by the *Type* variable are “Latin” producers serving food with Central and South American origins; “Mediterranean” carts with offerings from Greece, Turkey, North Africa, and the Middle East; “Italian” carts

that produce plates of pasta and pizza; and “Dessert” carts supplying ice creams, baked sweets, and both sweet and savory crepes and waffles. Regression estimation coefficients will indicate which of these food types fare the best with consumers, and to what degree Portland’s eaters can influence the survival of a firm in the market based upon its product type.

One final variable included in the firm-level index is that which measures the length of time (in months) a given firm has existed in the street food market. The *Lifespan* measure is expected to inversely influence the probability a given firm exits the market in a given period. That is, the longer a firm exists in the market, the lower the predicted probability of exit is expected to be. For food carts in Portland, this is not an unreasonable assumption. Producers with longer market lifespans are those that have proven their product is desirable and their production function is effective. For these firms, longer lifespan means more time to command market power and avoid shutdown. Therefore, longer lifespan means more opportunities for profit, and reduced probability of exit.

An interaction of this variable is also included to capture any non-linearity in the effect of firm lifespan on exit probability. Positive regression coefficients on *Lifespan*² will indicate an increase in the rate of change in the effect of *Lifespan* on exit probability, while a negative coefficient denotes a decrease in the rate of change in *Lifespan* on exit probability over time.

Market-Level Index

Beyond the individual firm, there are other, larger factors that affect the probability a food cart will exit in a given period as well. Appending these to Equation 3 gives us:

Equation 4

$$Z = \beta_1 + \beta_2 Pod + \beta_3 Location + \beta_4 Type + \beta_5 Lifespan + \beta_6 Lifespan^2 + \beta_7 Population + \beta_8 Income + \beta_9 Unemployment + \varepsilon$$

Where *Population* measures the population of Multnomah County, the administrative boundary that encompasses the majority of the greater Portland metropolitan area, including the center of the city itself. The *Population* variable has been restricted to the confines of Multnomah County because this boundary defines the limit of data for

this study; all food carts analyzed are located exclusively within Multnomah County. Firms operating outside of the county are not required to register themselves with Multnomah County officials, and are thus absent from the dataset. Regardless, Multnomah's county lines serve as effective representatives for the City of Portland alone, excluding its suburbs. This is advantageous because it allows for the segregation of the distinct geographic markets of city and suburbs. Measuring the population of a metro area not only tests the effect of a city's size on the mortality of its firms, but also serves as something of a controlling trend variable that can capture changes in general socioeconomic conditions over time, thereby making it a desirable independent variable in an industrial investigation such as this.

Another variable measure of more macroeconomic market forces is average per capita personal income (*Income*) earned by residents of the Portland metropolitan area. Just as the number of people living in the area able to purchase food cart meals influences firms' profitability, so too does the amount of money those potential consumers have. Per capita personal income is a meaningful indicator of the average individual's ability to purchase goods and services such as meals from food carts on the open market. The more personal income is earned, the easier it is for consumers to buy food from the carts.

However, the service offered by carts may be somewhat unique. It is hypothesized that food cart meals are what economists categorize as an inferior good: one for which consumers' demand decreases as their income increases. Street food fits with this pattern; more affluent eaters will generally elect to dine in more costly full-service restaurants, where indoor seating, table service, and silverware are the norm. Consumers with less personal income to spend on food, conversely, will seek to avoid elevated costs and longer wait times associated with dining in restaurants and tend to frequent food carts for their fill instead.

To further test this hypothesis, per capita personal income has been deflated (adjusted for inflation to ensure a consistent measurements of dollar values over time)

using a Consumer Price Index¹⁴ for spending on all food items excluding food at home. The polarity of the regression estimation coefficient on the *Income* variable will indicate whether food cart meals can in fact be treated as an inferior good. The magnitude of the marginal effect of this coefficient will indicate the degree to which changes in exit probabilities respond to changes in the per capita personal income of Portland area residents—the income elasticity of demand for food cart meals.

The final economic variable indexed by *Z* is a measurement of the monthly unemployment rate for workers in the labor force in the Portland metropolitan statistical area (*Unemployment*). It follows from the previous discussion regarding the attractiveness of food carts as business options during periods of economic recession that unemployment rate—one measure of the impact of the severity of a business cycle fluctuation in an economic system—could affect the probability that a food cart exits the market. A general positive relationship between high unemployment rates and the numbers of producers operating in the food cart market has been observed; including this deterministic variable in an estimated model may establish causality between the two measures. Assuming that high unemployment causes growth in Portland’s food cart market, we would expect a positive relationship between unemployment and the probability of exit: as unemployment rises, more entrepreneurs open new food carts, intensifying competition and reducing market power, thus increasing the probability that a firm is unable to earn non-negative economic profit, and so chooses to exit.

Methods

To this point, regressions and estimations have been bandied about as the ultimate solutions to my questions regarding the determinants of market performance by Portland food carts. Yet these perhaps mysterious processes beg clarification if I am to meaningfully interpret their outputs. Generally, regressions seek to identify relationships between one dependent variable and a multitude of independent variables, and rely upon observations of each to work. I do not expect to uncover a perfect

¹⁴ The calculated index of average prices of a predetermined basket of goods consumed over time (Blanchard, 2006).

relationship between the two sets, but rather attempt to maximize the amount of changes in the dependent variable I can statistically explain with changes in the independent variables used in the regression model (Dougherty, 2011). In this way, a regression takes observed sample characteristics and models actual relationships between regressors and the dependent variable for an entire population of subjects. The result is reliable estimates of the true value of a dependent variable for any specified level of a given independent variable (holding all other independent variables constant).

In order to properly estimate a binary model of food cart exit, it is assumed that cart exit data are shaped following a cumulative standardized normal distribution, such that the probability of an event such as exit occurring at any period of time can be defined as a function of Z_t . I can substitute for Z_t to reach:

Equation 5

$$\Pr(\text{Exit})_t = F(\beta_1 + \beta_2 \text{Pod}_t + \beta_3 \text{Location}_t + \beta_4 \text{Type}_t + \beta_5 \text{Lifespan}_t + \beta_6 \text{Lifespan}_t^2 + \beta_7 \text{Population}_t + \beta_8 \text{Income}_t + \beta_9 \text{Unemployment}_t + \varepsilon_t)$$

Equation 5 above is the final model estimated in this study. When a regression of this equation is run, I assume the form of the error term is such that it is possible to estimate model parameters with a probit model via maximum likelihood estimation, following Blonigen, Liebman & Wilson (2013). This requires an iterative process to estimate parameters. To understand and interpret parameter estimates, for their part, also requires special care.

Because exit probabilities are assumed to follow a normal distribution, the effect of each independent variable on the dependent variable changes with the value of Z . As a consequence, regression coefficients do not immediately correspond to marginal effects of one explanatory variable on the dependent variable, *ceteris paribus* (Dougherty, 2011). Coefficient estimates are useful only for their general indications of the polarity and magnitude of each determinant on exit probability. However, in order to establish the amount of change in the dependent variable caused by a unit increase in a given explanatory factor, marginal effects must be calculated separately through a series of partial derivatives. The output of these calculations varies significantly depending upon the exact specifications of inputted variable measures.

Marginal effects presented in this study are calculated two different ways. In order to get a sense of overall the marginal effect of a model parameter on exit probability, average marginal effects (AME's) are reported for each deterministic variable. These indicate, on average, the marginal effect of each independent variable on the outcome variable, holding all other independent variables fixed. For a given level of explanatory variable, the AME calculation yields an exit probability. This process is repeated for all increments of the same explanatory variable, at which point differences in probabilities across all levels of explanatory variable are averaged, producing an average marginal effect. Effectively, this process compares several discrete hypothetical populations, each with identical characteristics save for a given value of one deterministic variable. This process is desirable in regression models with several categorical indicator variables such as mine, as comparable groups are easily delineated based upon discrete categorical changes from zero to one, holding all else constant (Williams, 2011).

However, marginal effects do not remain constant across all values of other deterministic variables, and forcing the characteristics of one sample subset onto another may not be entirely realistic. As such, marginal effects at representative values (MER's) are also calculated. Using MER's, it is possible to specify a range of values for one or more explanatory variable, and thereby identify changes in marginal effects of another determinant across that range. This is especially useful in a time series investigation, where marginal effects of certain determinants may vary over periods of time or throughout the lifespan of a firm in the market.

Data

Data analyzed by the model of exit probability were collected from the Multnomah County Health Department as operational permits. Initial data contained listings for more than 800 uniquely identified food carts operating within Multnomah County between 2006 and 2011. Before entering the market, each firm is required by county regulation to pass a preliminary health code inspection conducted by the Multnomah County Health Department and register with its Bureau of Inspection and

Licensing. Firms are further mandated to renew their business license annually, and, in the event they exit the market, must notify the Health Department so as to avoid penalties for operating without a license (City of Portland, 2009).

Data on period of entry and exit were gathered from these Health Department regulation records. These data were augmented with location information for carts listed in the Health Department registry gathered from numerous sources. Chief among these are Internet sites detailing Portland food cart locations, such as foodcartsportland.com, which records both historic and current locations of firms across the city.

Approximately 50% of all location observations were gathered from foodcartsportland.com. Additional location data were gathered from select food carts themselves, by way of firm website site searches and telephone and personal interviews (30% of all location data). Finally, websites fueled by user-generated content such as yelp.com and urbanspoon.com (approximately 20% of all location observations) also proved relevant in supplying positional information, although data from these sources were considered less robust than the previous methods. Where applicable, firm location was verified by firsthand observation.

