Does Organic Command a Premium When the Food is Already Local?[1]

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Abstract

The emergence of community supported agriculture (CSA) farms has received attention as a new way for small farms to remain competitive while engaging their local community through direct marketing. In this study, we report some of the first revealed preference valuation of CSA attributes using data on share prices and CSA characteristics for the summer 2011 season. Using data on the prices and attributes of 188 CSA farms spanning Ohio and Pennsylvania we use hedonic and nearest-neighbor covariate matching methods to uncover consumer valuations of CSA attributes including various types of organic certification. Results from a semi-log hedonic reveal a price premium of approximately 10% for USDA organic certification, which is immune from potential biases introduced in more traditional retailing settings where perceptions of organic and local may be difficult to unbundle. In addition, we find no price premium associated with a competing organic certification program, suggesting that consumers are differentiating between types of organic certification in the local foods market. We also find a statistically significant premium associated with longer seasons, delivery, and the provision of additional products beyond fruits and vegetables.

Keywords: Organic; Local foods; Matching; Hedonic; Community supported agriculture

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I. Introduction

The number of small and medium sized farms across the United States has decreased substantially over the past 20 years. A variety of explanations is given for this trend, including increased competition from larger multi-farm corporations and the expansion of food retailers able to provide a large variety of fresh food offerings at low prices. Recently local production, and specifically organically grown produce, has taken on a prominent role in the marketing of food products and has provided additional revenue streams for small, local farms specializing in these commodities. The emergence of community supported agriculture (CSA) farms has created a direct marketing link between local consumers and local farmers and provided new, often niche, markets for small farms. As the local foods and CSA industry matures, it is important for CSA owners to understand what attributes of their CSA are attractive to potential customers to enable them to better tailor their products to consumers. In this paper we provide some of the first empirical evidence of consumers' valuation of a variety of characteristics typical of CSAs and the products they produce with a particular focus on the role of organic food production and certification.

In a CSA individuals purchase shares of a local farm's production at the beginning of a growing season in exchange for produce realized later in the season. This risk-sharing model benefits both farmers, who receive an up-front influx of capital, and consumers, who receive local produce that may be difficult to obtain through traditional retailing markets.[2] In addition to the local connection provided by these farms, many CSAs also advertise the pesticide-free

[2] In a single period, the consumer assumes the production risk. However, over multiple repeated seasons failure to provide adequate product would result in declining membership and place some risk on the producer.

aspects of their farming practices, including claims of natural, certified naturally grown, certified organic, and organic exempt produce. These certifications often come at considerable cost to the local farms in terms of both time required for certification and fees and it is important for farmers and policymakers to accurately understand the potential value of these certifications by consumers.[3]

The existing revealed preference literature provides substantial evidence that consumers are willing to pay a premium for organically labeled produce; however, few studies disentangle the role of organic labeling from that of local food production. Focusing on CSAs allows us to isolate consumer valuations for various attributes of CSA farms, including organic certification, while controlling for local food production since by construction the CSAs in our study only provide locally produced foods. As a result, our findings of a positive and significant premium associated with organic produce are immune from potentially confounding issues associated with differentiating local and organic perceptions that could complicate econometric identification in a more traditional retail setting.

In the current paper we carry-out both hedonic and nearest-neighbor covariate matching analysis to examine consumer valuations of CSA attributes. We find a substantial premium is associated with farms providing organic produce, but that a similar benefit is absent from farms that advertise as certified naturally grown. In addition, we find intuitive results for other attributes of CSA farms suggesting consumers are aware of the different attributes offered by CSAs and make tradeoffs when selecting among CSAs with differentiated characteristics. The next section provides additional background on local foods and the associated literature on organic products. Section three discusses our dataset on CSA farms and prices for the 2011

[3] While pecuniary costs are generally low, the bureaucratic costs may be substantial for small farms.

summer season while sections four and five outline our estimation strategy and discuss our results. Section six concludes.

II. A Review of Organic and Local Foods

Local, direct marketing has become increasingly popular for small farms. The number of farmers markets has grown from 1,755 in 1994 to 7,175 in 2011 (USDA Farmers), while there were 12,549 farms that advertised CSA's in the USDA Ag Census conducted in 2007. One explanation for the rapid growth in local, direct-marketing farms is the wide variety of benefits presumed to accrue to both farmers, through the creation of new markets for products, and consumers, who may place value on local foods. As outlined in a recent review of the local foods literature, Brown and Miller (2008) highlight the perceived positive impacts on consumers from CSA farms including improved health from eating fresh produce and increased variety of produce (Oberholtzer, 2004).

To provide an economic measure of the potential value associated with CSA membership, several authors have compared the cost of purchasing the quantity of organic produce received through a CSA membership with the cost of purchasing a similar quantity of organic produce through traditional retailers. The majority of this literature has shown that a CSA offers a better return compared to purchasing the produce from traditional retailers (Farnsworth et al., 1996).[4] In a more recent analysis of CSA farms in New York, Conner (2003) found that the value of a CSA relative to retail purchase was in one case dependent on whether or not a consumer picks their own produce at the farm. This study highlights the need to examine the attributes of CSA farms since key distinguishing features may impact their attractiveness to

[4] This finding does not consider that a household shopping solely in a retail environment may not choose to consumer the same quantity or variety of produce.

consumers. While much of the existing economic evaluation of CSA farms compares the value of CSA produce to organic retail purchases, there are few studies that provide evidence of consumers' actual willingness to pay for the different types of produce offered by CSA farms and the differences between CSA farm experiences.

