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Examining Market Channels for Local Produce: Consumer Affordability and Producer Profitability

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EXAMINING MARKET CHANNELS FOR LOCAL PRODUCE: CONSUMER AFFORDABILITY AND PRODUCER PROFITABILITY

by

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ABSTRACT

Examining Market Channels for Local Produce: Consumer Affordability and Producer Profitability

by

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This study examines the price differences of commonly consumed produce between farmers' markets and grocery stores in Utah. The first part determines the price differences of a market basket of goods. The second part of this study establishes the price differences of individual produce items based on the sales area where the produce, month, market channel, as well as production method using a hedonic price analysis.

Data collection took place weekly from June to October 2016 and June to September 2017 at eight different farmers' markets across Utah and 17 local and national grocery stores within the vicinity of the farmers' market. Prices for 32 different fresh produce items were collected over the two growing seasons, out of those, 30 produce items were used in this analysis.

To determine the price differences between the farmers' markets and grocery stores, we first created a market basket of commonly consumed produce, then we used the weighted consumption of the market basket and applied it to the monthly averaged produce price data for each farmers' market and grocery store. A difference in means test was used to compare the price of the market basket at the farmers' market to the price of the grocery stores in the same area. The results of this analysis can be used to inform consumers of the actual pricing differences between farmers' markets and grocery stores for fresh produce by area.

To look at the price differences of individual produce items, we performed a hedonic price analysis on a subset of produce items. This showed how time, market type and production method (organic versus conventional) effect the price of individual produce items. The results of this analysis can be used to inform producers of the price differences between farmers' markets and grocery stores. Producers can also use to this information to develop strategies to maximize their profits across the different outlet types, location, and production method.

(88 pages)

PUBLIC ABSTRACT

Examining Market Channels for Local Produce: Consumer Affordability and Producer Profitability

Karli A. Salisbury

This study examines the price differences of commonly consumed produce between farmers' markets and grocery stores in Utah. Our first objective is to compare price differences of a basket of produce between farmers' markets and grocery stores. We compare these price differences in terms of low-income consumer affordability and if an individual can afford a market basket of produce using a combination of Farmers' Market Nutrition Program (FMNP) dollars and Double Up Food Bucks (DUFB) incentive dollars. Our second objective for this study is to establish the price premiums of individual produce items based on where the produce was sold, time of season, market channel (farmers' market versus grocery store), as well as production method used (conventional versus organic).

The findings from this research can inform policy makers of the affordability of farmers' market produce and apply incentive programs more effectively. We can inform consumers of the price differences so they can maximize their food budgets. We can use the research to help producers make market strategies that can then maximize their profits.

DEDICATION

I dedicate this work to the beginning and small producers. If this information can help you figure out your own market strategies then I am truly grateful.

To the consumers, I hope this information can show you that farmers' markets are an affordable source for fresh produce and the money spent at farmers' markets is supporting our local economies.

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Karli A. Salisbury

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CHAPTER 1

OVERVIEW OF ISSUES AND PURPOSE OF STUDY

Introduction

The purpose of this study is to illustrate the actual pricing differences between grocery stores and famers' markets for a basket of fresh produce as well as at the individual produce level, in order to determine the implicit price premiums based on produce type, production type, market type, and area within Northern Utah. The reason for this study is threefold.

First, US residents do not consume the recommended amounts of fresh fruits and vegetables, this is particularly true for low-income individuals (Blisard, Stewart, and Jolliffe 2004; U.S. Department of Health and Human Services [USHHS] and U.S. Department of Agriculture [USDA] 2015; Larson, Story, and Nelson 2009). The main barriers are access, affordability, availability, and convenience (Wheeler and Chapman-Novakofski 2014; Haynes-Maslow et al. 2013; Racine, Vaughn, and Laditka 2010). In order to increase access and indirectly increase consumption, the United States Department of Agriculture (USDA) has made federal nutrition assistance program funds available to use at farmers' markets across the US. However, there is a misconception that farmers' markets are more expensive than grocery stores; whether this misconception is perceived or real is what we seek to illustrate. In any case, if farmers' markets are perceived to be more expensive, low income individuals may choose not to patronize the market. In order to counteract this effect, federal, state, and local governments partnered with private organizations to develop incentive plans to alleviate the financial costs of farmers' markets. The first of these types of incentive programs was the New York City Health Bucks, the pilot program was launched in 2005 by the NYC Department of Health and Mental Hygiene in conjunction with the participating famers' markets as well as the regional Public Health Offices to distribute $2 coupons to low income individuals who spend $5 at the participating farmers' markets. To date the New York City Health Bucks remains one of the largest farmers' market matching incentive programs (Winch 2008). With the success of the Health Bucks, other nutrition incentive programs have expanded across the U.S. with the help of non-governmental organizations (NGOs) like Wholesome Wave and the Fair Food Network. These incentive plans are designed to increase the affordability of farmers' markets for low income individuals. By comparing the price differences between farmers' markets and grocery stores we can assess the minimum incentive needed to cover the price premiums, if any, at the farmers' market.

These incentive plans are meant to increase the purchasing power of low income individuals but they do not take into account the convenience of shopping at a farmers' markets. For example, most farmers' markets are only open one day a week with short operational hours, which may not coincide with family/work schedules (Savoie Roskos et al. 2017), also budgeting enough SNAP dollars to use at the farmers' market can be difficult.

Second, this study is not only important for the low income consumer, but for all consumers. Research shows that there is an association in the increased in consumption of fresh fruits and vegetables when shopping at a farmers' market relative to shopping at traditional outlets, however there is no causation (Jilcott Pitts et al. 2014). Numerous studies have also shown that a diet rich in fruits and vegetables is associated with lower risk for obesity and cardiovascular diseases (Hu 2003; USDA ARS 2015). However, there is very little pricing data available for fresh produce sold through direct markets, making price comparisons difficult for consumers. This study provides important insights into the true differences in fresh produce prices across outlets and locations in Utah.

Third, farmers' markets have been increasing in popularity over the past two decades. This popularity can be seen through the increasing number of self-reported farmers' market directory listings. In 1994 there were 1,755 farmers' markets across the US, by 2004 farmers' market listings more than doubled to 3,706. By 2012, the number of farmers' markets had increased by 112% to 7,864 markets across the US. This spike in the growth rate could be attributed to the growing consumer demand for products with a perceived freshness, low environmental impact, greater bio-diversity, and a general support for local farmers (Hardesty 2008; Martinez et al. 2010; Guptill and Wilkins 2002; Hinrichs 2000). Although the number of farmers' markets is still increasing, it is at a decreasing rate, by 2017 the number of farmers' markets increased by 11%, with only 51 new farmers' markets added between 2017 and 2018 (USDA AMS 2018, 2014).

The number of farmers that participate in direct-to-consumer (DTC) sales, as well as the value of sales generated through DTC outlets are following a similar trend, between 2002 and 2007 the number of farmers participating in DTC sales increased by 17%, and the sales generated increased by 32%. Between 2007 and 2012 the number of farmers increased by only 5.5%, and the value of sales declined by 1% when adjusted for inflation (Low et al. 2015).

By conducting a hedonic price analysis, we can determine the implicit price premiums of individual produce items, whether it is by production type, market type, or area sold. We can present these price premiums to producers as an estimate of what their margins might be. In an industry where the margins are already low and the failure rate is high (Low et al. 2015), pricing information would be a valuable tool for estimating costs and benefits for the types of produce to grow and which outlet to sell through.

Literature Review

This literature review covers topics related to the low consumption of fruits and vegetables among Americans, particularly among low income individuals. The main reasons for low intake of fresh produce are availability, access, and affordability. A diet rich in fruits and vegetables can lead to a decreased risk of cardiovascular diseases, obesity, and other health related issues (Hu 2003; Larson, Story, and Nelson 2009; USDA ARS 2015). Farmers' markets have been shown to increase the availability and access of fresh produce to low income communities, as well as a positive increase in attitudes of fresh fruit and vegetable consumption by consumers (McCormack et al. 2010). The literature on the affordability of produce at farmers' markets has not come to a consensus on whether farmers' markets are indeed more expensive than traditional outlets. We have seen an increasing trend in the use of incentive programs to help offset these either perceived or actual costs at farmers' markets. These incentive programs have been shown to have a positive impact on low income consumers shopping at farmers' markets.

Benefits of Fruit and Vegetable Consumption

The benefits of a diet rich in fruits and vegetables, and a decrease in fats and sugars has become widely accepted. In 2010 the Dietary Guideline of Americans increased the recommended intake of fruits and vegetables. However, Americans of all ages still do not consume enough fruits and vegetables, only 24% of adults in the U.S. consume the recommended servings of fruit and 13% consume the recommended serving of vegetables (Moore and Thompson 2015). Historically we have seen a decrease in the consumption of fruits and vegetables (Casagrande et al. 2007). A study done by the Center for Disease Control (Lee-Kwan et al. 2017) found that when they used the USDA MyPlate guidelines for fruit and vegetable consumption, less than 1 in 10 adults consume the recommended number of servings of fruits and vegetables. White Non-Hispanic, highly educated, and higher income individuals are significantly more likely to meet the USDA fruit and vegetable intake guidelines (Casagrande et al. 2007).

This decreasing trend in fruit and vegetable consumption can have lasting effects on society. A large proportion of deaths in the U.S. result from a limited number of preventable and modifiable factors. The number of deaths related to poor diet and decreased activity level is on the rise and will soon over take tobacco as the leading cause of death (USDA ARS 2015).

Dietary patterns are the product of our food choices and purchasing patterns, understanding the economic factors that drive these choices is a necessary first step toward informing policy efforts aimed at dietary improvements (Mancino et al. 2018). Results from one study suggest it is the overall amount of money available for food purchases that is the main characteristic related to food purchases by households of different levels of income, more than a lack of access to food outlets (French, Wall, and Mitchell 2010). Individuals with lower income consume less fruits and vegetables compared to higher income individuals. It has also been shown that income disparities have a greater effect on dietary quality rather than on amount of calories consumed (Quandt et al. 2013).

Reasons for low fruit and vegetable consumption include availability, access, and cost (Wheeler and Chapman-Novakofski 2014; Haynes-Maslow et al. 2013). Which is why farmers' markets have been shown to be an effective strategy in increasing access to fruits and vegetables. They are viable alternatives in low income communities relative to traditional brick and mortar stores in terms of set up and operational costs, and have been gaining more federal, state, and local support (Dimitri, Oberholtzer, and Nischan 2013; Hinrichs 2000). The presence of a farmers' market can be associated with supporting a healthy eating environment (Young, Karpyn, Uy, Wich, & Glyn, 2011). It has also been shown that the diet quality of low income individuals has a positive relationship between shopping at farmers' markets and an increase in fruit and vegetable consumption (Jilcott Pitts et al. 2015; Evans et al. 2012; Larsen and Gilliland 2009; Olsho et al. 2015).

Because of the positive feedback concerning farmers' markets, the USDA Food and Nutrition Service (FNS) expanded programs providing benefits to low income individuals that can be redeemed at farmers' markets increasing access to fresh fruits and vegetables (USDA FNS 2016; Martinez et al. 2010). These programs are the Supplemental Nutrition Assistance Program (SNAP), Women, Infants, and Children Farmers' Market Nutrition Program (WIC FMNP), Senior Farmers' Market Nutrition Program (Senior FMNP), and WIC Cash Value Vouchers. State agencies may choose to participate in any of these programs, since Utah only participates in SNAP we will focus on that program (USDA FNS 2017b).

The acceptance of these federal programs has gone up and down over the years. This is in response to the USDA's implementation of the electronic benefits transfer (EBT) system which did not support the use of paper coupons which is how these programs were distributed (King et al. 2014). Since 2012, SNAP-authorized farmers' markets and other DTC outlets have increased from 3,214 to 7,377 in 2017 that is a 129.5% increase. SNAP redemptions have increased from $16,598,255 in 2012 to $22,440,312 in 2017 nationwide (United States Department of Agriculture 2017). The national redemption of SNAP benefits at DTC outlets are still really small and have a lot of room to grow with roughly 0.03% redemption in comparison to 82% redemption at grocery stores (USDA FNS 2017a). In Utah, SNAP-authorized farmers' markets have increased 100% from 17 in 2012 to 34 in 2017, and SNAP redemptions have increase 148.6% from $50,471 in 2012 to $125,458 in 2017 (USDA 2017). The SNAP redemption at farmers' markets and other DTC outlets are trivial compared to the $240,127,177 total SNAP redemptions in Utah (USDA FNS 2017a).

Farmers' markets are not without their drawbacks. These venues do not operate every day, have limited hours of operation, and many are not open during the winter months, thus they cannot meet all the needs of the surrounding community (Dimitri, Oberholtzer, and Nischan 2013; Savoie Roskos et al. 2017). For many individuals in a Michigan focus group stated that produce selection and prices are a significant consideration in deciding whether to shop at a farmers' market (Colasanti, Conner, and Smalley 2010). Lack of transportation and knowledge of farmers' market locations has also been reported as a barrier to use (Racine, Vaughn, and Laditka 2010). A study done by the USDA FNS (Karakus et al. 2014) surveyed SNAP participants on their shopping patterns at both grocery stores and farmers' markets. The top barriers cited for SNAP participants not shopping at farmers' markets are cost and convenience, inaccessibility due to transportation was another barrier cited. Where the convenience of shopping for all groceries at one store as the most important reason.

Price Comparisons Between Farmers' Markets and Grocery Stores

There have been few studies published on the cost comparison of farmers' markets, as well as other DTC outlets, and grocery stores. Research on these price comparisons have not come to a consensus on whether DTC outlets are more or less expensive. This inability to reach a consensus can be explained partially by how researchers measure prices, the variety of produce considered, and the geographic scope of the analysis (Stewart and Dong 2018). The majority of these studies were done at a regional level and therefore it can be difficult to make any generalized inferences.

A Vermont study (Claro 2011) performed a item by item doller per pound cost comparison of grocery stores and farmers' markets. Using a difference in means t-test, they found that for the most part farmers' market produce was competitive with grocery store prices, with a few exceptions like potatoes and eggs which were statistically more expensive at farmers' markets. Since these are staple food items and can be purchased cheaply from the grocery store it becomes a deterrient to shopping at the farmers' market.

Wheeler and Chapman-Novakofski (2014) conducted a doller per pound cost comparison of fresh produce between farmers' markets and supermarkets as part of a broader study on fruit and vegetable intake among WIC clients. Using a Wilcoxon signed-rank test, they found a significant price differences for broccoli, cucumbers, green beans, tomatoes, onions, peaches, and raspberries, with the lower cost found at the supermarkets.

A North Carolina study from 2011 (Valpiani et al. 2016) conducted a cost comparison of fresh produce between grocery stores, farmers' markets, and roadside stands. Using a one-way analysis of variance with a Bonferroni correction for multiple group comparison, they compared fruits and vegetables at an individual level, as well as group comparisons of all fruits and all vegetables, and most consumed fruits and most consumed vegetables. The groups were compared as a weighted and unweighted percent of consumption. The study found mixed results. There was no significant price difference between individual fruits. Combined fruits, both unweighted and weighted as a percent of consumption, had no significant price differences. The most consumed fruits, unweighted were significantly cheaper at the farmers' markets compared to supermarkets, however when you apply the weighted consumption the significance disappears. A select number of vegetables at the individual level did appear higher at the farmers' maket compared to grocery stores. Carrots, onions, potatoes and spinach were significantly less expensive at the supermaket. There was no significant price difference between the combined vegetables for both weighted and unweighted consumption. There was, however, a significant price difference for the unweighted most consumed vegetables, the significance dissappeared when the weighted consumption was applied.