Product type data was collected by the same method as that used for locational information. However, external sources and sampling were only minimally necessary for food type information. For the majority of carts in the sample, food type is reflected by firm name. For instance, a cart operating under the name “Fat Kitty Falafel” is expected to serve falafel and other Mediterranean foods; one called “Mr. Oink’s BBQ Express” is expected to supply barbequed meats in American-style sandwiches. While it is possible that inferences such as these are inaccurate, it is much more likely they are reliable because firms have incentive to honestly convey their product type through their name. In order to communicate accurate information regarding the exact nature of their service to consumers, a cart’s name must reflect its product. Because food carts are small firms that operate in a crowded, constantly changing market, many do not have the luxury of establishing definite associations between their names and their products. Thus, it is necessary to convey product type information through the firm name. Inaccurate or incomplete information resulting from a firm’s failure to identify itself

may prohibit consumers from identifying and purchasing the type of good offered by that food cart, thus costing the firm revenues.

Appended to this information on individual food carts is data from the United States Department of Commerce Bureau of Economic Analysis (BEA) and United States Bureau of Labor Statistics (BLS) for population, income, and unemployment levels. Population information for Multnomah County residents were obtained by the BEA from the US Census Bureau's annual population estimates series. Per capita personal income data were also measured annually, using Census Bureau midyear population estimates. Additional data on Consumer Price Indices were collected from the BLS as well. The specific CPI series used to deflate personal income was for all urban consumers in West region cities of between 50,000 and 1,500,000 residents; the basket of goods used was "food away from home", or the value of all meals (including tips) purchased from any type of food vendor or caterer.

Unemployment data were gathered using the St. Louis Federal Reserve Bank's ALFRED database, and are sourced from the BLS Metropolitan Area Employment and Unemployment series. Unemployment levels are measured monthly for the entirety of the Portland-Vancouver-Hillsboro MSA. Unemployment rates throughout the larger Portland MSA are related to economic activity within the city itself. Moreover, unemployed workers living outside of Multnomah County may elect to enter the food cart market within the county rather than in the suburbs. Indeed, 116 total carts were registered within Multnomah County by principals with listed billing addresses in three of Portland's largest suburbs over the six years included in the sample. Like unemployment rates, per capita personal income was measured for all Portland-Vancouver-Hillsboro MSA residents.

Characteristics and Concerns

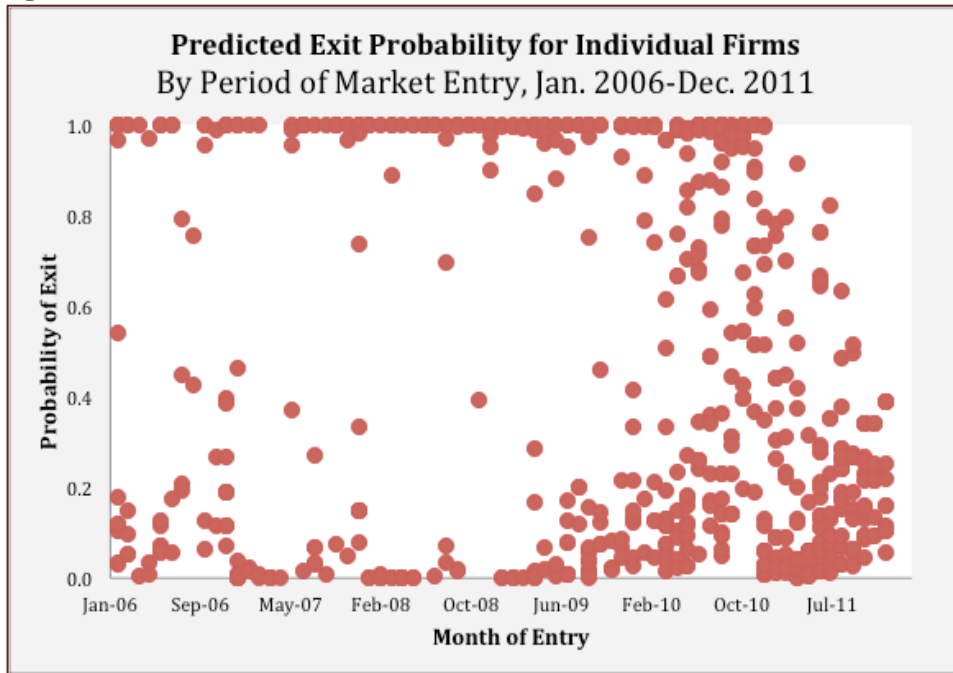
The dataset considered in this study consists of observations for 706 firms over a span of six years. The objective is to use this sample of food carts to estimate relationships between variables that I think to be true of the entire population as well. Results achieved following this process are, at best, informed inferences regarding the true nature of food cart market operation. That said, statistical rigor is the order of the

day when it comes to establishing the validity of estimation models, and there are a variety of methods by which to assess the performance of a regression model.

Although it is difficult to truly evaluate maximum likelihood estimations, the model estimated using this data fared well. If I were to take all model results for predicted probabilities above 0.5 (a 50% chance of exit) as true instances of exit, the regression model correctly predicted over 95% of all exit outcomes, incorrectly interpreting results for only 34 out of 706 food carts. Moreover, the Pseudo R^2 measure of fit for the regression model indicated almost 67% of all variance in exit probability explained by the model. To further substantiate the model as a whole, Hosmer and Lemeshow's goodness of fit test (using 10 quantiles of estimated probabilities) was performed; results indicated valid parameter estimates up to the 99% level of confidence. That is, there is less than a 1% chance that any given outcome as extreme as that generated by the regression model could occur by random chance. Finally, regression results do not report any instances of complete failure to determine an exit outcome, and coefficient estimates returned overwhelmingly statistically significant parameter estimates and marginal effects. While these latter measures are at best approximations of fit, taken together, they present a compelling case for a solid regression model that interprets relationships between parameters relatively close to their true values.

However, as with any empirical analysis, there are limits to this investigation. It is immediately obvious from inspection of illustrations (such as Figure 19 below) of predicted exit probability that there is a high degree of variation in exit outcomes. Large variance indicates random noise in a sample, which hampers the effectiveness of estimators. A potential source of this noise, and an area of concern for the dataset as a whole, is measurement error.

Figure 19



Chief among areas for potential measurement error are location data points gathered from external sources. Portland’s street food market, as has been noted, is one marked by constant dynamism on the part of its suppliers. Food carts can change locations or even operate without a fixed location, and consequently, it can be hard to definitely locate a specific cart. Over 100 firms listed in the initial Multnomah County Health Department Register of street food vendors were excluded from this analysis as a result of missing, incomplete, or conflicting location information. For the remaining firms for which locational information was obtained, there remains a certain probability that listed addresses—especially those found on yelp.com or urbanspoon.com—are inaccurate. However, in cases of uncertainty, observations were omitted so as to maximize the validity of regression estimates.

Another potential root of measurement error is in the *Lifespan* variable. For those firms that entered the market towards the end of the sample (starting in 2011, for instance), measured market lifespan was sometimes artificially short, as I could not observe exit for all of these firms. As a result, although these firms do not exit, they have been in the market for sometimes as little as two months. This gives an incomplete representation of the true nature of these firms’ characteristics, which could bias sample estimates. However, significant structural differences between this group of firms and

the sample as a whole were not identified by a Chow test, validating their inclusion in the model.

Overall, while measurement error may affect the ability of the econometric model to accurately describe the relationships between dependent and deterministic variables, there is reason to believe estimates from this model are valid. Coefficient estimates are overwhelmingly statistically significant, predicted instances of exit differed from actual observations by only 4.8%, and a relatively high Pseudo R^2 indicate meaningful estimates for each measure. While it is difficult to isolate actual bias resulting from measurement errors, I am confident enough in my empirical results to regard any measurement bias as negligible and proceed with the regression models specified as legitimate estimates of true parameters.

Results

Presented in Table 1 are the results of the maximum likelihood estimation of a probit model of exit occurrences among a sample of Portland food carts. Both regression coefficients and average marginal effects are presented. For the categorical indicator variables of location and product type, only statistically significant estimates are displayed. Estimates for each variable are displayed above their standard errors, with significance levels represented as stars on coefficients. Results and implications of each component of this model will be addressed individually.

Table 1

Exit Probability Model Estimates

<i>Variable</i>	Coefficient Estimate	Marginal Effect	<i>Mean</i>
	<i>Impact on Exit Probability</i>		
Pod	0.254 (0.175)	0.035 (0.023)	0.618
Location: Northeast	0.610** (0.244)	0.097** (0.042)	0.085
Location: Southeast	-0.382** (0.177)	-0.052** (0.023)	0.323
Type: American	0.333** (0.166)	0.048** (0.024)	0.385
Type: Asian	-0.583** (0.238)	-0.076** (0.028)	0.183
Lifespan	-0.326*** (0.0318)	-0.041*** (0.002)	21.14
Lifespan ²	9.62x10 ⁻⁴ *** (2.93x10 ⁻⁴)	-	855.6
Population	-1.88x10 ⁻⁴ *** (1.74x10 ⁻⁵)	-2.64x10 ⁻⁵ *** (1x10 ⁻⁴)	2.2x10 ⁶
Personal Income	0.00250*** (3.83x10 ⁻⁴)	3.52x10 ⁻⁴ *** (1.4x10 ⁻⁴)	39,635.6
Unemployment	1.040*** (0.130)	0.146*** (0.0457)	8.633
Constant	312.5*** (25.83)	-	-
Observations	706		
Pseudo R ²	0.633		
Complete Successes	60		
Complete Failures	0		

*** p<0.01, ** p<0.05, * p<0.1

Results and Implications

Outputs outlaid and minutiae behind me, I can turn to relevant regression estimation results regarding the performance of firms in the market for street food in Portland. The first step in this process is to interpret what these model outputs say about the characteristics of survival for Portland’s food carts. There is power in the numbers reported by this model, as each implies a specific conclusion regarding the relationship between a given determinant and its outcome. Furthermore, my understanding of regression model outputs is conditioned by my understanding of economic theory, and fundamental economic principles can be used to explain observed phenomena in

Portland's street food market. With regression model outputs, I will be able to see how closely Portland food carts follow theoretical trends. More importantly, however, I will also be able to test the inverse: how applicable these theories are in real-world markets. Above and beyond the prime directive of complete comprehension of Portland's food carts, this analysis allows me to evaluate the performance of economic models in actual situations.