The literature on CSA pricing suggests that farm operators consider their operating costs and farm expenses in determining optimal pricing while they often ignore the value of the opportunity costs of their own labor (Tegtmeier and Duffy, 2005). This implies that price varies depending on the characteristics of the CSA, particularly if those attributes are costly to produce. Examples of these attributes include food delivery, quantity of deliveries, non-produce offerings, as well as expenses related to organic certification. To attract customers, the prices offered by CSAs must match consumer's willingness to pay, which is also likely to vary along observable attributes of CSA farms that compete with each other for shareholders. Invariably this competition leads to product and price differentiation among CSAs in close proximity to each other.

One aspect in which differentiation is likely is the organic status of produce. The decision of a CSA farm to provide certified organic produce is likely to impact costs and yields to the farmer as well as the perceptions of the produce when received by consumers. Organic food often has a higher cost of production compared to conventionally grown produce due to the costs of certification as well as potential decreases in yield. Park (1996) found that price differences between organic and conventional produce could be explained in large part by demand, suggesting that organic advertising is a key means of improving farmer profit. This finding is consistent with the expansion of organic marketing across all food sectors and the associated increase in sales from $3.6 billion in 1997 to $21.1 billion in 2008 (Dimitri and

Oberholtzer, 2012) despite the lack of a widely accepted organic certification program during much of this time period.

To address the lack of standards across organic producers, the USDA established the National Organic Program to define uniform procedures for organic certification. The USDA organic certification process requires an Organic System Plan that describes the practices, substances, monitoring procedures and management practices the farm intends to employ in order to maintain organic production, as well as land use for the previous three years. This plan is analyzed by a 3rd-party certification agency to ensure that all NOP standards are met. Each farm also partakes in an on-site inspection, and if accepted the farm must continue updating their information annually. In order to be certified organic by the USDA there are several fees that must be paid to the certifying agent. One such agent employed by several of the farms in our current study, the OEFFA, lists fees ranging from $725-$825.[5]

To avoid the USDA organic certification process, competing certification programs have arisen. Certified naturally grown (CNG) is a program run by a non-profit organization that follows the NOP standards and is a competitor to the national USDA certification which some small farms view as burdensome. Its goal is to allow farms to signal to consumers their pesticide-free status while avoiding the lengthy USDA process. Members choose their own certification donation, though produce certification requires a minimum annual fee of $125. An application must be completed, but is significantly less involved than USDA certified organic. Inspections are done by nearby CNG farmers, and each member is expected to conduct at least one inspection of a farm within a one-hour drive.

[5] A farm with less than $5,000 in annual, gross organic agricultural sales may file for exempt status. These farms must still follow all NOP guidelines and maintain records for relevant state agencies.

As the sale of local produce becomes more prevalent, understanding the demand-side drivers is of increasing importance to local farmers and policymakers. Local is a vague term and can be confused with a variety of attributes, including freshness and organic. In order to differentiate consumer WTP for local strawberries Darby et al (2008) used a choice-based conjoint analysis and found that consumers showed a preference for locally grown produce, though there was no distinction for a specific state vs. region label. Consumers also preferred smaller farms, though this effect was limited. Toler (2009) used an experiment of bidding on different distributions of a monetary sum ($11) and found participants were more willing to allocate funds to local vs. non-local farmers, and that some portion could be attributed to a preference for fairness.

In early evidence on consumers' willingness to pay for organic, Thompson and Kidwell (1998) conducted a consumer survey at retailers offering both organic and conventional products and found an organic price premium that ranged from 40% to 175%. Loureiro (2001) measured WTP of Colorado consumers and found they were willing to pay a premium of 5 cents per pound for local potatoes, compared to 3 cents for organic. Misra (1991) found that 46% of household survey respondents were willing to pay a premium for certified pesticide-free food. Roosen (1998) used an auction where consumers could bid to exchange their endowed bag of conventionally-grown apples in order to measure consumer WTP for insecticide reduction. He found consumers were willing to pay on average 9%-18% more for produce that was not grown with certain pesticides.

To disentangle the value of local from organic, several authors have applied stated preference methods. Lusk (2009) used a best-worst scale to measure how consumers valued different food attributes, and followed up with questions about WTP. He found that food safety mattered most, followed by nutrition, taste and price, while origin was one of the least important values. He also found that consumers most willing to pay for organic tended to be concerned with naturalness and environment, but not as much with safety, and that organic purchasers were less concerned with price. Batte et al. (2006) used a survey to measure WTP for organic multi-ingredient processed foods, and found that not only was there a WTP for organic cereal but that WTP increased as the percentage labeled organic increased. This WTP differed between consumers of traditional grocery stores and specialty natural stores.

III. Data

The primary data source of CSA characteristics in our analysis is Local Harvest, an independent website that maintains a database of CSA's across the United States. This data is entered by the CSAs themselves and includes a wide range of attribute and pricing information. Between October, 2011 and November, 2011 we collected data on CSA pricing and attributes covering both Ohio and Pennsylvania for the 2011 summer growing season. Lastly, we updated and verified the attributes obtained from Local Harvest using data from CSA websites and shareholder agreements which were obtained directly from CSA websites.

