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Title: **Disaggregated Retail Food Price Indices Using Homescan Data: An Application to Income Levels and SNAP Benefits**

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Disclaimer: The views presented here are those of the authors and do not represent either USDA or ERS.

Introduction: Even small food retailers, such as convenience stores or organic markets, carry 1000s of unique products. Therefore economists typically rely on price indices to measure price changes or levels within geographic markets, retailers, and even product categories. The BLS CPI is publicly available and widely used to measure inflation or deflate economic indicators over time. But it has strict limitations for researchers and consumers, as indices for even broad food categories (e.g. meats) are only available nationally. Plus users are limited to only those indices already defined and calculated by BLS.

We apply the CPI methodology to Homescan household scanner data. In doing so, we are able to calculate price indices according to any combination of variables, provided the data are rich enough. Examples most relevant to ongoing issues in food economics include retail chains, national brands and private labels, demographics, and store format. We investigate price inflation for high- and low-income households, by city, for fresh vegetables and fluid milk for the years 2004-2010. Our findings have implications for the research into the food prices paid by the poor (e.g. Chung and Myers, 1999, Darmon and Drewnowski, 2008) as well as the purchasing power of food assistance programs, such as SNAP, during times of high and volatile food prices. We also highlight important geographic differences in inflation.

Objectives:

- To develop an approach to calculating retail food price indices using Homescan or store scanner data that is comparable to the CPI but more disaggregated and flexible.
- To use these indices to investigate differences in inflation rates across geographic markets, to complement research on spatial price differences (Leibtag and Kumcu, 2011, Todd, et al., 2011).
- To investigate whether inflation may be different according to income levels. This may be the case due to different purchasing habits during times of relatively high or low food prices or the outlets at which different socioeconomic groups shop.

Method: Following BLS, we calculate the geometric means of price relatives for UPCs having purchases in consecutive months. By linking UPCs across months we ensure that price changes are not due to short-term, quality-based shifts in baskets. Price relatives are unitless to account for intrinsic differences across UPCS and weighted by their quantity shares within the dimension of interest (e.g. store, product category). The formula is given by

$$\prod \left[\frac{P_t^i}{P_{t-1}^i} \right]^{\frac{Q_i}{\sum_i Q}}$$ where P = price, t = month, i = UPC, and Q = yearly purchase quantity.

Results: The panel of households in the Homescan survey are selected to be nationally representative. It is therefore encouraging that price indices calculated using the entirety of the Homescan data generate similar economic findings to those of BLS for comparable products. Some differences are to be expected, given that ERS and BLS use slightly different methodologies and different data in terms of both respondents and product coverage.

