A CASE STUDY OF PRICE PREMIUMS FOR LOCAL FOODS

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ABSTRACT

This study uses econometric techniques to assess price premiums for local foods, including five fresh products and four semi-processed/processed products. In our model, the natural logarithm of retail price is a function of product attributes (local, organic, and product type), retail outlet types, and seasons. In our model, a local food product is produced, processed and distributed within a 30-mile radius of Ithaca, New York. The model allows us to determine the value of the attribute local, control for other sources of price variability. Our results suggest that the attribute local enjoys price premiums for two out of five fresh products (strawberries and potatoes) and for three out of four semi-processed/processed foods (whole chickens, eggs, and two percent milk).

BIOGRAPHICAL SKETCH

The Author was born and grew up in Chengdu, Sichuan Province. In 2008, she attended in the Sino-American 1+2+1 Dual Degree Program. In 2012, she earned her two bachelor's degrees in Economics from Beijing Jiaotong University and George Mason University. She developed a great passion for applied economics. This led her to the Dyson School of Applied Economics and Management at Cornell University. During her graduate study at Cornell University, she was very pleased and honored to have the opportunity to work with Professor Miguel I. Gómez.

This is dedicated to my family.

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CHAPTER 1: INTRODUCTION

Locally produced food is increasingly gaining attention in the United States. Owing to the U.S. Department of Agriculture (USDA) support, the number of local food suppliers has increased rapidly. For example, the USDA has supported over 2,600 projects nationwide to build new market opportunities for local and regional foods, mainly through programs authorized in the Farm Bill (U.S. Department of Agriculture 2013). Moreover, the USDA has invested in more than 860 projects under the Specialty Crop Block Grants Program to expand the production of fruits and vegetables for sale at local markets (U.S. Department of Agriculture 2013).

The number of farmers markets, a channel through which a large number of locally produced foods and goods reach the final consumer, has increased by 151% from 2002 to 2012. According to the 2012 National Farmers Market Directory, there were more than 7,800 farmers markets in the United States in that year. These farmers markets allow consumers to have direct access to locally produced and farm-fresh foods. New York State has 647 farmers markets, the second highest number of markets reported in the directory (U.S. Department of Agriculture 2012).

Food retailers including natural food stores and supermarkets are also increasing their offerings of local foods. For example, the top natural food retailer in the United States, Whole Foods, markets and emphasizes social, environmental, and quality benefits from local products. Several national supermarket chains including Walmart have initiated efforts to source and sell local foods. Walmart features locally-grown produce regularly in its stores and, about 20 percent of the fresh fruits and vegetables

available during the summer months are produced in the state where the store is located (Walmart 2012). The company asserts that these local sourcing efforts are yielding not only cost savings but also environmental benefits and positive impacts on local economies.

Regional chains also have embraced procurement from local farms. One notable example is Wegmans, a self-distributing supermarket company with over 70 stores in New York, New Jersey, Maryland, Pennsylvania, and Virginia. Twenty years ago they started a "Locally Grown Produce" program. According to the company, local products delivered directly from family farms to stores account for about 30 percent of produce sales in a typical Wegmans store when local products are in season (King et al., 2010).

A large body of literature highlights the benefits of local food systems (Brown, 2003; Pirog et al., 2001; Saunders et al., 2007; Anderson, 2007; Martinez et al., 2012; Swenson, 2008). The local food systems help minimize handling and transport costs, thereby increasing the viability of local farming operations. Buying locally produced foods also keeps money circulating in the local communities. For example, if everyone in Tompkins County of New York State spends 10 percent of their grocery and dining dollars on local foods, it would generate over $29 million in economic value for the region (Cornell Cooperative Extension 2012). The local food system not only holds more opportunities for the local economy, but also benefits the environment. For example, it helps farmland preservation. If farmers pay more attention to local farming management, they are less likely to sell farmland for development.

Local foods have seen a dramatic increase in demand as well as in their availability (Grunert, 2006; Weatherell et al., 2003; Onyango, 2004). A lead article in

Time magazine states that "local is the new ideal that promises healthier bodies and healthier planet" (Cloud, 2007). Local foods are believed to taste better because they offer the freshest products, harvested just a few hours before delivery to local stores. Most produce in mainstream distribution channels in the U.S. is harvested 4 to 7 days before reaching supermarket shelves. In addition, it travels an average of 1,500 miles before reaching the consumer table (Cornell Corporative Extension 2012). Some products quickly lose their nutrients once they are picked. Thus, local products may also preserve nutritional properties, especially for fresh produce (Cornell Corporative Extension 2012).

The above discussion indicates that demand for locally produced food has increased sharply in the past and is likely to continue increasing in the future. An important and interesting question for members of supply chains producing and distributing local foods is: does the attribute *local* in food products command price premiums in the marketplace?

Many researchers have addressed this question. Most of these studies are based on surveys and controlled marketing experiments that attempt to tease out consumer's willingness to pay for the attribute 'local' in food products. The majority of their papers show that consumers are willing to buy locally produced foods at higher prices. However, we would like to ask whether local foods command price premiums in the actual marketplace not just for consumer's willingness to pay.

CHAPTER 2: LITERATURE REVIEW

Many researchers have focused on perceived benefits of local foods. The literature suggests that locally produced foods are valuable because the products are usually perceived as healthier, more environmentally friendly, and more supportive of small scale agriculture and local communities, than their nonlocal counterparts. Brown (2003) points out that consumers often perceive local foods to be fresher and better-tasting than nonlocal foods. Local foods may retain more nutrients than items offered in nonlocal food systems because of shorter travel distances. Furthermore, according to Pirog et al. (2001) and Saunders and Hayes (2007), as foods travel further from farmers to consumers, the food system increasingly relies on long-distance transport and global distribution networks, contributing to negative environmental outcomes. Advocates of increased localization of food systems, therefore, argue that local foods can contribute to reduce energy usage and air pollution (Anderson, 2007).