In total, we collected data on 264 CSAs containing both address and pricing information. We restricted our attention to direct marketing CSAs, eliminating 26 farms which were part of 3rd-party marketing efforts. We further restricted the set of CSAs to only those with either current websites or those who had updated their Local Harvest listing in 2009, 2010, or 2011.[6] This removed an additional 15 CSAs which we were unable to verify were in operation during the 2011 season. To focus solely on the summer growing season, we removed CSAs with delivery dates spanning the winter months of September through February resulting in a further

[6] Specification 2 in appendix Table A2 provides a robustness check.

reduction of 32 CSAs. Lastly, we removed 3 additional CSAs due to missing attribute data ending with a final dataset of 188 CSA farms.

Combining data from Local Harvest with information contained on CSA websites provided a wide range of attributes. In addition to the price of a full summer share and number of weeks[7] in the summer season, we also obtained data on the number of pickup locations and pickup days, whether delivery was provided, work on farm options, whether the CSA provides products beyond fruits and vegetables, if the CSA provides food from more than one farm, the use of a pest management plan, as well as location information and detailed information on farming practices. Using ArcGIS, we geocoded the location of each CSA and calculated the distance to the nearest city with a population over 100,000. We further assigned each CSA to one of 12 regions, defined in relation to major population centers. The locations of CSAs, municipal areas, and regions are shown in figure 1.

Using data on farming practices, mutually exclusive farming practice categories of naturally grown, organic exempt, certified organic, certified naturally grown, and conventional were assigned to each CSA. As numerous farms classified themselves as both conventional and naturally grown, we combined these two categories. Several farms also classified themselves as certified organic, organic exempt, or certified naturally grown and categorized themselves as naturally grown. For these farms, we chose to assign them based on the former classifications as it is a more specific characterization. No farms identified themselves as combinations of certified naturally grown, certified organic and organic exempt. Summary statistics for the farms falling within each category as well as the additional attributes of those farms are shown in table 1.

[7] Only 78 CSAs reported week information directly, while the remainder provided start and end months. To impute weeks, we estimated a regression of start and end months on total weeks and used those estimates to predict total weeks. Specification 3 in appendix Table A2 uses 4*months as a robustness check.

Across all farms, the average price of a 21.5 week summer season was approximately $535. The average farm had slightly over 2 pickup locations and 1.6 pickup days. Only 2.1% of farms delivered food directly to their members while fewer than 10% allowed members to pick their own produce. Turning to farming practices, 19% of farms advertised that a pest management program existed on their farm. Nearly 25% of the farms identified themselves as either certified organic or organic exempt while a further 6.3% participated in the certified naturally grown program.

Figure 1 also shows the distribution of farming practices, with certified naturally grown farms shown as squares and both certified organic and organic exempt farms as triangles. Organic farms are, on average, located closer to large metropolitan areas than other CSA farms, approximately 13 km from a city compared to 19 km for non-organic CSAs. The same pattern is not as obvious for certified naturally grown farms, which tend to be located slightly further from large metro regions than organic farms. Overall, this examination suggests that there is a wide variety of farming practices across space providing variation for econometric identification.

IV. Econometric Model

To recover consumers' valuations for the various attributes and farming practices of CSAs we carry out first-stage hedonic estimation as well as nearest neighbor covariate matching estimation. Rosen's (1974) first-stage hedonic has been used extensively to decompose the price of bundled goods into their various attributes. In the context of food and agriculture, Nimon and Behin (1999) estimated a hedonic model of eco-labeled clothing and found a premium of over 30% associated with the use of organic fibers. In the space of organic foods, Maguire et al (2004) found evidence of an organic price premium for baby foods in the range of 16% to 27%.

Estes and Smith (2003) examined the willingness to pay for organic produce in Tucson, AZ supermarkets during the early 1990s using hedonic models and found a price premium of over 100% for organic apples.

The first stage hedonic is derived from a utility maximizing process where heterogeneous households are assumed to receive utility from consumption of a composite good made up of attributes, in this case the attributes of the CSA farm share, as well as numeraire consumption according to equation (1)

(1) $U^i = U^i(\boldsymbol{X_j}, c, \boldsymbol{\alpha^i})$,

where i is an index for household, $\boldsymbol{X_j}$ is the set of attributes associated with each of $j = 1 \dots J$ CSA farms, c is a numeraire good, and $\boldsymbol{\alpha^i}$ are household specific preference parameters. The bid function is an implicit function of the characteristics contained in the utility specification in equation (1) as well as household income and a reference utility level and is written as shown in equation (2)

(2) $\theta^i = \theta^i(\boldsymbol{X_j}, m^i, \boldsymbol{\alpha^i}, u^i)$

where u^i is the utility level and m^i is household income.

An equilibrium price schedule is obtained from equation (2) which is the well-known first-stage hedonic. Assigning a functional form to this price schedule has taken on a voluminous amount of interest in the early hedonic literature. Following Cropper et al (1988), we estimate a semi-log hedonic and include region specific fixed effects to control for unobservable location varying components of equilibrium prices as shown in equation (3)

(3) $\ln P_j = \beta_0 + \sum_{k=1}^{K} \beta_k X_{jk} + \sum_{r=1}^{R} \delta_r + \epsilon_j$

where $k = 1 \dots K$ is an index for attributes of each CSA, $\delta_r = 1 \dots R$ are region specific fixed effects, and ϵ_j is an idiosyncratic unobservable.

