Ascertaining the Role of Socio-Economic-Demographic and Government Food Policy Related Factors on the Per Capita Intake of Dietary Fiber Derived from Consumption of Various Foods in the United States

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Abstract

The 2010 USDA Dietary Guidelines for Americans recommended that individuals consume around 25 grams of dietary fiber per person per day. Yet despite these recommendations, consumers do not purchase enough foods high in dietary fiber. To investigate the factors behind this behavior, we use the Nielsen Homescan data to create a quarterly panel from 2004 through 2014 of 9,896 households from across the United States. This research contributes to the literature by simultaneously investigating per capita purchases of products containing fiber: (1) bread (2) pasta, (*3*) tortilla, (*4*) fresh fruit, (5) fresh vegetables and beans, (6) frozen fruit, (7) frozen vegetables and beans, (8) canned fruit, (9) canned vegetables and beans. We perform the estimation using a random effects panel Tobit model in order to account for the censored nature of the available data. Preliminary results suggest that those with a higher income or education report more consumption of fiber from fresh and frozen vegetables and less from pasta. Those living below 130 percent and 185 percent of the poverty level do not seem to purchase significantly less fiber per capita relative to those above these poverty levels. A test of the effectiveness of fiber consumption promotion in the 2010 Dietary Guidelines seems to show mixed results

Keywords: Dietary fiber, fiber consumption, Nielsen Homescan Panel, USDA Dietary Guidelines, Panel Tobit

JEL Classification: D12, I18

1. Introduction and Motivation

The 2010 USDA *Dietary Guidelines for Americans* recommend that individuals consume around 25 grams of dietary fiber per person per day. The *Dietary Guidelines for Americans (*USDA, 2005 & 2010) are the main source of dietary recommendations for health professionals and government agencies. One suggestion from these guidelines is to increase the consumption of foods high in fiber. These fiber rich foods include many fruits and vegetables, beans, whole grains, and nuts. Yet despite encouragement from the government, consumers do not purchase enough foods high in dietary fiber. For example, many consumers continue to purchase too few whole grain products (higher in dietary fiber) and too many refined grain products (lower in dietary fiber) than recommended (Volpe and Okrent, 2013).

Dietary fiber provides a range of important health benefits. Consumption of dietary fiber from cereals and fruits is inversely associated with the risk of coronary heart disease (Pereira et al., 2004). Increased intake of dietary fiber may reduce cardiovascular disease, stroke, hypertension, diabetes, obesity, and some gastrointestinal diseases (Anderson et al., 2009; McKeown et al., 2002). There may be an association between adults who eat more whole grains, particularly those higher in dietary fiber, and a lower body weight relative to adults who eat fewer whole grains (USDA, 2010). These health benefits from the dietary fiber make it an important dietary component.

This paper goes beyond a simple total fiber consumption analysis. This paper contributes to the literature by conducting a panel Tobit regression on nine separate per-capita fiber purchase categories: (1) bread, (2) pasta, (*3*) tortilla, (*4*) fresh fruit, (5) fresh vegetables and beans, (6) frozen fruit, (7) frozen vegetables and beans, (8) canned fruit, (9) canned vegetables and beans. These results can be used to determine whether the recent dietary guidelines have had any effect

on fiber consumption. Understanding the factors influencing consumers' demand for fiber and whether dietary guidelines have an effect on this demand is an important issue.

We perform the empirical analysis using Nielsen Homescan data. We create a quarterly panel of households for the years 2004 through 2014. This dataset is well suited to the analysis as information is collected on purchases from participating panelists. The dataset also provides a wealth of socioeconomic data but does have some limitations. This dataset does not provide time spent preparing food and only includes food purchases. The need to account for time is especially important since food prices influence food production and time allocation decisions (Aguiar and Hurst, 2007; Senia, Jensen, and Zhylyevskyy, 2014). One must be careful to differentiation between food that is purchased and food that is consumed.[1] The results of this study can best be interpreted as purchase amount decisions and not consumption amount decisions.[2]

Our main findings can be summarized as follows: Those with a higher income or education report more consumption of fiber from fresh and frozen vegetables and less from pasta. Those living below 130 percent and 185 percent of the poverty level do not seem to purchase significantly less fiber per capita relative to those above these poverty levels. Households with an older head purchase more fiber per capita from bread and fresh vegetables relative to those with a younger head of household. Regional effects in fiber purchases are also evident in that the pacific region purchases a larger amount of fiber.