In terms of social and economic benefits, a number of studies have indicated that local foods benefit local farmers and communities. As the number of marketplaces, including farmers markets and natural food stores for buying local foods increases, the market for local food expands, implying that consumers are able to purchase more of their food from nearby sources. As a result, more of the money consumers spend remains in the local economy (Martinez et al, 2012). The direct way that expansion in local foods could impact the local economy is through the concept of import substitution. That is, if consumers purchase food produced within a local area instead of products from outside the area, sales accrue to people and businesses within the local

area. Consequently, workers and businesses spend the additional income on production inputs and other investments within the area, creating a virtuous cycle that invigorates the local economy (Swenson, 2008).

In addition to the previously mentioned studies on benefits of local foods, another stream of empirical studies have examined consumer preferences and assessed consumers' willingness to pay (WTP) for local foods. Traditionally, consumer food choices are influenced by factors such as price and quality (Grunert, 2006). However, other factors related to public benefits associated with food systems, such as impacts on the local economy and environmental benefits also influence a consumer's food buying decision (Weatherell et al., 2003). Freshness and taste are food product attributes that are for obvious reasons associated to consumer preference for local foods (Onyango, 2004).

One of the well-known studies on local food is conducted in Tennessee by Eastwood, Brooker, and Orr (1987). The authors find no preference for local foods and no WTP for a premium of local products, except in the case of tomatoes. They postulate that there are regional or geographic differences in demand for local products and/or that a preference for local was an emerging trend. Many researches since then have indicated that WTP for a premium of local products varies by consumer demographics, geography, and product.

More recently, Loureiro and Hine (2002) in Colorado identify socio-demographic characteristics that affected consumer preferences and compared the effects of different attributes on consumers' willingness to pay. The results show that the attribute "Colorado Grown" carried a higher price premium than the attributes such

as organic and GMO-free. Brown (2003), in southeast Missouri, conducts a mail survey to gather information about consumer demographics and preferences for local foods. The author finds that 58 percent of consumers are unwilling to pay a price premium for any local food products, but 22 percent are willing to pay at least a 5 percent premium for local food products. The consumers in this study, who are members of an environmental group and have higher education background and income, are more willing to pay a higher price for local produce than other segments of the population.

A stream of literature has examined WTP for the attribute local in different geographies and different consumer segments. Hinson and Bruchhaus (2005) find that consumers in Louisiana are willing to pay a price premium of 21 percent for local strawberries. Darby and colleagues (2008) find that consumers in Ohio are willing to pay a price premium of 27 percent for locally produced strawberries in the supermarket and direct market. Carpio and Isengildina-Massa (2009) use a contingent valuation framework and find that consumers were willing to pay price premiums for locally-grown products. The authors report that respondents indicate a willingness to pay price premiums of 23 percent and 27.5 percent for local animal products and local produce respectively.

The studies mentioned above elicit consumer's willingness to pay for local foods that only measures consumer intentions but not actual prices in retail outlets. Park and Gómez (2011) use prices collected from thirty retail outlets in five U.S metropolitan areas for five commodities (apples, blueberries, spring mix, fluid milk, and ground beef). The results indicate that price premiums existed for local two percent fluid milk, blueberries, and spring mix, but not for local apples or ground beef.

Most studies use consumer intentions (e.g., WTP) to assess the value of the attribute local. However, very few have focused on actual retail prices to examine price premiums for locally-grown foods. Therefore, to fill this gap in the literature, in this study we follow Park and Gómez (2011) approach to examine the existence of price premiums for local foods in the Tompkins County metropolitan area in New York State. More specifically, we develop an econometric model using semi-monthly data for a one-year period (from April 10, 2010 to April 09, 2011) to examine whether price premiums exist for five fresh products (apples, sweet corn, strawberries, tomatoes, and potatoes) and four semi-processed/processed foods (whole chickens, eggs, two percent fluid milk, and whole wheat bread).

CHAPTER 3: METHODOLOGY

3.1 Data

We collected primary data on bi-weekly prices, varieties, attributes (e.g. local, organic) and package size of nine products, including five fresh products (apples, sweet corn, strawberries, tomatoes, and potatoes) and four semi-processed/processed foods (whole chickens, eggs, two percent fluid milk, and whole wheat bread). We used gala apples as a representative product for apples, given the wide assortment of apples offered in retail outlets. Price data were collected every two weeks during a 53 week-period, from April 10, 2010 to April 09, 2011.

The bi-weekly data were collected from a variety of retail outlets located in Ithaca, New York. The retail outlets in this study consist of two farmers markets (Ithaca Farmers Market and Eddydale), two natural food stores (Greenstar and Ithaca Bakery), and two supermarket chains (Wegmans and Aldi). Although supermarkets, farmers markets, and natural food stores are typical retail outlet types for the products in this study, they do not always carry all full assortment of the local or nonlocal products employed in this study. For example, in the data, local whole chickens are only sold in farmers markets and not in any other retail outlet.

Table 1 presents mean prices for the nine products in the study in the different retail outlets. Aldi has a unique business model based on limited assortment with hard discounts, generally selling at lower prices than other retail outlets. Therefore, we seperated the data from the two supermarket chains (Wegmans and Aldi) in our sample and we use Aldi's prices as a benchmark for comparison (i.e. Aldi is the excluded

dummy variable representing retail outlet type). Table 1 shows that retail prices of products such as apples, potatoes, whole chickens, eggs, two percent milk, and whole wheat bread, are higher in farmers markets and in natural food stores than in supermarkets. In addition, natural food stores appear to have the highest prices among all the retail outlets.