Our hedonic application differs slightly from the traditional derivation outlined in Rosen (1974) as we observe the prices offered by a discrete number of firms, rather than the individual purchase decisions of many individual consumers.[8] Recognizing the offer functions associated with the firm side of the hedonic equilibrium, Feenstra (1995) outlines the conditions under which hedonic specifications similar to equation (3) provide accurate valuation interpretations for the case of discrete firms. He shows that for profit maximizing firms, several conditions must be met. First, firms must compete in the same product varieties, a condition likely to be met in our CSA application of firms selling very similar produce. Second, firms must be perfectly competitive so the equivalency between price and marginal cost holds. Given the limited barriers to entry and exit in the CSA industry this assumption seems reasonable. With these two assumptions, Feenstra (1995) shows that the optimal bundles offered by firms align with utility maximizing consumers to form a hedonic equilibrium reflecting consumer valuation of attributes.

In addition to hedonic estimation, we perform nearest neighbor covariate matching to estimate the value of organic produce. Matching on the organic status of CSA farms enables us to identify whether a price premium for organic is present in the CSA market while controlling for differences in observable covariates that may influence pricing. The use of covariate matching also relaxes several strong identifying assumptions present in hedonic estimation and provides a flexible alternative to hedonic regression. First, matching flexibly controls for observable CSA attributes and is not subject to functional form considerations, while our hedonic model assumed a semi-log specification. Second, we can evaluate the appropriateness of the common support assumption directly by comparing differences in matched covariates to help identify the presence of poor matches. Following Imbens and Wooldridge (2009), we estimated

[8] This also explains the j subscripts used in equation (3) which are specific to each CSA firm.

the average treatment effect on the treated in order to recover the price premium associated with implementing organic farming practices. In our case, the treatment effect is the change in CSA price arising from the treatment of employing organic production that is paid by the consumers belonging to an organic CSA.

There are two primary types of matching methods, propensity score matching (PSM) as described by Rosenbaum and Rubin (1983) and nearest neighbor covariate matching (NN) which is frequently used in the program evaluation literature. We employ nearest neighbor matching because it allows for exact matching on key covariates, which we specify as geographic regions to control for potentially spatially varying differences (i.e. urban markets) which are likely to be present across the broad geographic study area used in our analysis. An identifying assumption for the consistency of matching estimators is rooted in discussions on the selection on observables. That is, we are relying on the assumption that after matching on observable attributes there are no unobservable differences in CSA farms between treated and control observations that systematically affect the price of CSA shares. To the extent that these factors may exist, they are likely to vary across spatial region. As with hedonic estimation, we control for unobservables across space by forcing matches to come from within the same spatial region, which is similar to the inclusion of region specific fixed effects in the first-stage hedonic.

The appeal of matching estimators lies in their ability to form a counterfactual (non-organic) outcome associated with each treated (organic labeled) CSA. Because each data point is observed uniquely as either treated or untreated, there is no directly observable counterfactual associated with a treated observation. Consider our J CSAs indexed by j=1,..,J, and an outcome variable W_j which defines whether or not a CSA is certified organic, where $W_j = 1$ is a treated (organic) CSA. The observed outcome Y_j is the the share price for a given CSA. Define $Y_j(1)$ as the price of a treated outcome (organic CSA price) and $Y_j(0)$ as the price of an untreated outcome (non-organic CSA price).

In practice, it is not possible to observe the price for an identical non-organic CSA $Y_j(0)$ associated with each certified organic share price $Y_j(1)$ as there is only one farm. The matching estimator is used impute the unobserved counterfactual, $\hat{Y}_j(0)$ using a set of control observations which are observationally similar to the treated outcome. In covariate matching, a full set of estimated outcomes can be expressed, in general, as

$$\text{(4a)}\quad \hat{Y}_j(0) = \begin{cases} Y_j, & if\ W_j = 0 \\ \frac{1}{M}\sum_{j\in\ell_M(j)} Y_j, & if\ W_j = 1 \end{cases}$$

$$\text{(4b)}\quad \hat{Y}_j(1) = \begin{cases} \frac{1}{M}\sum_{j\in\ell_M(j)} Y_j, & if\ W_j = 0 \\ Y_j, & if\ W_j = 1 \end{cases}$$

where M denotes the number of matches and $\ell_M(j)$ identifies the set of matched CSA farms. We observe the outcome $Y_j(1)$, which is the share price of organic CSAs, so we need only impute $\hat{Y}_j(0)|W_j = 1$ in our application. Matches are formed using a vector norm, $\|x\|_A = (x'Ax)^{\frac{1}{2}}$ that measures the closeness of a match in the K dimensional space of observable covariates. Following Abadie and Imbens (2011) we measure the distance between treated and control observations using Euclidean distance obtained from the diagonal elements of the sample covariance weighted by the inverse of their standard errors.[9]

The outcome of interest is the average treatment effect on the treated (ATT) which is defined as

$$\text{(5)}\ ATT = \frac{1}{J}\sum_j Y_j(1) - \hat{Y}_j(0).$$

[9] We also explored using alternative norms and found little qualitative difference.