Agglomeration

Locational decisions and their implications for firm survival is the first factor of food cart functionality to consider. From the first variable (*Pod*) presented above, it is clear that clustering has no statistically significant effect on a given firm's exit probability. That is, I cannot say a firm's chances of surviving for the entirety of its time in the market throughout the study period are significantly influenced by its decision to join a cluster of other carts. This means, on average, Portland's food cart pods do not offer benefits substantial enough to appreciably improve the survivability of individual carts located within clusters. This is perhaps not a surprise, given the typical operating and vending structure of many food carts.

Food carts rely on a minimum number of laborers and produce final goods using relatively simple, inexpensive, and readily accessible inputs. These aspects of the food cart production function suggest clustered carts stand to gain relatively little in the way of labor matching or labor pool and intermediate input sharing, two primary benefits to firms from clustering. Remaining sources of agglomerative economies are knowledge spillovers on the supply side of the market and one-stop-shopping on the demand side. Yet for street food suppliers in a city with such a thriving culinary culture as Portland, operating a food cart in a pod is hardly the exclusive path to exploitation of flows of culinary knowledge or interaction with other chefs, food critics, and gastronomic innovators. Placing an order at any food cart window or restaurant bar around the city realizes this objective just as effectively as locating one cart near another, which nullifies the need for clustering as a source of knowledge spillovers. Further, with so many food carts spread across Portland (especially by the end of the sample in 2011), consumers need not necessarily seek out specific cart pods to satisfy their various

preferences. In all, the food cart production function does not amend itself to agglomerative economies.

Location

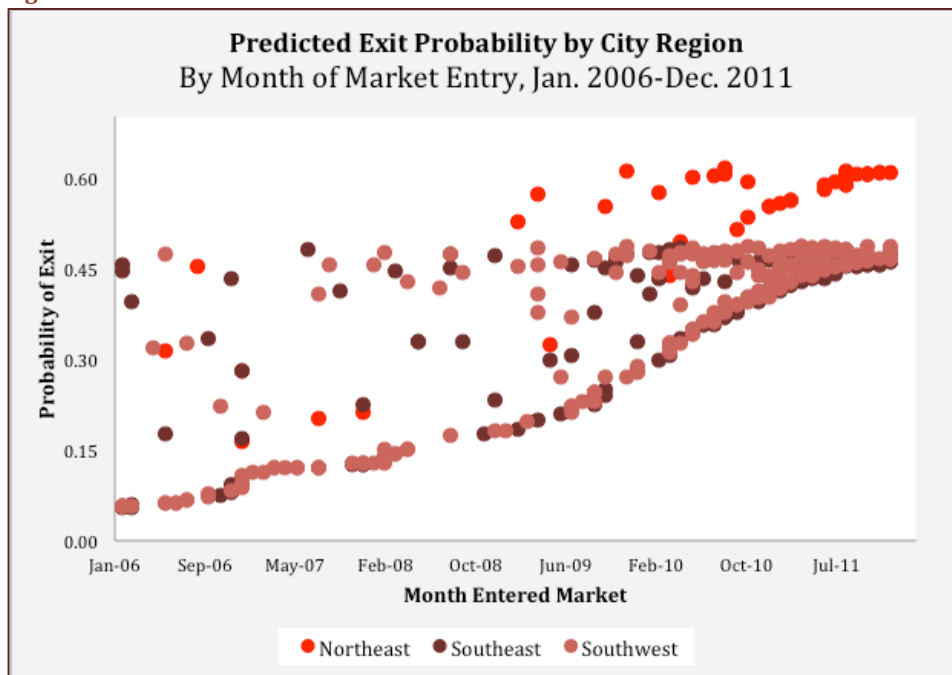
There is, however, an aspect of location decision that does have serious implications for a firm's ability to survive in the street food market—spatial location selection. Two regions of the city in particular, its Northeast and Southeast areas, have significant (yet diverging) impacts on exit probability. Based upon the positive coefficient and marginal effect of *Location* on exit probability, carts located in Northeast Portland have a higher probability of exiting the market than do those located elsewhere in the city. Conversely, carts located in Southeast Portland have a reduced probability of exit compared to their competitors. These impacts are significant, and their magnitudes are not trivial. Northeast Portland carts have, on average, a 9.7% higher chance of exit, while Southeast Portland carts enjoy an exit probability reduced by an average of 5.2% compared to other carts anywhere else in the city. In accordance with my previous discussion of cart pods and their effects on exit probability, Southwest Portland locations (many of which are defined by large pods in the central business district) have no significant impact on exit probability. Northwest, North, and Mobile locations also carry no significant effect. This indicates the effects felt in these regions are not powerful enough to influence survival of firms located there, unlike elsewhere in the city.

As to the immediate explanations of these trends, it is hypothesized some of these dissimilarities are due to differences in demographics across city regions. In the Southeast, it is anticipated most local consumers have less disposable income and are of a lower median age than anywhere else in the city, making them ideal consumers of street food meals. Conversely, Northeast consumers are expected to have more income and have a higher median age versus other city regions, suggesting they would be less inclined to eat street food compared to other sources of meals, such as restaurants. Testing hypotheses regarding the demographic structure of each Portland district is beyond the scope of this project, but is achievable through a thorough, painstaking, and thoroughly painful examination of census tract data on income, population, and labor supply in each region.

While I have identified location-specific advantages to firms within urban areas, it is impossible to determine the nature of individual firms' cost functions, and thus inappropriate to define a concrete conclusion as to the cost-specific factors that drive one cart to locate in a certain region over others in order to minimize production costs. However, I speculate that North and Northeast Portland regions are more desirable for supply-oriented firms, while Southeast and Southwest regions are more suitable for demand-oriented firms. Perhaps food carts following supply-oriented business models are less successful than demand-oriented firms. For firms in an industry such as food service, this deduction is not unreasonable—consumers generally expect meals purchased when dining out to be greater than the sum of their parts. That is food cart chefs are expected by consumers to create final goods from cohesive combinations of ingredients that are above all else tastier than each individual input alone, making them demand-oriented firms.

There are important nuances to the effect of locational decisions on survival. The first of these is the variability of locational choice effects on exit probability over time. Take, for example, Figure 20 below, which illustrates predicted exit probabilities for individual food carts in three city regions by period of entry into the market.

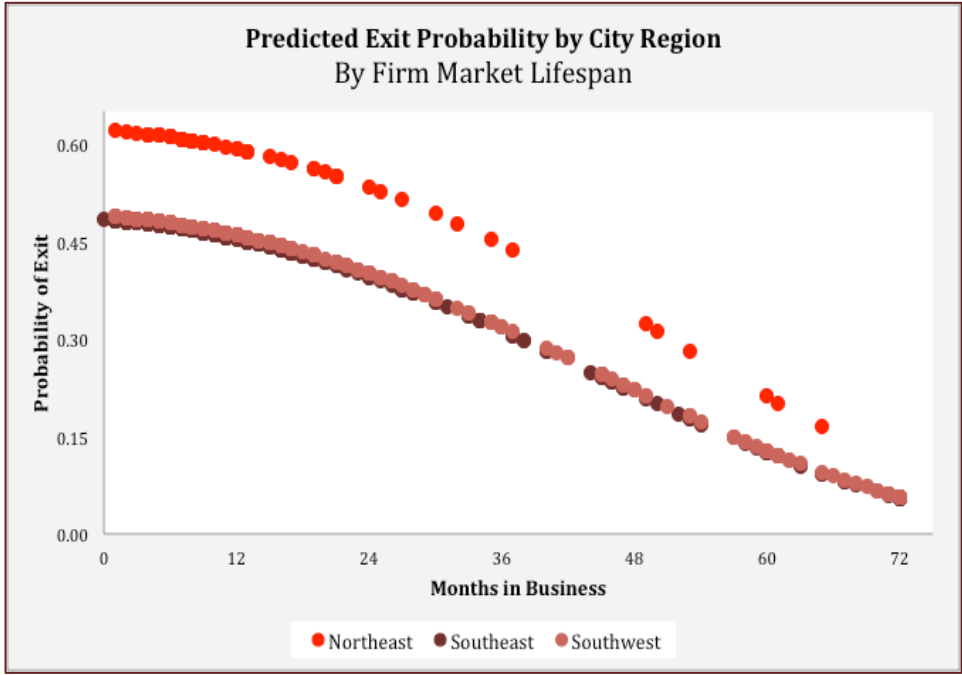
Figure 20



While this relationship is somewhat volatile, it is clear that for carts in all regions considered, exit probability increases over time. This figure indicates that early entrants—initial adapters of the food cart model and the first firms to break into the street food market—face reduced exit probabilities (on average) compared to those firms that attempt to enter in later periods, amid heightened competition from an increased number of firms.

The trend of higher exit probability over time is reversed, however, when considering the time a given firm has spent in the market rather than the time at which it entered, as demonstrated by Figure 21 below. Here, a clear relationship between exit probability and locational choice can be defined: for all carts, longer market lifespan leads to lower probability of exit.

