Abstract
Organic products sold in retail chains across America have been booming with growth. Retailers are rushing to invest more into their organic product lines. As retailers grow their organic product lines as and demand for organics grows, organic product lines may have been able to affect the traditional cross-price elasticity asymmetry that exists between national goods and private label goods. This paper intends to find the cross-price elasticity relationship between private label organic products and national label organic products compared to their non-organic counterparts. Using the Nielsen Retail Scanner Dataset from 2014 - 2016 we find that organic private label goods are relatively less substitutable with organic national label goods than non-organic private label goods are with non-organic national label goods.
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1. Introduction:

In the American supermarket, premium national label brands have held and continue to hold a privileged status over their private label retail counterparts. Strong public perception of premium national label brands’ quality compared to their private retail counterparts’ perceived quality results in an asymmetric price elasticity relationship, where premium national label brand prices can affect their retail counterparts’ sales but not vice versa.

However, private label retail brands have been on the up and up. O Organics, a private retail brand of Albertsons, has grown to over $1 billion in sales since its inception in 2005 (Siegner, 2018). Other private brands have followed suit: Kroger’s Simple Truth product line eclipsed $2 billion in sales in 2018 (ProgressiveGrocer, 2018) and Target added a new discount brand named Smartly to its stores in October, 2018 (Stump, 2018). Private retail brands are especially desired by retailers over national label brands due to their higher profit margins (Pauwels et al. 2004) but retailers would not create and grow these brands if they didn’t have a reasonable expectation of making a profit. Whether or not retailers are expanding their private label brand revenue through increased competition with their national label counterparts or by expanding the market as a whole is a question of interest in this paper. In particular, this paper is interested in seeing if organic private label brands are found by consumers to be more substitutable with national label organic brands than their non-organic retail counterparts with non-organic national label brands.

The inspiration behind studying organic private label retail brands stems from the relative proliferation of organic goods in respect to their non-organic counterparts. In the early 1990s, organic products used to be only sold in natural product stores. Since 1997, organic food sales have increased from $3.6 billion to $21.1 billion in 2008 and organic products are now sold in mainstream retailers like Wal-mart, Target, and Costco. Even though organic sales accounted for only 3% of sales in the United States in 2008, 69% of Americans purchased organic products in 2008 (Green et al. 2008). If private label
organic brands have proliferated as organic products have in the tastes and preferences of American consumers, then private label organic brands should be relatively more substitutable with their national label counterparts than non-organic private label brands and their national label counterparts. Thus the cross-price elasticities of private label organic products to their national label organic counterparts should be higher than the cross-price elasticities of private label non-organic products to their national label counterparts. If substitutability and competition is not actually higher among organic product lines, then the cross-price elasticities of organics should be lower than their non-organic counterparts.

The remainder of this paper is organized as follows. In section 2 I will be discussing relevant literature that have studied cross-price elasticities between private label and national label goods in American supermarkets and commenting on how this paper adds to their findings. In section 3 I discuss the nuances of the dataset I studied to reach my results and discuss the availability of the data and code. In section 4 I present my model, its objectives, and describe its variables. In section 5 I discuss the findings and interpretation of my model, as well as the limitations of my study. In section 6 I state my conclusions from my analysis. The sections afterwards are dedicated to the appendix and the code used for this paper.

2. Literature Review:

Several studies have observed the cross-price elasticity asymmetrical relationship between private label goods and national label goods, using different data sources.

Blattberg et al. (1989): Using 49 weeks of transactional and ad data from a Chicago retailer, Blattberg found that promotional price competition could induce asymmetrical sales effects within a retail product category. Specifically higher-price/higher-quality brands steal sales from lower-price/lower-quality brands when the higher tiered brand lowers their price. Yet the lower-price/lower-quality brands could barely draw sales from the higher tiered brands when they reduced their prices.
Allenby et al. (1991): Using a scanner panel data set of purchases of margarine, Allenby found that a higher quality brand will have higher price elasticity than a lower quality brand with the same market share due to the interaction between income and substitution effects. However, for lower quality brands, the income and substitution effects cancel each other out, which leads to lower elasticities.

Pauwels et al. (2004): Using scanner data from a Chicago supermarket chain, Pauwels found that a price cut from store brands hardly affects the sales of the most premium national brand in that product category. He also found that second-tier national brand sales are more affected by the prices of store brands.

The above literature agrees on the existence of the cross-price elasticity asymmetrical relationship between private label goods and national label goods. However, they all use proprietary supermarket data localized to one area of the United States and they did not study how this relationship would change when taking organics into account. My paper seeks to expand the existing literature by focusing on organics’ effect on the cross-price elasticity asymmetry using national-level transactional panel data.

3. Data Source and Description:

In this paper I used the Nielsen Retail Scanner Dataset from 2014 - 2016. The dataset contains information from approximately 35,000 individual stores from approximately 90 retail chains in the United States of America. Nielsen estimates it covers approximately 53% of the sales of food products with these individual stores. Nielsen collects weekly transactional data by individual store (store_code_uc), by week ending date (week_end), and by individual unique product code (upc) to result in units sold (units) and weighted average price (price) by each of the preceding variables. Figure 1 summarizes the variables Nielsen provides with the scanner data. I ignored the variables for display and feature as I did not study the effects of promotions on products.
To determine which products belonged to private label retail brands and which products belonged to national label brands, I referred to the product file that Nielsen provided with their data. In that file, Nielsen uses a single masked brand code for all private label brands to protect the anonymity of the individual retailers. National brands do not get this code and have their own unique brand code that identifies each individual national brand. Thus, I indicated all of the upcs that shared the same brand code “536746” as being private label retail products. All of the upcs that had a different brand code were labeled as national label products, resulting in a retail dummy variable.