The remainder of this paper proceeds as follows. In Section 2, we discuss the existing literature on fiber purchase and consumption. In Section 3, we specify the econometric model and outline the estimation methodology. In Section 4, we give a detailed description of the data

[1] The data do not provide information on food that is purchased and given away or food waste.
[2] Though an attempt has been made to ensure the distinction in the paper, it is possible that consumption and purchase may be used interchangeable. The food items purchased in this paper are usually ready to eat and need little preparation time. Thus time inputs are less likely to affect the quality of these goods.

and the constructed dependent and explanatory variables. In Section 5, we discuss and present the results. In Section 6, we summarize the results and discuss relevance.

2. Literature Review

Current literature dealing solely with consumer dietary fiber demand is somewhat limited. Miguel and Diansheng (2012) use a dynamic Tobit model that allows past purchase occasions to affect current purchase decisions for fiber using the Nielsen Homescan dataset. The authors find that participation in the WIC program, the age and presence of children between thirteen and seventeen, not being Hispanic, and the employment level of the female head do not significantly affect fiber consumption. Also the authors find that the female head's education level has a negative impact on fiber purchases and coupon use has a positive effect. The authors do not include fiber from fresh or frozen fruits and vegetables and do not separate the sources of dietary fiber into multiple categories.

The effect of nutritional information on nutrient consumption is a popular closely related line of research. Variyam and Blaylock (1996) conducted a survey on the fiber content of food and attitudes toward consumption of foods high in fiber. The authors find that knowledge of nutritional information has an influence on fiber consumption. The major factors affecting fiber intake are household income, meal planner age, smoking status, vegetarian status, race, and ethnicity. Education exerts a sizable intake effect by enhancing the information level. Ollberding, Wolf, and Contento (2011) use the 2005-2006 National Health and Nutrition Examination Survey and find that food label users report higher fiber consumption than those that do not use food labels. Thus it is likely that in our sample, higher educated individuals will have higher fiber consumption.

Literature has previously examined the impact of the 1994 Nutrition Labeling and Education Act. Variyam (2008) examined the impact of thirteen nutrients on consumer diets

displayed on the consumer nutrition label. When consumers use the nutrition labels, they increase their fiber intake by 0.69 grams per 1000 calories. Using the same data and a different estimation technique, Kim, Nayga and Capps (2000) reported that consumer nutrition label use increase the average daily fiber intake of consumers by 7.51 grams.

Literature has also been focusing on consumer whole grain (a good source of dietary fiber) demand likely due to the USDA making specific quantity recommendations in 2005. Mancino et al. (2008) find that the release of 2005 Dietary Guidelines for Americans increased the availability and sales of whole-grain foods, with a large impact due to reformulation of existing products. Lin and Yen (2008) use the 1994–1996 Continuing Survey of Food Intakes by Individuals to examine how nutrition knowledge and sociodemographic variables affect the consumption of refined and whole grain products. Mancino and Kuchler (2012) estimate demand for whole grain bread to determine if the release of the 2005 Dietary Guidelines for Americans affected demand for whole grain. They find an increase in demand even after accounting for price changes.

It is important for policymakers to know if their guidelines are effective in changing the behavior of citizens. Thus, testing whether or not government regulations are effective in changing behavior is an important area of research. Palma and Jetter (2012) observed no significant changes in consumption or shifts from one food group to another. These results would be similar to the Guidelines from 2000 and 2005 with very minor changes in consumption.

Dong and Lin (2009) estimate that a 10-percent subsidy for fruits and vegetables would encourage low-income Americans to increase their consumption of fruits by 2.1-5.2 percent and vegetables by 2.1-4.9 percent. The annual cost of such a subsidy would be about $310 million for fruits and $270 million for vegetables. This would still not meet the level from the dietary guidelines. Klerman, Bartlett, Wilde, and Olsho (2014) studied the effects of the USDA Healthy

Incentives Pilot. This test provided a 30% incentive for purchases of certain fruits and vegetables. These authors find that participants had a 24-percent higher intake of these fruits and vegetables compared to those in the control group.

Studies have also shown that revisions to government programs can lead to changes in diet. Andreyeva and Luedicke (2013) find the 2009 WIC revisions increased the share of whole-grain bread and brown rice purchased while not increasing the total amount purchased. WIC households used their benefits to change some of their bread purchases, rather than to buy more bread overall, whereas total rice purchases increased.