In finite samples, the presence of inexact covariate matching can result in biased estimates as shown by Abadie and Imbens (2011). To correct for this bias, we follow Abadie and Imbens (2011) and employ a bias-corrected estimator that adjusts for differences in covariate values using an auxiliary regression given by,

(6) $\mu_0 = E\{P(0)|X = x\} = \hat{\beta}_o + \boldsymbol{\hat{\beta}'_1 x}$,

where linearity is assumed and OLS is used to estimate the regression. Estimates of the bias-corrected ATT are obtained by replacing $\widehat{Y_\iota}(0)$ with

(7) $\tilde{Y}_j^{BC}(0) = \frac{1}{M}\sum_{j\in\ell_M(j)} Y_j + \hat{\mu}_0(\boldsymbol{X_i}) - \hat{\mu}_0(\boldsymbol{X_j})$

and estimating equation (5). Abadie and Imbens (2006) derive the asymptotic properties of this estimator. Taken together, our hedonic provides estimates for a wide range of CSA attributes while we additionally use matching estimators to focus more narrowly on the role of organic production.

V. Results

First-stage hedonic results for two semi-log specifications of equation (3) are reported in table 2. The left-hand panel contains results for a model specification (A) that includes farming practices of certified organic, organic exempt, and certified naturally grown, compared to an omitted baseline category of natural/no certification. For the second specification (B) on the right side of table 2, we have combined organic and organic exempt into a single organic category. All other variables in the two regressions are the same. Comparing the two model specifications we find virtually identical coefficients and significance across both specifications, with slight changes in significance (although not magnitude) associated with the combining of organic produce categories.

Turning to the attributes of the CSA farms themselves, we find a small positive and significant effect associated with increasing the length of CSA season as one would expect given the additional produce provided. We also find a large and significant 18% premium[10] associated with delivery which likely reflects the enhanced convenience that direct delivery provides. Additionally, there is a positive and significant premium of nearly 9% associated with farms that offer goods beyond vegetables and fruit. These products often consist of baked goods, dairy and egg products. We find little significance associated with pickup locations, pickup days, and options to pick your own produce, perhaps reflecting the omitted variability in these attributes across our sample which may preclude identification. We find a negative, but insignificant effect associated with both pest management advertising and distance to the nearest metropolitan area. We find a positive effect of work on farm options and the use of multiple farms to provide produce, although these are not significant at the 10% level. Our region fixed effects are largely significant (with Cleveland the omitted category) suggesting that controlling for differences across space is important.

Focusing on organic and certified naturally grown produce, in specification A we find a positive and significant premium associated with certified organic produce of over 10%, while we find a positive but insignificant premium of 8% for organic exempt. We find no significant effect of certified naturally grown labeling relative to the baseline natural/no certification category. Given the close similarity in magnitude between certified organic and certified organic exempt we combine those two categories in specification B and find a positive and significant coefficient representing a premium of nearly 9% while we still find no significant difference between certified naturally grown and the baseline natural/no certification category.

[10] Following Halvorsen and Palmquist (1980) we use a correction when interpreting dummy variable coefficients from our hedonic estimates.

To further investigate the value of organic produce, we turn to matching estimators. Nearest neighbor matching estimates for organic are shown in table 4, which reports the average treatment effect of the treated for an organic treatment, combining both certified organic and certified organic exempt farms into the treated category. Matching covariates are identical to those used in the hedonic analysis with the addition of latitude and longitude included to provide added weight to nearby CSA farms. We force exact matching, if possible, on the region that each CSA is located in. We report the average treatment effect on the treated for matches using the nearest 1, 2, and 4 neighbors and in all cases find a positive and significant price premium associated with the organic treatment, ranging from $38.90 to $70.22.

In order to gauge the common support assumptions underlying our matching estimates, table 5 reports matching metrics using mean zero and standardized covariates. The first two columns report the standardized means of covariates for organic and non-organic farms while the remaining three columns show differences in matched covariates for each matching specification. For the covariates identified as significant in the hedonic specification (# of weeks, delivery, and additional products) these diagnostics reveal that matching did indeed improve the closeness along these key dimensions. In particular, the discrepancy between delivery options for the unmatched treated and control farms are driven to zero through the matching process. In addition, many of the other covariates are much closer under matching compared to unmatched means, with differences in the region covariates near zero reflecting the exact matching on those covariates. Across all three versions, it appears that the specification employing nearest neighbor matching to the two nearest neighbors may provide the best match while the specification with four matches in some cases fails to exact match on region due to limited observations.

Table 5 compares the implied value of organic recovered from the hedonic and matching estimators, using the mean CSA price of $535.26 to transform the semi-log hedonic specification into a dollar value. The organic valuation measures from the matching estimators overlap the point estimates from the hedonic estimates, with the $44 valuation from the specification using two nearest neighbors especially close to the hedonic estimates. Finding such comparable results between the different approaches suggests that our hedonic specification is not unduly influenced by functional form assumptions and provides additional confidence in our findings of a significant organic premium. Overall, the estimates show an organic valuation that ranges from a high of $70.22 to a low of $38.90, suggesting a significant premium of nearly 10% exists for organic.