To determine which products were organic and which products were non-organic, I employed two different methodologies. The first methodology was to reference the “product extras” file for each year of data. These files described which upcs contained a USDA organic label. I took the following labels and their corresponding description codes as evidence of being an organic product: "USDA ORGANIC SEAL", "MULTIPLE USDA ORGANIC SEAL", "MULTIPLE", "ASSORTED", "ORGANIC USDA ORGANIC SEAL", "Regular", "SOLID WHITE", "USDA ORGANIC SEA", "USDAO ORGANIC SEAL" and "VARIETAL". I accepted these descriptions as being organic due to their resemblance to actual descriptions of USDA organic labels. The second methodology was to reference the upc descriptions of the product file that Nielsen provided with the data. I searched for the string “ORG” within the descriptions as the descriptions were filled with different acronyms. While Nielsen does not provide guidance to the meaning of these acronyms, I am confident that the acronym “ORG” is referencing organic products due to the fact that the acronym is used consistently across product categories and upcs. Even the upcs confirmed as organic by methodology 1 contained the acronym “ORG”. I merged the findings from both methods to create an organic dummy variable to distinguish between organic and non-organic upcs.

I selected the studied product categories based on the availability of data filtered through the following requirement: whether or not there were retail and national label products sold for both organic
and non-organic products in a given store at a given time. Of the 46 different product categories that Nielsen initially provided, 4 product categories met my research requirements. These categories are milk, eggs, dressings, and fresh produce. It should be noted that fresh produce is packaged produce as loose produce lack individual upcs. Nielsen also groups all types of milk together, be it whole, 2%, skim, or soy. I treat all types of milk as equal for the purposes of this study.

I also subset the data by semester and I define the semesters using the variable “week_end” by allocating 26 consecutive weeks into each semester. With three years of data I am left with six semesters of equal length, save for semester 6 where Nielsen counts an extra week by virtue of 2016 being a leap year.

My filtering and subsetting of the data as mentioned above reduced my original data set from 699,114,777 weekly transactional data to 59,711 semesterly data. The summary of the data is shown in Figure 2. “Lnqdiff” is my dependent variable and my regressors are “ratiodiff” and “orginteraction”. I discuss these variables in more detail below. The variables of my final dataset are shown in Figure 3.

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<th>#</th>
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<th>Len</th>
<th>Format</th>
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<td>Num</td>
<td>8</td>
<td>BEST12</td>
<td>BEST32.</td>
</tr>
</tbody>
</table>

Figure 1.
3.1 Data and Code Availability Statement

As per UC Berkeley’s license agreement with the Kilts Center for Marketing at Chicago Booth, no part of the data may be posted online or provided without an official license from the Kilts Center. Data used in this study may be re-requested from the Kilts Center by someone in possession with a license agreement with the Kilts Center for Marketing at Chicago Booth.

SAS code and STATA code used in the assembling of data and in regression analysis can be found at the very end of this paper.
4. Model Specification:

In this paper, I look at the change in relative sales of private label products to national label products regressed by the change in relative prices of private label products to national label products and an interaction term of the organic dummy variable and this price ratio. To calculate elasticities, I take the log of each regressor and the dependent variable. The model is represented below (Figure 4): 

\[ \Delta \log \left( \frac{Sales_{private \ label}}{Sales_{national \ label}} \right)_{stobp} = \beta_0 + \beta_1 \Delta \log \left( \frac{Price_{private \ label}}{Price_{national \ label}} \right)_{stobp} + \beta_2 \text{Organic} \times \Delta \log \left( \frac{Price_{private \ label}}{Price_{national \ label}} \right)_{stobp} + u_{stobp} \]

Where \( s = \) individual store (store_code_uc)

\( t = \) semester 

\( o = \) organic indicator 

\( b = \) retail indicator 

\( p = \) product group (product_group_code) 

To calculate the regressand, I summed the sales of all retail products and all national products by store, by product category, and by semester. I divided retail sales by national sales to get a sales ratio for each semester, store, and product category. I then took the natural log of the ratio. Afterwards, I took the difference of each logged ratio from the previous semester by store and by product category. The result is the variable “lnqdiff”.

To calculate the first regressor, I took the median of all retail prices and all national prices by store, by product category, and by semester. I divided retail prices by national sales to get a sales ratio for each semester, store, and product category. I then took the natural log of the ratio of retail prices in the next period divided by the retail prices of the current period and the natural log of the ratio of national
prices in the next period divided by the national prices of the current period. The price ratio for both retail and national price is the median of prices by store, by product category, and by time period. I then take the difference of the logged retail price ratio and the logged national price ratio (illustrated in Figure 5 below). The result is the variable “ratiodif”.

\[
\log\left(\frac{\text{Price}_{\text{private label} t+1}}{\text{Price}_{\text{national label} t+1}}\right) - \log\left(\frac{\text{Price}_{\text{private label} t+1}}{\text{Price}_{\text{national label} t+1}}\right) = \Delta \log\left(\frac{\text{Price}_{\text{private label} t+1}}{\text{Price}_{\text{national label} t+1}}\right)
\]

To calculate the second regressor, I multiplied the regressor “ratiodif” by the dummy variable “Organic”. The result is the variable “Orginteraction”.

5. Analysis:

Figure 6 displays the regression results from the model mentioned above. Because the model is a log-log model, \(\beta_1\) tells me the cross-price elasticity of a change in the relative price ratio between median retail non-organic prices and median national non-organic prices on the change in the relative sales ratio of retail and national non-organic goods. \(\beta_2\) is the coefficient of an interaction term between the change in the relative logged price ratio and an organic dummy variable. \(\beta_2\) tells me the cross price elasticity of a change in the relative price ratio between median retail organic prices and median national organic prices on the change in the relative sales ratio of retail and national organic goods.