The USDA Economic Resource Service (ERS) conducted a study where its findings were published in a report to congress in 2015. This is the first nationally representative price comparison of fresh produce between direct marketing channels and traditional retail outlets. The report used the 2006 Nielson Homescan data that provides weekly detailed food purchasing information for at-home consumption from various retail outlets in at least 10 months of the year from a pannel of U.S. households (Low et al. 2015).

The methods the authors used to determine if a DTC outlet was used, a panelists would likely indicate “fruit stand” as the store name which is classified as “all other” retailer types which includes all DTC outlets including farmers’ markets, roadside stands, on farm purchases, and CSAs. While they are able to identify sales from DTC outlets, they cannot verify if the items sold are actually local. Sales of non-local produce are more pevalent durring the winter months (Low et al. 2015).

Low et. al. (2015) analyzed the five most popular produce items in terms of both purchase fequency and expenditures; these produce items include apples, grapes, tomatoes, potatoes, and peppers. The average prices were found by taking the total amount spent and divided it by the total quantity purchased. T-tests were used to compare the difference in mean price between DTC outlets and traditional stores, both areaally and seasonally. They found that the selected produce prices at DTC outlets to be lower, on average, than prices at retail stores for all seasons.

The authors found that DTC outlets, on average, offer the greatest seasonal price discout for tomatoes at 38.4% relative to grocery stores durring the winter months to 24.6% durring the summer months. The smallest statistically significant discount is for grapes which range from 8.4% in the winter months to 24.9% durring the spring months. The rocky mountain area, which is where Utah is classified, offered the greatest discounts of DTC produce relative to grocery stores. Discounts in this area range from 17.7% for peppers to 48.4% for tomatoes.

Either way, the real or percieved price premiums found at farmers' markets can be seen as a barrier particularly for low-income individuals who can be more price sensitive. Which is why we have seen an uptick in farmers' market incentive programs that help off-set the barriers of shopping at farmers' markets (Winch 2008). Incentive programs decrease the cost barriers for shopping at farmers' markets' but they do not address other barriers, like culinary skill, culture, or time that may influence whether individuals buy fresh produce (Dimitri et al., 2013).

Farmers' Market Incentive Programs

The first incentive program, Health Bucks, started in NYC in 2005 under the direction of the Department of Health and Mental Hygiene in partnership with local community groups. The District Public Health Offices would distribute $2 coupons that could be redeemable at farmers' markets in the area that accepted SNAP benefits via the EBT system. For every $5 spent using SNAP benefits, an additional $2 is given in the form of Health Bucks (Stevens, Huber, and Hurwitz 2015). This is a 40% increase in food expenditures, survey results found that 90% of SNAP customers purchased more prduce because of the Health Buck incentive program (White 2010).

An article on the Health Bucks incentive program analyzed 4 years of EBT sales data (2006-2009). When farmers' markets offered the Health Bucks incentive program to SNAP participants they saw higher average daily EBT sales compared to those markets that did not offer Health Bucks (Sacks, Yi, and Nonas 2015). It was also found that an increased awareness of the Health Bucks program increased the self-reported frequency and amount of farmers' market purchases (Olsho et al. 2015). Similar responses were found in a study of the Philly Food Bucks which offered the same incentive as the NYC Health Bucks (C. R. Young et al. 2013).

A qualitative study done in a Northern Utah farmers' market (Savoie Roskos et al. 2017) interviewed SNAP participants about their experiences using famers' market incentives. Prior to receiving farmers' market incentives cost was a commonly cited barriers to fruit and vegetable consumption. Most participants reported that the incentives helped over come this barrier and gave them greater spending flexability. However, a reported drawback to the incentive program was difficulty in budgeting SNAP spending through out the month to use at the farmers' market where sometime incentives went unused. Overall, the authors found that the incentive program benefits outweighed the barriers to shopping at farmers' markets resulting in continued program participation.

Utah currently participates in the Double Up Food Bucks (DUFB) program, which is a farmers' market incentive program that matches dollar for dollar – up to $10 for every market day. Orignially based out of Michigan, this progam has now reached farmers' markets in 26 different states. Implemented in 2015 at the Downtown Farmers' Market in Salt Lake City, the DUFB program has now expanded to 23 farmers' markets and food stands across Utah (Deseret News 2017). Since 2015, the DUFB program has impacted over 10,000 low-income individuals in Utah, completed 13,663 transactions, with $178,665 in SNAP benefits and $114,719 in DUFB. Also, 80% of families surveyed reported eating more fresh fruits and vegetables (Utahns Against Hunger 2018).

There are clear benefits to implementing farmers' market incentive progams like increasing access and affordability of fresh produce at farmers' markets for low income individuals. A portion of this study is aimed at comparing a market basket of commonly consumed produce between farmers' markets and grocery stores across the Northern Utah area. This insight will help consumers make more informed decisions about where they can access the most affordable produce. The other portion of this study is directed towards fresh produce growers and aiding them in creating an effective marketing strategy. By performing a hedonic price analysis we can analyse the implicit marginal prices of produce characteristics that will help producers make effective marketing decisions.

This chapter has highlighted the need for conducting this study. The next chapter will cover the data collection process as well as the summary statistics for our observations.

CHAPTER 2

DATA COLLECTION AND SUMMARY STATISTICS

This chapter describes the data collection process and provides summary statistics for our individual produce items. This chapter also illustrates how the characteristics of the observations collected drove the type of analysis conducted.

Data collection took place weekly from June to October 2016 and June to September 2017 at eight different farmers' markets across Utah and seventeen local and national grocery stores within the vicinity of the farmers' markets. Table 2.1 includes the different areas and markets where data was collected. Prices for 32 different fresh produce items were collected over the two growing seasons, out of those, 30 items were used in this analysis. The majority of the observations, 86%, come from grocery stores, of the total grocery store observations 57% of them come from national chains and the remaining 43% come from locally owned grocery stores. Approximately 97% of the observations are from urban areas, there was no data collection in the rural areas in 2016.

Each observation included the produce item, market type (farmers' market vs. grocery store), area, growing practice (organic vs. conventional), and whether the grocery store is local or a national chain, as well as a normalized price in dollars per pound ($/lb.). If the produce item is priced as a random weight, for example a watermelon can be priced as $5.49 ea. regardless of the size of watermelon, an average weight was collected and used to create the normalized price. When the weight of an item was not available, the average weight from the entire growing season was used. This allows for the comparison across markets for either an individual produce item or a "basket of produce."

Table 2.1. Number of Observations Collected Across the Different Market Types and Areas

Northern (Urban)			Southern (Rural)		
Logan	N	% Obs.	Moab	N	% Obs.
Cache Valley FM	418	4%	Moab FM	75	1%
Lee's Marketplace*	761	7%	Village Market*	100	1%
Smith's Grocery	935	9%	City Market	104	1%
Walmart	788	7%			
Ogden	N	% Obs.	Cedar City	N	% Obs.
Downtown Ogden FM	226	2%	Cedar City FM	5	0.0%
Smith's Grocery	1,123	11%	Lin's*	29	0.3%
Macey's*	849	8%	Walmart	30	0.3%
Rancho Market*	426	4%			
Layton/Kaysville	N	% Obs.	Roosevelt	N	% Obs.
USU Botanical Center FM	211	2%	Roosevelt FM	26	0.2%
Bowman's*	731	7%	Davis*	19	0.2%
Target	710	7%			
Salt Lake City	N	% Obs.	Vernal	N	% Obs.
Downtown FM	511	5%	Vernal FM	29	0.3%
Smith's Grocery	952	9%	Davis*	11	0.1%
Walmart	588	6%			
Harmon's*	958	9%			
Urban Total	10,187	96%	Rural Total	428	4%
FM Total	1,501	14%	GS Total	9,114	86%
Local GS Total	3,884	37%	National GS Total	5,230	49%

Note: Asterisks denote a local grocery store

When collecting observations at the grocery stores, prices were collected for both bulk packaged items, as well as individually priced items. For example russet potatoes come in a 5 lb. bag, as well as individually sold as a unit price. These prices were averaged to create a single observation for that item. Grocery store observations include a 3% grocery food tax which is standard for Utah to reflect the full cost of the produce item. When collecting observations at the farmers' markets the vendors used were randomly chosen at each visit, and prices were only collected for produce items that could be directly comparable to items found at the grocery stores. For each farmers' market multiple observations, when possible at least three, were collected for a single produce item and the average of these prices was taken as a single observation for that produce item. Two of the produce items were omitted from the analysis because of a severe lack of data. The remaining observations were averaged for each produce item based on the date and market name for a total of 1,501 and 9,114 farmers' market and grocery store fresh produce price observations respectively. Table 2.2 shows the mean price in dollars per pound for conventional produce items between farmers' markets and grocery stores, this is the average price ranging across both seasons of data collection across the state of Utah. There are 1,158 and 6,792 observations for conventionally grown produce at farmers' market and grocery stores respectively which accounts for 75% of all observations.

Of the 30 individual conventional produce items 19 are, on average, more expensive at the farmers' markets than at the grocery store. The price premiums for farmers' market produce range from a 5% increase for cucumbers to 195% for romaine lettuce. Carrots, romaine lettuce, spinach, strawberries, on average, have a farmers' market premium that more than doubles the price per pound over the grocery store. On average farmers' markets offer a discount price on 11 produce items. This price discount ranges from 2% for Napa cabbage and green bell peppers to 29% for zucchini. The price discounts and the farmers' markets on average are modest, where six of the eleven produce items offer less than a 10% discount.

Table 2.2. Grocery Store vs. Farmers' Market Price Comparison for Conventional Produce

Produce Item	Farmers' Market			Grocery Store			Difference
	N	Mean ($/lb.)	(SD)	N	Mean ($/lb.)	(SD)	
Beets	64	1.56	0.71	162	1.36	0.46	14%
Broccoli	24	2.67	1.45	255	1.56	0.39	72%
Cabbage Green	26	1.00	0.56	246	0.71	0.16	41%
Cabbage Napa	6	1.44	0.68	206	1.59	0.54	-10%
Cabbage Red	8	0.96	0.37	227	1.03	0.31	-6%
Cantaloupe	45	0.83	0.40	243	0.53	0.20	56%
Carrots	50	2.13	1.00	224	0.80	0.42	166%
Cucumbers English	10	1.75	0.68	182	1.96	0.59	-11%
Cucumbers Normal	70	1.13	0.62	257	1.08	0.38	5%
Garlic	56	6.88	3.43	224	3.97	1.52	73%
Green Beans (Snap Peas)	54	2.81	0.68	213	2.48	0.93	13%
Green Bell Pepper	56	1.67	1.20	259	1.70	0.51	-2%
Mixed Greens	38	6.82	2.75	171	7.27	2.65	-6%
Onions Red	31	1.84	1.44	261	1.38	0.49	34%
Onions Sweet	24	1.47	0.87	200	1.13	0.27	30%
Onions White	36	1.31	0.89	252	1.17	0.36	12%
Onions Yellow	41	1.21	0.78	234	0.73	0.16	65%
Potatoes Gold	32	1.25	0.69	183	1.02	0.38	23%
Potatoes Red	54	1.56	0.74	258	0.92	0.23	71%
Potatoes Russet	23	0.97	0.44	260	0.68	0.26	43%
Raspberries	56	7.39	1.87	186	9.26	2.98	-20%
Romaine Lettuce	16	3.70	2.47	221	1.26	0.93	195%
Spinach	13	5.47	3.39	207	2.01	0.81	172%
Strawberries	11	5.37	2.41	231	2.59	0.86	107%
Sweet Corn	51	0.45	0.15	239	0.51	0.23	-13%
Tomatoes Cherry	45	3.81	1.55	207	4.97	1.10	-23%
Tomatoes Roma	42	1.61	0.70	250	1.16	0.35	39%
Tomatoes Slicing/Vine	61	1.62	0.62	259	1.63	0.43	-1%
Watermelon	46	0.44	0.16	238	0.45	0.33	-3%
Zucchini (Squash)	69	0.97	0.74	237	1.37	0.58	-29%

Table 2.3 compares the mean price of organic produce between farmers' markets and grocery stores across both growing seasons for the state of Utah. There are significantly fewer organic farmers' market observations, 353, which account for roughly 3% of the total observations. This can be explained by the classification of organic produce. If a vendor was selling produce that was grown using organic practices, but was not USDA certified then they were classified as conventional. Only producers who had a USDA organic certification are classified as organic. Of the 30 produce items, 16 of them have a price premium at the farmers' market. This premium ranges from 4% for cherry tomatoes up to 181% for broccoli, however there is only one observation for organic broccoli at the farmers' market. Strawberries and broccoli are the only organic produce items that have price premiums that are more than double those at the grocery stores. There are 12 produce items with price discounts at the farmers' market which range from 2% for slicing/vine tomatoes up to 47% for watermelon, again there is only one observation for organic watermelon at the farmers' market.

Although we have a rich dataset of prices for fresh produce, when the data is subdivided by certain characteristics, there becomes a clear lack of data, which makes it difficult to draw conclusions. For example, when the data is subdivided by urban areas (10,187 observations) versus rural areas (428 observations) it is difficult to draw conclusions for the rural areas of Utah. This is also true for the organic produce at the different market types, as there are 353 organic farmers' market observations and 2,322 organic grocery store observations.

Table 2.3. Grocery Store vs. Farmers' Market Price Comparison for Organic Produce

Produce Item	Farmers Market			Grocery Store			
	N	Mean ($/lb.)	(SD)	N	Mean ($/lb.)	(SD)	Difference
Beets	21	2.51	0.79	124	1.99	0.79	26%
Broccoli	1	6.33	N/A	164	2.25	0.82	181%
Cabbage Green	6	1.71	0.68	90	1.54	0.60	11%
Cabbage Napa	0	N/A	N/A	0	N/A	N/A	N/A
Cabbage Red	2	1.50	0	61	1.50	0.31	0%
Cantaloupe	1	0.70	N/A	82	0.97	0.23	-28%
Carrots	34	2.33	1.10	141	1.27	0.72	84%
Cucumbers English	2	3.54	1.44	25	3.34	1.05	6%
Cucumbers Normal	15	2.05	0.82	140	2.24	0.97	-8%
Garlic	26	7.75	3.61	16	8.19	3.52	-5%
Green Beans (Snap Peas)	14	3.78	1.91	59	4.51	0.87	-16%
Green Bell Pepper	10	2.29	0.76	127	3.11	1.09	-26%
Mixed Greens	9	5.67	2.48	114	8.86	2.88	-36%
Onions Red	9	2.93	2.11	62	2.31	0.41	27%
Onions Sweet	4	1.28	0.35	22	1.54	0.58	-17%
Onions White	9	2.35	0.67	36	1.64	0.31	43%
Onions Yellow	15	1.97	1.12	56	1.23	0.30	60%
Potatoes Gold	16	2.12	1.20	25	1.24	0.15	71%
Potatoes Red	17	2.08	1.17	63	1.40	0.29	49%
Potatoes Russet	8	2.28	0.39	58	1.22	0.58	86%
Raspberries	1	9.00	N/A	104	11.52	2.53	-22%
Romaine Lettuce	23	2.96	1.29	110	2.32	1.85	27%
Spinach	7	6.99	4.23	87	4.96	1.74	41%
Strawberries	4	9.38	0.10	116	3.87	0.69	142%
Sweet Corn	16	0.88	0.81	2	1.30	1.07	-33%
Tomatoes Cherry	18	4.83	2.67	91	4.64	0.90	4%
Tomatoes Roma	10	2.32	0.58	64	1.64	0.24	41%
Tomatoes Slicing/Vine	19	2.54	0.47	106	2.59	0.87	-2%
Watermelon	1	0.50	N/A	40	0.93	0.43	-47%
Zucchini (Squash)	25	2.28	1.80	137	2.71	1.41	-16%

Keeping in mind the limitations of the dataset, the next chapter will explore the significance of these price premiums and the effect that has on the perception of farmers' market affordability for all consumers, as well as consumers using SNAP and Double-Up Food Bucks. A difference in means test on a market basket that is made of up of the most commonly consumed fresh fruits and vegetables will be conducted. The following chapter will compare marketing channels for individual produce items based on factors like time of year, area, and production method. This information can help producers assess marketing strategies and evaluate their farm profitability.