Figure 21

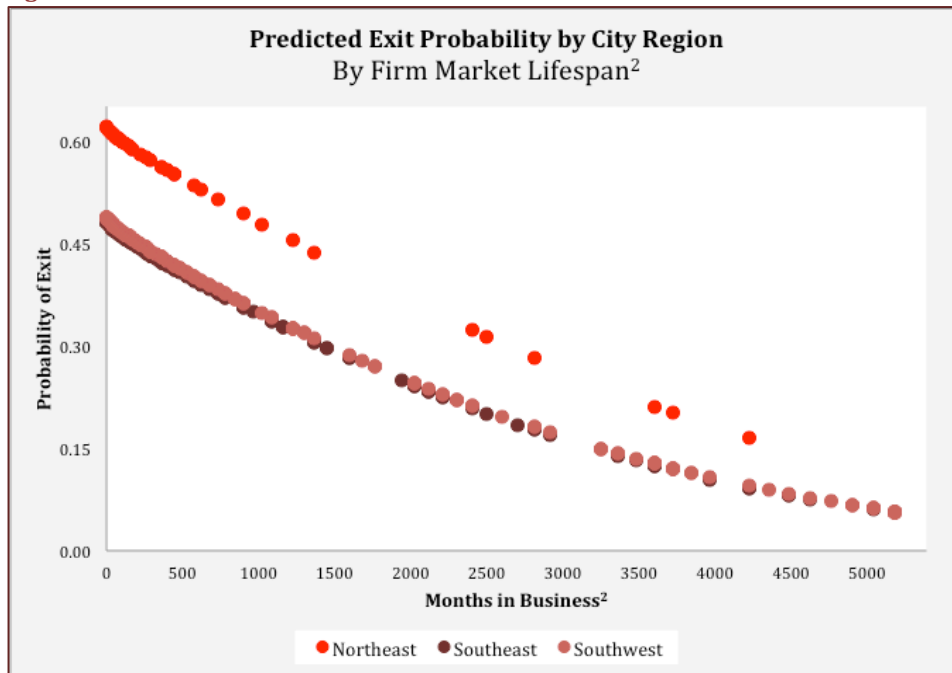


This effect is reinforced by Figure 22, which plots exit probability by *Lifespan*², the interaction term of *Lifespan*. The interaction of a variable indicates the rate of change in that variable with respect to the outcome variable¹⁵; here, I can say

¹⁵ Note from Table 1 that the interaction term does not carry a marginal effect. Because this variable measures the rate of change in another independent variable, its marginal effects on the dependent variable are inseparable from those of *Lifespan*, and are thus not calculated.

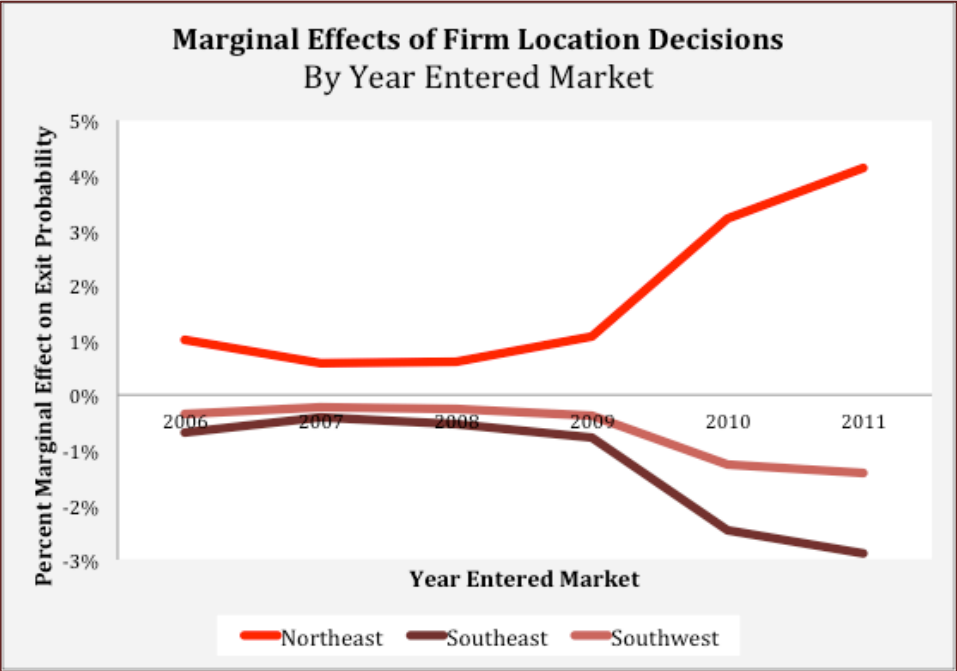
that early entrants into the street food market face exponentially reduced exit probabilities than do their less mature counterparts.

Figure 22



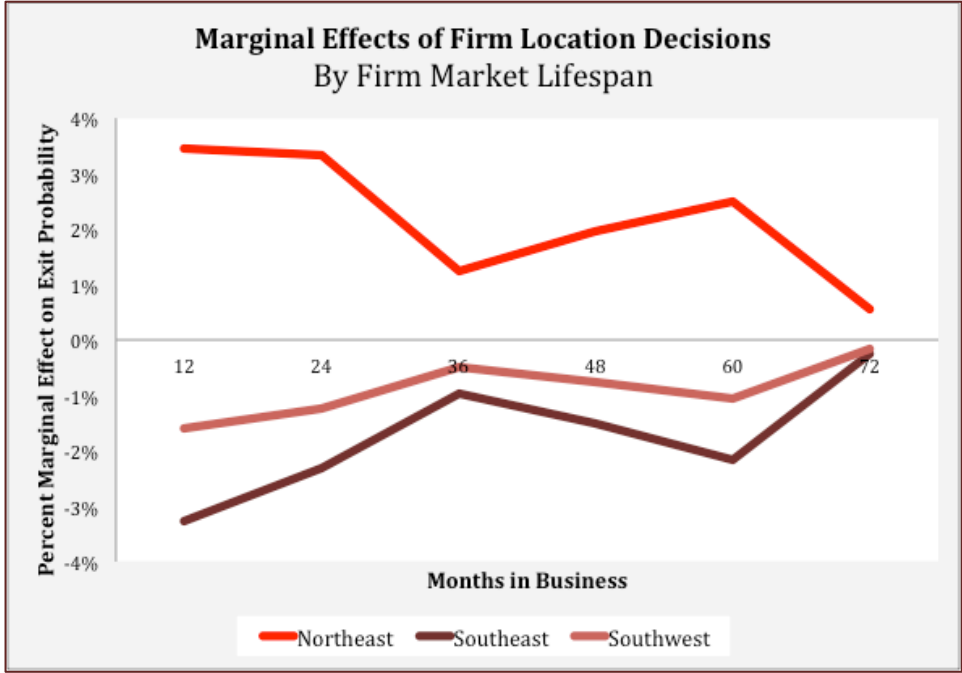
Furthermore, there is yet another angle from which to approach the relationship between location decisions and firm survival: through their marginal effects on exit probabilities. The marginal effect of a location decisions is a dynamic phenomenon. It can be seen from Figure 23 that the later a food cart enters the market, the more important its locational choice becomes for its survival, as marginal effects trend away from zero over time.

Figure 23



Marginal effects of spatial choices diminish as firms advance in age, as evidenced by Figure 24 below. This indicates the oldest food carts in the market depend less upon specific locational factors for their survival over time in the market. As firms increase in age, their initial spatial choices matter less for their survival, while other factors become more influential to a firm’s profitability in the long run.

Figure 24



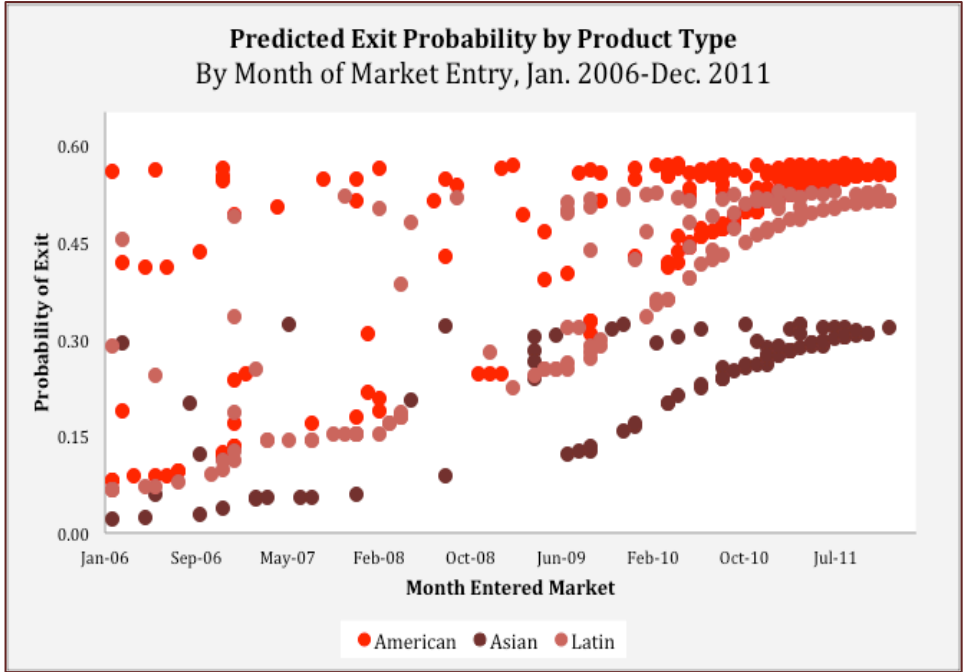
In all, over the lifespan of any given food cart regardless of location, exit probability increases the later a cart enters the market. Conversely, exit probability decreases exponentially as a cart advances in age. Furthermore, the importance of locational decisions to firm survival is heightened as the market grows, while it is reduced as a firm increases its lifespan as a market participant. When considering spatial decisions specifically, food carts in Northeast Portland tend to exit with greater probability than do carts elsewhere in the city, while the inverse holds true for carts in Southeast Portland. Although estimates of magnitude of effects are statistically insignificant for the many food carts in Southwest Portland, exit probabilities there closely follow the same pattern for firms in this region as do exit probabilities for firms located in Southeast Portland.

Product Differentiation

Locational choice is one of the significant decisions all food carts must make when they enter the street food market. Another is the product type that new cart will offer its consumers. Examine Figure 25 below. Although it charts predicted exit probabilities for individual firms over periods of market entry by type of product offered, its trends are remarkably similar to those presented in Figure 20, which illustrated this relationship by geographical location. This similarity indicates a strong

relationship between market age and survival in general, independent of both location and product type—it seems as though there’s a definite market pattern developing.