From the regression, we find that \(\beta_1\) is equal to 0.1411883 and is highly statistically significant at the 99% confidence level with a z-score of 21.28. A 1% increase in the change of the price ratio leads
to a 14.1% increase in the change of the sales ratio of private label non-organic goods to national label non-organic goods. A positive cross-price elasticity suggests that non-organic private and national label goods are at least somewhat substitutable. We also find that $\beta_2$ is equal to -0.1497538 and is highly statistically significant at the 99% confidence level with a z-score of -5.89. A 1% increase in the change of the price ratio leads to a 14.97% decrease in the change of the sales ratio of private label organic goods to national label organic goods. The fact that $\beta_1 > \beta_2$ suggests that organic private label products are less substitutable with organic national label products when compared to non-organic private label products with non-organic national label products. A very small R-squared of 0.0107 suggests that this is a small effect size.

**Figure 6.**

<table>
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<th>Random-effects GLS regression</th>
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<tr>
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<td>Obs per group:</td>
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<tr>
<td>between = 0.0468</td>
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</tr>
<tr>
<td>overall = 0.0107</td>
<td>max = 5</td>
<td></td>
</tr>
<tr>
<td>corr(u_i, X) = 0 (assumed)</td>
<td>Wald chi2(2) = 453.13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prob &gt; chi2 = 0.0000</td>
<td></td>
</tr>
</tbody>
</table>

| Inqdiff | Coef. | Std. Err. | z    | P>|z| | [95% Conf. Interval] |
|---------|-------|-----------|------|-------|----------------------|
| ratiodiff | .1411883 | .0066335 | 21.28 | 0.000 | .1281869 .1541898 |
| orginteract-n | -.1497538 | .0254081 | -5.89 | 0.000 | -.1995528 -.0995549 |
| _cons   | -.2535672 | .0119933 | -21.14 | 0.000 | -.2770736 -.2300608 |

| sigma_u | 1.5433252 |
| sigma_e | 1.2824113 |
| rho     | .59155424  (fraction of variance due to u_i) |

The limitations in my research are attributable to the data that is available to my research and the approach as outlined in my model. My data from Nielsen only covers three years of data and only around 53% of the food product channel in American retailers. I also rely on Nielsen’s definition of product categories in subsetting my data, which leads to some overgeneralizations. An example of a
generalization is Nielsen’s treatment of soy milk and regular milk as the same, where in reality the consumers of these products are very different. In my model, I take the median of prices and sales by product categories, by stores, by semesters, by retail or national, and by organic or non-organic to calculate the price and sales ratios. By taking medians, I am simplifying my data analysis at the cost of not accounting for all observations. I also divide the data into semesters to simplify my model, but by doing so I do not account for any demand shocks that may come from recurring events such as holidays.

My model also does not account for the inherent simultaneity bias that occurs between sales and prices. Since there is no way to determine from my data if a change in the price of a good is due to an endogenous or exogenous supply shock, I must accept that my coefficients contain some simultaneity bias.

6. Conclusion:

With the cross-price elasticity of organics being smaller than the cross-price elasticity of non-organics, I come to the conclusion that organic private label products are relatively less substitutable with organic national label products than non-organic private label products are with non-organic national label products. Thus the prices of private label organic products and national label organic products follow each other more closely than how their non-organic counterparts do with each other. The relatively complementary nature of organic private label brands and organic national label brands may result from retail and national brands choosing to keep their prices very similar to each other. As consumers are buying private label and national label organic products together, it would appear that a greater price dispersion between private label and national label organic products drives down demand and favors neither of the two competing parties. The pricing strategy for organic private label goods should thus be different than the pricing strategy non-organic private label goods since organic private label goods are relatively less substitutable.
7. Appendix:


8. SAS Code:

/* ECON H195B Final Thesis Code for “Title”
   By Mitchell Wong 5/5/19*/

/* Introduce Library Name*/
LIBNAME research 'D:\SAS';

/* Import all Individual Files */
proc import out=work.data1
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2014\Movement_Files\2501_2014\3608_2014.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

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run;

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run;

proc import out=work.data4
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run;

proc import out=work.data5
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run;
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run;

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run;

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run;

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run;

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proc import out=work.data36
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\2501_2015\3608_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data37
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\2501_2015\3611_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data38
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\2505_2015\4100_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data39
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\2506_2015\3592_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;
**proc import** out=work.data40
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\2506_2015\3625_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

**proc import** out=work.data41
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\2506_2015\3626_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

**proc import** out=work.data42
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\2506_2015\3627_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

**proc import** out=work.data43
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\2506_2015\3628_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

**proc import** out=work.data44
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\2506_2015\3650_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

**proc import** out=work.data45
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\2506_2015\6041_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

**proc import** out=work.data46
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4010_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;
proc import out=work.data47
datafile = 
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4015_20
15.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data48
datafile = 
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4020_20
15.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data49
datafile = 
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4023_20
15.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data50
datafile = 
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4050_20
15.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data51
datafile = 
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4055_20
15.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data52
datafile = 
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4060_20
15.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data53
datafile = 
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4085_20
15.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data54
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4140_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data55
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4180_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data56
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4225_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data57
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4230_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data58
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4275_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data59
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4280_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data60
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4350_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data61
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4355_2015.tsv"
run;

proc import out=work.data62
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4400_2015.tsv"
run;

proc import out=work.data63
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4415_2015.tsv"
run;

proc import out=work.data64
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4460_2015.tsv"
run;

proc import out=work.data65
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4470_2015.tsv"
run;

proc import out=work.data66
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\4475_2015.tsv"
run;

proc import out=work.data67
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\6049_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data68
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\6050_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data69
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\6064_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data70
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2015\Movement_Files\4001_2015\6070_2015.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data71
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\2501_2016\3608_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data72
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\2501_2016\3611_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data73
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\2505_2016\4100_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;
```sql
proc import out=work.data74
datafile =
  "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\2506_2016\3592_2016.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data75
datafile =
  "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\2506_2016\3625_2016.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data76
datafile =
  "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\2506_2016\3626_2016.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data77
datafile =
  "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\2506_2016\3627_2016.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data78
datafile =
  "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\2506_2016\3628_2016.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data79
datafile =
  "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\2506_2016\3650_2016.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data80
datafile =
  "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\2506_2016\6041_2016.tsv"
dbms=dim replace; getnames = yes; datarow=2; delimiter='09'x;
run;
```