CHAPTER 3

COST COMPARISON OF A BASKET OF PRODUCE – FARMERS' MARKETS VERSUS GROCERY STORES

Defining a Market Basket

The contents of the market basket is comprised of fresh produce items based on the 2015 loss adjusted food availability data set. This data, provided by the United States Department of Agriculture – Economic Resource Services (USDA-ERS), collects the total supply of produce available in the U.S. from production and imports, then applies a loss estimate for post-harvest losses at the farm level and the retail level. Although this data has its limitations, for example it does not account for actual consumption of fresh produce, it does however capture the trends in the amount of food available which can serve as a proxy for the national per capita consumption of fresh produce. From this data set, we selected the top eighteen most consumed fresh fruits and vegetables on a per capita basis.

The amount of each produce item in the market basket is based on the consumption of a four-person household for one month. Table 3.1 provides a list of the top consumed fresh produce items. The most consumed vegetables include potatoes, tomatoes, and onions. The most consumed fruit includes watermelon and strawberries. Table 3.1 also includes the amount of each produce item we used in the analysis of the market basket. Since it would be unusual to purchase a portion of a produce item to meet the per capita consumption requirements, we rounded the purchased items based on the average weight of the produce over both seasons. For example, only 3.66 pounds of watermelon are consumed for a four person household per month which is 10% of the total fruit consumption; usually a watermelon cannot be purchased in parts. Therefore we include the purchase of a whole watermelon instead which has an average weight of 12.13 lbs. which is 32% of the total fruit consumption. This deviates from the potential amount consumed per capita but depicts a more realistic purchasing pattern.

Table 3.1. Loss-Adjusted Food Availability and Contents of a Fresh Produce Basket

2015 Per Capita Consumption (Lbs./year)		%	4-person HH (Lbs./month)	Market Basket Contents Quantity	Weight	% of Total Consumption
Total Vegetable Consumption	**155.20**	**100%**	**51.73**			
Broccoli	5.99	4%	2.00	2 head	2.07 Lbs.	4%
Cabbage	5.02	3%	1.67	1 head	2.71 Lbs.	5%
Carrots	8.09	5%	2.70	1 bunch	2.29 Lbs.	4%
Sweet Corn	7.87	5%	2.62	4 ear	3.98 Lbs.	8%
Cucumbers	6.50	4%	2.17	2 each	1.37 Lbs.	3%
Garlic	1.77	1%	0.59	2 clove	0.57 Lbs.	1%
Onions	16.00	10%	5.33	2 each	4.39 Lbs.	8%
Green Bell Peppers	9.45	6%	3.15	5 each	2.52 Lbs.	5%
Potatoes	30.60	20%	10.20	3 bag	9.29 Lbs.	18%
Snap Beans	1.22	1%	0.41	1 lb	0.53 Lbs.	1%
Romaine	8.81	6%	2.94	2 head	2.42 Lbs.	5%
Spinach	1.30	1%	0.43	1 bag	0.73 Lbs.	1%
Squash	3.65	2%	1.22	1 each	1.14 Lbs.	2%
Tomatoes	15.10	10%	5.03	5 each	5.01 Lbs.	10%
Total Fruit Consumption	**113.90**	**100%**	**37.97**			
Raspberries	0.60	1%	0.20	1 carton	0.47 Lbs.	1%
Strawberries	6.50	6%	2.17	2 carton	2.16 Lbs.	6%
Cantaloupe	5.40	5%	1.80	1 each	4.35 Lbs.	11%
Watermelon	11.00	10%	3.67	1 each	12.13 Lbs.	32%

There is a lack of data available for organic produce at each famers' market. In order for a produce item to be considered organic it must have been certified by the USDA. If a producer noted that their produce was grown using organic practices but not certified, we considered the produce to be conventionally grown. It would not be wise to make any generalized statement about the prices of organic produce at famers' markets, so for this part of the analysis we will only use conventional produce items. As stated above, we collected data across the state of Utah, at eight different farmers' markets and 17 local and national grocery store chains. However some of the more rural areas of southern Utah are missing enough observations that it becomes impractical to create market baskets for these areas, for this analysis we will use the four farmers' markets and 11 grocery stores in northern Utah.

Another issue is the lack of produce availability and/or observations collected during certain months. Although data collection was done during June of 2016 and 2017 there was not enough produce items to make a full market basket, those months were omitted from the analysis, this was also true for the month of July 2016. Strawberries, spinach, and romaine in general have a lack of observations at the farmers' markets, this could be due to either a lack of availability or a missed data collection date. Since these produce items are part of the per capita consumption trends we did not want to initially omit them from the market basket. Instead, we interpolated the prices of the missing observations and then compared the statistical significance of the difference in means with and without the interpolated prices. The insertion of missing observations was dealt with in one of two ways. If the produce item in question was missing more than three monthly observations, the average price from all farmers' markets or grocery stores was used. In the case when no more than three monthly observations were missing the average price for that specific market channel was used. The omission of these interpolated prices did not affect the statistical significance of the difference in means tests, therefore we kept the interpolated prices in the comparison of the market baskets. The weekly price observations were used to create a monthly average price for each produce item.

The weighted contents of our market basket (see Table 3.1) was applied to the six different monthly price averages, as well as the interpolated price observations for each of the 11 grocery stores and four farmers' markets. If a market basket contained more interpolated prices than actual observations it was omitted from the analysis. There were no grocery store market baskets that needed to be omitted which means there are 66 market baskets based on the 11 individual grocery stores and the six monthly price averages. However, three of the farmers' market baskets had to be omitted from the analysis, two market baskets from the Kaysville/Layton farmers' market for September 2016 and October 2016, and one from the Ogden farmers' market for October 2016. This means we have 21 monthly price observations for the 4 farmers' markets used in this analysis.

Of the 66 grocery store market baskets used in the comparison 45% have one or more produce items that have an interpolated observation. All but one of the farmers' market baskets have one or more interpolated observations.

Market Basket Size: Large, Medium, and Small

For further analysis we created a sub-set of market baskets. The original market basket which contains all of the produce items listed from Table 3.1 will now be referred to as the large market basket. The contents of each of the market baskets used are listed in Table 3.2, along with the average prices for each market basket. The medium market basket contents include the produce items that have more ample observations, however there are still interpolated data points but this could be more representative of the actual pricing at each market. In regards to the medium market basket, 26% of the 66 grocery store market baskets have one or more interpolated observations for an individual produce item and 41% of the 22 farmers' market baskets have one or more interpolated observations. The small market basket is the most complete basket that we derived. Six percent of the grocery store market baskets and 14% of the farmers' market baskets have interpolated observations. The price averages shown in Table 3.2 are the price averages across both seasons at all the farmers' markets and grocery stores.

The average price of a large market basket is $28.51 more at the farmers' market compared to the grocery store that is a 45.39% price premium on average for shopping at a farmers' market. The price premium for a medium market basket decreases significantly to only $8.30 more at the farmers' market relative to the grocery store. The farmers' market becomes less expensive when we compare the small market basket, which has the most actual observations and could be considered the most abundant produce items available at the farmers' markets. This shows that on average the contents in a basket will greatly influence the price and will determine whether or not a farmers' market can be competitive with a grocery store. This also shows that there is greater variability in the price of a market basket at a farmers' market relative to a grocery store. This variability can be explained by area and time of year the market basket price was created, which will be discussed later.

Table 3.2. Summary Statistics for the Large, Medium, and Small Market Baskets

			Large Market Basket		Medium Market Basket		Small Market Basket	
Total Consumption (4-person HH/month)			Mean FM ($)	Mean GS ($)	Mean FM ($)	Mean GS ($)	Mean FM ($)	Mean GS ($)
Sweet Corn	4 ear	3.98 Lbs.	1.76	2.03	1.76	2.03	1.76	2.03
Cucumbers Normal	2 each	1.37 Lbs.	1.53	1.63	1.53	1.63	1.53	1.63
Green Bell Peppers	5 each	2.52 Lbs.	4.05	4.42	4.05	4.42	4.05	4.42
Zucchini (Squash)	1 each	1.14 Lbs.	1.03	1.64	1.03	1.64	1.03	1.64
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	8.09	8.15	8.09	8.15	8.09	8.15
Carrots	1 bunch	2.29 Lbs.	4.82	1.74	4.82	1.74		
Garlic	2 clove	0.57 Lbs.	3.89	2.14	3.89	2.14		
Potatoes Red	3 bag	9.29 Lbs.	13.82	8.85	13.82	8.85		
Raspberries	1 carton	0.47 Lbs.	3.41	4.53	3.41	4.53		
Cantaloupe	1 each	4.35 Lbs.	3.35	2.32	3.35	2.32		
Broccoli	2 head	2.07 Lbs.	5.63	3.15				
Green Cabbage	1 head	2.71 Lbs.	2.45	1.96				
Yellow Onions	2 each	4.39 Lbs.	5.64	3.24				
Green Beans (Snap Beans)	0.5 Lb.	0.53 Lbs.	1.44	1.29				
Romaine	2 head	2.42 Lbs.	9.28	3.22				
Spinach	1 bag	0.73 Lbs.	4.29	1.46				
Strawberries	2 carton	2.16 Lbs.	11.67	5.53				
Watermelon	1 each	12.13 Lbs.	5.17	5.51				
		N	21	66	22	66	22	66
		Maximum	123.68	79.83	69.12	48.97	27.13	27.64
		Average Market Basket Price	91.74	62.81	45.62	37.44	16.24	17.87
		Minimum	68.28	44.42	26.50	28.35	9.34	12.16
		SD	16.96	6.54	12.11	4.31	4.87	3.13

Market Basket Price Comparisons by Month

We will only discuss the graphical representation of the medium market basket since it has a reasonable amount of produce without the drawback of having too many interpolated prices, the large and small basket monthly price comparisons are available in the Appendix. However, we will discuss the statistical significant price differences between the farmers' markets and the neighboring grocery stores for all of the market basket sizes later in the chapter.

Figures 3.1-3.4 show the monthly price comparison of a medium market basket of produce for the farmers' markets and their area grocery stores. There are 10 produce items in the medium market basket, if any basket has less than 50% actual price observations they have been omitted from the analysis. The lines of the graphs represent the average total price for that month while the columns indicate the number of actual observations.

Across all areas there is a spike in the farmers' market basket price for July 2017. This is partially due to the fact that most of the produce in the market basket is slightly more expensive at the farmers' market relative to the grocery stores. However a large portion of this price increase is due to early season vine/slicing tomatoes and red potatoes.

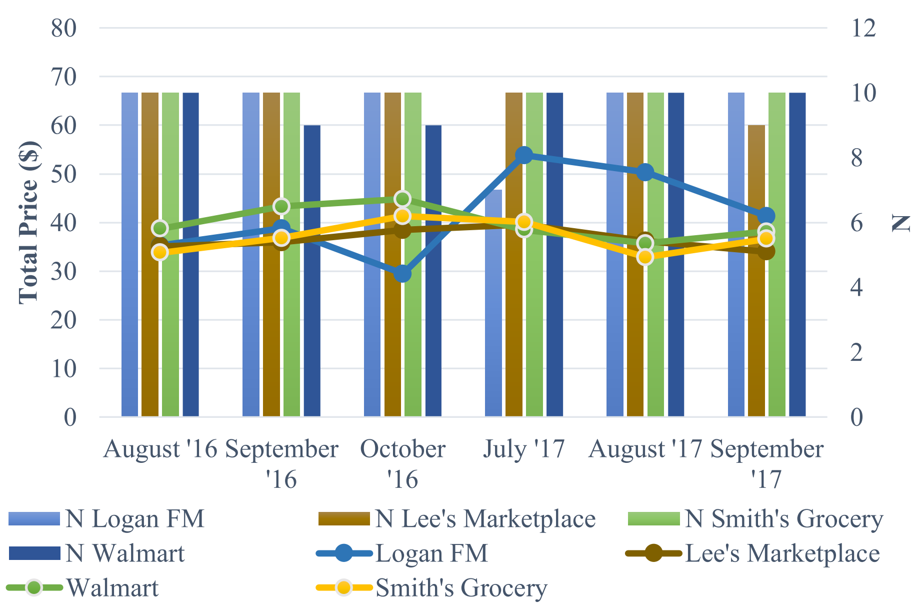

Figure 3.1. Medium market basket price comparison by month in the Logan area

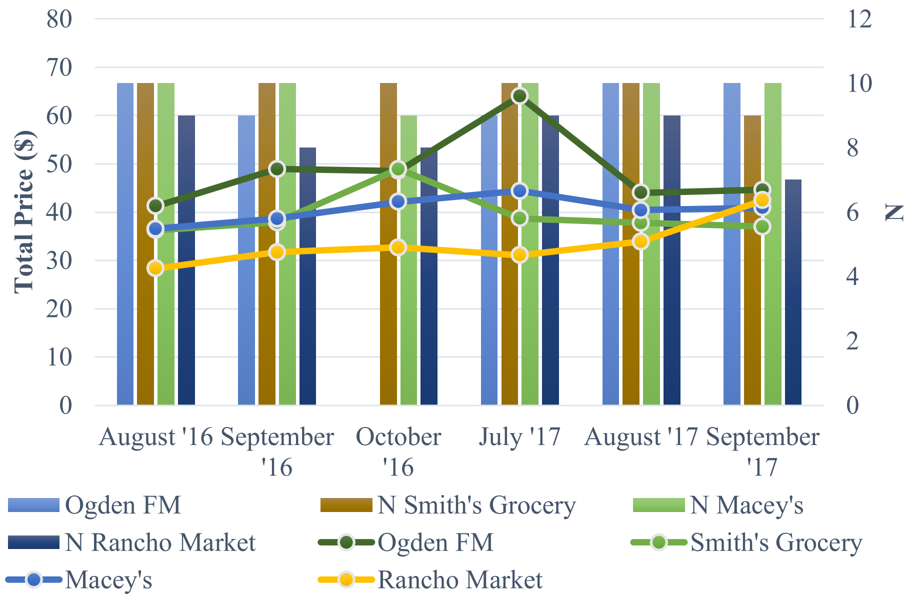

Figure 3.2. Medium market basket price comparison by month in the Ogden area

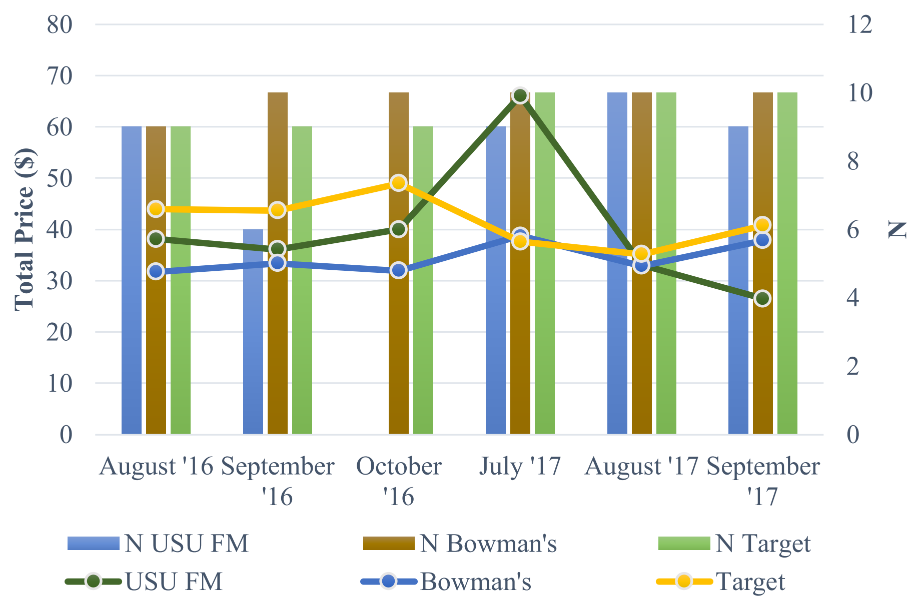

Figure 3.3. Medium market basket price comparisons by area and month in the Kaysville/Layton area

