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Spatial and Temporal Variation in Price Premiums for Organic Fresh Fruits and Vegetables

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University of Minnesota
Driven to Discover℠

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Introduction

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- Sales of organic foods have increased from $13 billion in 2005 (U.S. Department of Agriculture 2012) to over $43 billion in 2015, corresponding to an average growth rate of approximately 14 percent. Organic Trade Association press release.
- One of the main factors influencing the growth of organic farming, processing, and retailing is the existence of organic price premiums.
- To date there does not exist a comprehensive documentation of price premiums for organic foods and how they change over time and space.
- Understanding premiums for organically grown fresh produce is essential to production and marketing decisions of producers.
- A grower would like to know the extent to which transitioning to organic production is profitable, what type of produce to grow, or how much to charge for the organic produce given the price of a conventional variety.

Source: rochebros.com

Existing Information on Prices of Organic Foods

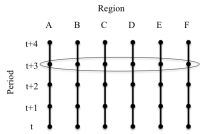
- The first source is the daily, weekly, and biweekly reports that are published by the US Department of Agriculture's (USDA) Agricultural Marketing Service (AMS).
- Limitations: Prices are reported for large geographic regions, sampled from relatively small number of stores, and are only available intermittently for most of the items. In addition, comparable prices for conventional varieties are not available from the same set of stores
- The second source of information comprises the published research on consumers' willingness-to-pay for organic products. The findings are generally product, market, or time specific and are limited in scope

Research Objectives

• Construct panel price indices for both organically and conventionally grown fresh fruits and vegetables to estimate temporal and spatial changes in organic price premiums in the United States.
• Investigate temporal and spatial changes in organic price premiums for fresh fruits and vegetables and evaluate their impact on the growth of organic farming and retailing.
• Estimate farmer's share of organic produce prices at retail and evaluate their policy implications.

Analytical Framework and Data

The Chronological Graph Method (Hill, 2004)



The CG method combines temporal price indices, which are strictly chronological, with a reference spatial index in a single period.

Temporal Indices: GEKS approach (Ivancic, Diewert, Cox 2011)

GEKS indices are computed by taking the geometric mean of the product of all bilateral indices between a number of periods, where in turn each period is taken as the base.

GEKS:

$$P_{0t}^{GEKS} = \prod_{s=0}^{T} (P_{0s} \times P_{st})^{1/(T+1)},$$

Spatial Indices: Minimum Spanning Tree approach (Hill 1999)

The MST approach finds a path through regions that minimizes a penalty function, where the penalty is based on the similarity of price structures between any two regions

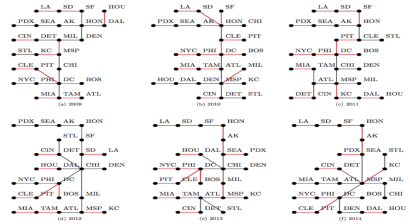


Figure 1: Minimum Spanning Trees of Metropolitan Statistical Areas (2009-2014)

Data

• We use store scanner data collected by IRI. The data comprises weekly sales information at the UPC level from retailers across United States between 2009 and 2014, for a total of 312 weeks.
• We construct indices for 26 Metropolitan Statistical Areas, for which at least one price index is reported by the Bureau of Labor Statistics .

References

- Hill, R.J. 1999. "Comparing Price Levels across Countries Using Minimum Spanning Trees." *The Review of Economics and Statistics* 81, 1: 135-142.
- Ivancic, L., W.E. Diewert, K.J. Fox. 2011. "Scanner Data, Time Aggregation and the Construction of Price Indices." *Journal of Econometrics* 161, 1: 24-35.

Preliminary Results

Spatial and Temporal Price Variation in Fresh Fruits and Vegetables Prices

Figure 2 shows the quarterly fruits and vegetables panel price index for selected MSAs for the period between 2009 and 2014. The index takes the base value of 100 for the first quarter prices in Chicago in 2010. A comparison of other data points in the figure to the base value provides estimates of temporal and spatial price changes.

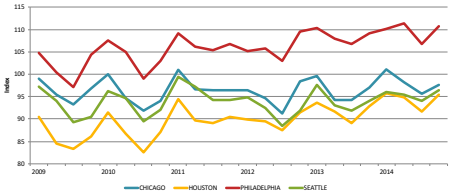


Figure 2: Quarterly fresh fruits and vegetables panel price indices of select metropolitan statistical areas for the period 2009 and 2014.

Main findings

- The spatial differences in Fruits and Vegetables prices are substantial
- Relative to fresh fruits and vegetables prices in Chicago (Illinois), on average the prices in Houston (Texas) and Seattle (Washington) are 6.4 and 2.5 percentage points lower, respectively; whereas the prices in Philadelphia (Pennsylvania) are 9.6 percentage points higher.
- The estimates of temporal changes in prices are not substantially different across the MSAs.
- Between the first quarter of 2011 and the first quarter of 2014 the prices are down by 4.6, 4.6, 3.8, and 4.6 percentage points for Chicago, Houston, Philadelphia, and Seattle, respectively.

Ongoing Work

Ongoing Work

- Construct the panel price indices separately for organic and conventional fresh fruits and vegetables.
- Obtain the panel indices of price premiums for organic fresh fruits and vegetables and investigate spatial and temporal patterns.
- Determine the implications of the estimates of spatial and temporal changes in premiums for organic farming and marketing, and for policy.

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