25
DATA;
GETNAME = yes;
DATAROW = 2;
DELIMITER = '09'x;
RUN;

DATA;
GETNAME = yes;
DATAROW = 2;
DELIMITER = '09'x;
RUN;

DATA;
GETNAME = yes;
DATAROW = 2;
DELIMITER = '09'x;
RUN;

DATA;
GETNAME = yes;
DATAROW = 2;
DELIMITER = '09'x;
RUN;

DATA;
GETNAME = yes;
DATAROW = 2;
DELIMITER = '09'x;
RUN;

DATA;
GETNAME = yes;
DATAROW = 2;
DELIMITER = '09'x;
RUN;

DATA;
GETNAME = yes;
DATAROW = 2;
DELIMITER = '09'x;
RUN;

DATA;
GETNAME = yes;
DATAROW = 2;
DELIMITER = '09'x;
run;

proc import out=work.data88
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4085_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data89
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4140_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data90
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4180_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data91
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4225_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data92
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4230_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data93
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4275_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data94
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4280_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data95
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4350_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data96
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4355_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data97
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4400_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data98
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4415_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data99
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4460_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data100
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4470_2016.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data101
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\4475_2016.tsv"
       dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data102
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\6049_2016.tsv"
       dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data103
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\6050_2016.tsv"
       dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data104
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\6064_2016.tsv"
       dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

proc import out=work.data105
datafile = "D:\Globus\Extracted\nielsen_extracts\RMS\2016\Movement_Files\4001_2016\6070_2016.tsv"
       dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

/* Reformatting some columns from string to numeric variables*/

data data12a (DROP = feature display); set data12;
   featurea = input(feature, best5.);
   displaya = input(display, best5.);
run;

data data12b (DROP = featurea displaya); set data12a;
   feature = input(featurea, best5.);
   display = input(displaya, best5.);
run;

data data13a (DROP = feature display); set data13;
   featurea = input(feature, best5.);
displaya = input(display, best5.); run;

data data13b (DROP = featurea displaya); set data13a;
feature = input(featurea, best5.);
display = input(displaya, best5.); run;

data data14a (DROP = feature display); set data14;
featurea = input(feature, best5.);
displaya = input(display, best5.); run;

data data14b (DROP = featurea displaya); set data14a;
feature = input(featurea, best5.);
display = input(displaya, best5.); run;

data data23a (DROP = feature display); set data23;
featurea = input(feature, best5.);
displaya = input(displaya, best5.); run;

data data23b (DROP = featurea displaya); set data23a;
feature = input(featurea, best5.);
display = input(displaya, best5.); run;

data data25a (DROP = feature display); set data25;
featurea = input(feature, best5.);
displaya = input(displaya, best5.); run;

data data25b (DROP = featurea displaya); set data25a;
feature = input(featurea, best5.);
display = input(displaya, best5.); run;

data data36a (DROP = feature display); set data36;
featurea = input(featurea, best5.);
displaya = input(displaya, best5.); run;

data data36b (DROP = featurea displaya); set data36a;
feature = input(featurea, best5.);
display = input(displaya, best5.); run;
data data37a (DROP = feature display); set data37;
featurea = input(feature, best5.);
displaya = input(display, best5.);
run;

data data37b (DROP = featurea displaya); set data37a;
feature = input(featurea, best5.);
display = input(displaya, best5.);
run;

data data39a (DROP = feature display); set data39;
featurea = input(feature, best5.);
displaya = input(display, best5.);
run;

data data39b (DROP = featurea displaya); set data39a;
feature = input(featurea, best5.);
display = input(displaya, best5.);
run;

data data62a (DROP = feature display); set data62;
featurea = input(feature, best5.);
displaya = input(display, best5.);
run;

data data62b (DROP = featurea displaya); set data62a;
feature = input(featurea, best5.);
display = input(displaya, best5.);
run;

data data77a (DROP = feature display); set data77;
featurea = input(feature, best5.);
displaya = input(display, best5.);
run;

data data77b (DROP = featurea displaya); set data77a;
feature = input(featurea, best5.);
display = input(displaya, best5.);
run;

data data87a (DROP = feature display); set data87;
featurea = input(feature, best5.);
displaya = input(display, best5.);
run;

data data87b (DROP = featurea displaya); set data87a;
feature = input(featurea, best5.);
display = input(displaya, best5.)
/* Merge all datasets together*/

data research.alldata;
  set data1 data2 data3 data4 data5 data6 data7 data8 data9 data10 data11
data12b data13b data14b data15 data16 data17 data18 data19 data20 data21 data22
data23b data24b data25b data26 data27 data28 data29 data30 data31 data32 data33
data34 data35 data36b data37b data38 data39b data40 data41 data42 data43 data44
data45 data46 data47 data48 data49 data50 data51 data52 data53 data54 data55
data56 data57 data58 data59 data60 data61 data62b data63 data64 data65 data66
data67 data68 data69 data70 data71 data72 data73 data74 data75 data76 data77b
data78 data79 data80 data81 data82 data83 data84 data85 data86 data87b data88
data89 data90 data91 data92 data93 data94 data95 data96 data97 data98 data99
data100 data101 data102 data103 data104 data105;
run;