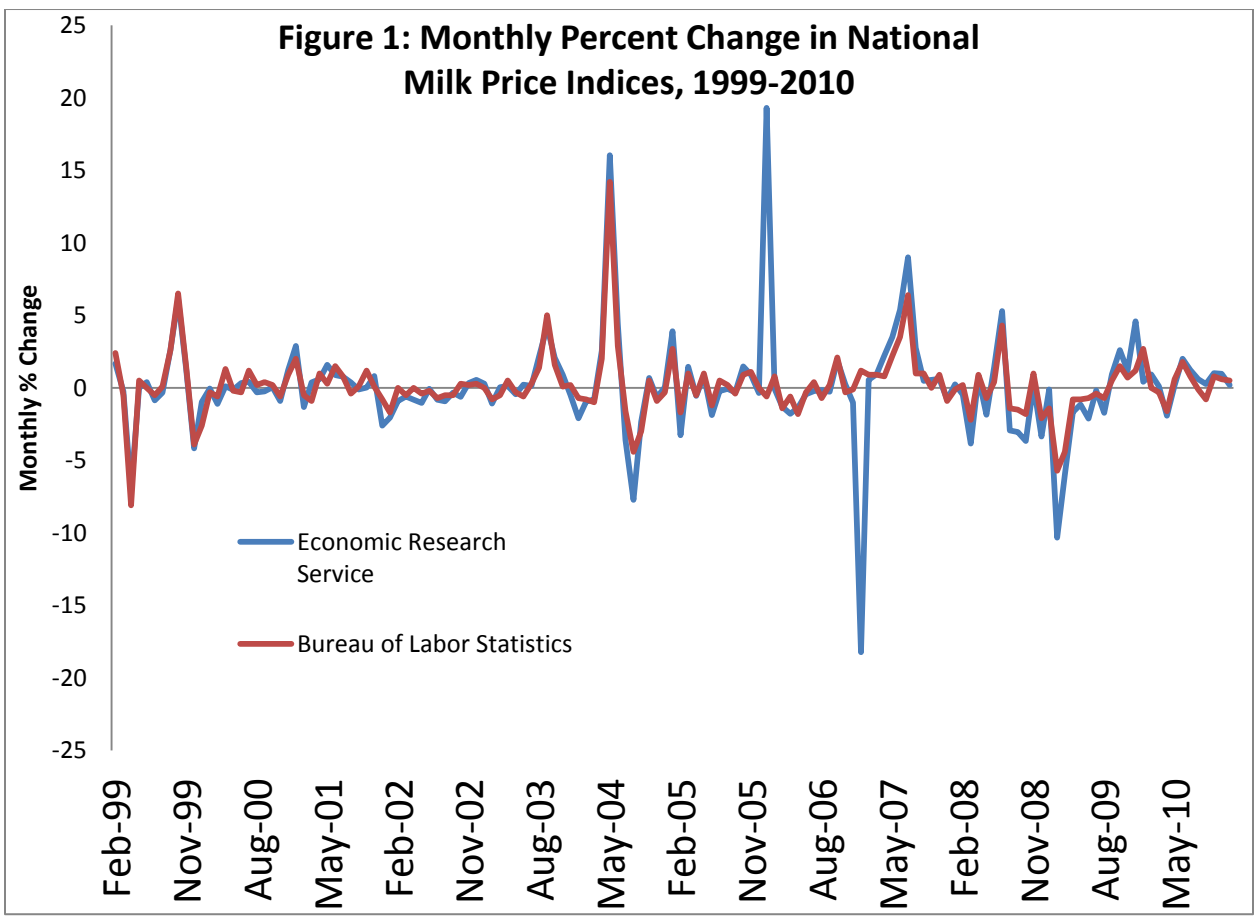

Figure 1 source: ERS calculations based on BLS data and Nielsen Homescan Data, 1999-2010.

This flexible approach, combined with the rich Homescan data, allows for insights into spatial differences in food price inflation for specific food categories. Across major cities in the U.S., there can be large differences in rates of inflation for foods that are central to the Dietary Guidelines for Americans, such as vegetables or milk. These differences are important both when comparing cities to one another or to the national average, and they suggest that further research is called for towards understanding price transmission and dispersion in the agribusiness sector.