VI. Conclusion

The growing demand for local foods and organic produce is in part being met by increasing numbers of direct marketing ventures connecting local farms directly to consumers. One example of this is the growing number of community supported agriculture farms across the United States. Using data on CSA farms located in Ohio and Pennsylvania, we find strong evidence that consumers have a positive and economically significant valuation associated with organic produce provided by local CSAs as well as additional CSA attributes that help to differentiate the CSA experience. These results suggest that consumers and small farms are effectively differentiating between similar CSA farms on the basis of the farm's attributes. These results provide valuable information to local farmers as well as policymakers exploring new opportunities afforded by local direct food marketing and sales.

Focusing on the market for CSAs, which by definition is a local foods source, allows us to estimate consumer valuations associated with organic produce and avoid the potentially confounding effects of local production as would be found in a traditional retailing environment. If consumers maintain a positive valuation for local produce, similar analyses that fail to account for the different sources of value in a retail setting would likely overestimate consumers' valuation of organic produce if that produce is also perceived as local. Our results suggest that firms are successfully marketing USDA organic certification to consumers and are receiving a price premium from this certification. However, our results also suggest that competing certification programs, often designed to be lower cost or less burdensome to firms, offer little additional value to consumers and small farms.

For policymakers interested in the growing local foods trend our estimates also provide insights into the role of food access, variety and quantity. The provision of additional products, both through longer growing seasons and the bundling of non-produce products, in CSA food deliveries was highly valued by consumers. For small farms seeking to penetrate the local foods market, this finding may suggest that forming cooperatives to provide additional products as well as extending the produce season would be advantageous marketing strategies. In addition, the large premium associated with delivery suggests that costs to the firm of transporting produce to consumers as well as the cost-savings realized by consumers receiving delivery is highly valued and suggests that policy or programs designed to reduce these costs could play a large role in the public's enthusiasm for local, direct marketed foods.

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Table 1. CSA summary statistics (N=188)

	Full Sample (N=188)			
Variable	Mean	Std. Dev.	Min	Max
Price	535.26	143.96	185	1280
Weeks	21.59	3.57	10	32
Pickup Locations	2.19	1.89	1	10
Pickup Days	1.62	1.20	1	7
Distance to Metro (km)	17.38	23.33	0	133
Distance to Metro^2 (km^2)	843.49	2067.13	0	17731
Variable	Percent	Number		
Delivery (0/1)	2.13%	4		
Pick Own (0/1)	9.57%	18		
Work on Farm (0/1)	10.11%	19		
Pest Management (0/1)	19.15%	36		
Multi-Farm (0/1)	6.38%	12		
Additional Products (0/1)	31.38%	59		
Certified Naturally Grown	6.38%	12		
Certified Organic	11.17%	21		
Organic Exempt	13.83%	26		
Region - Cleveland	17.55%	33		
Region - Toledo	4.79%	9		
Region - Columbus	7.45%	14		
Region - Dayton	2.66%	5		
Region - Appalachia	2.13%	4		
Region - Cincinnati	5.32%	10		
Region - Philadelphia	14.36%	27		
Region - Scranton	7.45%	14		
Region - Harrisburg	20.21%	38		
Region - State College	6.91%	13		
Region - Pittsburgh	5.85%	11		
Region - Erie	5.32%	10		

Table 2. Hedonic model results (y = ln price)

	Specification			Specification	
Variable	A	B	Variable	A	B
# of Weeks	0.0119*	0.0120*	Distance to Metro^2 (km^2)	0.0000	0.0000
	(0.0060)	(0.0060)		(0.0000)	(0.0000)
Pickup Locations	0.0132	0.0132	Region - Toledo	0.1396***	0.1378***
	(0.0170)	(0.0170)		(0.0400)	(0.0400)
Pickup Days	-0.0031	-0.0036	Region - Columbus	0.0744*	0.0731*
	(0.0150)	(0.0140)		(0.0390)	(0.0380)
Delivery (0/1)	0.1719***	0.1720***	Region - Dayton	0.0198	0.0142
	(0.0540)	(0.0540)		(0.0360)	(0.0260)
Pick Own (0/1)	0.0395	0.0411	Region - Appalachia	-0.1237*	-0.1234*
	(0.0770)	(0.0750)		(0.0590)	(0.0570)
Work on Farm (0/1)	0.0793	0.0798	Region - Cincinnati	-0.3182**	-0.3181***
	(0.0490)	(0.0490)		(0.0160)	(0.0160)
Pest Management (0/1)	-0.0583	-0.0584	Region - Philadelphia	0.1295***	0.1271***
	(0.0730)	(0.0720)		(0.0380)	(0.0360)
Multi-Farm (0/1)	0.0585	0.0581	Region - Scranton	-0.1019**	-0.1059***
	(0.0440)	(0.0440)		(0.0360)	(0.0290)
Additional Products (0/1)	0.0836*	0.0837*	Region - Harrisburg	-0.0841**	-0.0863**
	(0.0420)	(0.0420)		(0.0310)	(0.0320)
Certified Organic	0.0986*	n/a	Region - State College	-0.0099	-0.013
	(0.0500)	n/a		(0.0710)	(0.0690)
Organic Exempt	0.0778	n/a	Region - Pittsburgh	-0.1418**	-0.1448***
	(0.0530)	n/a		(0.0280)	(0.0310)
Organic (Any)	n/a	0.0876**	Region - Erie	-0.2084**	-0.2108***
	n/a	(0.0380)		(0.0330)	(0.0320)
Certified Naturally Grown	-0.0762	-0.0761	Constant	5.9939***	5.9939***
	(0.0910)	(0.0910)		(0.1210)	(0.1220)
Distance to Metro (km)	-0.0033	-0.0033			
	(0.0020)	(0.0020)			
Observations	188	188			
R-squared	0.334	0.334			