/* Import in product data to find organics and retail products*/

proc import out = work.product
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\Master_Files\Latest\products.tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

/* Method 1: Acronym ORG in upc_descr defining organic*/

data tess;
  set product;
  if find(upc_descr,'ORG','i') ge 1;
  ORG = 1;
  /* equivalent WHERE clause */
  *where upcase(name) contains 'IAN';
run;

proc sort data=work.product
  out=work.onee;
  by upc;
run;

proc sort data=work.tess
  out=work.three;
  by upc;
run;

data work.mergedd;
merge work.oney(keep = upc upc_descr product_group_code department_descr brand_code_uc)
   work.three;
by upc;
run;

data merged2;
   set mergedd;
   IF ORG not = 1 and ORG not = 0
   THEN ORG = 0;
RUN;

proc sort data=research.alldata
   out=research.alldata;
   by upc;
run;

proc sort data=work.merged2
   out=work.toe;
   by upc;
run;

data research.merged4;
   merge research.alldata(keep = store_code_uc upc week_end units price)
      work.toe;
   by upc;
run;

data research.merged4;
   set research.merged4;
   where store_code_uc > 0;
run;

data research.merged4;
   set research.merged4 (keep = store_code_uc upc week_end units price upc_descr product_group_code department_descr brand_code_uc org);
   where store_code_uc > 0;
   IF brand_code_uc = 536746 THEN RETAIL = 1;
   ELSE RETAIL = 0;
run;

/* Defining Semesters*/

data research.merged4;
   set research.merged4;
   IF week_end >= 20140104 and week_end <= 20140628 THEN semester = 1;
   IF week_end >= 20140705 and week_end <= 20141227 THEN semester = 2;
   IF week_end >= 20150103 and week_end <= 20150627 THEN semester = 3;
IF week_end >= 20150704 and week_end <= 20151226 THEN semester = 4;
IF week_end >= 20160102 and week_end <= 20160625 THEN semester = 5;
IF week_end >= 20160702 and week_end <= 20161231 THEN semester = 6;
run;

/* Method 2: USDA Organic Seal Indicator*/

proc import out=work.productextra2014
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2014\Annual_Files\products_extra_2014 .tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

data productextra2014;
set productextra2014;
keep upc product_descr organic_claim_code organic_claim_descr
usda_organic_seal_code usda_organic_seal_descr;
run;

proc import out=work.productextra2015
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2015\Annual_Files\products_extra_2015 .tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

data productextra2015;
set productextra2015;
keep upc product_descr organic_claim_code organic_claim_descr
usda_organic_seal_code usda_organic_seal_descr;
run;

proc import out=work.productextra2016
datafile =
"D:\Globus\Extracted\nielsen_extracts\RMS\2016\Annual_Files\products_extra_2016 .tsv"
dbms=dlm replace; getnames = yes; datarow=2; delimiter='09'x;
run;

data productextra2016;
set productextra2016;
keep upc product_descr organic_claim_code organic_claim_descr
usda_organic_seal_code usda_organic_seal_descr;
run;

data productextra;
set productextra2014 productextra2015 productextra2016;
run;

data twoo;
  set productextra;
  if usda_organic_seal_code in (612, 122, 373, 123, 799, 487, 4, 297, 796, 507) then org2 = 1;
  else org2 = 0;
run;

proc sort data=work.product
  out=work.one;
  by upc;
run;

proc sort data=work.twoo
  out=work.two;
  by upc;
run;

data work.mergedd;
  merge work.one(keep = upc upc_descr product_group_code department_descr brand_code_uc) work.two;
  by upc;
run;

/* Finalizing Organic indicator*/

data merged2;
  set mergedd;
  if org2 not = 1 and org2 not = 0 then org2 = 0;
run;

proc sort data=research.alldata
  out=work.onee;
  by upc;
run;
proc sort data=work.merged2
  out=work.toe2;
  by upc;
  run;
/* Start of sales variable creation*/
data research.merged5;
  merge research.merged4(keep = store_code_uc upc week_end units price upc_descr product_group_code ORG RETAIL semester)
    work.toe2;
  by upc;
  run;
data research.merged5;
  set research.merged5 (keep = store_code_uc week_end upc units price upc_descr product_group_code org retail semester department_descr org2);
  where store_code_uc >0;
  run;
data research.merged5;
  set research.merged5;
  IF ORG = 0 and ORG2 = 0 then Organic = 0;
  ELSE Organic = 1;
  run;
data research.allstuff;
  set research.merged5 (keep = store_code_uc upc units price product_group_code organic retail semester week_end);
  IF retail = 0 then quantitynational = units;
  ELSE quantitynational = 0;
  IF retail = 1 then quantityretail = units;
  ELSE quantityretail = 0;
  IF retail = 0 then pricenational = price;
  ELSE pricenational = 0;
  IF retail = 1 then priceretail = price;
  ELSE priceretail = 0;
  run;
proc sort data = research.allstuff;
  by store_code_uc upc week_end semester;
  run;
data research.organicq;
  set research.allstuff;
  where organic = 1;
  run;
```sas
data research.nonorganicq;
  set research.allstuff;
  where organic = 0;
  run;
proc sql;
  create table research.neworganicq as
    select store_code_uc,
           upc,
           price,
           product_group_code,
           organic,
           retail,
           week_end,
           semester,
           sum(quantitynational) as quantitynational,
           sum(quantityretail) as quantityretail
    from research.organicq
    group by store_code_uc,product_group_code,semester;
quit;

proc sql;
  create table research.newnonorganicq as
    select store_code_uc,
           upc,
           price,
           product_group_code,
           organic,
           retail,
           week_end,
           semester,
           sum(quantitynational) as quantitynational,
           sum(quantityretail) as quantityretail
    from research.nonorganicq
    group by store_code_uc,product_group_code,semester;
quit;

data research.newnonorganicq;
  set research.newnonorganicq;
  where quantityretail > 0;
  run;

data research.neworganicq;
  set research.neworganicq;
  where quantityretail > 0;
  run;

proc sort data=research.neworganicq
```
out=main1 nodupkey;
by store_code_uc semester;
run;