3. Empirical Model and Estimation Procedure

To account for zero instances of fiber consumption, we adopt a Tobit model (Tobin, 1958; Amemiya, 1984). To account for the panel nature of the data, a random effects panel Tobit model is used to estimate each fiber demand (Maddala, 1987). This means that the unobservable factors that differentiate individuals in the panel are assumed to be randomly distributed variables. The individuals in the panel are likely to differ in culture, tastes, and other unobservable factors. Thus, it is reasonable to assume that the differences between them are randomly distributed.

We let y_{it}^{*} be a continuous latent variable described by the following equation with panel-level random effects:

$$y_{it}^{*} = \boldsymbol{x}_{it}\,\beta + v_i + \varepsilon_{it},$$

for i=1,…,n panels. $\boldsymbol{x}_{it}$ is the vector of explanatory variables for individual i, β is the vector of coefficients to estimate, v_i are the random effects which are i.i.d. $\mathcal{N}(0, \sigma_{\mathrm{v}}^2)$, and ε_{it} are the error terms which are i.i.d. $\mathcal{N}(0, \sigma_{\mathrm{e}}^2)$ and independent of v_i. To account for the censored nature of the purchase data, we specify that the observed purchase in activity j, y_{ij}, is related to the latent variable y_{ij}^{*} as follows:

$$y_{ij} = \begin{cases} y_{ij}^* = \boldsymbol{x}_{it}\,\beta + v_i + \varepsilon_{it}, & if\ \ y_{ij}^* > 0 \\ 0, & if\ \ y_{ij}^* \le 0 \end{cases},$$

We estimate the model parameters using the Stata XTTOBIT command. To allow interpretation of the results, we calculate and report partial effects associated with the explanatory variables for each of the fiber consumption categories (Greene, 2012, pp. 848-850; McDonald and Moffitt, 1980). The unconditional elasticities are defined as

$$\epsilon_{x_{ij}} = \frac{\beta_{ij}}{\overline{y}_i}\ \Phi\left(\frac{\overline{x}_i\,\beta}{\sigma}\right),$$

and the conditional elasticities are defined as

$$\epsilon_{x_{ij}}^* = \frac{\beta_{ij}}{\overline{y}_i^*}\left[1 - \frac{\overline{x}_i\,\beta}{\sigma}\frac{\Phi\left(\frac{\overline{x}_i\,\beta}{\sigma}\right)}{\Phi\left(\frac{\bar{x}\,\beta}{\sigma}\right)} - \frac{\Phi\left(\frac{\overline{x}_i\,\beta}{\sigma}\right)^2}{\Phi\left(\frac{\overline{x}_i\,\beta}{\sigma}\right)^2}\right],$$

where $\Phi(\cdot)$ is the standard normal cumulative distribution function, $\phi(\cdot)$ is the standard normal probability density function, and $\sigma = \sqrt{\sigma_{\mathrm{v}}^2 + \sigma_{\mathrm{e}}^2}$.

4. Data

Data are obtained from Nielsen Homescan panel. We create a quarterly panel of households for the years 2004 through 2014 consisting of 9,896 households across the United Sates. Each participating household is given a scanner to read UPCs from products purchased at stores. Nielsen matches the scanned UPC with products characteristics in their database. The household is also asked to enter quantity, price, and any coupon information about the products.

For a selection of fiber rich products the quantity and demographic characteristics of the household are used. The products selected for study bread, pasta, tortilla, fresh fruit, fresh vegetables and beans, frozen fruit, frozen vegetables and beans, canned fruit, canned vegetables and beans. For each UPC an estimate is made of the fiber content by utilizing UPC keyword search. We are able to identify around 154,000 products across the nine categories. Then the

fiber content each category is summed to create the total fiber consumed for the household in that quarter. This total for each category is then divided by the number of members of the household to create an approximation of daily fiber consumed per capita.

Table 1 lists summary statistics for these dependent variables. It is important to take notice of the large number of zero observations for some of the categories. There are a few households that report unusually large fiber purchases. This may be due to reporting issues, problems estimating the fiber content of certain foods, or the household purchasing food for members outside of the household (donations to food banks as one possible example).