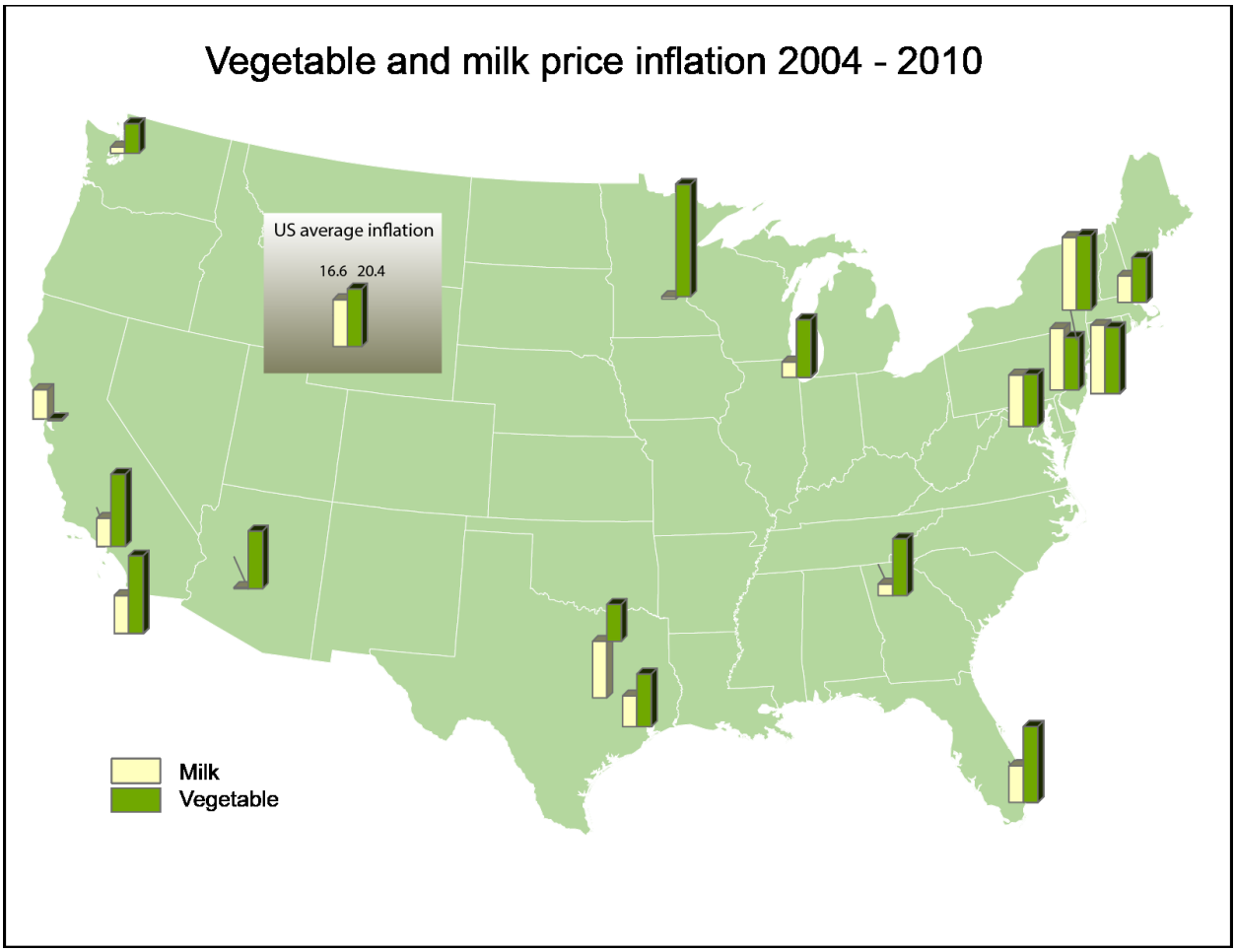

Figure 2 source: ERS calculations based on BLS data and Nielsen Homescan Data, 2004-2010.

Food price inflation can vary by income levels. When the price index weights are calculated annually, these differences can reflect only in part the substitution patterns undertaken by households as food prices vary. More likely we are observing structural differences, driven by the retailers frequented at different income levels and the price dynamics therein.