proc sort data=research.newnonorganicq
  out=main2 nodupkey;
  by store_code_uc semester;
run;

data research.consolidatedquantity;
  set research.neworganicq research.newnonorganicq;
run;

proc sort data = research.consolidatedquantity
  out = research.main
  NODUPKEY;
  BY store_code_uc upc week_end semester organic;
RUN;

proc sort data = research.main
  out = research.four
  nodupkey;
  by store_code_uc semester organic;
run;

proc sort data = research.four;
  by store_code_uc product_group_code semester organic;
run;

data research.four;
  set research.four;
  where quantityretail >0;
  lnqratio = log(quantityretail/quantitynational);
run;

data research.five;
  set research.four (DROP = upc price week_end quantitynational quantityretail);
  if store_code_uc = lag(store_code_uc)
    and product_group_code = lag(product_group_code)
    and semester NE lag(semester)
  then lagqratio = lag(lnqratio);
  else lagqratio = .;
  lnqdiff = lnqratio - lagqratio;
run;

/*start price sorting here*/
data research.organicp;
   set research.allstuff;
   where org = 1;
run;

proc sort data = research.organicq;
   by store_code_uc semester;
run;

proc sort data = research.nonorganicq;
   by store_code_uc semester;
run;

/* This code finds the median of the prices by store by product type code by semester*/
proc sql;
create table research.pricevariable1 as
   select store_code_uc,
          upc,
          price,
          product_group_code,
          organic,
          retail,
          week_end,
          semester,
          median(pricenational) as medianpricenational,
          median(priceretail) as medianpriceretail
   from research.organicq
   group by store_code_uc, upc, semester;
quit;

data research.pricevariable2retail;
   set research.pricevariable1;
   where retail = 1;
run;

data research.pricevariable2national;
   set research.pricevariable1;
   where retail = 0;
run;

proc sql;
create table research.pricevariable2 as
   select store_code_uc,
          upc,
          price,
          product_group_code,
          organic,
data research.pricevariableretail2;
set research.pricevariable2;
where retail = 1;
run;

data research.pricevariablenational2;
set research.pricevariable2;
where retail = 0;
run;

/* Retail Organic Milk Price*/
data orgmilk;
set research.pricevariableretail;
where product_group_code = 2506;
run;

proc sort data = orgmilk
dupout = lao
nodupkey;
by store_code_uc semester;
run;

data orgmilk;
set orgmilk;
if store_code_uc = lag(store_code_uc)
and product_group_code = lag(product_group_code)
and semester NE lag(semester)
then lagprice = lag(medianpriceretail);
else lagprice = .;
Pratioretail = log(medianpriceretail/lagprice);
run;

data orgmilkretail;
set orgmilk (DROP = upc price week_end medianpricenational);
where pratioretail NE .;
run;

/* National Organic Milk Price*/
data orgmilk2;
set research.pricevariablenational;
where product_group_code = 2506;
run;

proc sort data = orgmilk2
dupout = lmao2
nodupkey;
by store_code_uc semester;
run;

data orgmilk2;
set orgmilk2;
if store_code_uc = lag(store_code_uc)
   and product_group_code = lag(product_group_code)
   and semester NE lag(semester)
then lagprice = lag(medianpricenational);
else lagprice = .;
Pratiationational = log(medianpricenational/lagprice);
run;

data orgmilknational;
set orgmilk2 (DROP = upc price week_end medianpricenational);
where pratiationational NE .;
run;

/*Retail Organic Egg Price*/

data orgegg;
set research.pricevariableretail;
where product_group_code = 2505;
run;

proc sort data = orgegg
nodupkey;
by store_code_uc semester;
run;

data orgegg;
set orgegg;
if store_code_uc = lag(store_code_uc)
   and product_group_code = lag(product_group_code)
   and semester NE lag(semester)
then lagprice = lag(medianpriceretail);
else lagprice = .;
Pratioretail = log(medianpriceretail/lagprice);
run;

data orgeggretail;
set orgegg (DROP = upc price week_end medianpricenational);
where pratioretail NE .;
run;
/* National Organic Egg Price*/
data orgegg2;
set research.pricevariablenational;
where product_group_code = 2505;
run;
proc sort data = orgegg2
  nodupkey;
  by store_code_uc semester;
run;
data orgegg2;
set orgegg2;
if store_code_uc = lag(store_code_uc)
  and product_group_code = lag(product_group_code)
  and semester NE lag(semester)
then lagprice = lag(medianpricenational);
else lagprice = .;
Prationational = log(medianpricenational/lagprice);
run;
data orgeggnational;
set orgegg2 (DROP = upc price week_end medianpricenational);
where prationational NE .;
run;
/*Retail Organic Produce Price*/
data orgproduce;
set research.pricevariableretail;
where product_group_code = 4001;
run;
proc sort data = orgproduce
  nodupkey;
  by store_code_uc semester;
run;
data orgproduce;
set orgproduce;
if store_code_uc = lag(store_code_uc)
  and product_group_code = lag(product_group_code)
  and semester NE lag(semester)
then lagprice = lag(medianpriceretail);
else lagprice = .;
Pratioretail = log(medianpriceretail/lagprice);
run;

data orgproduceretail;
set orgproduce (DROP = upc price week_end medianpricenational);
where pratioretail NE .;
run;