Table 1. The Mean Prices of Products in Retail Outlets

Product	Aldi	Farmers Markets	Natural food	Wegmans
Apples ($/lb.)	0.75	1.35	1.48	1.00
Sweet Corn ($/each)	0.44	0.42	0.88	0.57
Strawberries ($/quart)	1.95	2.67	5.45	3.17
Tomatoes ($/lb.)	1.60	2.28	3.26	2.34
Potatoes ($/quart)	0.46	0.96	0.98	0.68
Whole Chickens ($/lb.)	0.84	4.98	3.84	2.61
Eggs ($/dz.)	1.14	3.75	4.01	2.65
2 Percent Milk ($/0.5 gal.)	1.48	4.50	2.93	2.28
Whole Wheat Bread ($/lb.)	1.26	2.39	2.73	2.15

3.2 Definition of the Attribute 'Local'

There is no official definition of the attribute 'local'. For the purposes of this investigation, a local product is defined as one that is produced, processed, and distributed in the local region where the final product is marketed. In addition, for a product to be considered local, the label or marketing materials have to convey information about where it is produced.

In 2010, Choices Magazine published an entire theme focused on Local Food - Perceptions, Prospects, and Policies (King, 2010). In one of the articles, Onozaka et al. (2010) delve into how consumers define the term 'local'. The authors find that over 70 percent of survey respondents considered food grown within a 50-mile radius to be local (Onozaka et al., 2010). We follow Onozaka et al. (2010) and we define local products as those produced, processed, and transported within a 30-mile radius of Ithaca. This is the same definition applied to vendors in the Ithaca Farmers Market (Ithaca Farmers Market 2014). For example, store brand milk is defined as being produced in New York but not as being locally produced but does not convey information about it being locally produced. Even though in most cases milk is produced and processed within the local region, it does not convey detail information about where it is produced. Therefore, milk is not considered a local product in our study. Under this definition of the attribute local, nonlocal food products are those produced and distributed from outside the 30-mile radius of Ithaca.

3.3 Dependent Variable: Logarithmic Transformation of Retail Prices

We construct the dependent variables by transforming the retail prices collected in the different retail outlets into prices per unit of volume or weight, depending on the food product. Specifically, we used a pound for apples, a single serving for sweet corn, a quart (around one and a half pounds) for strawberries, a pound for tomatoes, one quart (around three pounds) for potatoes, a pound for whole chickens, one dozen for eggs, a half gallon for two percent milk, and a pound for whole wheat bread.

Table 2 shows the results of tests comparing mean prices of local foods and

nonlocal foods in our sample. The table suggests that, in average, the prices of local products are higher than the prices of nonlocal products in this study, with the exception of sweet corn. More specifically, the prices of local potatoes and whole chickens are almost double the prices of nonlocal products.

Table 2. Mean Price Comparison Tests for Local and Nonlocal Products

	Mean Prices	
	Local Price[a]	Nonlocal Price
Apples ($/lb.)	1.34**	1.14
Sweet Corn ($/each)	0.44	0.54
Strawberries ($/quart)	4.31	3.52
Tomatoes ($/lb.)	2.59*	2.30
Potatoes ($/quart)	1.29***	0.63
Whole Chickens ($/lb.)	4.98***	2.53
Eggs ($/dz.)	3.84***	2.45
2 Percent Milk ($/0.5 gal.)	2.80*	2.51
Whole Wheat Bread ($/lb.)	2.59***	2.10

[a] Local Price refers to mean price of the products produced within a 30-mile radius of Ithaca.
Note: Single asterisk (*), double asterisks (**), three asterisks (***) denotes that the t-test of a difference of the mean prices between local and nonlocal foods is significant at the 0.10, 0.05, or 0.01 levels.

We employ a logarithmic transformation of retail prices for two primary reasons. The first reason is to decrease influence of outlier data points in the data. The second reason is to make results of price premiums of local foods across products comparable. For instance, it is difficult to explain the difference between a one dollar price premium for local strawberries and a one dollar price premium for whole chickens, given that

these products have different retail prices. Therefore, we use the logarithmic transformation and calculate retail price premiums in percentage terms to facilitate comparisons across products.

3.4 Econometric Model

In this study, a systematic analysis of retail prices that control for multiple product attributes can provide reliable estimates regarding price premiums for local food products. We employ regression techniques to develop nine models (one for each food product) to examine the existence of price premiums for local foods. The empirical models can be represented using the following general equation:

$$(1)\quad \ln P_{ij} = Cons + \alpha_1 L_{ij} + \alpha_2 NYwL_{ij} + \alpha_3 O_{ij} + \alpha_4 Nf_{ij} + \alpha_5 Fm_{ij} + \alpha_6 Weg_{ij} + \alpha_7 Spring_{ij} + \alpha_8 Summer_{ij} + \alpha_9 Fall_{ij} + \alpha_{10} AA_{ij} + \varepsilon_{ij}$$