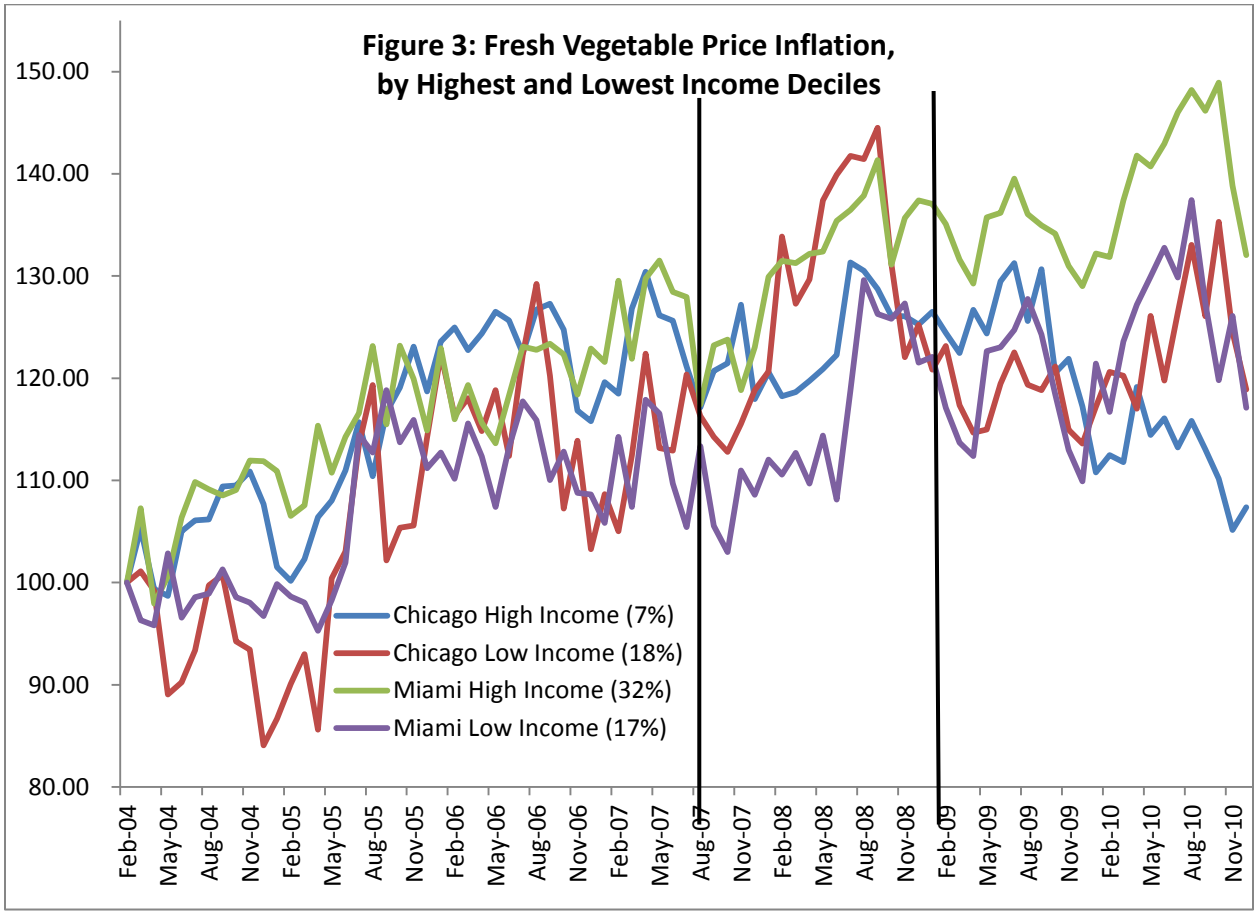

Figure 2 source: ERS calculations based on BLS data and Nielsen Homescan Data, 2004-2010.

Given that not only average prices but also rates of inflation can differ importantly by city or region, it is worth investigating the implications this can have purchasing power. During the period of 2004-2010 a number of federal appropriations significantly increased the benefits offered through a series of food assistance programs in the U.S. The purchasing power of food assistance programs is highly variable, across both time and space, and both economists and policymakers would do well to account for this notion going forward.