Figure 25



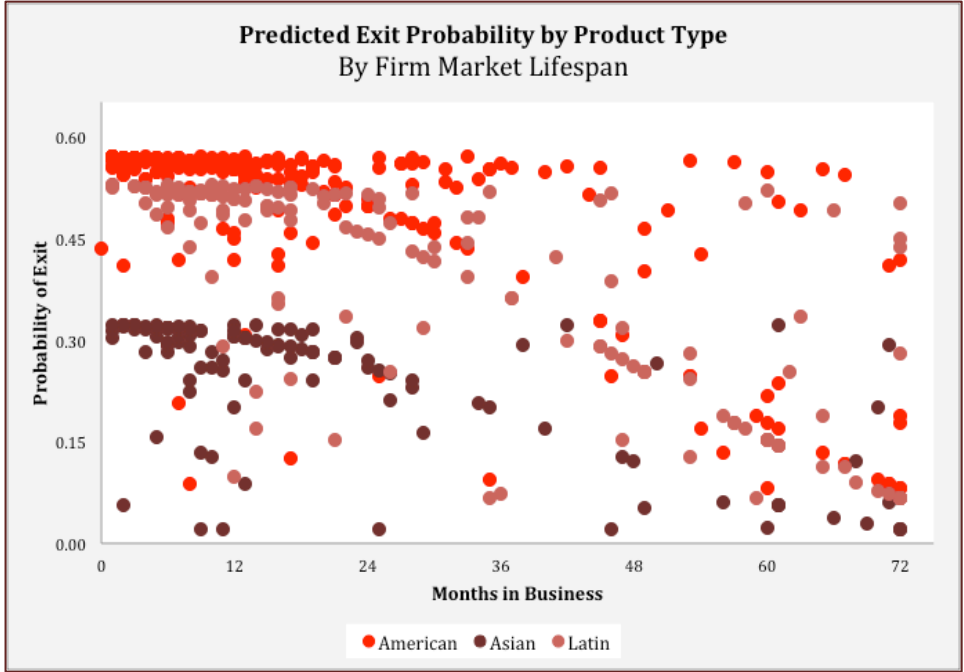
It is clear from Figure 25 and regressor coefficients noted in Table 1 that food carts producing Asian-themed meals face reduced exit probabilities compared to firms of other types. On average, firms offering Asian products exit with a probability 7.6% lower than other firms. Food carts producing American meals exit with a 4.8% higher probability. Because of the large number of producers of this type, Latin firms are included alongside Asian and American food carts in figures charting the relationship between product type and survival, even though its effects are statistically insignificant. Estimates for Asian and American firms were statistically significant, whereas all other product types indicated no effect on exit probability definitively different from zero. This implies consumers generally prefer Asian-themed meals to all others and favor American plates the least out of all types, but are indifferent between other offerings.

While it seems as though Portland’s street food consumers express increased demand for Asian more than any other type of street food meal, these preferences may be influenced by the nature of each product type as well. Certain cuisines—Asian ones especially—lend themselves well to rapid preparation in a tiny sidewalk kitchen and quick consumption on the street. Historically, Japanese, Korean, Chinese, Thai, Indian,

and other Southeast Asian cultures have all developed dazzling street food cultures. As testimony to the popularity of these gastronomic traditions, *Food and Wine* recently ranked Asian cities as home to nine of the world’s top 19 street food cuisines (Fisher, 2013). Popular in their native countries for taste, diversity, and affordability, Asian street food has thrived like no other anywhere else in the world. Applying Asian gastronomy and culinary methodology to street food in Portland, then, is expected to produce satisfying results for both consumers and producers.

While a firm’s product type influences the determination of survival as the street food market has developed over time, the relationship between food type and survival over the lifespan of a firm is less distinct. As with locational effects, the longer a firm has operated in the market, the less of a chance it has of realizing negative profits and exiting. From Figure 26 below, it is clear that Asian producers routinely exit less frequently than carts of other types. But exit probabilities are more randomly distributed based upon food type, suggesting that location, more so than product type, determines success for food carts.

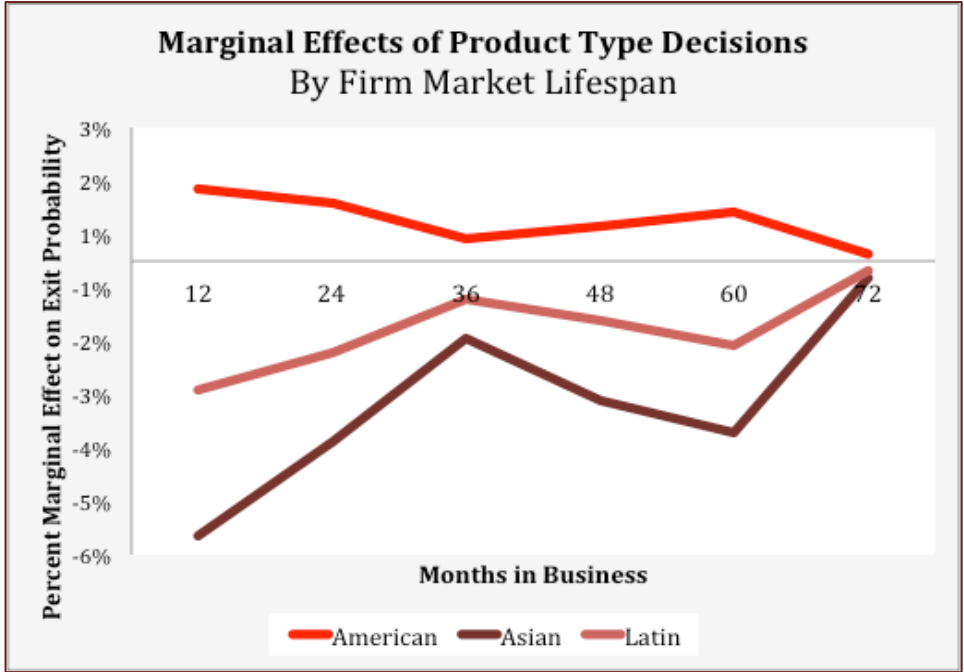
Figure 26



Food type choices, like locational choices, vary in their marginal effects as firms and the market age, and near-identical patterns in the marginal effect of food type variables on survival are seen as firm lifespan increases. Marginal effects of product

choices over time are not displayed so as to avoid repetition of trends already illustrated by Figure 23.

Figure 27



Lifespan

I have discussed the important implications for survival carried by choices of both food type and geographic location in the street food market. In the course of my examination of these aspects of firm characteristics, I have touched upon the importance of the age of a firm to its survival. However, the exact nature of this relationship can be fleshed out even further. I have shown that as firms age, their exit probability decreases. I have also shown that individuating characteristics, at first so vital to survival, decline in importance with age. But when do those effects begin to occur?

As it turns out, there are two major milestones in the market lifespan of a food cart. The first of these is the definite age at which exit probability for that cart sharply and significantly decreases. At this point, I can say that firms have reached the threshold of market lifespan above which they are much less likely to exit, regardless of the specific locational or product choice the firm has made. The second is the point at which that exit probability begins to rise. Even though chances of survival increase as a firm ages in general, specific adjustments made in the first two years are important enough to their success that their results are statistically distinguishable from zero.

These conclusions were established through an alternate specification of the basic regression model using a series of dummy variables for lifespans of greater than six, 12, 18, and 24, and 36 months. Results of this process can be found in the Appendix.

Of these, the 12-month indicator returned a significant result, indicating carts that survive past one year of operation see significantly different exit probabilities than do carts that do not survive at least this amount of time. Moreover, both the coefficient estimate and marginal effect of the 12-month dummy indicated a negative association; for carts with market lifespans greater than 12 months, exit probability is significantly reduced. However, firms experience an increase in exit probability after 24 months in operation. After one year in the market, food carts have a lower probability of exiting the market; but after two years, this probability rises again, although by a noticeably reduced magnitude. Three years in the market makes no impact on firm survival.

These phenomena possibly relate to differences in short and long run production. Recall that in the short run, suppliers are constrained by at least one of their factors of production being held more or less constant. Whether it is the number of employees, amount of raw ingredients purchased, or stock of physical capital used in production, altering levels of inputs into a production function takes time. More importantly, it also takes time for principals to even determine the amount to which they wish to change these factors to attempt to maximize profit. Over 12 full months of survivable operation (not necessarily profitable, but at least not overwhelmingly negative), firm owners have enough time to alter their production functions to levels they expect to be more profitable. This is the logical scenario after 12 months of production. It stands to reason that after a full year of operation, food cart owners understand their business and their market better than they did at the outset, and are able to make more informed business decisions.

But if the correct adjustments are not made (or if incorrect adjustments are made instead) firms harm their chances of survival. And more often than not, food cart owners get them wrong. The 24-month dummy variable carries a significant, positive coefficient, indicating that after two years in the market—enough time for factors of production to be altered again—exit probabilities increase. It seems cart owners are outsmarting themselves. Principals may attempt to alter their input mixes again after an

additional 12 months of operation, based upon the success their adjustments brought them a year ago; conversely, satisfied with their progress, owners fail to apply the same analysis and adjustment process to their production function they did previously, and, consequently, the fate of their firm suffers. Note from Table 1 that the average age of all firms sampled was approximately 21 months; most firms did not even survive long enough to fully experience the effects of their 24-month adjustments—that's how bad they were.

An alternate explanation of this trend could be that cart owners and operators begin to lose their sense of rationality after a prolonged period in the market. After 12 months of operation, some proper adjustments are made, and mortality declines. However, after two years, running a food cart is simply not worth it. Regardless of profitability, principals decide to exit the market in pursuit of other opportunities, as suddenly, sweating inside an airstream trailer all day for relatively little money loses the appeal it once had, and firms exit even if they are still marginally profitable. From a purely economic standpoint, this is not always a rational decision, unless there is an even more profitable alternative to food cart production.