/* National Organic Produce Price*/
data orgproduce2;
set research.pricevariablenational;
where product_group_code = 4001;
run;

proc sort data = orgproduce2
   nodupkey;
   by store_code_uc semester;
run;

data orgproduce2;
set orgproduce2;
if store_code_uc = lag(store_code_uc)
   and product_group_code = lag(product_group_code)
   and semester NE lag(semester)
then lagprice = lag(medianpricenational);
else lagprice = .;
Prationational = log(medianpricenational/lagprice);
run;

data orgproducenational;
set orgproduce2 (DROP = upc price week_end medianpricenational);
where prationational NE .;
run;

/*Retail Organic Dressings Price*/
data orgdressings;
set research.pricevariableretail;
where product_group_code = 3001;
run;

proc sort data = orgdressings
   nodupkey;
   by store_code_uc semester;
run;

data orgdressings;
set orgdressings;
if store_code_uc = lag(store_code_uc)
    and product_group_code = lag(product_group_code)
    and semester NE lag(semester)
then lagprice = lag(medianpriceretail);
else lagprice = .;
Pratioretail = log(medianpriceretail/lagprice);
run;

data orgdressingsretail;
set orgdressings (DROP = upc price week_end medianpricenational);
where pratioretail NE .;
run;

/* National Organic Dressings Price*/
data orgdressings2;
set research.pricevariablenational;
where product_group_code = 3001;
run;

proc sort data = orgdressings2
    nodupkey;
    by store_code_uc semester;
run;

data orgdressings2;
set orgdressings2;
if store_code_uc = lag(store_code_uc)
    and product_group_code = lag(product_group_code)
    and semester NE lag(semester)
then lagprice = lag(medianpricenational);
else lagprice = .;
Pratcionational = log(medianpricenational/lagprice);
run;

data orgdressingsnational;
set orgdressings2 (DROP = upc price week_end medianpricenational);
where prationational NE .;
run;

/* Merge all organic together*/

/* Milk*/
data organicmilkprice;
merge orgmilkretail(keep = store_code_uc product_group_code organic RETAIL semester pratioretail)
    orgmilknational;
    by store_code_uc product_group_code semester;
run;
```sas
data organicmilkprice;
  set organicmilkprice (DROP = medianpriceretail lagprice);
  where pratioretail NE . and prationational NE .;
run;

/* Egg*/
data organiceggprice;
  merge orgeggretail(keep = store_code_uc product_group_code organic RETAIL semester pratioreetail)
    orgeggnational;
  by store_code_uc product_group_code semester;
run;

data organiceggprice;
  set organiceggprice (DROP = medianpriceretail lagprice);
  where pratioreetail NE . and prationational NE .;
run;

/* Produce*/
data organicproduceprice;
  merge orgproduceretail(keep = store_code_uc product_group_code organic RETAIL semester pratioreetail)
    orgproducenational;
  by store_code_uc product_group_code semester;
run;

data organicproduceprice;
  set organicproduceprice (DROP = medianpriceretail lagprice);
  where pratioreetail NE . and prationational NE .;
run;

/* Dressings*/
data organicdressingsprice;
  merge orgdressingsretail(keep = store_code_uc product_group_code organic RETAIL semester pratioreetail)
    orgdressingsnational;
  by store_code_uc product_group_code semester;
run;

data organicdressingsprice;
  set organicdressingsprice (DROP = medianpriceretail lagprice);
  where pratioreetail NE . and prationational NE .;
run;

/* All Organic Prices*/
data allorganicprices;
```
set organicmilkprice organiceggprice organicproduceprice
organicdressingsprice;
    ratiodif = pratioretail - prationational;
    run;

/* Retail Non-organic Milk Price*/
data milk;
set research.pricevariableretail2;
where product_group_code = 2506;
run;

proc sort data = milk
    nodupkey;
    by store_code_uc semester;
    run;

data milk;
    set milk;
    if store_code_uc = lag(store_code_uc)
        and product_group_code = lag(product_group_code)
        and semester NE lag(semester)
    then lagprice = lag(medianpriceretail);
    else lagprice = .;
    Pratioretail = log(medianpriceretail/lagprice);
    run;

data milkretail;
    set milk (DROP = upc price week_end medianpricenational);
    where pratioretail NE .;
    run;

/* National Non-organic Milk Price*/
data milk2;
set research.pricevariablenational2;
where product_group_code = 2506;
run;

proc sort data = milk2
    nodupkey;
    by store_code_uc semester;
    run;

data milk2;
    set milk2;
    if store_code_uc = lag(store_code_uc)
        and product_group_code = lag(product_group_code)
        and semester NE lag(semester)
    then lagprice = lag(medianpricenational);
else lagprice = .;
Prationational = log(medianpricenational/lagprice);
run;

data milknational;
  set milk2 (DROP = upc price week_end medianpricenational);
  where prationational NE .;
run;

/*Retail Non-organic Egg Price*/
data egg;
  set research.pricevariableretail2;
  where product_group_code = 2505;
run;

proc sort data = egg
  nodupkey;
  by store_code_uc semester;
run;

data egg;
  set egg;
  if store_code_uc = lag(store_code_uc)
      and product_group_code = lag(product_group_code)
      and semester NE lag(semester)
  then lagprice = lag(medianpriceretail);
  else lagprice = .;
  Pratioretail = log(medianpriceretail/lagprice);
run;

data eggretail;
  set egg (DROP = upc price week_end medianpricenational);
  where pratioretail NE .;
run;

/* National Non-organic Egg Price*/
data egg2;
  set research.pricevariablenational2;
  where product_group_code = 2505;
run;

proc sort data = egg2
  nodupkey;
  by store_code_uc semester;
run;

data egg2;
set egg2;
if store_code_uc = lag(store_code_uc) and product_group_code = lag(product_group_code) and semester NE lag(semester)
then lagprice = lag(medianpricenational);
else lagprice = .;
Prationational = log(medianpricenational/lagprice);
run;

data eggnational;
set egg2 (DROP = upc price week_end medianpricenational);
where prationational NE .;
run;