The variables and their definitions are listed in Table 3. In the above equation, i and j denote the particular observation and the food product, respectively. The dependent variable ($\ln P_{ij}$) is the natural logarithm of the retail prices of product j. All explanatory variables are dichotomous variables. The explanatory variables are following: L_{ij} is a dummy variable equal to one if the product is local, zero otherwise (recall that a local product is produced and distributed within a 30 mile-radius of Ithaca); $NYwL_{ij}$ is equal to one if the product is produced in NYS but outside the local region, zero otherwise. This variable allows us to estimate price premiums for food products produced in the state, but outside the local region; O_{ij} is equal to one if the product is

labeled as organic, zero otherwise; Nf_{ij}, Fm_{ij}, and Weg_{ij} are equal to one if product j is sold in natural food stores (*Nf*), farmers markets (*Fm*), and Wegmans (*Weg*) respectively, and zero otherwise; $Spring_{ij}$, $Summer_{ij}$, and $Fall_{ij}$ are equal to one if a product is sold in the spring, summer, and fall respectively, zero otherwise; AA_{ij} denotes a matrix of some additional attributes specific to a food product in the study. Specifically, these additional attributes are: $Grassfed_{ij}$ is equal to one if chickens or cow are grass fed, zero otherwise; $Freerange_{ij}$ is equal to one if chickens are free-range fed, zero otherwise; $Brown_{ij}$ is equal to one if the color of eggs is brown, zero otherwise; $Nonrusset_{ij}$ is equal to one if the color of potatoes is non-russet, zero otherwise; $Bulk_{ij}$ is equal to one if apples and potatoes are bulk packaging, zero otherwise.

The dataset do not satisfy all of the assumptions of the Ordinary Least Squares (OLS) method. Failure to meet these assumptions can lead to biased estimates of coefficients and especially biased estimates of the standard errors. We use Breusch-Pagan/Cook-Weisberg test for heteroscedasticity. For the test result of strawberries data, the calculated chi square statistic (5.31) is rejected and p-value is equal to 0.0212. For the test result of potatoes data, p-value is equal to 0.0017. Whole chicken p-value is equal to 0.0064 and chi-square is equal to 7.43. Chi-square of eggs is equal to 51.82. Chi-square of two percent milk is equal to 36.83. In sum, the null hypotheses for constant variance of error term were rejected, indicating that standard errors of the parameter estimates from OLS should be corrected, otherwise heterskedasticity bias our parameter estimates. Therefore, we employ standard errors for statistical inference.

Table 3. Variables and Definitions

Dependent Variable	Definition
Ln (Retail Price)	The natural logarithm of the retail prices
Independent Variable	
Place of origin:	
Local	Foods produced from within a 30-mile radius of Ithaca = 1; otherwise = 0
NYwL	Foods produced within NYS with the exception of the local region (within a 30-mile radius of Ithaca); otherwise = 0
	Foods produced outside NYS= reference variable
Organic	Organic = 1; otherwise = 0
Retail outlet types:	
Natural food Stores	Foods sold in natural food stores = 1; otherwise = 0
Farmers Markets	Foods sold in farmers markets = 1; otherwise = 0
Wegmans	Foods sold in Wegmans = 1; otherwise = 0
(Supermarket)	Aldi = reference variable
Season of the year:	
Fall	Foods sold in fall = 1; otherwise = 0
Spring	Foods sold in spring = 1; otherwise = 0
Summer	Foods sold in summer = 1; otherwise = 0
	Winter = reference variable
Additional variables for eggs and milk:	
Grass-fed	Chicken fed by grass = 1; otherwise = 0
	Milk from grass-fed cows = 1; otherwise = 0
Free-range	Chicken free-range = 1; otherwise = 0
Brown	Brown eggs = 1; otherwise = 0
Additional variables for apples and potatoes:	
Other apples	Gala apples as representative for apples; other apples =1; otherwise = 0
Non-russet	Non-russet potatoes = 1; otherwise = 0
Bulk	Bulk packaging (sold individually rather than in a bag) = 1; otherwise = 0

Chapter 4: RESULTS

We divide the nine products into two categories for the analysis: five fresh products and four semi-processed/processed foods. We conduct statistical tests for the existence of price premiums for foods described as 'local'. We also evaluate possible differences in price premiums between fresh produce and semi-processed/processed foods. We first run regressions and obtain parameter estimates for apples, sweet corn, strawberries, tomatoes, and potatoes (see Table 4). We discuss the results corresponding to each product below.

Apples

The adjusted R-squared for the apple model indicates that the regression explains about 58 percent of the variability in prices. Apples are available nearly year-round in all marketplaces. Although apples are harvested in the fall, they can be stored for relatively long time periods in coolers and even longer in specialized controlled atmosphere coolers. They can also be shipped over long distances and can be imported, particularly during summer. Although the local region in this study is not a primary area for apple production in NYS, the state ranked second nationally in apple production in 2010. Parameter estimates in Table 4 suggest that local apples do not have a significant price premium over conventional apples. Nevertheless, apples produced in NYS but outside the local region exhibit higher retail prices (18 percent higher) than those produced outside NYS.

Our results indicate that apple prices in natural food stores and in farmers markets are significantly higher than their prices in supermarkets. The prices of apples in natural food stores and in farmers markets are 37.5 and 34.6 percent higher than in the local discount store, respectively. Wegmans apples are priced 18.6 percent higher than Aldi apples. Our results indicate no seasonal differences in the price of apples. The prices of apples sold individually (bulk apples) are significantly 16.7 percent higher than the apples sold in bags (at the ten percent level). Finally, the price of organic apples is 74 percent higher than the price of standard apples.

Sweet Corn

The adjusted R-squared for the sweet corn model indicates that the regression explains about 44 percent of the variability in prices. The prices of sweet corn produced in NYS are not significantly higher than the sweet corn produced outside NYS (both for sweet corn grown in the local area and in other regions of the state). Sweet corn production in NYS is relatively small compared with other major sweet corn production states, such as Florida, California, and Washington.

Our results show that the supply of sweet corn in NYS is highly seasonal and limited to the period from July to November. Local sweet corn is not available in the winter. The sweet corn sold in the winter is priced significantly higher than those sold in the other seasons (at the one percent level). This may be due to high transport costs for fresh sweet corn in winter. Specifically, the price of spring sweet corn is 77.3 percent lower than the price of winter sweet corn. The summer and fall sweet corn are priced 73.6 and 47.7 percent lower than the winter sweet corn, respectively.