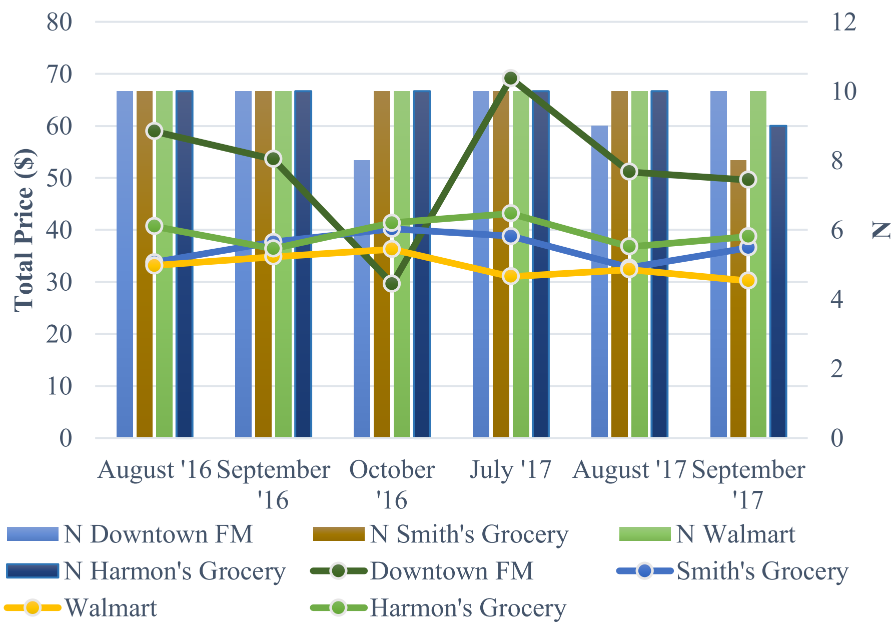

Figure 3.4. Medium market basket price comparison by month in the Salt Lake City area

From the figures we can see that there is a lot of variability in prices of a market basket at the farmers' markets compared to the grocery stores. There also seems to be more of a seasonality effect at the farmers' markets compared to the grocery stores. This is something that we will explore further in Chapter 4.

Market Basket Price Comparison by Area

This section will cover the average price differences between the farmers' markets and their corresponding grocery stores for the large, medium, and small market baskets for the Northern Utah areas. From these results, we can infer whether or not the prices at farmers' markets are statistically more expensive and what types of implications this has on the farmers' market incentive programs as well as implications for the general farmers' market patron.

For the area comparisons we have taken the monthly averages from each market outlet and used a simple difference-in-means test between the farmers' market and each grocery store. Tables 3.3-3.6 show the area price comparison of each farmers' market and its neighboring grocery stores. The price range for a large market basket at a farmers' market is narrower than the price range of a grocery store market basket. The lowest priced basket is in the Kaysville/Layton area at \$86.35 to the highest priced basket in Salt Lake City at \$97.44. This is an \$11.09 difference or a 13% premium for shopping at the Salt Lake City farmers' market relative to the Kaysville farmers' market. The grocery stores have a wider price range with the lowest price being in Ogden, Rancho Market, at \$50.90 and the highest priced in Kaysville, Target, at \$73.17, this is a \$22.27 price spread. Even comparing the most expensive grocery store in Ogden to the least expensive farmers' market in Kaysville, the farmers' market still demands a price premium of \$12.57 or 17.2%.

Table 3.3. Logan Price Comparison of a Large Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			Logan FM	Lee's Marketplace +	Smith's Grocery	Walmart
Broccoli	2 head	2.07 Lbs.	\$6.62	\$2.74	\$2.89	\$4.15
Green Cabbage	1 head	2.71 Lbs.	\$2.72	\$2.20	\$1.62	\$2.33
Carrots	1 bunch	2.29 Lbs.	\$4.33	\$1.92	\$2.02	\$1.69
Sweet Corn	4 ear	3.98 Lbs.	\$1.32	\$2.24	\$2.26	\$1.60
Cucumbers Normal	2 each	1.37 Lbs.	\$1.19	\$1.58	\$1.34	\$2.60
Garlic	2 clove	0.57 Lbs.	\$3.85	\$2.55	\$1.57	\$2.24
Yellow Onions	2 each	4.39 Lbs.	\$5.82	\$3.03	\$3.52	\$3.15
Green Bell Peppers	5 each	2.52 Lbs.	\$3.55	\$4.07	\$4.14	\$5.87
Potatoes Red	3 bag	9.29 Lbs.	\$11.65	\$7.38	\$9.47	\$8.64
Green Beans	0.5 lb.	0.53 Lbs.	\$1.51	\$1.22	\$0.99	\$1.92
Romaine	2 head	2.42 Lbs.	\$9.87	\$2.32	\$2.46	\$3.54
Spinach	1 bag	0.73 Lbs.	\$4.01	\$1.78	\$1.20	\$1.73
Zucchini (Squash)	1 each	1.14 Lbs.	\$0.79	\$1.58	\$1.32	\$3.28
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	\$7.52	\$7.79	\$7.93	\$8.30
Raspberries	1 carton	0.47 Lbs.	\$3.94	\$4.94	\$4.39	\$3.75
Strawberries	2 carton	2.16 Lbs.	\$11.79	\$5.72	\$5.31	\$5.61
Cantaloupe	1 each	4.35 Lbs.	\$3.37	\$2.54	\$2.48	\$1.89
Watermelon	1 each	12.13 Lbs.	\$5.16	\$5.44	\$6.26	\$4.34
		Total Price	**\$89.00**	**\$61.03****	**\$61.19****	**\$66.63****

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

Table 3.4. Ogden Price Comparison of a Large Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			Ogden FM	Smith's Grocery	Macey's+	Rancho Market+
Broccoli	2 head	2.07 Lbs.	$5.88	$2.88	$3.02	$2.36
Green Cabbage	1 head	2.71 Lbs.	$2.54	$1.63	$2.35	$1.62
Carrots	1 bunch	2.29 Lbs.	$5.90	$1.88	$1.97	$1.33
Sweet Corn	4 ear	3.98 Lbs.	$1.87	$2.25	$1.73	$1.71
Cucumbers Normal	2 each	1.37 Lbs.	$1.62	$1.36	$1.67	$1.20
Garlic	2 clove	0.57 Lbs.	$4.54	$1.59	$2.46	$2.20
Yellow Onions	2 each	4.39 Lbs.	$5.99	$3.27	$3.62	$2.31
Green Bell Peppers	5 each	2.52 Lbs.	$4.95	$4.49	$4.73	$4.16
Potatoes Red	3 bag	9.29 Lbs.	$14.34	$11.07	$9.33	$9.39
Green Beans	0.5 lb.	0.53 Lbs.	$1.55	$1.11	$1.10	$1.29
Romaine	2 head	2.42 Lbs.	$9.81	$2.25	$2.73	$2.26
Spinach	1 bag	0.73 Lbs.	$4.29	$1.52	$1.40	$0.97
Zucchini (Squash)	1 each	1.14 Lbs.	$0.82	$1.39	$1.55	$1.07
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$8.67	$8.75	$9.22	$5.39
Raspberries	1 carton	0.47 Lbs.	$3.22	$4.49	$5.65	$4.49
Strawberries	2 carton	2.16 Lbs.	$9.00	$5.62	$5.19	$3.12
Cantaloupe	1 each	4.35 Lbs.	$2.61	$2.14	$2.22	$2.41
Watermelon	1 each	12.13 Lbs.	$4.89	$6.39	$5.43	$3.61
		Total Price	**$92.50**	**$64.09*** **	**$65.34*** **	**$50.90*** **

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

Table 3.5. Kaysville/Layton Price Comparison of a Large Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			USU FM	Bowman's+	Target
Broccoli	2 head	2.07 Lbs.	$3.24	$2.74	$4.14
Green Cabbage	1 head	2.71 Lbs.	$2.41	$2.19	$1.90
Carrots	1 bunch	2.29 Lbs.	$4.28	$1.64	$1.34
Sweet Corn	4 ear	3.98 Lbs.	$1.88	$2.13	$2.91
Cucumbers Normal	2 each	1.37 Lbs.	$1.48	$1.75	$1.99
Garlic	2 clove	0.57 Lbs.	$2.39	$2.23	$2.86
Yellow Onions	2 each	4.39 Lbs.	$4.98	$3.26	$3.82
Green Bell Peppers	5 each	2.52 Lbs.	$3.78	$4.32	$4.84
Potatoes Red	3 bag	9.29 Lbs.	$10.60	$7.30	$9.13
Green Beans	0.5 lb	0.53 Lbs.	$1.21	$2.04	$1.24
Romaine	2 head	2.42 Lbs.	$12.30	$2.44	$8.02
Spinach	1 bag	0.73 Lbs.	$4.29	$1.76	$1.49
Zucchini (Squash)	1 each	1.14 Lbs.	$1.07	$1.32	$1.69
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$7.62	$7.28	$10.55
Raspberries	1 carton	0.47 Lbs.	$3.33	$4.40	$3.81
Strawberries	2 carton	2.16 Lbs.	$11.50	$5.30	$6.33
Cantaloupe	1 each	4.35 Lbs.	$4.51	$2.06	$2.56
Watermelon	1 each	12.13 Lbs.	$5.48	$6.60	$4.55
		Total Price	**$86.35**	**$60.76** **	**$73.17**

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

Table 3.6. Salt Lake City Price Comparison of a Large Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			Downtown FM	Smith's Grocery	Walmart	Harmon's+
Broccoli	2 head	2.07 Lbs.	$6.77	$2.87	$3.32	$3.50
Green Cabbage	1 head	2.71 Lbs.	$2.14	$1.62	$2.07	$2.04
Carrots	1 bunch	2.29 Lbs.	$4.78	$1.86	$1.57	$1.87
Sweet Corn	4 ear	3.98 Lbs.	$1.99	$2.07	$1.29	$2.14
Cucumbers Normal	2 each	1.37 Lbs.	$1.83	$1.47	$1.26	$1.67
Garlic	2 clove	0.57 Lbs.	$4.76	$1.25	$2.23	$2.35
Yellow Onions	2 each	4.39 Lbs.	$5.79	$3.34	$2.85	$3.45
Green Bell Peppers	5 each	2.52 Lbs.	$3.91	$4.34	$3.27	$4.37
Potatoes Red	3 bag	9.29 Lbs.	$18.70	$9.47	$7.62	$8.56
Green Beans	0.5 lb.	0.53 Lbs.	$1.49	$1.12	$1.14	$1.02
Romaine	2 head	2.42 Lbs.	$5.14	$2.31	$4.40	$2.71
Spinach	1 bag	0.73 Lbs.	$4.55	$1.24	$1.67	$1.33
Zucchini (Squash)	1 each	1.14 Lbs.	$1.42	$1.45	$1.87	$1.51
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$8.57	$8.04	$8.06	$8.37
Raspberries	1 carton	0.47 Lbs.	$3.14	$4.28	$3.76	$5.84
Strawberries	2 carton	2.16 Lbs.	$14.40	$5.61	$4.64	$8.40
Cantaloupe	1 each	4.35 Lbs.	$2.91	$2.40	$2.04	$2.84
Watermelon	1 each	12.13 Lbs.	$5.15	$5.86	$6.88	$5.25
		Total Price	**$97.44**	**$60.59*****	**$59.95*****	**$67.22*****

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

The Salt Lake City farmers' market (Table 3.6) is the most expensive farmers' market in Northern Utah and has a price premium of 62.5% on average over the lowest priced grocery store in that area, or a $37.49 price premium. This, however, isn't the highest premium. The Ogden farmers' market (Table 3.4) is the second most expensive farmers' market in our study at $92.50 and compared to its neighboring low cost grocery store has a price premium of 82% which is a $41.60 price premium. The lowest price premium for a farmers' market relative to the lowest cost grocery store is in the Kaysville/Layton area (Table 3.5) at 42% where a large market basket could cost on average $86.35. The Logan area farmers' market (Table 3.3) is the third most expensive market at $89.00 with a price premium of $27.97 over the lowest priced grocery store, which is a 46% increase. Each farmers' market has a statistically significant price difference relative to the neighboring grocery stores, with the exception of the Kaysville farmers' market and Target. Also noted from Tables 3.3-3.6, that the local grocery store is the least expensive option on average for the Logan, Ogden, and Kaysville/Layton areas.

Tables 3.7-3.10 show the area price comparisons between farmers' markets and grocery stores for the medium market basket. Since this market basket has fewer interpolated prices we can say that this would be more representative of what the actual average prices would be at each market. The price premiums have decreased between the farmers' markets and their neighboring grocery stores.