/*Retail Non-organic Produce Price*/

data produce;
set research.pricevariableretail2;
where product_group_code = 4001;
run;

proc sort data = produce
nodupkey;
by store_code_uc semester;
run;

data produce;
set produce;
if store_code_uc = lag(store_code_uc) and product_group_code = lag(product_group_code) and semester NE lag(semester)
then lagprice = lag(medianpriceretail);
else lagprice = .;
Pratioretail = log(medianpriceretail/lagprice);
run;

data produceretail;
set produce (DROP = upc price week_end medianpricenational);
where pratioretail NE .;
run;

/* National Non-organic Produce Price*/
data produce2;
set research.pricevariablenational2;
where product_group_code = 4001;
run;

proc sort data = produce2
nodupkey;
by store_code_uc semester;
run;

data produce2;
  set produce2;
  if store_code_uc = lag(store_code_uc)
      and product_group_code = lag(product_group_code)
      and semester NE lag(semester)
    then lagprice = lag(medianpricenational);
  else lagprice = .;
  Prationational = log(medianpricenational/lagprice);
run;

data producenational;
  set produce2 (DROP = upc price week_end medianpricenational);
  where prationational NE .;
  run;
/*Retail Non-organic Dressings Price*/

data dressings;
  set research.pricevariableretail2;
  where product_group_code = 3001;
run;

proc sort data = dressings
  nodupkey;
  by store_code_uc semester;
run;

data dressings;
  set dressings;
  if store_code_uc = lag(store_code_uc)
      and product_group_code = lag(product_group_code)
      and semester NE lag(semester)
    then lagprice = lag(medianpriceretail);
  else lagprice = .;
  Pratioretail = log(medianpriceretail/lagprice);
run;

data dressingsretail;
  set dressings (DROP = upc price week_end medianpricenational);
  where pratioretail NE .;
  run;
/* National Non-organic Dressings Price*/
data dressings2;
set research.pricevariablenational2;
where product_group_code = 3001;
run;

proc sort data = dressings2
nodupkey;
by store_code_uc semester;
run;

data dressings2;
set dressings2;
if store_code_uc = lag(store_code_uc)
   and product_group_code = lag(product_group_code)
   and semester NE lag(semester)
then lagprice = lag(medianpricenational);
else lagprice = .;
Prationational = log(medianpricenational/lagprice);
run;

data dressingsnational;
set dressings2 (DROP = upc price week_end medianpricenational);
where prationational NE .;
run;

/* Merge all non-organic together*/

/* Milk*/
data nonorganicmilkprice;
merge milkretail(keep = store_code_uc product_group_code organic RETAIL semester pratioretail)
milknational;
by store_code_uc product_group_code semester;
run;

data nonorganicmilkprice;
set nonorganicmilkprice (DROP = medianprice retail lagprice);
where pratioretail NE . and prationational NE .;
run;

/* Egg*/
data nonorganiceggprice;
merge eggretail(keep = store_code_uc product_group_code organic RETAIL semester pratioretail)
eggnational;
by store_code_uc product_group_code semester;
run;

data nonorganiceggprice;
set nonorganiceggprice (DROP = medianpriceretail lagprice);
where pratioretail NE . and prationational NE .;
run;

/* Produce*/
data nonorganicproduceprice;
merge produceretail(keep = store_code_uc product_group_code organic RETAIL semester pratioretail)
    producenational;
by store_code_uc product_group_code semester;
run;

data nonorganicproduceprice;
set nonorganicproduceprice (DROP = medianpriceretail lagprice);
where pratioretail NE . and prationational NE .;
run;

/* Dressings*/
data nonorganicdressingsprice;
merge dressingsretail(keep = store_code_uc product_group_code organic RETAIL semester pratioretail)
dressingsnational;
by store_code_uc product_group_code semester;
run;

data nonorganicdressingsprice;
set nonorganicdressingsprice (DROP = medianpriceretail lagprice);
where pratioretail NE . and prationational NE .;
run;

/* All Non-Organic Prices*/
data research.allnonorganicprices;
set nonorganicmilkprice nonorganiceggprice nonorganicproduceprice
    nonorganicdressingsprice;
ratiodif = pratioretail - prationational;
run;

/*All Prices*/
data research.pricevariablefinal;
set research.allorganicprices research.allnonorganicprices;
run;

proc sort data = research.pricevariablefinal;
by store_code_uc product_group_code organic semester;
run;
/*Fixing Sales Data */

data research.salesvariablefinal;
   set research.five (DROP = lnqratio lagqratio);
   where lnqdiff NE .;
run;

proc sort data = research.salesvariablefinal;
   by store_code_uc product_group_code organic semester;
run;

/* Merge for final dataset*/
data research.finaldataset;
   merge research.pricevariablefinal
       research.salesvariablefinal;
   by store_code_uc product_group_code organic semester;
run;

data research.finaldataset;
   set research.finaldataset (drop = pratioretail prationational);
   where ratiodif NE . and lnqdiff NE .;
run;

proc sort data = research.finaldataset
   out = test3;
   by store_code_uc product_group_code semester;
run;

proc export
data = research.finaldataset
   outfile = "d:\sas\finaldataset.csv"
   replace;
run;

data research.finaldataset;
   set research.finaldataset;
   orgindicator = organic*ratiodif;
run;
9. STATA Code:

import delimited \Client\DS\SAS\finaldataset.csv

egen id = group(store_code_uc product_group_code organic)

g orginteraction = ratiodif*organic

xtset id semester

xtreg lnqdiff ratiodif orginteraction