Natural food stores tend to carry organic sweet corn. The results presented in Table 4 indicate that the prices of organic sweet corn are 36.5 percent higher than the prices of non-organic sweet corn (at the one percent level significance). Sweet corn is sold at a significantly higher price, 48.8 percent higher, in natural food stores than in the local discount store.

Strawberries

As can be seen in Table 4, the adjusted R-squared for the strawberry model indicates that the regression explains about 71 percent of the variability in prices. Strawberries easily spoil in normal air. Moreover, strawberries are very fragile and thus highly susceptible to bruising during transportation. Given how fragile this product is, consumers pay more attention to the quality and taste of strawberries. Consumers like buying local fresh and delicious strawberries. Our results indicate that locally produced strawberries are significantly more expensive than the strawberries produced outside NYS (at the one percent level). The price premium for the attribute local for strawberries is equal to 58.7 percent. The results also suggest that strawberries produced in NYS but outside the local region exhibit higher retail prices (49 percent higher) than those produced outside NYS.

According to our sample, strawberries are available nearly year-round in supermarkets. The price of strawberries in Wegmans is significantly 42.9 higher than the price in Aldi (at the one percent level). Natural food stores tend to carry organic strawberries, which are priced 46 percent higher than non-organic ones. Specifically,

our parameter estimates suggest that the price of strawberries in natural food stores is 60.8 percent higher than in the local discount store.

Although strawberries are highly seasonal, they can have different ripened dates in various production areas in the U.S. The best harvest and purchasing time for local strawberries is short. Early harvested strawberries are ready by the end of May and those strawberries from mountainous and colder areas are harvested late until mid-July. Winter strawberries exhibit higher retail prices than those produced in the rest of year. During the harvest time period, summer strawberries exhibit at the lowest prices.

Tomatoes

The adjusted R-squared for the tomato model indicates that the regression explains about 59 percent of the variability in prices. While local tomatoes are not available year-round, tomatoes produced outside of the local region are available in stores year-round. Our results indicate that local tomatoes do not have a statistically significant price premium. Tomatoes are in season from July to October in the local area. Tomatoes sold at harvest time are priced significantly lower than those tomatoes sold in the winter. The prices of fall and spring tomatoes are significantly lower than winter tomatoes by 18.4 percent and 11.8 percent, respectively.

In our sample, the majority observations of organic tomato prices are collected in natural food stores and in farmers markets. The price of organic tomatoes is 37 percent higher than the price of standard tomatoes. Tomatoes in natural food stores exhibit higher retail prices (34.5 percent higher) than those in the local discount store.

The prices of tomatoes in farmers markets and in Wegmans are also 15.5 percent and 30.1 percent higher than the prices of Aldi tomatoes, respectively.

Potatoes

As can be seen in Table 4, the adjusted R-squared for the potato model indicates that the regression explains about 82 percent of the variability in prices. In our sample, there are no potatoes produced in NYS outside the local region. The results suggest that the price of locally produced potatoes is 70.7 percent higher than the price of nonlocal potatoes (at the one percent level of significance). Organic potatoes are priced 27.7 percent higher than non-organic potatoes (at the one percent level significance).

Our results indicate that the prices of potatoes in natural food stores and in Wegmans are significantly higher than in supermarkets (at the one percent level). That is, the prices of potatoes in natural food stores and in Wegmans are 46.3 percent and 34.8 percent higher than in the local discount store, respectively (at the one percent level significance).

Potatoes are available year-round, because they can be stored for a long time. The prices of fall and spring potatoes are 7 percent and 12 percent lower than winter potatoes, respectively. Finally, similar to bulk apples, bulk potatoes are significantly more expensive than non-bulk potatoes. The price of bulk potatoes is 39.2 percent higher (at the one percent level significance).

Table 4. Regression Estimates for Five Fresh Products

	(1) Apples	(2) Sweet Corn	(3) Strawberries	(4) Tomatoes	(5) Potatoes
Local	0.108	-0.0921	0.587***	0.0678	0.707***
	(0.140)	(0.144)	(0.177)	(0.0744)	(0.117)
NYwL[a]	0.180*	-0.102	0.494***	-0.0866	
	(0.0933)	(0.137)	(0.173)	(0.0584)	
Organic	0.742***	0.365***	0.460***	0.372***	0.277***
	(0.0539)	(0.101)	(0.113)	(0.0904)	(0.0434)
Natural food	0.375***	0.488***	0.608***	0.345***	0.463***
	(0.0541)	(0.136)	(0.144)	(0.116)	(0.0929)
Farmers Markets	0.346**	-0.100	-0.129	0.155*	-0.197
	(0.136)	(0.131)	(0.183)	(0.0799)	(0.145)
Wegmans	0.186***	-0.0454	0.429***	0.301***	0.348***
	(0.0228)	(0.154)	(0.0978)	(0.0653)	(0.0764)
Fall	0.0356	-0.477***	-0.244***	-0.184***	-0.0702*
	(0.0437)	(0.149)	(0.0919)	(0.0435)	(0.0394)
Spring	0.0531	-0.773***	-0.318***	-0.0839	-0.123**
	(0.0486)	(0.131)	(0.0727)	(0.0570)	(0.0599)
Summer	0.105	-0.736***	-0.350***	-0.118*	-0.120
	(0.0653)	(0.149)	(0.0796)	(0.0668)	(0.0775)
Other apples	0.0152				
	(0.125)				
Bulk	0.167*				0.392***
	(0.100)				(0.0689)
Non-russet					0.128
					(0.148)
_cons	-0.498***	-0.0910	0.866***	0.645***	-0.770***
	(0.0911)	(0.154)	(0.0795)	(0.0714)	(0.0481)
N	136	38	74	107	142
adj. R-sq	0.571	0.437	0.703	0.583	0.815

[a] Potatoes are produced and distributed either in the local region or outside of NYS.
Note: *, **, ***denote coefficient estimates statistically significant at the 0.10, 0.05, and 0.01 level, respectively. Standard errors are presented in parentheses. Each variable is defined in Table 3.