Table 3.7. Logan Price Comparison of a Medium Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			Logan FM	Lee's Marketplace +	Smith's Grocery	Walmart
Carrots	1 bunch	2.29 Lbs.	$4.33	$1.92	$2.02	$1.69
Sweet Corn	4 ear	3.98 Lbs.	$1.32	$2.24	$2.26	$1.60
Cucumbers Normal	2 each	1.37 Lbs.	$1.19	$1.58	$1.34	$2.60
Garlic	2 clove	0.57 Lbs.	$3.85	$2.55	$1.57	$2.24
Green Bell Peppers	5 each	2.52 Lbs.	$3.55	$4.07	$4.14	$5.87
Potatoes Red	3 bag	9.29 Lbs.	$11.65	$7.38	$9.47	$8.64
Zucchini (Squash)	1 each	1.14 Lbs.	$0.79	$1.58	$1.32	$3.28
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$7.52	$7.79	$7.93	$8.30
Raspberries	1 carton	0.47 Lbs.	$3.94	$4.94	$4.39	$3.75
Cantaloupe	1 each	4.35 Lbs.	$3.37	$2.54	$2.48	$1.89
		Total Price	**$41.50**	**$36.57**	**$36.93**	**$39.86**

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

Table 3.8. Ogden Price Comparison of a Medium Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			Ogden FM	Smith's Grocery	Macey's+	Rancho Market+
Carrots	1 bunch	2.29 Lbs.	$5.90	$1.88	$1.97	$1.33
Sweet Corn	4 ear	3.98 Lbs.	$1.87	$2.25	$1.73	$1.71
Cucumbers Normal	2 each	1.37 Lbs.	$1.62	$1.36	$1.67	$1.20
Garlic	2 clove	0.57 Lbs.	$4.54	$1.59	$2.46	$2.20
Green Bell Peppers	5 each	2.52 Lbs.	$4.95	$4.49	$4.73	$4.16
Potatoes Red	3 bag	9.29 Lbs.	$14.34	$11.07	$9.33	$9.39
Zucchini (Squash)	1 each	1.14 Lbs.	$0.82	$1.39	$1.55	$1.07
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$8.67	$8.75	$9.22	$5.39
Raspberries	1 carton	0.47 Lbs.	$3.22	$4.49	$5.65	$4.49
Cantaloupe	1 each	4.35 Lbs.	$2.61	$2.14	$2.22	$2.41
		Total Price	**$48.54**	**$39.42****	**$40.52****	**$33.36*****

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

Table 3.9. Kaysville/Layton Price Comparison of a Medium Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			USU FM	Bowman's+	Target
Carrots	1 bunch	2.29 Lbs.	$4.28	$1.64	$1.34
Sweet Corn	4 ear	3.98 Lbs.	$1.88	$2.13	$2.91
Cucumbers Normal	2 each	1.37 Lbs.	$1.48	$1.75	$1.99
Garlic	2 clove	0.57 Lbs.	$2.39	$2.23	$2.86
Green Bell Peppers	5 each	2.52 Lbs.	$3.78	$4.32	$4.84
Potatoes Red	3 bag	9.29 Lbs.	$10.60	$7.30	$9.13
Zucchini (Squash)	1 each	1.14 Lbs.	$1.07	$1.32	$1.69
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$7.62	$7.28	$10.55
Raspberries	1 carton	0.47 Lbs.	$3.33	$4.40	$3.81
Cantaloupe	1 each	4.35 Lbs.	$4.51	$2.06	$2.56
		Total Price	**$39.97**	**$34.42**	**$41.68**

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

Table 3.10. Salt Lake City Price Comparison of a Medium Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			Downtown FM	Smith's Grocery	Walmart	Harmon's+
Carrots	1 bunch	2.29 Lbs.	$4.78	$1.86	$1.57	$1.87
Sweet Corn	4 ear	3.98 Lbs.	$1.99	$2.07	$1.29	$2.14
Cucumbers Normal	2 each	1.37 Lbs.	$1.83	$1.47	$1.26	$1.67
Garlic	2 clove	0.57 Lbs.	$4.76	$1.25	$2.23	$2.35
Green Bell Peppers	5 each	2.52 Lbs.	$3.91	$4.34	$3.27	$4.37
Potatoes Red	3 bag	9.29 Lbs.	$18.70	$9.47	$7.62	$8.56
Zucchini (Squash)	1 each	1.14 Lbs.	$1.42	$1.45	$1.87	$1.51
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$8.57	$8.04	$8.06	$8.37
Raspberries	1 carton	0.47 Lbs.	$3.14	$4.28	$3.76	$5.84
Cantaloupe	1 each	4.35 Lbs.	$2.91	$2.40	$2.04	$2.84
		Total Price	**$52.02**	**$36.62****	**$32.98****	**$39.52****

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

The Kaysville/Layton area (Table 3.8) farmers' market basket price is less expensive than Target, but is still more expensive than Bowman's, the lowest cost grocery store. These price differences are not statistically significant. In fact, that is also true with the Logan farmers' market and its neighboring grocery stores (Table 3.7), on average the farmers' market is still more expensive than each grocery store, but it is not statistically significant. Meaning the Logan farmers' markets can be competitive with grocery stores in this area. There is still a significant price difference in the Salt Lake City area (Table 3.10) and the Ogden area (Table 3.8), however the significance level has decreased. The Salt Lake City farmers' market on average demands a 58% price premium over the lowest priced grocery store in that area, which is a $19.04 price premium. The Ogden farmers' market price premium for the medium market basket has dropped significantly for the large market basket from 81% to 45.5%. This is another example showing that the price differences of a basket of produce will greatly depend on the produce items in the basket.

Tables 3.11-3.14 show the area price comparisons for the small market basket of produce between each farmers' market and its neighboring grocery stores. The farmers' market price premium is shown to be all but diminished for the produce items that we have the most observations for, and seem to be the most abundant at the farmers' markets.

Table 3.11. Logan Price Comparison of a Small Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			Logan FM	Lee's Marketplace +	Smith's Grocery	Walmart
Sweet Corn	4 ear	3.98 Lbs.	$1.32	$2.24	$2.26	$1.60
Cucumbers Normal	2 each	1.37 Lbs.	$1.19	$1.58	$1.34	$2.60
Green Bell Peppers	5 each	2.52 Lbs.	$3.55	$4.07	$4.14	$5.87
Zucchini (Squash)	1 each	1.14 Lbs.	$0.79	$1.58	$1.32	$3.28
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$7.52	$7.79	$7.93	$8.30
		Total Price	**$14.37**	**$17.25**	**$16.99**	**$21.65****

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

Table 3.12. Ogden Price Comparison of a Small Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			Ogden FM	Smith's Grocery	Macey's+	Rancho Market+
Sweet Corn	4 ear	3.98 Lbs.	$1.87	$2.25	$1.73	$1.71
Cucumbers Normal	2 each	1.37 Lbs.	$1.62	$1.36	$1.67	$1.20
Green Bell Peppers	5 each	2.52 Lbs.	$4.95	$4.49	$4.73	$4.16
Zucchini (Squash)	1 each	1.14 Lbs.	$0.82	$1.39	$1.55	$1.07
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$8.67	$8.75	$9.22	$5.39
		Total Price	**$17.93**	**$18.25**	**$18.90**	**$13.53***

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

Table 3.13. Kaysville/Layton Price Comparison of a Small Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			USU FM	Bowman's+	Target
Sweet Corn	4 ear	3.98 Lbs.	$1.88	$2.13	$2.91
Cucumbers Normal	2 each	1.37 Lbs.	$1.48	$1.75	$1.99
Green Bell Peppers	5 each	2.52 Lbs.	$3.78	$4.32	$4.84
Zucchini (Squash)	1 each	1.14 Lbs.	$1.07	$1.32	$1.69
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$7.62	$7.28	$10.55
		Total Price	**$15.03**	**$16.80**	**$21.97****

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

Table 3.14. Salt Lake City Price Comparison of a Small Market Basket – Conventional Fresh Produce

Total Consumption (4-person HH/month)			Downtown FM	Smith's Grocery	Walmart	Harmon's+
Sweet Corn	4 ear	3.98 Lbs.	$1.99	$2.07	$1.29	$2.14
Cucumbers Normal	2 each	1.37 Lbs.	$1.83	$1.47	$1.26	$1.67
Green Bell Peppers	5 each	2.52 Lbs.	$3.91	$4.34	$3.27	$4.37
Zucchini (Squash)	1 each	1.14 Lbs.	$1.42	$1.45	$1.87	$1.51
Tomatoes Vine/Slicing	5 each	5.01 Lbs.	$8.57	$8.04	$8.06	$8.37
		Total Price	**$17.73**	**$17.36**	**$15.75**	**$18.06**

Note: + Denotes a local grocery store. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

The Logan area (Table 3.11) and Kaysville/Layton area (Table 3.13) farmers' markets are on average the least expensive option compared to their grocery stores. Logan's farmers' market offers a 15.4% discount over the least expensive grocery store outlet, these results are not statistically significant. Compared to the most expensive grocery store in the area, Logan's farmers' market offers a 33.6% discount on average, these results are statistically significant (p-value = 0.0133). The Kaysville farmers' market has a slight advantage on average over the lowest priced grocery store by $1.77, and even more of an advantage over the more expensive grocery store by $6.97, the price difference between Target and the USU farmers' market is statistically significant (p-value = 0.0294). The Ogden area farmers' market is still not the least expensive outlet, Rancho Market offers deep discounts on their fresh produce items and remains the least expensive option. The Ogden farmers' market has a price premium of 32.4% over Rancho Market, and it is statistically significant (p-value = 0.0838). There are no statistically significant price differences between the farmers' market in the Salt Lake City area and the neighboring grocery stores. In general, with the abundance of this type of produce available at the farmers' markets, this shows that on average farmers' markets can be competitive with the neighboring grocery stores. This also shows that a more in-depth analysis on the individual produce items should be conducted.

Implications for Consumers

In one month, a low-income consumer could potentially spend $80 in SNAP benefits and Double Up Food Bucks (DUFB) at the farmers' markets, that is $10 SNAP benefits plus another $10 DUFB weekly, this is what we will use to analyze the viability of patronizing farmers' markets. Table 3.15 summarizes the total costs of each of the market baskets. The contents of a large market basket are the most consumed fruit and vegetables in the U.S. The amount of produce is for a four person household for one month. The medium and small market baskets are subsets of the large market basket based on the number of observations collected.

Table 3.15. Summary of the Total Costs of a Large, Medium, and Small Market Basket ($)

Market Name	N	Total Price Large Market Basket	Medium Market Basket	Small Market Basket
		Logan Area		
Logan FM	**6**	**$89.00**	**$41.50**	**$14.37**
Lee's+	6	$61.03**	$36.57	$17.25
Smith's	6	$61.19**	$36.93	$16.99
Walmart	6	$66.63**	$39.86	$21.65**
		Ogden Area		
Ogden FM	**5**	**$92.50**	**$48.54**	**$17.93**
Smith's	6	$64.09***	$39.42**	$18.25
Macey's+	6	$65.34***	$40.52**	$18.90
Rancho Market+	6	$50.9***	$33.36***	$13.53*
		Kaysville Layton Area		
USU FM	**4**	**$86.35**	**$39.97**	**$15.03**
Bowman's+	6	$60.76**	$34.42	$16.80
Target	6	$73.17	$41.68	$21.97**
		Salt Lake City Area		
Downtown FM	**6**	**$97.44**	**$52.02**	**$17.73**
Smith's	6	$60.59***	$36.62**	$17.36
Walmart	6	$59.95***	$32.98**	$15.75
Harmon's+	6	$67.22***	$39.52**	$18.06

Note: + denotes local chain. 95% CI Significance Level: (***) 1%, (**) 5%, (*) 10%

On average the combination of SNAP benefits and DUFB is not enough to cover the costs of a large market basket where the price premiums can range from $25.59 to $41.60 above the lowest priced grocery store in the area. All of the large market baskets at the farmers' market had statistically significant price differences between all of their neighboring grocery stores, with the exception of the Kaysville/Layton farmers' market and Target. When the DUFB incentives are taken into account, a low-income individual will end up spending, on average, roughly \$8 to \$17 of either additional SNAP benefits or their own personal income at farmers' markets. Whereas, grocery stores do not accept DUFB and low-income individuals will end up spending an additional \$11 to \$21 of either additional SNAP benefits or their own personal income on top of the original \$40. However, we cannot imply that solely relying on a farmers' market to purchase fresh produce would be a viable option for low-income individuals to meet dietary needs, even with the additional incentives. This is because the ability to budget SNAP benefits as well as the convenience of shopping at the farmers' market may not offset the price barriers for this specific market basket, but choosing certain produce items may be well worth shopping at the farmers' market.

The medium and small market baskets contain items that have a greater number of observations, which could translate to produce items that are more abundant at the farmers' markets. From Table 3.15, the price of a medium market basket ranges from \$39.97 to \$52.02 at the farmers' market, where the price premiums can range from roughly \$5 to \$19 relative to the lowest priced grocery store. Salt Lake City and Ogden areas still have statistically significant price differences between the farmers' markets and their neighboring grocery stores, while Kaysville/Layton and Logan area farmers' markets are more price competitive with their respective grocery stores. The price of a small market basket at a famers' market is competitive with the surrounding grocery stores in all areas.

Using SNAP benefits along with the DUFB would greatly enhance the purchasing power of low-income individuals shopping at farmers' markets. With the potential to spend $80 a month using SNAP and DUFB incentives at the farmers' markets, the medium and small market baskets leave enough money left over that low-income individuals are free to spend the additional money on produce items that are either the higher valued items that are not in the market basket like raspberries, or produce items that are not normally consumed like bok choy, in either case the additional purchasing power is not available at the grocery stores.

The affordability of farmers' markets is greatly increased with the use of incentive plans, however we cannot say for certain if this incentive program offsets the other barriers like convenience, since this is something that we did not measure.

In regards to the everyday shopper, we can see by the different market baskets, that farmers' markets can be competitive with the grocery stores, it is these items that a producer can use to draw in new customers and then provide produce that can sell for a higher premium.

Implications for Fresh Produce Growers

Figures 3.1-3.4 show that in all areas there is an early season price premium at the farmers' market for the month of July 2017. All produce items in the medium market basket have a slight premium as compared to the neighboring grocery stores for the month of July, however the largest part of the medium market basket premium can be attributed to the early season red potatoes, strawberries, and vine ripened tomatoes. This price premium can be attributed to the lack of availability of produce items, or the size/weight of produce items being sold during this time. If a producer can make available these produce items during the early season they can expect to see high price premiums for farmers' market sales.

Also from Figures 3.1-3.4, we can see that there is more variability in the prices at the farmers' markets compared to the grocery stores. The price variability can be risky especially during the mid- and late-season when there is an abundance of produce and prices drop, this could be alleviated by partnering with a grocery store to off load the excess produce items.

From Table 3.15 we can see that the large market basket is significantly more expensive at most of the farmers' markets compared to the neighboring grocery stores. However, the significance disappears when we compare the small market baskets which have produce items that are more common at the farmers' markets. A producer at a farmers' market can highlight the low-cost items from the small market basket to draw in customers and then display the higher premium items that could either be novel/new things to try or impulse buys like strawberries or spinach and romaine.

Further analysis will be done on individual produce items to determine what produce items can demand a higher premium and in which areas these premiums exits. Although the prices show do not reflect the actual amount a producer will receive, this analysis will be beneficial to producers by helping them figure out their market strategy.

CHAPTER 4

COMPARING MARKET CHANNELS FOR INDIVIDUAL PRODUCE ITEMS – A HEDONIC PRICE ANALYSIS

Introduction

In this chapter we will cover use hedonic price analysis to determine the marginal implicit prices of characteristics. This type of analysis has not been done for individual produce items at various marketing channels. From Chapter 3 we conclude that depending on the contents of the market basket, as well as where that market basket was purchased, creates statistically different purchase prices. This shows a need for a comparison of market channels for individual produce items across the different areas as well as different production methods, which are all important decisions a producer must make; where, when and what to sell. In this chapter we will use hedonic price analysis to determine the implicit price of these external characteristics.

The motivation for estimating this model is to assist produce growers in developing a marketing strategy to maximize sales. This is done by deciding on a combination of produce to grow, what area to sell produce, and if a farmers' market can demand a high enough premium to offset the costs required to sell at a farmers' market or if off-loading produce in bulk to grocery stores is more cost efficient.