Clustered robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Matching Estimates

Matching #	Estimate	% Exact
ATT (M=1)	70.2154***	100.0%
	(24.5910)	
ATT (M=2)	44.4800*	100.0%
	(23.5820)	
ATT (M=4)	38.9462*	98.4%
	(20.9050)	

Standard errors in parenthesis
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Matching Diagnostics*

			Matched Differences		
Covariate	Organic	Non-Organic	M=1	M=2	M=4
# of Weeks	0.0388	-0.0129	0.0537	0.0507	0.0328
Pickup Locations	0.0141	-0.0047	-0.0675	0.0506	0.1660
Pickup Days	0.2788	-0.0929	0.3363	0.3983	0.3629
Delivery (0/1)	-0.1470	0.0490	0.0000	0.0000	0.0000
Pick Own (0/1)	-0.1803	0.0601	0.0000	0.0000	0.0180
Work on Farm (0/1)	0.0176	-0.0059	0.2112	0.2112	0.1056
Pest Management (0/1)	0.0000	0.0000	0.2157	0.1888	0.2427
Multi-Farm (0/1)	0.0868	-0.0289	0.0000	0.1302	0.2387
Additional Products (0/1)	0.0572	-0.0191	-0.0915	0.0229	0.0114
Distance to Metro (km)	-0.1858	0.0619	0.0832	0.0620	-0.0561
Distance to Metro^2 (km^2)	-0.1191	0.0397	0.0823	0.0863	0.0116
Latitude	-0.0690	0.0230	-0.0488	-0.0053	0.0089
Longitude	0.0758	-0.0253	0.0473	0.0343	0.0402
Region - Cleveland	-0.0139	0.0046	0.0000	0.0000	0.0000
Region - Toledo	-0.0248	0.0083	0.0000	0.0000	0.0000
Region - Columbus	-0.2021	0.0674	0.0000	0.0000	0.0000
Region - Dayton	0.0989	-0.0330	0.0000	0.0000	0.0659
Region - Cincinnati	0.0473	-0.0158	0.0000	0.0000	0.0000
Region - Philadelphia	-0.0454	0.0151	0.0000	0.0000	0.0000
Region - Scranton	-0.0404	0.0135	0.0000	0.0000	0.0000
Region - Harrisburg	0.1321	-0.0440	0.0000	0.0000	-0.0132
Region - State College	-0.0209	0.0070	0.0000	0.0000	0.0000
Region - Pittsburgh	0.1130	-0.0377	0.0000	0.0000	0.0000
Region - Erie	-0.0473	0.0158	0.0000	0.0000	0.0000

* All results use standardized covariates based on the full data sample

Table 5: Price Premium for Organic

Price Premium ($)			
Specification	Organic	Cert Org	Org Ex
Hedonic - A		55.47	43.36
Hedonic - B	49.00		
Matching (M=1)	70.22		
Matching (M=2)	44.48		
Matching (M=4)	38.95		