We second run regressions and obtain parameter estimates for whole chickens, eggs, two percent milk, and whole wheat bread (see Table 5). We discuss the results corresponding to each product below.

Whole Chickens

The adjusted R-squared for the whole chicken model indicates that the regression explains about 89 percent of the variability in prices. In our sample, all local whole chickens are only in farmers markets and nonlocal whole chickens are not sold in farmers markets. Therefore, the parameter estimate of the attribute 'local' combines the price premiums for both attribute 'local' and retail outlet type 'farmers markets', which is equal to 129 percent.

Given that whole chickens are stored frozen, whole chickens are generally available year-round. The prices of whole chickens sold in the winter are lower than the prices of whole chickens sold in the other seasons. This may be due to cold weather saving some storage costs. Whole chickens in the summer are priced significantly higher than those sold in the rest of the year (at the one percent level). Our results indicate that the prices of whole chickens in the fall and spring are 22.5 percent and 17.9 percent higher, respectively, than the price of whole chickens in the winter. The prices of whole chickens in natural food stores and in Wegmans are significantly higher than in supermarkets (at the one percent level). The prices of whole chickens in natural food stores and in Wegmans are 136 percent and 79.5 percent higher than in the local discount store, respectively (at the one percent level of significance).

Parameter estimates in Table 5 also suggest that grass-fed whole chickens do not have a significantly positive price premium. Meats may be complicated and confusing for consumers, because commodity meats are associated with a number of concerns including sources of animal feed, antibiotic and hormone usage, humane treatment, food safety, and health benefits. Consumers feel intimidated and distrustful of the range of claims like 'natural' and 'grass-fed'. Consumers are less familiar with livestock farming and choosing meats than they are about vegetables (Colorado State University Extension 2014). People are familiar with the attribute organic and more trust it. The price of organic whole chickens is 62.7 percent higher than the price of standard whole chickens (at the one percent level of significance).

Eggs

As can be seen in Table 5, the adjusted R-squared for the egg model indicates that the regression explains about 94 percent of the variability in prices. In our sample, the prices of local eggs are collected in natural food stores and in farmers markets. Local eggs have a significant 10 percent price premium (at the five percent level of significance). Organic eggs are priced significantly (at the one percent level) 54 percent higher than standard eggs. The prices of eggs in natural food stores and farmers markets are significantly (at the one percent level) higher than the prices in supermarkets. Our results indicate that egg prices in natural food stores and farmers markets are 56.2 percent and 53.8 percent higher than in the local discount store, respectively. Eggs in Wegmans are priced 34.9 percent higher than in Aldi.

Brown eggs are often advertised as a healthier alternative to white eggs. The results indicate that brown eggs are sold at 23 percent higher prices than white eggs (at the one percent level of significance). The attribute free-range does not have a significant price premium. Eggs are available year-around. Our results indicate no significant seasonal differences in the price of eggs.

Two Percent Milk

The adjusted R-squared for the two percent milk model indicates that the regression explains about 99 percent of the variability in prices. Milk production accounted for nearly half of New York's agricultural sales in 2010. New York was the nation's fourth largest milk producer, with 2.2 billion dollars in sales (DiNapoli et al., 2010). Local two percent milk is priced significantly 46.9 percent higher than nonlocal two percent milk (at the five percent level).

In our sample, the prices of local milk are collected in supermarkets and in natural food stores. Our results indicate that the prices of milk in Wegmans and in natural food stores are 15 percent and 24.3 percent higher than in the local discount store, respectively (at the one percent level of significance). Two percent milk in farmers markets exhibit higher retail prices (116 percent higher) than those sold in Aldi. One reason may be that consumers believe that they can buy high quality and fresh milk in farmers markets.

Milk is not a seasonal food product. Supply and demand of milk are quite stable in Ithaca. The price of milk sold in the fall is only 1 percent lower than the price of milk sold in the winter.

Our results indicate that the price of grass-fed milk is 6 percent lower than the price of regular milk. As expected, organic milk is priced significantly 76.6 percent higher than the price of standard milk (at the one percent level). Therefore, consumers pay more for local or organic milk than grass-fed milk. If this is an indication of consumer preference, it indicates that consumers are most interested in purchasing milk under specific, desirable production practices and they most prefer organic milk.

Whole Wheat Bread

As can be seen in Table 5, the adjusted R-squared for the whole wheat bread model indicates that the regression explains about 64 percent of the variability in prices. The price of local whole wheat bread is significantly 26.4 percent lower than the price of nonlocal whole wheat bread (at the one percent level). Organic whole wheat bread is also priced 37 percent lower than the standard whole wheat bread. The main reason is that the prices of non-organic whole wheat bread are collected in Ithaca Bakery which sells bread at much higher prices than in supermarkets and farmers market. The prices of local whole wheat bread are mainly collected in farmers markets and in natural food stores.

Our results indicate that whole wheat bread prices in natural food stores and in farmers markets are significantly higher than in supermarkets (at the one percent level). The prices of whole wheat bread in natural food stores and in farmers markets are 117.7 percent and 98.7 percent higher than in the local discount store, respectively (at the one percent level of significance). The results indicate no seasonal differences in the price of whole wheat bread.