Hedonic Price Analysis

Hedonic price analysis is used to find the marginal implicit price of observed characteristics that are bundled at varying qualities and quantities which make up the observed price of the good (Rosen 1974). Although it was coined hedonic price analysis by Andrew Court (1939) for his work in the automobile industry examining price indices, it was popularized by Zvi Griliches (1961) in his analysis of automobile price indices. He argued that the failure to account for changes in quality or technological changes is a major flaw of these indices (Goodman 1998). Griliches is also known for his earlier work in measuring the demand for fertilizer where he derived implicit price weights for nitrogen (N), phosphoric acid (P_2O_5), and potash (K_2O) from an analysis of the relationship between the prices of different mixed fertilizers and their nutrient content (Griliches 1958).

The hedonic price analysis has been applied to a myriad of industries including the housing market (Abidoye and Chan 2017), wine industry (Combris, Lecocq, and Visser 2010; Oczkowski 2001), tourism industry (Fleischer and Tchetchik 2005), agricultural industry (Schlenker, Hanemann, and Fisher 2005), as well as the willingness to pay for environmental amenities such as clean air, and green spaces (Bayer, Keohane, and Timmins 2009; Kuminoff, Parmeter, and Pope 2010). Since this can be applied to so many different areas of study, the economic theory behind hedonic price analysis does not put restrictions on the functional form, instead it has been suggested to use a goodness-of-fit criterion (Rosen 1974; Cropper, Deck, and McConnell 1988).

Cropper et at. (1988) used housing bid simulations to study the errors of the estimated marginal attributes of a hedonic price function and how they vary depending on the functional form. The authors the following functional forms: linear, semi-log, log-log, quadratic, as well as linear and quadratic forms of the Box-Cox transformed variables. The results show that when all attributes are observed the linear and quadratic Box-Cox functions perform best in terms of a normalized error and a variance of error term.

However, when some of the attributes are not observed the quadratic and Box-Cox quadratic functions produce the largest normalized bias, whereas the linear and semi-log functions have the smallest average variance of errors. It would seem that in cases where variables are omitted it is the simpler functional forms, linear, semi-log, log-log, and the Box-Cox linear form that perform best. Based off of this work, we will be using a simple linear equation.

There are several other hedonic price analysis applications in the agriculture industry. A study done in British Colombia, Canada (Carew 2000), used a hedonic analysis on apple prices based on variables like apple variety, grade standards, packing size, fruit size, and marketing season, as well as several different interaction terms between these variables. Using three different model types: linear, log-linear, and a power transformation of the dependent price variable, the authors found that grade is one of the primary characteristics that influence apple prices. Though, varieties, storage and marketing season also explain a significant portion of prices.

Another study looked at the price premium of organic tomatoes over conventional tomatoes across four different regions (Huang and Lin 2007). The authors used a log-linear model with random individual effects to estimate the price premium of organic tomatoes. Using the 2004 Neilson Homescan data, the authors compared prices of organic and conventional tomatoes at supermarkets, supercenters, and discount or warehouse clubs. The regions they looked at include the New York – Philadelphia (NY-PHI) market, Atlanta – San Antonio (ATL-SA) market, Chicago – Baltimore/Washington (CHI-B/W) market, and the Los Angeles – San Francisco (LA-SFR). Using four different models for each of the regions, the authors controlled for product attributes like organic and if produce was sold under one of four brand names, as well as market factors like if the produce item was packaged with a UPC code, or if produce item was on sale, or sold at a discount store, the time of year (months), as well as demographic information for each region. Results show that organic premiums range from $0.14/lb in the CHI-B/W market to $0.29/lb in the ATL-SA market. Also, there are some significant seasonal variations, across all regional markets consumers paid a higher price for tomatoes in October through December compared to August when prices are typically at their lowest.

More work in hedonic price analysis is seen in feeder cattle auctions. Results show that cattle quality as well as market conditions, merchandizing strategies, and market structure are a function of successful bids at feeder cattle auctions and can ultimately identify buyer market areas (Bailey, Brorsen, and Thomsen 1995). Bailey et al. used a one-way random effects generalized least squares model to estimate the highest bid on a lot of feeder cattle. Accounting for the marginal implicit price of cattle quality in their analysis allows for better model specification in identifying market areas, otherwise the quality characteristics would be absorbed in the error term and estimators could possibly be biased and inefficient.

Hedonic price analysis has also been used to reveal the implicit prices for beef steak branding (Schulz, Schroeder, and White 2012). Under the assumptions that goods can be distinguished by various product characteristics Schulz et al. used a two-step regression analysis to find the brand value of beef steak. In the first step a hedonic model is implemented using a fixed effects least squares dummy variable regression to find the implicit marginal value of a brand type while controlling for the beef steak characteristics using indicator variables like a type of breed, organic certification, if there is religious processing, type of cut and if a bone is present. Controlling for the beef steak characteristics allows the authors to find an unbiased and consistent estimator for the marginal implicit value of each brand tested. That estimator is then used in the second step regression to determine the factors that contribute to the brand's value.

When we apply hedonic price analysis to fresh produce pricing we first assume that produce varieties are homogenous, i.e. a slicing tomato is the same across all areas and time. So the marginal implicit values of some combination of factors like the growing season, area, market type, and production type sum to the observed price of a produce item. For example, when controlling for all the other variables, we can observer a price difference for a slicing tomato at a farmers' market versus a grocery store but cannot determine the actual cause. For example, the difference in prices could be due to difference in demand for a perceived quality and freshness, or as a difference in supply or the cost of production. We must be careful to point out that estimated hedonic price-characteristics functions do not identify supply or demand functions (Rosen 1974).

Variable Description and Summary Statistics

The methods used to collect data is described in Chapter 2. However, for this analysis we omitted the Cedar City farmers' market and grocery store observations due to a lack of observations. Table 4.1 provides a description of the variables used in the analysis as well the summary statistics of each variable.

Table 4. 1. Description of Variables and Summary Statistics of Produce

Variable	Description	Mean	SD
	Dependent Variable		
$Price_{ijt}$	Price of produce *i* in area *j* during week *t* ($/Lb.)	2.21	2.35
	Independent Variables	**(%)**	**(%)**
$Produce_{i}$	Binary variable for produce type *i*	NA	NA
$Organic_{i}$	Binary variable =1 for certified organic claim	0.25	0.43
FM_{it}	Binary variable =1 if produce was sold at a farmers' market	0.14	0.35
$City_{j}$	Binary variable for the *j* city the produce sold	NA	NA
$Month_{it}$	Binary variable for the *t* month the produce sold	NA	NA

Our analysis will be done on a selection of the 32 produce items, where we have the most observations at both farmers' markets and grocery stores. Of the 10,551 observations 25% are certified organic produce, 14% were sold at a farmers' market, and 96% of produce items are sold at either a farmers' market or a grocery store in an urban setting. We also have factor variables for the eight different areas a produce item was sold, as well as the five different months the produce item was sold, this will allow us to look at the price premiums from month to month. For ease of price comparisons we will divide our observations by produce variety. Table 4.2 shows how we divided the produce types and what produce items we will be discussing. As mentioned in chapter 2, once we subset the data based on the produce type, production method, area, and month the dataset becomes very thin. For comparison, we will discuss the tomato varieties, which have ample observations, and leafy greens, which have more sparse observations. We also used the produce items from the medium sized market basket to compare their seasonality.

Table 4.2. Subset of Produce Items Used in the Analysis

	N		Mean ($/Lb.)	
	FM	GS	FM	GS
Tomato Varieties	192	971	2.52	2.60
Vine Tomatoes	79	363	4.07	1.91
Roma Tomatoes	51	312	1.72	1.26
Cherry Tomatoes	62	296	4.66	4.87
Leafy Greens	106	904	2.26	3.98
Romaine Lettuce	39	329	3.26	1.61
Mixed Greens	47	283	6.59	7.89
Spinach	20	292	6.00	2.87
Medium Market Basket	673	2,996	2.17	1.61
Cantaloupe	45	323	0.83	0.64
Carrots	84	363	2.22	0.98
Cucumbers	85	395	1.30	1.49
Garlic	82	238	7.15	4.25
Green Bell Peppers	66	384	1.76	2.17
Red Potatoes	71	319	1.69	1.01
Sweet Corn	67	239	0.55	0.52
Vine Tomatoes	79	363	1.83	1.91
Zucchini	94	372	1.32	1.86

When we apply a hedonic price analysis to produce pricing we first assume that produce varieties are heterogeneous in terms of where and when the produce item is sold. So the marginal implicit values of a combination of factors like the growing season, area, market type, and production type which will sum to the observed price of a produce item.

Another assumption that we make is that subjective characteristics like freshness and taste are not important in this analysis. This is supported from a study of Bordeaux wine (Combris, Lecocq, and Visser 2010), which found that individual consumer preferences for subjective characteristics like finish, and suppleness are statistically insignificant compared to the more objective characteristics that are easily identifiable and identically perceived by all consumers. A study done on the consumer perceptions of price and quality (Zeithaml 1988) found that brand name significantly affected the perception of quality, in this case we can consider the different market channels i.e. Walmart produce versus a local grocery store produce versus the farmers' market produce as the "brand." We can also support this through qualitative observations, where some farmers' market vendors are also highlighted as local producers at the grocery stores.

Model Specifications

Some of the studies (Bartik 1987; Oczkowski 2001) have stated that using ordinary least squares (OLS) procedures is not appropriate when conducting hedonic price analysis because there is a correlation between the unobserved "tastes" component and the error term. For example an individual with greater tastes for farmers' markets will choose greater quantities for that characteristic (Bartik 1987). We are still using OLS but control for the unobserved "taste" components by controlling for the city effects and time effect, as well as using White's robust standard errors. We tried to control for individual markets, however the number of observations becomes very thin, and the coefficients of our models become erroneous.

Following Rosen (1974), we suppose that a good, z, is composed of n characteristics

(1) $$z = (z_1, z_2, \dots, z_n),$$

and the price of the good is related to its characteristics by

(2) $$p(z) = p(z_1, z_2, \dots, z_n).$$

Where each good has a market price, p, which is associated with the fix value of vector z. This function is the buyer's equivalent of a hedonic price regression, which is the equivalent of an individual shopping around and comparing prices of fresh produce with different characteristics. The marginal implicit values of characteristic z_i can be found by differentiating $p(z)$ with respect to the *i*th characteristic:

(3) $$p_i(z) = \partial p(z)/z_i$$

where $p_i$represents the marginal value of the *i*th characteristic. This is the framework that we will apply to the pooled OLS model.

Pooled OLS Model

Keeping with the previous notation, the equation that we use is:

(4) $$\boldsymbol{p}_{ijt} = \boldsymbol{z}'_{ijt}\boldsymbol{\beta} + \varepsilon_{ijt}.$$

Here, $\boldsymbol{z}'_{ijt}$ is a vector of the observed characteristics of produce *i* at time *t* in city *j*, and ε_{it}, is the unobserved error term, assumed to be independently and identically distributed (i.i.d.). Where the goal of this analysis is to estimate the vector of marginal values, $\boldsymbol{\beta}$, that are associated with the observed characteristics.

The dependent variable in this equation is $\boldsymbol{p}_{it}$, which is the price of produce *i* at time *t*. The vector of observed characteristics includes: $Produce_i$, which is a subset of the complete produce list based on the variety and production method; $Organic_i$, a binary variable = 1 if produce *i* is organic; FM_{it}, a binary variable = 1 if produce *i* is sold at a farmers' market; $City_j$, if produce *i* is sold in city *j*; and $Month_{it}$, if produce *i* is sold in month *t*.

Classical assumptions imply strict exogeneity of the predictor variables, $\mathrm{E}(\varepsilon_{it}|\boldsymbol{z}_{it}) = 0$. The pooled OLS model also assumes that the individual effects are uncorrelated to the predictor variables i.e. Cov(ν_n,$\boldsymbol{z}_{it}$) = 0. A violation in these assumptions will lead to bias and inconsistent estimators. Therefore, we use the Durbin-Watson test for autocorrelation to ensure this assumption holds.

Analysis of Results

The prices presented in the analysis are based on the price consumers would be paying for the produce items. This can help producers figure out the expected prices of produce items at a farmers' market. However, the grocery store prices do not reflect what a producer would expect from selling directly to a grocery store, these prices can vary greatly based on the grocery store policy and contract agreement, but the seasonal trends and price differences can help estimate a marketing strategy.

From a producer point mat use the results look at the price differences between grocery stores and farmers' market, as well as the price differences for produce varieties, and if the organic price premium is significant enough to cover the organic certification costs. We will also explore significant area differences, if there are any, so a producer could expect higher or lower price premiums in these areas. Further, we will look at the monthly price difference between farmers' markets and grocery stores, it may be beneficial for producers to target certain produce items, in specific market areas, at certain times of the year.

Tomato Varieties

Table 4.3 displays the results of the Pooled OLS model for tomato varieties accounting for heteroscedasticity using white's robust standard errors. Tomato varieties are compared to vine ripened tomatoes, and prices are compared to the baseline of the Salt Lake City area during the month of July.

Table 4.3. Tomato Variety Comparison between Farmers' Markets and Grocery Stores with Time and City Effects

	Dependent Variable:			
	Price per Lb.			
	Farmers' Market Varieties	Grocery Store Varieties	Farmers' Market Varieties w/ Organic	Grocery Store Varieties w/ Organic
Constant	2.650***	1.947***	2.398***	1.821***
	(0.261)	(0.077)	(0.248)	(0.071)
Cherry Tomatoes	2.219***	2.951***	2.216***	2.943***
	(0.249)	(0.072)	(0.241)	(0.072)
Roma Tomatoes	-0.118	-0.658***	-0.088	-0.622***
	(0.139)	(0.043)	(0.136)	(0.036)
Organic			1.000**	0.397***
			(0.433)	(0.061)
Logan	-0.317	-0.113*	0.099	-0.104
	(0.276)	(0.068)	(0.266)	(0.067)
Ogden	-0.644**	-0.079	-0.355	-0.102*
	(0.285)	(0.060)	(0.277)	(0.059)
Kaysville/Layton	-0.971***	0.028	-0.556**	0.077
	(0.261)	(0.089)	(0.224)	(0.087)
Moab	-0.241	0.349*	-0.961**	0.272
	(0.282	(0.200)	(0.459)	(0.201)
Roosevelt	0.042	-0.913***	0.444	-0.792***
	(0.709)	(0.137)	(0.721)	(0.137)
Vernal	-1.626**	-1.037***	-1.277*	-0.917**
	(0.699)	(0.400)	(0.717)	(0.398)
June		-0.007		-0.008
		(0.070)		(0.069)
August	-0.248	-0.057	-0.446	-0.043
	(0.313)	(0.080)	(0.279)	(0.079)
September	-0.614**	0.056	-0.774***	0.066
	(0.287)	(0.070)	(0.285)	(0.068)
October	-0.847	0.231**	-1.057**	0.241**
	(0.548)	(0.112)	(0.532)	(0.108)
Observations	192	971	192	971
R2	0.491	0.805	0.53	0.816
F Statistic	15.882***	330.581***	16.818***	325.956***

Note: *p<0.1; **p<0.05; ***p<0.01

The price differences are significant at the grocery store for the three varieties of tomatoes, whereas at the farmers' market only cherry tomatoes are significantly different. We can explain this qualitatively since farmers' market vendors tend to combine tomatoes together and price as either dollar per pound or as a unit amount per dollar, without distinguishing between Roma or vine ripened tomatoes. The organic certification is significant at both farmers' markets and grocery stores; however the price premium is more than double at the farmers' market at $1.00 more expensive compared to conventional tomatoes. The grocery store organic price premium is significant, but the premium is only $0.40 more expensive compared to the conventional tomatoes.