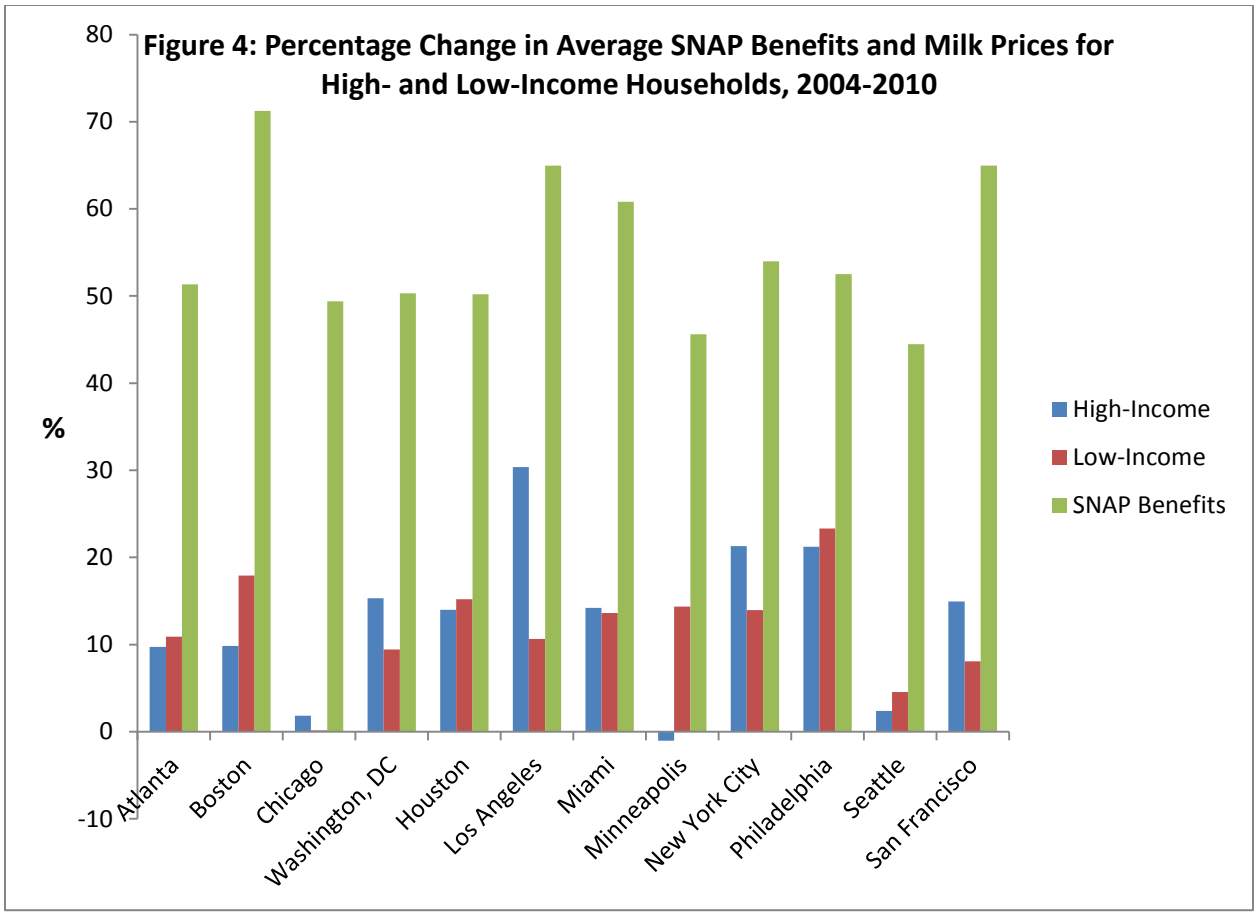

Figure 4 source: USDA Food and Nutrition Service, and ERS calculations based on BLS data and Nielsen Homescan Data, 2004-2010.

Conclusions: The Economic Research Service has developed a flexible approach to constructing food price indexes that can be applied to scanner data of nearly any variety. It has the potential to uncover issues with price variation that are ripe for further research, and to help measure and control for price inflation in microeconomic studies that otherwise would need to rely on limited samples or assumptions.

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