Table 5. Regression Estimates for Four Semi-processed and Processed Foods

	(1)	(2)	(3)	(4)
	Whole Chickens	Eggs	Two Percent Milk	Whole Wheat Bread
Local	1.291***	0.105**	0.469***	-0.264***
	(0.0633)	(0.0465)	(0.0116)	(0.0233)
NYwL[a]	0.0757			
	(0.122)			
Organic	0.627***	0.542***	0.766***	-0.370***
	(0.0778)	(0.0277)	(0.0280)	(0.0105)
Natural food	1.368***	0.562***	0.243***	1.177***
	(0.120)	(0.0593)	(0.0176)	(0.0252)
Farmers Markets[b]		0.538***	1.116***	0.897***
		(0.0605)	(0.0155)	(0.0437)
Wegmans	0.795***	0.349***	0.150***	0.479***
	(0.0890)	(0.0535)	(0.0153)	(0.0435)
Fall	0.225***	0.00249	-0.0150*	-0.0341
	(0.0805)	(0.0209)	(0.00839)	(0.0469)
Spring	0.179**	-0.00658	-0.0000574	0.0385
	(0.0788)	(0.0290)	(0.00674)	(0.0475)
Summer	0.244***	-0.0696*	-0.00146	-0.0395
	(0.0815)	(0.0363)	(0.00841)	(0.0546)
Grass-fed	-0.188***		-0.0600***	
	(0.0396)		(0.00646)	
Brown		0.232***		
		(0.0280)		
Free-range		0.0265		
		(0.0305)		
_cons	-0.334***	0.130***	0.395***	0.235***
	(0.0641)	(0.0374)	(0.0143)	(0.0336)
N	113	192	134	167
adj. R-sq	0.882	0.935	0.990	0.634

[a] Eggs, 2 percent milk, and whole wheat bread are produced and distributed either in the local region or outside NYS.

[b] All local whole chickens are only in farmers markets and nonlocal whole chickens are not sold in farmers markets.

Note: *, **, ***denote coefficient estimates statistically significant at the 0.10, 0.05, and 0.01 level, respectively. Standard errors are presented in parentheses. Each variable is defined in Table 3.

Summary of Results

Table 6 presents the summary of price premiums for local foods identified in the analysis. The results suggest that the attribute 'local' enjoys price premiums in two out of five fresh products (strawberries and potatoes) and in three out of four semi-processed and processed foods (whole chickens, eggs, and two percent milk). The price premiums for local fresh produce are not significantly higher than the local price premiums for semi-processed and processed foods. In addition, as expected, all nine products except whole wheat bread have positive price premiums for the attribute 'organic'. The attribute 'local' for strawberries, potatoes, and whole chickens have higher price premiums than the attribute 'organic'. In general, food products in natural food stores are sold at higher prices.

We also statistically test the existence of price premiums of an alternative definition of attribute 'local' as foods produced and distributed in New York State. We conduct another nine models with this alternative definition for the attribute 'local'. We employ the same explanatory variables as in Table 4 and Table 5. Table 6 also presents the summary of price premiums for new definition for attribute local. The results for price premiums in the different models with the different definitions of local are slightly different.

Under the second definition for the attribute local, the results indicate that the prices of apples produced in NYS are significantly (at the ten percent level) 16.4 percent higher than the prices of apples produced outside NYS. Strawberries and whole chickens still have positive and significant price premiums for the attribute local, but

the price premiums are slightly lower than the price premiums for local defined as products produced within a 30-mile radius of Ithaca.

Table 6. Summary of Price Premiums for Local Products

Product	Premium for Local[a]	Premium for NYS
Apples ($/lb.)	10.8%	16.4%*
Sweet Corn ($/each)	-9.2%	-9.7%
Strawberries ($/quart)	58.7%***	56.3%***
Tomatoes ($/lb.)	6.8%	2.5%
Potatoes ($/quart)	70.7%***	70.7%***
Whole Chickens ($/lb)	129.1%***	82.9%***
Eggs ($/dz.)	10.5%**	10.5%**
Two Percent Milk ($/0.5 gal.)	46.9%***	46.9%***
Whole Wheat Bread ($/lb.)	-26.4%***	-26.4%***

[a] Local refers the products produced and distributed within a 30-mile radius of Ithaca
Note: *, **, ***denote estimates statistically significant at the 0.10, 0.05, and 0.01 level, respectively.

CHAPTER 5: CONCLUSION

The price premiums suggested in this study for the product attribute 'local' hinge on the definitions of local foods used in these models, and changes in these definitions could alter the results. Definitions of local rely on consumer perceptions on what is local. Consumers may have different perceptions as to what is local according to different products. For example, fluid milk is costly to transport long distances and would likely be labeled as local, yet consumers do not think of milk purchased in the grocery store as being a local product. And in general, milk packaging does not provide any information that would help to identify the milk as being locally produced or processed.

Premiums calculated in this study are generally higher than those reported in willingness-to-pay studies. The majority of residents living in Ithaca have higher education background and higher incomes than other small metropolitan areas. Therefore, these consumers may be willing to pay more to buy local food products, given the perception that they are healthier and fresher than their nonlocal counterparts.

The results of this study can help policymakers and marketers in the local region to make more informed decisions about consumers' response to locally-grown products. For policymakers and marketers, the estimates of price premiums that consumers are willing to pay for the attribute local in various products can guide promotion investment decisions and efficient fund allocation to support local food systems.

Overall, our findings suggest positive prospects for agricultural branding and promotion campaign in the local region (within a 30-mile radius of Ithaca) if marketers are able to differentiate and consumers are able to identity local products. Local

producers can add value to their locally-grown products, including strawberries, potatoes, whole chickens, eggs, and two percent milk, by labeling and identifying them as “grown within a 30-mile radius of Ithaca”.