Comparing area differences, Roosevelt and Vernal show significant price differences at the grocery stores and stay significant when we add the organic indicator. However, we left them in the analysis to have more accurate seasonality coefficients. Part of the significance of these areas can be explained by the lack of observations, so any observation becomes significant. Farmers' market price discounts occur in the Ogden, Kaysville/Layton areas when we do not account for organic production, however Ogden's significant price discount diminishes when we include organic production, the Kaysville/Layton area retain a significant price discount for conventional production compared to the Salt Lake area.

The seasonal differences at the grocery stores do no show significant monthly effects with the exception of October where there is a significant price premium of $0.24 relative to July. Early season tomato varieties were not available at the farmers' markets in June. With the baseline set to July, there is a slowly increasing price discount throughout the summer with significant price discounts in September at $0.77 and October at $1.06.

As a producer, Table 4.3 shows that among the tomato varieties, cherry tomatoes have the highest price premiums available. Organic price premiums are available through both grocery stores and farmers' markets; however the premium is higher for farmers' markets, and my help to offset the costs of becoming a certified grower. In deciding what area would be best to sell produce, these results show that there are only significant differences in the Kaysville/Layton area and Moab, which offer price discounts at the farmers' markets. Seasonality could play an important role for a producer deciding where to sell their tomato varieties. The grocery store has fairly consistent prices throughout the growing seasons, whereas the farmers' market shows to have higher price discounts in the later part of the seasons. Meaning, a producer could maximize profits by selling at a farmers' market in the early season months and as the season continues start off loading more produce to the grocery stores.

Leafy Green Varieties

Table 4.4 continues our analysis with leafy green varieties like, spinach, romaine lettuce, and mixed greens. The baseline comparison that we use for our leafy green varieties is spinach sold in the Salt Lake City area in June, which is the constant in the analysis, the coefficients shown in the results are either a premium or a discount from the baseline. Using Pooled OLS and white's robust standard errors, which corrects for heteroskedacity our results are as follows.

Table 4.4. Leafy Green Variety Comparison between Farmers' Markets and Grocery Stores with Time and City Effects

	Dependent Variable: Price per Lb.			
	Farmers' Market Varieties	Grocery Store Varieties	Farmers' Market Varieties w/ Organic	Grocery Store Varieties w/ Organic
Constant	6.977***	3.083***	7.023***	2.266***
	(0.870)	(0.271)	(0.883)	(0.210)
Mixed Greens	-0.803	4.923***	-0.919	4.723***
	(0.858)	(0.368)	(0.907)	(0.298)
Romaine Lettuce	-3.670***	-1.294***	-3.573***	-1.375***
	(0.786)	(0.174)	(0.770)	(0.124)
Organic			-0.394	1.834***
			(0.613)	(0.195)
Logan	-1.413***	-0.214	-1.418***	-0.026
	(0.457)	(0.188)	(0.460)	(0.174)
Ogden	2.088**	-0.090	2.082**	0.158
	(0.849)	(0.199)	(0.855)	(0.173)
Kaysville/Layton	2.086*	0.194	1.832	0.598*
	(1.232)	(0.385)	(1.276)	(0.333)
Moab	-1.595*	2.252***	-1.256	2.339***
	(0.936)	(0.798)	(1.078)	(0.600)
Roosevelt		-0.866**		-0.487
		(0.423)		(0.583)
Vernal		-0.290		0.595***
		(0.249)		(0.212)
July	1.764**	0.374	1.946**	0.387*
	(0.790)	(0.265)	(0.848)	(0.228)
August	0.673	-0.360	0.760	-0.217
	(0.957)	(0.368)	(1.020)	(0.289)
September	-0.219	-0.468	-0.117	-0.285
	(0.549)	(0.315)	(0.610)	(0.246)
October	-1.521**	-0.822**	-1.412*	-0.672***
	(0.697)	(0.389)	(0.771)	(0.290)
Observations	106	904	106	904
R2	0.509	0.650	0.512	0.713
F Statistic	9.87***	137.96***	8.95***	170.49***

Note: *p<0.1; **p<0.05; ***p<0.01

The prices are statistically different at both the farmers' markets and grocery stores for the romaine lettuce, whereas mixed greens are not significantly priced different than spinach at the farmers' markets and they are significantly different at the grocery stores. Grocery stores show a significant price discount of $1.38 per pound for romaine lettuce, whereas the farmers' market shows a significant price discount of $3.57 per pound compared to spinach. The organic premium at the grocery store is significantly positive, whereas at the farmers' market it is not significant. A possible explanation for this is that there is more opportunity to talk with the vendor about production practices at the farmers' market and whether or not they are certified organic becomes less important. Whereas, at the grocery store, that formal communication is not possible and a consumer relies on the labeling of the produce items and the premium that is associated with organic labeling.

In the comparison by area and month it is more difficult to make any inferences. There are no leafy green varieties available at the farmers' markets in Roosevelt and Vernal and very few observations at the Moab farmers' market, also the variability of the prices at each of the remaining farmers' markets is large. This is a problem that could be solved with more data collection. The Logan area is significantly less expensive at the farmers' markets with a discount of $1.42 per pound, whereas the Ogden area is significantly more expensive with a premium of $2.08 per pound. When we compare the area price differences among the grocery stores, there is a significant price difference for Kaysville/Layton, Moab, and Vernal areas. However, we should not draw too many conclusions from the Vernal and Moab areas since there is a lack of data. We can conclude that the Kaysville/Layton area has a significant price premium of $0.60 per pound on greens compared to the Salt Lake City area. When we add the organic indicator the Kaysville/Layton area coefficient increases from 0.194 to 0.595 and becomes significant, meaning that the Kaysville/Layton area values their conventional produce more than the Salt Lake City area.

Although there is not a lot of significance when comparing seasons, there are some trends that we see. Early season greens at the farmers' market are significantly less expensive than in July, and although not significant, there is a positive premium for the month of August as well. These are the hotter months when greens have a harder time growing in most Utah climates. When the weather starts cooling off in September there is a discount on greens, which is not significant, but October has a significant price discount.

For producers, spinach at the farmers' market can be sold for $7.02 per pound while mixed greens are not statistically priced different than spinach, romaine offers a price discount of $3.57 per pound. Whereas the grocery store sells spinach at an expected price of $2.27 per pound, and mixed greens have a price premium of $4.72 per pound. Conventional greens have the highest price premium in Ogden at the farmers' markets for $2.08 per pound. However, there is a lot of variability in prices and the availability of greens is sporadic at the farmers' markets, especially in the hotter months. Consistently making greens available during the entire growing season would be the best practice, since this is a produce item that is not readily available throughout the whole growing season and especially during the hotter months a higher premium can be demanded.

Seasonality of the Medium Market Basket

Without thinning the number of observations by including area indicators, we wanted to look at the seasonality of conventional produce items in the medium market basket and compare between farmers' markets and grocery stores. Using OLS with monthly effect and white's robust standard errors, Table 4.5 summarizes the results.

Table 4.5. Farmers' Market and Grocery Store Seasonality Comparison of the Medium Market Basket ($/Lb.)

	Produce Item							
	Carrots		Sweet Corn		Cucumbers		Garlic	
	Farmers' Market	Grocery Store	Farmers' Market	Grocery Store	Farmers' Market	Grocery Store	Farmers' Market	Grocery Store
Constant	3.478***	0.720***	0.689***	0.539***	1.717***	0.870***	8.049***	4.268***
	(0.322)	(0.019)	(0.056)	(0.029)	(0.166)	(0.041)	(1.069)	(0.259)
June	-1.478***	0.084**		-0.005		0.114**		0.357
	(0.322)	(0.036)		(0.038)		(0.054)		(0.378)
August	-1.535***	0.083	-0.279***	-0.122***	0.835***	0.136**	-2.192	-0.379
	(0.371)	(0.060)	(0.059)	(0.032)	(0.184)	(0.055)	(1.336)	(0.334)
September	-1.699***	0.103	-0.289***	0.015	-0.637***	0.396***	-0.971	-0.750***
	(0.370)	(0.073)	(0.063)	(0.050)	(0.202)	(0.060)	(1.311)	(0.291)
October	-1.952***	0.325	-0.396***	0.072	-1.071***	0.715***	-1.449	-0.687**
	(0.519)	(0.232)	(0.056)	(0.055)	(0.183)	(0.137)	(1.092)	(0.346)
Observations	50	222	51	237	70	255	56	222
R2	0.897	0.793	0.949	0.845	0.843	0.922	0.815	0.880
F Statistic	78.46***	166.34***	219.67***	253.31***	69.56***	587.12***	57.39***	318.67***

	Produce Item									
	Green Bell Peppers		Red Potatoes		Zucchini		Vine Tomatoes		Cantaloupe	
	Farmers' Market	Grocery Store	Farmers' Market	Grocery Store	Farmers' Market	Grocery Store	Farmers' Market	Grocery Store	Farmers' Market	Grocery Store
Constant	2.581***	1.954***	2.233***	0.909***	1.382***	1.145***	2.209***	1.624***	0.624***	0.645***
	(0.234)	(0.087)	(0.181)	(0.027)	(0.114)	(0.042)	(0.136)	(0.059)	(0.030)	(0.044)
June		-0.254		-0.045		0.183**		0.015		-0.108**
		(0.109)		(0.037)		(0.075)		(0.083)		(0.050)
August	-1.217***	-0.299***	-0.862***	0.016	-0.657***	-0.107*	-0.631***	-0.047	0.276***	-0.149***
	(0.261)	(0.101)	(0.238)	(0.037)	(0.156)	(0.064)	(0.158)	(0.076)	(0.092)	(0.049)
September	-0.822*	-0.350***	-0.749***	0.039	-0.389*	0.457***	-0.680***	0.032	0.175*	-0.155***
	(0.452)	(0.107)	(0.230)	(0.042)	(0.235)	(0.117)	(0.198)	(0.081)	(0.099)	(0.049)
October	-1.176***	0.220**	-1.566***	0.059	-0.717***	0.392***	-1.429***	0.204*	-0.260***	-0.072
	(0.249)	(0.097)	(0.230)	(0.092)	(0.152)	(0.077)	(0.180)	(0.111)	(0.030)	(0.059)
Observations	56	257	54	256	69	235	61	257	45	241
R2	0.699	0.925	0.874	0.942	0.678	0.861	0.906	0.937	0.828	0.884
F Statistic	30.14***	620.75***	86.78***	814.06***	34.30***	248.65***	137.52***	755.61***	49.33***	360.24***

Note: *p<0.1; **p<0.05; ***p<0.01

Overall we can see that grocery stores do not have the seasonality effects that farmers' markets show. Also, the availability of produce items are more consistent at the grocery stores compared to farmers' markets and the variability of prices is more consistent at the grocery store, which is something that we found in Chapter 3. With the exception of cucumbers and carrots there was no produce available at the farmers' markets in June, therefore the baseline for these regressions is July.

Consistently July is shown to have the highest price premium at the farmers' markets, with the exception of cantaloupe which has a higher price premium in August. Also, all of the produce items, with the exception of garlic, are significantly less expensive at the farmers' markets in October relative to July. Additionally, there is a significant price discount trend at the farmers' market for sweet corn, cucumbers, and vine tomatoes as the growing season progresses. Whereas at the grocery stores there is a significant price premium trend for cucumbers, zucchini, and vine tomatoes.

As a producer it is good to know that early season produce can consistently expect a higher price premium at the farmers' market and when produce becomes more abundant and prices decrease. Table 4.5 shows that grocery stores have the price premiums in the later growing months (i.e. September and October). The stipulation is that these prices are not what a producer should expect to receive at the grocery store, and each grocery store will have different wholesale prices they pay to producers, however this price trend information is a helpful reference when figuring out a market strategy.

As a consumer it is good to know that as produce becomes in season it is not necessarily more expensive, in fact it is quite competitive at the farmers' market. This is especially useful information for price sensitive consumers who have access to SNAP and DUFB which can increase their purchasing power at the farmers' markets.

CHAPTER 5

CONCLUSIONS

The purpose of this study is to quantify the price differences for fresh produce between farmers' markets and grocery stores throughout Utah. The motivations for this study include: the U.S. population is not meeting the dietary recommendations on fruit and vegetable consumption, especially among low income populations. There are perceptions that farmers' markets are more expensive than grocery stores and studies that have examined the price differences do not come to a consensus. These studies are conducted regionally which also makes it difficult to make broad assumptions. It must be noted that a national study done by the USDA – ERS found that during a ten month period direct market channels, including farmers' markets and roadside stands, were found to be less expensive than grocery stores. Studies have also shown that shopping at a farmers' market can lead to increased purchase of fresh fruits and vegetables.

We have shown in Chapter 3 that a basket of conventional produce is not more or less expensive, but it does depend on what type of produce a consumer buys at a farmers' market. The most abundant produce items at farmers' markets: cucumbers, tomatoes, corn, and zucchini are significantly less expensive, and there are other items that are just as price competitive as the ones sold in a grocery store. Especially when we account for low income food assistance programs like Double Up Food Bucks, farmers' markets can be significantly more affordable for low income consumers.

Another reason for conducting this study is that the number of farmers' participating in DTC sales has been plateauing in recent years, and the revenue from DTC sales has been decreasing, when adjusted for inflation. The reasons for this are that producers are finding intermediate channels to sell produce through either restaurants or wholesale to grocery stores. Also, since the rise of the local food movement there has been a growing demand for grocery stores to market local produce making it more convenient for the consumer, yet taking away the appeal of the local farmers' markets. Although this study cannot quantify the profitability of a producer either selling at a farmers' market or a grocery store, we can show the expected prices in each of the markets.

Chapter 4 used hedonic price analysis model to find the marginal price of produce varieties, by market type, month, and area. The selection of tomato varieties show that cherry tomatoes demand the highest price premium at both farmers' markets and grocery stores, and that Roma tomatoes have a statistically significant discount at the grocery store whereas they are not priced any differently at the farmers' markets compared to the baseline vine ripened tomatoes. Organically produced tomatoes can offer a higher price premium at the farmers' market compared to the grocery stores. Monthly effects show that farmers' markets have early season price premiums and late season discounts.

Chapter 4 also revealed that leafy green varieties have significant price differences between the varieties of leafy greens where mixed greens could offer the highest premium at the grocery store, on the other hand spinach and mixed greens do not have distinguishing price differences at the farmers' market. Organic production has significant effects at grocery stores and less so at the farmers' markets. The monthly and area effects are not easily defined because of inconsistent availability and large variability in price.

Chapter 4 also covered the seasonality difference of the medium market basket of conventional produce we analyzed in chapter 3. This shows that there are large seasonality effects at farmers' markets whereas grocery stores have more stable prices throughout the growing season. Not only did we see significant price discounts at the farmers' markets as the growing season progressed, but also a significant price premium at the grocery stores in the later part of the growing season. These seasonality differences can help a producer figure out their marketing strategy of selling produce to the market with the highest premiums available.

Although this study cannot be generalized to a national scale, we have shown that farmers' markets can be price competitive in some instances, either an individual produce item in general is less expensive or because of the time of year, a produce item becomes more affordable at the farmers' markets. This research can be used as supporting evidence for policy makers in addition to advocates of affordable and accessible fresh produce which shows that farmers' markets can be a viable alternative for low-income consumers seeking affordable fresh produce. We have also shown that programs like the DUFB are important for increasing affordability of farmers' markets, especially during the early season when farmers' markets do not have significant price discounts, or for produce types that are less abundant at the farmers' market and possibly have a higher price premium. We can apply this to extension programming to help producers figure out budgets and estimate revenue streams. This can also show academics that when looking at these price comparisons seasonality and areas can play a role in the price premiums.