But for certain street food vendors, there is. Some food carts are conceived and operated with the equally irrational long run goal of exiting early, during a period of high profitability. Although there is more profit to be had from continued operation, select street food salesmen have another objective besides profit maximization for their time in the market: to earn just enough money to sufficiently fund another, more costly business venture—a restaurant. Certain would-be restaurateurs are prohibited from entry by significant fixed costs, so as a way to deepen their capital (both physical and human), they embark upon a more achievable business venture first. After two years at the wheel a food cart, these chefs have acquired the money and improved the skills necessary to open a formal restaurant. This model works: five food carts-turned-restaurants made *Willamette Week*'s best of the city restaurant guide in 2013.

Population and Unemployment

To this point, I have reached several important conclusions and heightened my understanding of firm functionality in Portland's street food market. I have detailed the importance of specific firm characteristics to survival and seen how the effects of these

features change over time, all while analyzing only those deterministic variables contained in my firm-level index. My index of market characteristics, for its part, also reveals some important facets of street food in Portland.

The first variable in the market-level index, *Population*, is relatively unimportant for food cart survival. Although its coefficient estimate is statistically significant, its magnitude is so close to zero that its effect is more or less irrelevant. The number of people living in the Portland area does affect certain aspects of the city's street food market, but is hardly directly influential for individual firm survival.

The effects of *Unemployment* on survival are, however, more interesting. Coefficient estimates and marginal effects on exit probability are positive, and logically, if more Portland residents are without jobs, they will be less likely to purchase meals from food carts, opting for even less expensive home cooking instead. Food carts are especially attractive to certain out-of-work entrepreneurs and cooks seeking opportunities for income during periods of severe economic recession considered in this study, as I have discussed. But the positive marginal effect of Portland's unemployment rate on food cart exit probability may serve as a warning to the droves of chefs and entrepreneurs that have turned to Portland's carts in periods of high unemployment and recession. Entering the market under these conditions induces exit, meaning opening a food cart as direct, personal means of money making may not be as secure of a business decision as it might seem. Over time in this market, as unemployment increased, so did the number of food carts, heightening competition, and increasing average exit probability.

Income

The most compelling result of estimation of market-level variables is the coefficient and marginal effect of *Income* on firm survival. The positive polarity on these estimations indicates that, all else held constant, as personal income increases, so too does the probability that a given food cart will exit. Thus, as consumers earn more money, they actually choose to purchase fewer meals from food carts. Street food meals are therefore inferior goods—ones that become less popular among increasingly affluent consumers. This is a logical conclusion; eaters with more money will more likely prefer to dine in more expensive full-service restaurants.

It is therefore something of a surprise food carts are so popular, since Portland is a relatively affluent city. In the 2007-2013 American Community Survey, The Portland-Vancouver-Hillsboro MSA had the 23rd highest concentration of households with earnings in the top 5% of the national median household distribution, out of 273 MSA's (Bee, 2013). Culture, it seems, outweighs cash flow in Portland, and despite relatively elevated income levels, consumers prefer to eat at food carts. This is reflected by the small magnitude of the *Income* coefficient—although street food is an inferior good, consumers do not strongly discriminate against street food based upon their income.

Overall, my regression model of food cart exit probability leads to some compelling conclusions as to the nature of survival and the details of operation for firms across different stages of individual and market growth. For instance, Portland's proclaimed cart pods actually have no significant effect on the success or failure of any of the firms of which they are comprised. Southeast Portland neighborhoods are the best suited to sustain food carts, perhaps due to their younger, poorer demographics. Portlanders on the whole seem to prefer their street food in Asian varieties, which happens to be a culinary genre especially suited to food cart marketing and munching. Those carts that entered the market in its early stages face reduced exit probabilities, and all of Portland's food carts increase their chances of survival as they advance their age in the market. Most important to this progression of exit probability over firm lifespan is the milestone of one full year of operation without exit, after which point surviving carts enjoy reductions in their probability of exit. But when given the chance to adjust their production processes over time, cart owners more often than not made poor business decisions, and actually increased their exit probability after two years in the market. In all, these patterns are not random, but systematic.

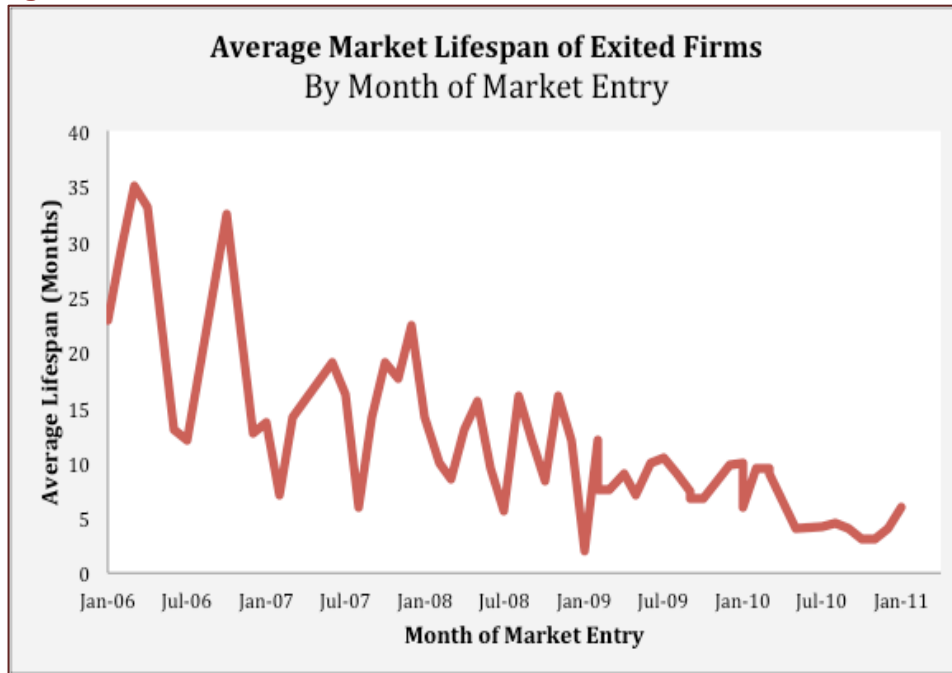
Explanations and Interpretations

So what does all this mean? My ultimate goal is to comprehend how food carts function, and an econometric estimation is a crucial part of this objective. But can I extend model results beyond simple lists of numbers and explain the relationships they express? The answer to this question will not only complete my analysis of Portland's street food market, but also test hypotheses of theoretical economic fundamentals by weighing them against the standard of real world market operation.

First, I have shown that early entrants into a market are less likely to fail, and thus more likely to earn positive economic profit. This is in accordance with fundamental economic theories regarding the nature of product market cycles. Kessides (1991) demonstrates theoretically as well as empirically that in competitive product markets, entry rates respond to profits realized by incumbent firms, noting that both are higher in the early stages of a market's existence, and—crucially—both decline over time. This indicates average profit is indeed higher for firms entering in the early stages of a market's product life cycle. But why?

Recall my earlier discussion of Mueller's (1972) theories regarding profitability in the face of uncertainty. Early entrants stand to gain more from their operation in a market, as "profits accrue to those entrepreneurs who possess the information, intuition, or courage and luck to make correct investment decisions in the face of uncertainty." But as markets solidify over time, risk decreases, and, as has been established, opportunities for profit evaporate; consequently, exit increases. This trend is exactly what has happened in Portland's street food market. Examine Figure 28, which plots the average lifespan of firms that have actually exited the market by the period in which they entered. It is clear for those firms that entered in earlier periods, average lifespan is much longer than for those that entered in later periods. Over time, fewer food carts last longer, and more firms earn less profit.

Figure 28



Second, I have indicated that as Portland’s street food market developed over time, the marginal effects of individuating factors such as location and product choice became more important for firm survival. This is mainly due to the returns to firms from innovation: initially, new products sold in developing markets are revolutionary, and for this reason attractive to consumers. Producers stand to gain more from simply entering the market, regardless of their location and product choice decisions. But as novelty fades, new developments in the product market produce only marginal improvements, and the innovation premium declines (Mueller, 1972). Firms no longer profit to the extent early entrants did from production alone, and must seek profit in other ways—such as by entering into new market niches or defining a specific type of product and identity for itself. This mirrors the type of relationship between product types and number of firms expressed theoretically by the Bowley model of product differentiation.

Furthermore, as the underlying level of knowledge among producers in an industry increases, entry becomes motivated less by profits from basic entry into the market and more by entry into specific niches of the market. This circumstance explains the observed dispersion of firms across the city as the market has grown. While the number of clustered firms grew dramatically over six years, so too did the number of locations where firms cluster, and, generally, new firms commanded more and more

new locations across the city over time as they attempted to separate themselves from their competition.

Considering another component of time, I also noticed that as a given firm ages, its probability of exit declines. It is established that market forces select against firms that are consistently unable to produce efficiently; firms that don't make money don't last. However, as Bellone et al. (2008) find, "this selection process is more severe for young firms because industry structures favor the survival of mature firms." Contrary to their older counterparts, new entrants are confronted by a lack of reputation among consumers, are without established product distribution channels, and operate without full information regarding their relative efficiency and profit maximizing conditions. This lack of operating information especially is painfully obvious in the results of the 12 and 24-month dummy model, which indicated most new food cart owners do not always make profitable or rational business decisions. Moreover, this trend of market selection explains the decrease in marginal effects of various location and product type decisions over the lifespan of a firm. As a firm ages, these factors become less important because the market itself improves survival probabilities for more mature firms.