Our study has certain limitations that suggest the need for future research. For example, the finding of this case study may be specific for the focal area, and may not be generalizable to other regions, even in NYS. Further, it is hard to distinguish between effects from local and other unobserved attributes like quality. For example, consumers usually do not know whether the product is local or not. They may choose a local food product because it is fresher than a conventional product, but not because it is local. To make this paper comprehensive, future research should focus on which factors influence the price premiums for local products in future. For instance, researches can examine specific factors, such as consumer preferences and demographic factors that determine the willingness to buy and pay for locally-grown products.

APPENDIX

Descriptive Tables

Apples

	Obs	Mean	Std. Dev.	Min	Max
Price per Unit	136	1.21	0.57	0.52	2.50
Local	136	0.390	0.489	0	1
NYwL	136	0.493	0.502	0	1
Organic	136	0.154	0.363	0	1
Natural food	136	0.265	0.443	0	1
Farmers Markets	136	0.346	0.477	0	1
Wegmans	136	0.243	0.430	0	1
Fall	136	0.493	0.502	0	1
Spring	136	0.184	0.389	0	1
Summer	136	0.132	0.340	0	1
Other apples	136	0.059	0.236	0	1
Bulk	136	0.294	0.457	0	1

Sweet Corn

	Obs	Mean	Std. Dev.	Min	Max
Price per Unit	38	0.51	0.21	0.25	0.99
Local	38	0.263	0.446	0	1
NYwL	38	0.105	0.311	0	1
Organic	38	0.053	0.226	0	1
Natural food	38	0.079	0.273	0	1
Farmers Markets	38	0.421	0.500	0	1
Wegmans	38	0.395	0.495	0	1
Fall	38	0.395	0.495	0	1
Spring	38	0.263	0.446	0	1
Summer	38	0.289	0.460	0	1

Strawberries

	Obs	Mean	Std. Dev.	Min	Max
Price per Unit	74	3.58	1.67	1.00	6.99
Local	74	0.081	0.275	0	1
NYwL	74	0.027	0.163	0	1
Organic	74	0.378	0.488	0	1
Natural food	74	0.311	0.466	0	1
Farmers Markets	74	0.189	0.394	0	1
Wegmans	74	0.338	0.476	0	1
Fall	74	0.189	0.394	0	1
Spring	74	0.527	0.503	0	1
Summer	74	0.122	0.329	0	1

Tomatoes

	Obs	Mean	Std. Dev.	Min	Max
Price per Unit	107	2.37	0.79	0.99	4.25
Local	107	0.271	0.447	0	1
NYwL	107	0.234	0.425	0	1
Organic	107	0.206	0.406	0	1
Natural food	107	0.215	0.413	0	1
Farmers Markets	107	0.355	0.481	0	1
Wegmans	107	0.243	0.431	0	1
Fall	107	0.364	0.484	0	1
Spring	107	0.243	0.431	0	1
Summer	107	0.196	0.399	0	1

Potatoes

	Obs	Mean	Std. Dev.	Min	Max
Price per Unit	142	0.83	0.42	0.20	2.00
Local	142	0.303	0.461	0	1
NYwL					
Organic	142	0.373	0.485	0	1
Natural food	142	0.162	0.370	0	1
Farmers Markets	142	0.486	0.502	0	1
Wegmans	142	0.190	0.394	0	1
Fall	142	0.373	0.485	0	1
Spring	142	0.282	0.451	0	1
Summer	142	0.162	0.370	0	1
Bulk	142	0.268	0.444	0	1
Non-russet	142	0.451	0.499	0	1

Whole Chickens

	Obs	Mean	Std. Dev.	Min	Max
Price per Unit	113	3.11	1.62	0.79	5.75
Local	113	0.239	0.428	0	1
NYwL	113	0.177	0.383	0	1
Organic	113	0.354	0.480	0	1
Natural food	113	0.230	0.423	0	1
Farmers Markets					
Wegmans	113	0.336	0.475	0	1
Fall	113	0.336	0.475	0	1
Spring	113	0.310	0.464	0	1
Summer	113	0.142	0.350	0	1
Grass-fed	113	0.106	0.309	0	1

Eggs

	Obs	Mean	Std. Dev.	Min	Max
Price per Unit	192	3.24	1.32	0.89	5.00
Local NYwL	192	0.573	0.496	0	1
Organic	192	0.578	0.495	0	1
Natural food	192	0.245	0.431	0	1
Farmers Markets	192	0.396	0.490	0	1
Wegmans	192	0.245	0.431	0	1
Fall	192	0.328	0.471	0	1
Spring	192	0.328	0.471	0	1
Summer	192	0.161	0.369	0	1
Brown	192	0.573	0.496	0	1
Free-range	192	0.156	0.364	0	1

Two Percent Milk

	Obs	Mean	Std. Dev.	Min	Max
Price per Unit	134	2.65	0.94	1.25	4.50
Local NYwL	134	0.500	0.502	0	1
Organic	134	0.045	0.208	0	1
Natural food	134	0.373	0.485	0	1
Farmers Markets	134	0.119	0.325	0	1
Wegmans	134	0.306	0.463	0	1
Fall	134	0.343	0.477	0	1
Spring	134	0.328	0.471	0	1
Summer	134	0.127	0.334	0	1
Grass-fed	134	0.336	0.474	0	1

Whole Wheat Break

	Obs	Mean	Std. Dev.	Min	Max
Price per Unit	167	2.29	0.67	1.20	3.39
Local NYwL	167	0.401	0.492	0	1
Organic	167	0.263	0.442	0	1
Natural food	167	0.407	0.493	0	1
Farmers Markets	167	0.126	0.333	0	1
Wegmans	167	0.335	0.474	0	1
Fall	167	0.299	0.459	0	1
Spring	167	0.341	0.476	0	1
Summer	167	0.138	0.346	0	1

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