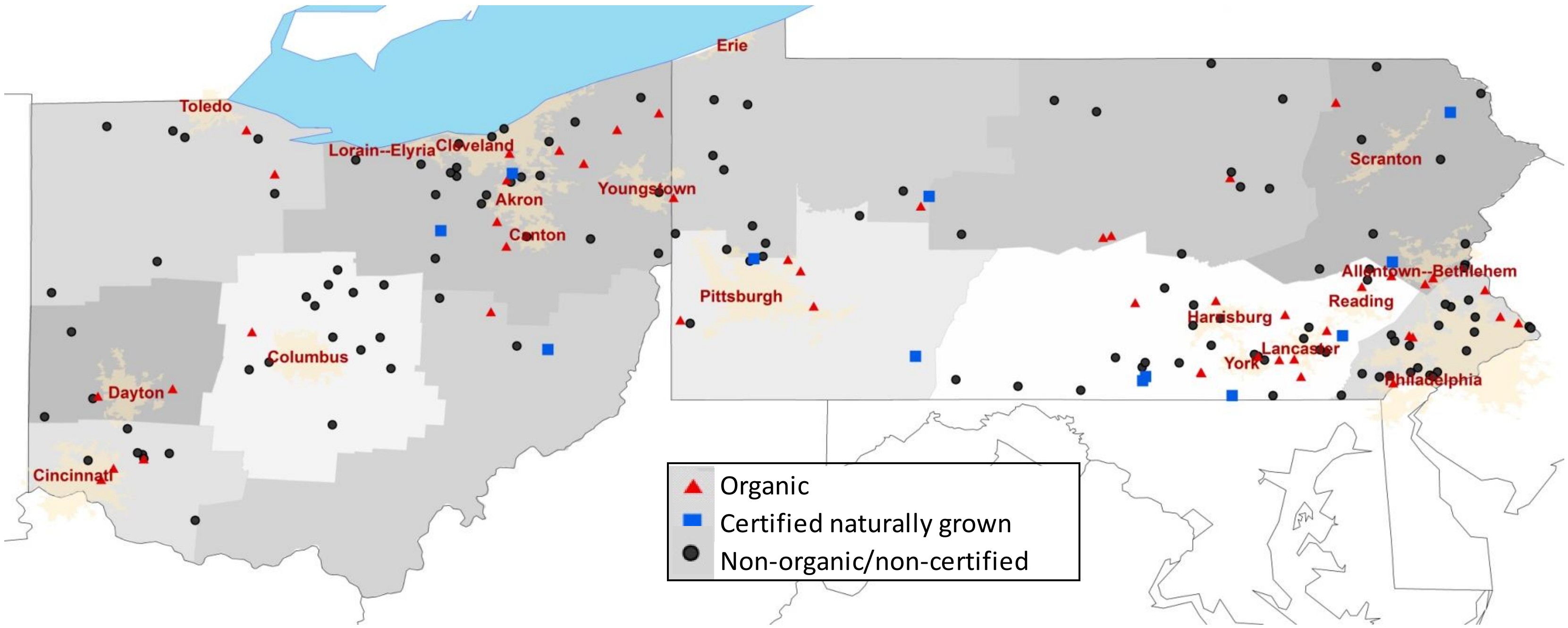

Figure 1. Locations and Types of CSA Farms

Supplemental Appendix

Table A1: Weeks Regression

Variable	A
May Start	-5.1198*
	(2.9357)
June Start	-5.5036*
	(3.2007)
July Start	-9.1149**
	(4.1999)
October End	1.1895
	(0.9860)
November End	3.4019**
	(1.5045)
Total Months	1.5729**
	(0.7219)
Constant	17.5880***
	(5.0023)
Observations	73
R-squared	0.55

Standard errors in parenthesis
*** p<0.01, ** p<0.05, * p<0.1

Table A2: Robustness Checks

Variable	Specification 1	2	3	Variable	Specification 1	2	3
# of Weeks	0.0118*	0.0120*	0.0140**	Large CSA (>100 shares)	0.0663	0.0608	n/a
	(0.0060)	(0.0070)	(0.0050)		(0.0440)	(0.0410)	n/a
Pickup Locations	0.0082	0.0065	0.0119	Region - Toledo	0.1267**	0.1237**	0.1177**
	(0.0170)	(0.0210)	(0.0170)		(0.0440)	(0.0460)	(0.0470)
Pickup Days	-0.0053	-0.0045	-0.004	Region - Columbus	0.0668	0.0653	0.0528
	(0.0130)	(0.0130)	(0.0130)		(0.0400)	(0.0440)	(0.0410)
Delivery (0/1)	0.1757**	0.1630**	0.2053***	Region - Dayton	0.0185	0.0226	-0.0119
	(0.0570)	(0.0600)	(0.0520)		(0.0260)	(0.0280)	(0.0310)
Pick Own (0/1)	0.0333	0.0343	0.043	Region - Appalachia	-0.1212*	-0.2134***	-0.1422*
	(0.0740)	(0.0700)	(0.0710)		(0.0570)	(0.0670)	(0.0720)
Work on Farm (0/1)	0.0755	0.0678	0.0934*	Region - Cincinnati	-0.3280***	-0.3246***	-0.3232***
	(0.0520)	(0.0550)	(0.0480)		(0.0180)	(0.0200)	(0.0160)
Pest Management (0/1)	-0.0561	-0.0549	-0.056	Region - Philadelphia	0.1069**	0.1065**	0.1076***
	(0.0710)	(0.0750)	(0.0690)		(0.0400)	(0.0420)	(0.0270)
Multi-Farm (0/1)	0.056	0.0589	0.0405	Region - Scranton	-0.1046***	-0.0980**	-0.1115***
	(0.0510)	(0.0750)	(0.0450)		(0.0280)	(0.0370)	(0.0280)
Additional Products (0/1)	0.0868*	0.0975**	0.0858*	Region - Harrisburg	-0.0910**	-0.1030***	-0.0928**
	(0.0420)	(0.0410)	(0.0420)		(0.0340)	(0.0320)	(0.0320)
Organic (Any)	0.0826**	0.0784*	0.0822*	Region - State College	-0.0149	-0.0421	-0.0148
	(0.0370)	(0.0410)	(0.0400)		(0.0700)	(0.0750)	(0.0750)
Certified Naturally Grown	-0.075	-0.0246	-0.097	Region - Pittsburgh	-0.1501***	-0.1122***	-0.1627***
	(0.0890)	(0.1040)	(0.0960)		(0.0340)	(0.0340)	(0.0360)
Distance to Metro (km)	-0.003	-0.0028	-0.003	Region - Erie	-0.2156***	-0.2222***	-0.2165***
	(0.0020)	(0.0020)	(0.0020)		(0.0340)	(0.0340)	(0.0370)
Distance to Metro^2 (km^2)	0.0000	0.0000	0.0000	Constant	6.0047***	5.9979***	5.9860***
	(0.0000)	(0.0000)	(0.0000)		(0.1190)	(0.1210)	(0.0990)
Observations	188	177	188				
R-squared	0.339	0.327	0.347				

Clustered robust standard errors in parentheses

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