Market selection mechanisms do not work to the advantage of young firms, all of which suffered a high mortality rate in the sample. Yet perversely, markets depend upon their newest entrants to continue their development. Free from pressure by innovative and daring entrants, incumbents with proven potential for profitability will tend to crystallize their outputs unless forced to advance by the threat of deductions in profit young firms pose (Agarwal & Audretsch, 2001). Innovation in product specifications, organizational structure, and even marketing techniques are all essential to market evolution because they remove barriers to growth posed by uncertainty and lack of information and are paths to positive profit, which motivates the continued development of industries (Mueller, 1972). By necessity, young firms must make these advancements if they are to survive: "innovations available to non-incumbent firms are a mechanism for entry insofar as they offset advantages of earlier entry by incumbents" (Agarwal & Gort, 1996).

Third, from my model, it can be seen that the marginal importance of heterogeneity to survival is considerable for young firms yet considerably reduced for

older incumbents, a direct testimony to the vulnerability of new entrants. To explain some of the liability of new entrants with respect to their individual characteristics, a return to basic microeconomics is in order. As Samuelson and Nordhaus (2005) explain, in their first periods of production, new firms typically operate with average total costs¹⁶ above their marginal revenues¹⁷ from sales, and must recoup their fixed costs of production with a sustained period of positive revenues. Simultaneously, variable costs are higher as a result of firms' inability to adjust their input mixes in the short run. But over time, average total costs decline, expenses on fixed factors of production such as equipment and food carts themselves are recovered with revenues from sales, and output can be adjusted so as to maximize profit given the market price of a standard street food meal.

At this point, firms can earn enough profit to sustain their enterprises, and therefore have incentive to continue operation in the market. After several years, ultimate success is contingent less upon differentiating features and more upon a firm's ability to define a production function that allows it to produce where its marginal revenue is at least equal to its marginal cost and thus avoid negative economic profit (Samuelson & Nordhaus, 2005). This progression holds true for virtually every firm in virtually every open market, regardless of good or geography, and is the fundamental starting point of any economic analysis of market structure or firm conduct.

However, I expect there to be more to it than that. As Agarwal and Gort (1996) state, in modern industrial economics, "the pattern of entry [and exit] cannot be adequately explained in terms of U-shaped cost curves and as a response to market growth in the context of a well-defined optimal scale of firm." Industry dynamics and product market developments have been identified as other variable determinants of mortality for both young and old firms, neither of which are explicitly addressed here. Thus, the necessity for further understanding of the specific determinants of survival for young firms in particular is crucial to the continued study of industrial organization. Bellone et al. (2008) and Agarwal and Audretsch (2001), among others, have made

¹⁶ The total cost incurred by a firm to produce all units divided by the number of units of output that firm produces (O'Sullivan & Sheffrin, 2005).

¹⁷ The change in amount of money a firm gets from selling its product that results from selling one more unit of output (O'Sullivan & Sheffrin, 2005).

noteworthy progress in this pursuit, but additional gains in the field could be accomplished through a supplementary analysis of this very food cart dataset.

Conclusion

Food carts, like all other firms across all other markets, exist because people want what they have to offer. In Portland, demand originates from a unique mix of emphasis on high quality gastronomy, innovative individual entrepreneurship, regulatory freedom, and economic recession. The result of this fusion is explosive growth in a market that was relatively flat and almost entirely undeveloped only ten years ago, yet today continues to perform dynamically and vigorously. The terms of this growth and the determinants of success and failure for the firms that make up this market are complex, yet their characteristics can be broken down into concrete, comprehensible concepts reaffirmed by accepted economic theories.

This final point is the ultimate import of this study. As economic theory claims, people respond to incentives, and firms invariably attempt to maximize their profits. Decisions are made on the understanding that the marginal benefit of an action exceeds its marginal cost. I attempted to test the extent to which these idealized relationships apply in the seemingly unpredictable real world.

Food carts may be an unexpected market in which to test these theories. It's easy to glance secondhand at the mismatched corrugated iron roofs, the old trailers propped up on cement blocks, and the hand-scrawled menus that identify street food vendors. It's easy to watch their seemingly indiscriminate sprawl across a city and dismiss their economic agency and rationality. Yet while their development may appear haphazard, Portland's food carts exhibit the carefully planned, economically efficient, and precise products of economic principles on display at every street corner.

appendix

As a reference to the discussion of exit probabilities after 12 and 24 months in operation, see Table 2. Similar to Table 1, this table illustrates the results of probit estimations for five models including variables for survival over discrete operational milestones. Especially important in this table is the insignificance of estimates for all but the 12 and 24-month indicator variables, including the 18-month indicator. This implies survival for 18 months makes no difference to mortality, whereas milestones both before and after this period are significant. This lends further validity to the significance of 12 and 24-month dummy models.

Table 2

Exit Probability Model Estimates: With Survival Milestone Indicators

Variable	6 Month Survival	12 Month Survival	18 Month Survival	24 Month Survival	36 Month Survival
	<i>Estimated Impact on Exit Probability</i>				
Pod	0.252 (0.175)	0.311* (0.181)	0.253 (0.175)	0.264 (0.176)	0.263 (0.176)
Location: Northeast	0.598** (0.247)	0.498** (0.250)	0.612** (0.244)	0.603** (0.246)	0.611** (0.245)
Location: Southeast	-0.386** (0.177)	-0.394** (0.186)	-0.380** (0.177)	-0.370** (0.178)	-0.370** (0.177)
Type: American	0.336** (0.167)	0.283 (0.173)	0.332** (0.167)	0.315* (0.168)	0.344** (0.167)
Type: Asian	-0.585** (0.238)	-0.574** (0.255)	-0.585** (0.238)	-0.565** (0.240)	-0.564** (0.239)
Lifespan	-0.331*** (0.035)	-0.266*** (0.036)	-0.335*** (0.038)	-0.360*** (0.037)	-0.331*** (0.032)
Lifespan ²	0.001*** (3.20x10 ⁻⁵)	-0.110x10 ⁻⁴ (3.81x10 ⁻⁴)	0.001*** (3.33x10 ⁻⁴)	0.001*** (3.26x10 ⁻⁴)	9.64x10 ⁻⁴ *** (2.92x10 ⁻⁴)
Population	-1.88x10 ⁻⁴ *** (1.74x10 ⁻⁵)	-2.15x10 ⁻⁴ *** (2.03x10 ⁻⁵)	-1.89x10 ⁻⁴ *** (1.78x10 ⁻⁵)	-1.96x10 ⁻⁴ *** (1.78x10 ⁻⁵)	-1.81x10 ⁻⁴ *** (1.88x10 ⁻⁵)
Personal Income	0.003*** (3.85 x10 ⁻⁴)	0.003*** (3.83 x10 ⁻⁴)	0.003*** (3.88 x10 ⁻⁴)	0.003*** (3.86 x10 ⁻⁴)	0.002*** (4.37 x10 ⁻⁴)
Unemployment	1.032*** (0.133)	1.308*** (0.156)	1.046*** (0.131)	1.120*** (0.136)	1.055*** (0.132)
6 Months	0.085 (0.267)	-	-	-	-
12 Months	-	-2.108*** (0.429)	-	-	-
18 Months	-	-	0.134 (0.326)	-	-
24 Months	-	-	-	0.718** (0.364)	-
36 Months	-	-	-	-	0.663 (0.779)
Constant	312.7*** (25.94)	367.4*** (33.30)	314.7*** (26.48)	322.5*** (26.56)	304.4*** (26.96)
Observations	706	706	706	706	706
Pseudo R ²	0.633	0.663	0.633	0.637	0.634
Complete Successes	61	82	61	63	56
Complete Failures	0	0	0	0	0

*** p<0.01, ** p<0.05, * p<0.1

references

- Agarwal, Rajshree, and David B. Audretsch. "Does Entry Size Matter? The Impact of the Life Cycle and Technology on Firm Survival." *The Journal of Industrial Economics* 49.1 (2001): 21-43. *JSTOR*. Web. 12 Feb. 2014.
- Agarwal, Rajshree, MB Sarkar, and Raj Echambadi. "The Conditioning Effect of Time on Firm Survival: An Industry Life Cycle Approach." *Academy of Management Journal* 45.5 (2002): 971-94. Web. 12 Feb. 2014.
- Agarwal, Rajshree, and Michael Gort. "The Evolution of Markets and Entry, Exit and Survival of Firms." *The Review of Economics and Statistics* 78.3 (1996): 489-98. Web. 6 Jan. 2014.
- Bee, Charles A. "The Geographic Concentration of High-Income Households: 2007–2011." *American Community Survey Briefs* Feb. 2013: 2-7. Print.
- Bellone, Flora, Patrick Musso, Lionel Nesta, and Michel Quere. "Market Selection Along the Firm Life Cycle." *Industrial and Corporate Change* 17.4 (2008): 753-77. *JSTOR*. Web. 12 Feb. 2014.
- Blanchard, Oliver. *Macroeconomics*. 4th ed. Upper Saddle River: Prentice Hall, 2006. 31-33. Print.
- Blonigen, Bruce A., Benjamin Liebman, and Wesley W. Wilson. "Antidumping and Production-line Exit: The Case of the U.S. Steel Industry." *REIO* (2013): 1-33. Print.
- Brandenberger, Adam M., and Barry J. Nalebuff. "The Right Game: Use Game Theory to Shape Strategy." *The Harvard Business Review* (1996): 57-71. *JSTOR*. Web. 24 Jan. 2014.
- Brillat-Savarin, Jean A. *The Physiology of Taste: Or Meditations on Transcendental Gastronomy*. Trans. MFK Fisher. 2nd ed. New York: Alfred A. Knopf, 2009. Print.
- Bresnahan, Timothy F., and Peter C. Reiss. "Do Entry Conditions Vary Across Markets?" *Brookings Papers on Economic Activity* (1987): 833-81. *JSTOR*. Web. 15 Jan. 2014.
- Bresnahan, Timothy P., and Peter C. Reiss. "Empirical Models of Discrete Games." *Journal of Econometrics* 48 (1991): 57-81. Web. 7 Jan. 2014