Other limitations to this study include the ability to estimate the profitability of individual producers, since that is determined by the amount of revenue brought in, which is dependent on the type of market and how much is being sold, less the production and labor costs, which is different for each producer. However, this study can help producers create a better marketing strategy to maximize their profits. Although not a direct goal, but a motivation for this study is to increase the consumption of fresh produce for low-income consumers. Although we cannot directly impact consumption, by illustrating the price differences in the various areas and market channels we can help consumers spend their money more efficiently.

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APPENDICES

Appendix A: Large and Small Market Basket Price Comparisons by Month and Area

Additional figures explaining the price comparisons of the small and large market baskets by month and area.

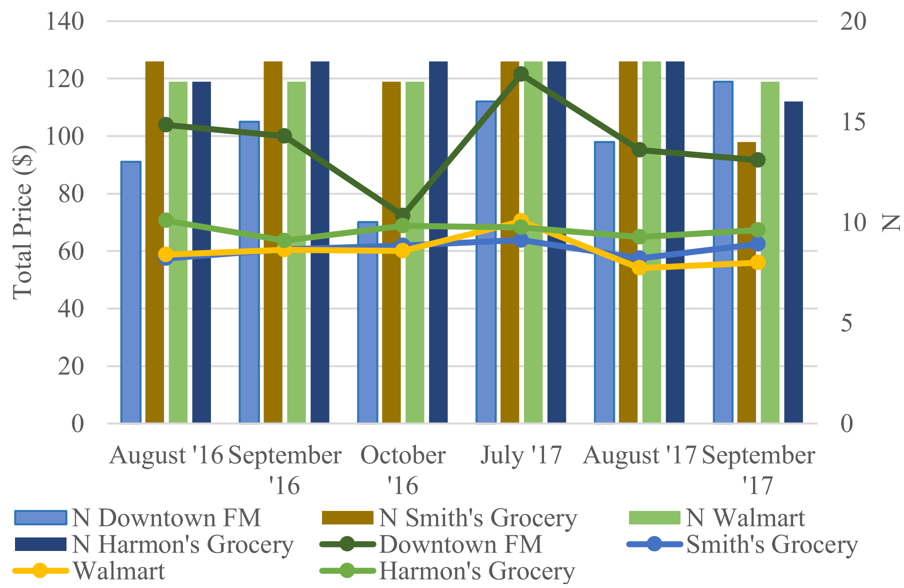

Figure A.1. Large market basket price comparison by month for the Salt Lake City area

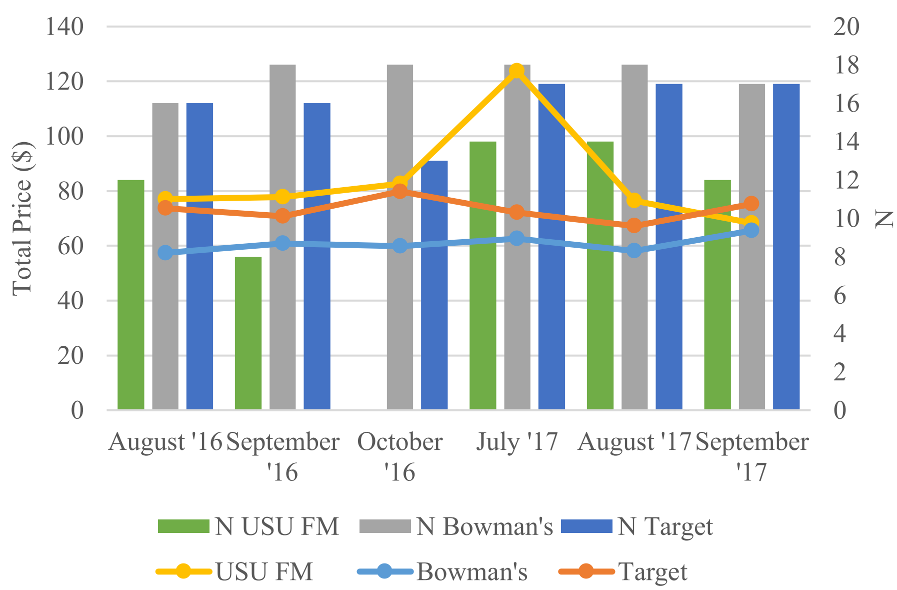

Figure A.2. Large market basket price comparison by month for the Kaysville/Layton area

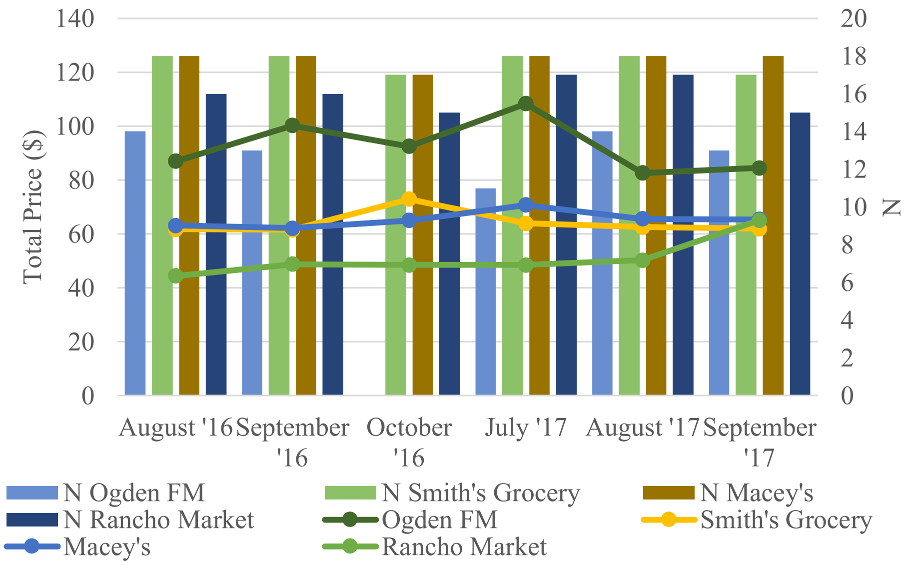

Figure A.3. Large market basket price comparison by month for the Ogden area

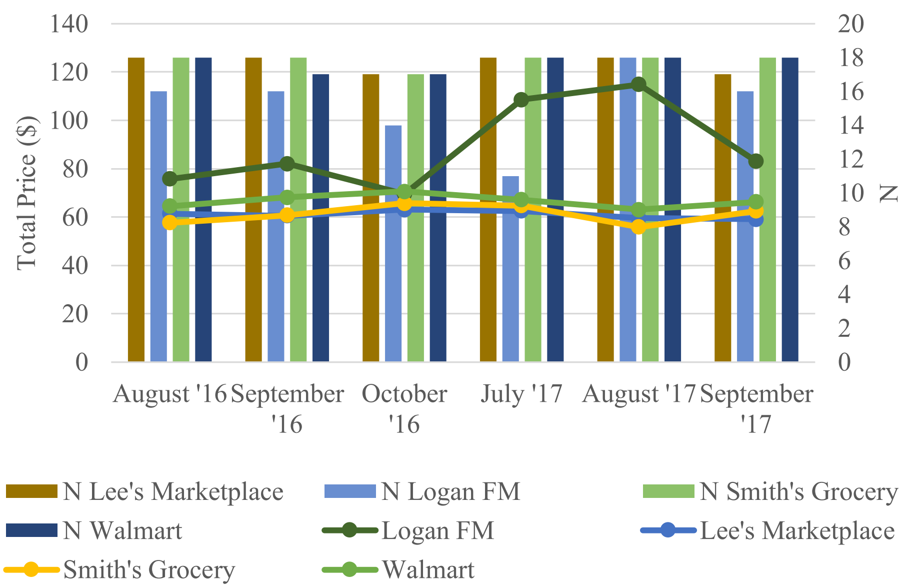

Figure A. 4. Large market basket price comparison by month for the Logan area

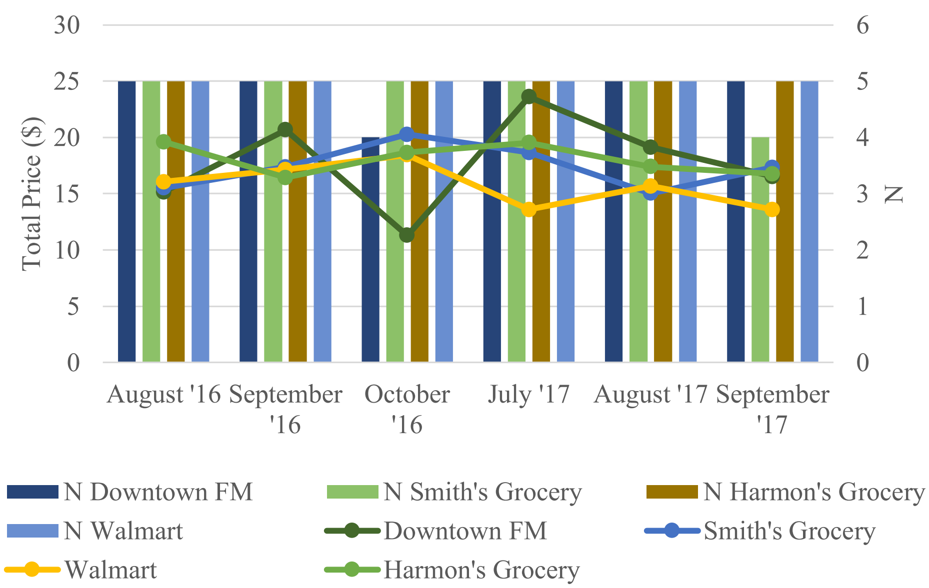

Figure A.5. Small market basket price comparison by month for the Salt Lake City area

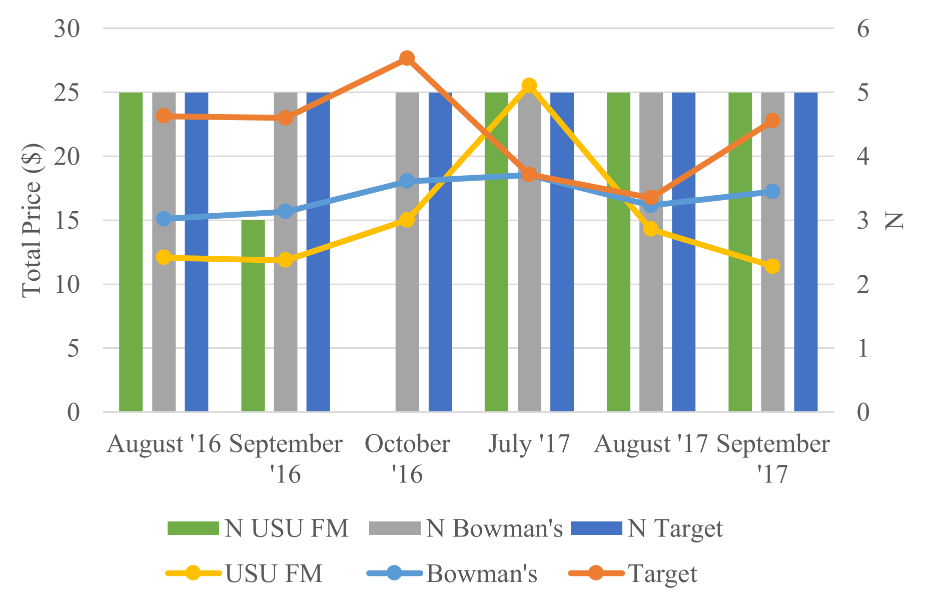

Figure A.6. Small market basket price comparison by month for the Kaysville/Layton area

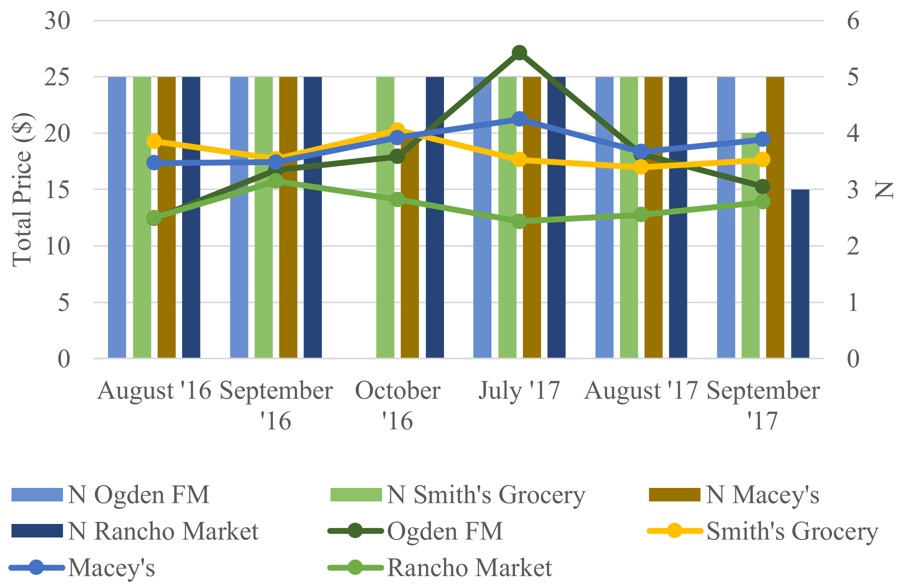

Figure A.7. Small market basket price comparison by month for the Ogden area

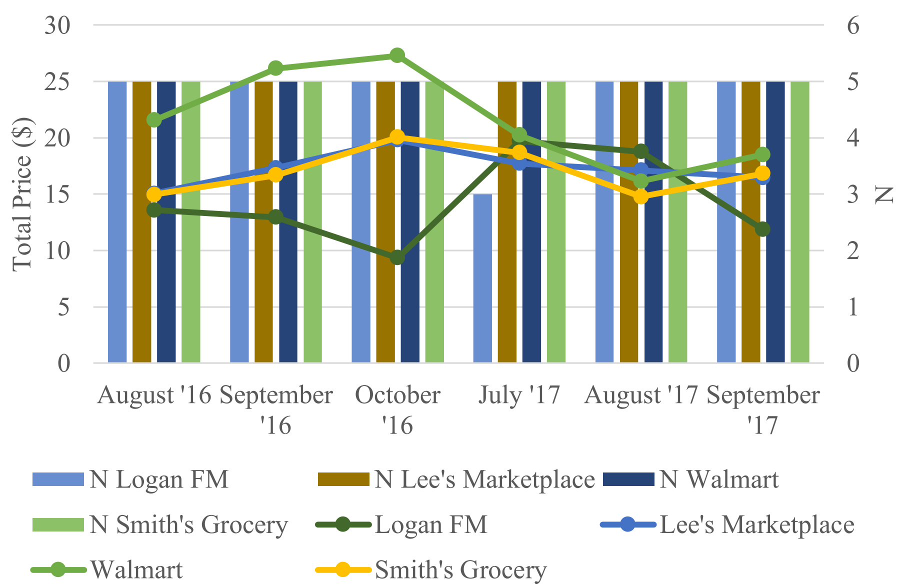

Figure A.8. Small market basket price comparison by month for the Logan area