- Bresnahan, Timothy F., and Peter C. Reiss. "Entry Into Monopoly Markets." *The Review of Economic Studies* 57.4 (1990): 531-53. JSTOR. Web. 6 Jan. 2014.
- Brunton, John. "Grub Street: Bangkok still reigns supreme when it comes to street food." *The Independent* 17 Nov. 2012: 8 pars. Web. 5 May 2013.
- Burningham, Lucy. "Portland Food Carts Push Through Recession." *Oregon Business* Jan. 2010. Web. 23 Jan. 2014
- Burnmeister, Brett. *Food Carts Portland.*, Jan. 2014. Web. 3 Feb. 2014.
- Carlton, Dennis W. "Barriers to Entry." *NBER Working Paper Series*. #11645 (2005): 1-28. Web. 20 Jan. 2014.
- Carlton, Dennis W. "The Location and Employment Choices of New Firms: An Econometric Model with Discrete and Continuous Endogenous Variables." *The Review of Economics and Statistics* 65.3 (1983): 440-49. Web. 23 Jan. 2014.
- Chatterjee, Satyajit, and Russell Cooper. "Entry and Exit, Product Variety and the Business Cycle." *NBER Working Paper Series* 4562 (1993): 1-39. Web. 7 Jan. 2014.
- City of Portland Bureau of Development Services. *Reporting Code Violations*. City of Portland, 2014. Web. 24 Jan. 2014.
- City of Portland Street Systems Management. *Sidewalk Vending Cart Application Packet*. Portland: The City of Portland, 2007. 1-13. Print.
- Chastain, April. "Food Carts as Retail Real Estate." *Quarterly & Urban Development Journal* (2010): 61-70. Print.
- Connor, John M., and William A. Schiek. *Food Processing: An Industrial Powerhouse in Transition*. 2nd ed. Hoboken: Wiley-Interscience, 1997. 132-217. Print.
- Donahue, Bill. "What's Eating Portland's Food Provocateur?" *Food & Wine* Jan. 2006. Web. 23 Jan. 2014.
- Dougherty, Christopher. *Introduction to Econometrics*. 4th ed. Oxford: Oxford University Press, 2011. 100-385. Print.
- Dunne, Timothy, Shawn D. Klimek, Mark J. Roberts, and Daniel Yi Xu. "Entry, Exit, and the Determinants of Market Structure." *NBER Working Paper Series* #15313 (2009): 2-52. Web. 7 Jan. 2014.

- Dunne, Timothy, Mark J. Roberts, and Larry Samuelson. "Patterns of Firm Entry and Exit in U.S. Manufacturing Industries." *The RAND Journal of Economics* 19.4 (1988): 495-515. *JSTOR*. Web. 11 Jan. 2014.
- Duranton, Gilles, and Diego Puga. "Micro-Foundations of Urban Agglomeration Economies." *NBER Working Paper Series #9931* (2003): 1-3. Web. 5 Jan. 2014.
- Fisher, Carly. *The World's Best Cities for Street Food*. Food & Wine, 2013. Web. 5 Feb. 2014.
- Gold, Jonathan. "Singapore Street Food." *Saveur* 18 July 2007: 19 pars. Web. 9 June 2013.
- Gort, Michael, and Steven Klepper. "Time Paths in the Diffusion of Product Innovations." *Economic Journal* 92.367 (1982): 630-53. Web. 12 Jan. 2014.
- Henderson, Jason R., and Kevin T. McNamara. "The Location of Food Manufacturing Plant Investments in Corn Belt Counties." *Journal of Agricultural and Resource Economics* 25.2 (2000): 680-97. Web. 25 Jan. 2014.
- Kamp, David. *The United States of Arugula: The Sun-Dried, Cold-Pressed, Dark-Roasted, Extra Virgin Story of the American Food Revolution*. New York: Broadway Books, 2006. 9-245. Print.
- Kapell, Hannah, Peter Katon, Amy Koski, Jinping Li, and Colin Price. *Food Cartology: Rethinking Urban Spaces as People Places*. Portland: Urban Vitality Group, 2010. 7. Print.
- Kessides, Ionides N. "Entry and Market Contestability: The Evidence from the United States." *Entry and Market Contestability: An International Comparison*. Ed. P. A. Geroski and J. Schwalbach. Cambridge: Blackwell, 1991. 23-48. Web. 6 Feb. 2014.
- Lewis, Jennifer. *Food on Wheels: The Complete Guide to Starting a Food Truck, Food Cart, or Other Mobile Food Business*. N.p.: Rabbit Ranch Publishing, 2011. 19-20. Print.
- Loftesness, Kate. "James Beard Award-winning chefs." *Travel Portland* 2012. Web. 23 Jan. 2014.
- Martin, Stephen. *Advanced Industrial Economics*. 2nd ed. Massachusetts: Blackwell Publishers, 2002. 41-273. Print.

- Metro. "Arterials." *RLIS Live Data Layers*. Metro, 31 Jan. 2014. Web. 22 Jan. 2014.
- Metro. "Major Rivers (poly)." *RLIS Live Data Layers*. Metro, 30 Jan. 2008. Web. 22 Jan. 2014.
- Metro. "Metro Boundary." *RLIS Live Data Layers*. Metro, 29 Jan. 2014. Web. 22 Jan. 2014.
- Moorthy, Sridhar K. "Using Game Theory to Model Competition." *Journal of Marketing Research* Aug. 1985: 262-82. *JSTOR*. Web. 24 Jan. 2014.
- Mueller, Dennis C. "A Life Cycle Theory of the Firm." *The Journal of Industrial Economics* 20.3 (1972): 199-219. Web. 12 Feb. 2014.
- Multnomah County Environmental Health Department. *Mobile Food Unit Plan Review Packet*. Portland: Multnomah County Health Department, 2012. 1-4. Print.
- O'Sullivan, Arthur M., and Steven M. Sheffrin. *Microeconomics*. 4th ed. Upper Saddle River, NJ: Peason Education, Inc., 2005. 1-275. Print.
- O'Sullivan, Arthur M. *Urban Economics*. 7th ed. New York: McGraw-Hill, 2009. 48-62. Print.
- Ono, Jiro, perf. *Jiro Dreams of Sushi*. Dir. David Gelb. 2012. Magnolia Pictures, 2012. Web. 18 May 2013.
- Osborne, Martin J. *An Introduction to Game Theory*. New York: Oxford University Press, 2003. 217-22. Print.
- Peat, Don. "Food Carts Can Be Good Business." *The Toronto Sun* 31 Aug. 2009. Web. 16 May 2013.
- Pence, Caprial, and John Pence. "Biographies." *Caprial + John: The Kitchen*. N.p., 2009. Web. 23 Jan. 2014.
- Rodgers, Kelly, and Kelley Roy. *Cartopia: Portland's Food Cart Revolution*. Portland: Roy Rodgers Press, 2010. 1-72. Print.
- Rosen, Sherwin. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *Journal of Political Economy* 82.1 (1974): 34-55. Web. 5 Jan. 2014.

- Rosenthal, Stuart S., and William C. Strange. "The Determinants of Agglomeration." *Journal of Urban Economics* 50.2: 191-229. Web. 25 Jan. 2014.
- Samuelson, Paul A., and William D. Nordhaus. *Microeconomics*. 18th ed. Boston: McGraw-Hill, 2005. 147-73. Print.
- Sarasohn, David. "The Rise and Fall of Caprial's." *The Oregonian* 22 Aug. 2009. Web. 23 Jan. 2014.
- Shaked, Avner, and John Sutton. "Relaxing Price Competition Through Product Differentiation." *Review of Economic Studies* 43 (1982): 3-13. *JSTOR*. Web. 26 Jan. 2014.
- Smith, Wendell R. "Product Differentiation and Market Segmentation as Alternative Marketing Strategies." *The Journal of Marketing* (1956): 1-8. Web. 26 Jan. 2014.
- Stavins, Joanna. "Model Entry and Exit in a Differentiated-Product Industry: The Personal Computer Market." *The Review of Economics and Statistics* 77.4 (1995): 571-84. Web. 5 Jan. 2014.
- Stigler, George J. *The Organization of Industry*. Chicago: University of Chicago Press, 1968. 1-318. Web. 15 Jan. 2014.
- Tierney, John. "Four Portland chefs named finalists for James Beard awards." *KATU News* 8 Mar. 2013 [Portland]. Web. 23 Jan. 2014.
- US Bureau of Economic Analysis. *CAI-3 Personal Income Summary: Portland-Vancouver-Hillsboro Metropolitan Statistical Area*. Washington, D.C.: US Bureau of Economic Analysis, 2012. Web. 2 Jan. 2014.
- US Bureau of Labor Statistics. *Consumer Price Index - All Urban Consumers: West - Size Class B/C Food away from home #CUURX400SEFV*. Washington, D.C.: US Bureau of Labor Statistics, 2013. Web. 2 Jan. 2014.
- US Bureau of Labor Statistics. *Unemployment Rate in Portland-Vancouver-Hillsboro, OR-WA (MSA) #PORT941URN*. Washington, D.C.: US Bureau of Labor Statistics, 2012. *ALFRED*. Web. 4 Jan. 2014.
- Various Authors. *Restaurant Guide 2013: Restaurant Index by Cuisine*. Willamette Week, 16 Oct. 2013. Web. 22 Feb. 2014.
- Vesecky, Marc, and David Lins. "Factors Influencing Expansion and Contraction Decisions by Illinois Agribusiness Firms." *Agribusiness: An International Journal* 11.5 (1995): 405-13. Web. 25 Jan. 2014.

von Neumann, John, and Oskar Morgenstern. *Theory of Games and Economic Behavior*. Princeton: Princeton University Press, 1944. 1-625. Print.

Weinberger, David. "Chef's exceptional talent spurs Clarklewis owners." *Portland Business Journal* 5 June 2005. Web. 23 Jan. 2014.

Williams, Richard. "Using the margins command to estimate and interpret adjusted predictions and marginal effects." *The Stata Journal* 12.2 (2012): 308-31. Web. 3 Feb. 2014.