Figure 1 shows a histogram for the yearly fiber consumption per capita. The red vertical line at 3.86 represents average daily fiber consumption per capita of our sample. This falls far short of a USDA target of 25 grams per day. The majority of our sample is not meeting the USDA guidelines. The USDA (2010, pg. 46) estimates the typical American diet provides 40 percent of needed fiber. Our sample average shows participants meeting 16 percent of the recommendation. This is far from an estimate from 2008 of dietary fiber consumption of 15.9 grams per day (King, Mainous, and Lambourne, 2012) and is likely due to not covering all possible sources of dietary fiber in this research.

We begin by including the prices for each of the nine product categories. Missing prices are imputed using a seemingly unrelated regression including the quantity, location, and time variables. Then we include a range of standard demographic characteristics. Table 2 lists summary statistics for these characteristics. The largest segment of individuals falls within the 50 to 64 age group with 45 percent of the sample. The age variable as constructed only takes into account the age of the oldest head of the household. It is assumed that the oldest member is likely to have more influence on purchase decisions. This sample has 5 percent of respondents identifying as being of Hispanic origin. Controlling for Hispanic origin is important because such

respondents may have different preferences over the categories (e.g. more likely to consume tortillas).

The yearly income is included in the explanatory variables. The dataset provides categorical income information. The income variable is constructed as the natural log of the midpoint of the categorical yearly income variable. The average for real income is around $47,100.

The poverty dummy variables indicate whether the respondent's household income is at or below 130% of the federal poverty level and whether the household is at or below 185% of the federal poverty level. The threshold levels here indicate eligibility for participation in public assistance programs such as the SNAP at 130% and below or WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) at 185% and below. By using indicators for eligibility, rather than indicators for actual participation, we avoid potential complications arising from non-random selection into the programs and under-reporting of participation.

Four educational variables denote the highest level of education received. This education variable is constructed to capture the highest level of education completed by either the male or female head of household. It is assumed the individual with the highest education has a large influence in purchase decisions. The sample consists of 53 percent with Bachelor's degree or higher, 29 percent with some college, 17 percent with high school degree, and 1 percent with less than a high school education. This sample is more highly educated than the general U.S. population.[3]

We also construct an indicator for the presence of children in the households. This variable indicates if there is at least one child present in the household. This may be important as

[3] Further research using the Nielsen provided survey weights can make the sample more representative of the U.S. population.

the presence for children may change the nutritional mix of food purchased. Parents may focus on purchases healthier food when children are present in the household.

The place of residence dummies use the nine U.S. Census Bureau designated divisions. These are used to control for possible differences in the characteristics of the food environment—including availability of grocery stores and other food outlets, and possible geographical differences in the food tastes and preferences.

5. Results

To facilitate the interpretation of the results, we use the estimate coefficients to compute elasticities and marginal effects. Table 3 presents the unconditional elasticities and marginal effects while Table 4 presents the conditional. The marginal effect of an explanatory variable illustrates the influence of a change in this variable on the expected purchase of fiber, by accounting for all impacts associated with the change in the variable. We focus on these when discussing the results below as these more accurately explain the effects of the explanatory variables on fiber purchase. The estimation results reveal statistically significant effects of economic variables on the fiber purchase categories.

Households below the poverty indicators do not significantly differ in their fiber purchases in most categories. That these individuals do not vary greatly in their fiber consumption from that of a higher income household is an interesting finding. Another income result is that those with a higher income are associated with getting less fiber from bread and pasta purchases and more fiber from fresh produce purchases. While our results find a small negative effect for WIC eligibility on fiber consumption in some categories, Miguel and Diansheng (2012) find that participation in the WIC program has no effect on dietary fiber consumption overall.

The indicator for the 2010 Dietary Guidelines seems to show mixed results. While individuals had higher fiber consumption from pasta and frozen fruit at the guidelines were announced, other categories showed a decrease in fiber consumption. This it may be more than likely that our sample was not persuaded by the guidelines to significantly alter their diets.

Some further interesting results arise from the household characteristics. An interesting trend is seen with the size of the household. Large households are associated with lower fiber per capita consumption in a majority of categories. Large households may have more difficulty reporting the large quantity of food that is purchased. Unexpectedly we find that the presence of children in the household does not affect a majority of the fiber categories. Thus the presence of children does not seem to be associated with healthier eating habits for fiber. This may be caused by only including an indicator for the presence of a child. Further refinement of this specific variable may reveal other effects related to the presences of children.

College graduate reports obtaining much more fiber from frozen fruit and less from bread. There also are interesting age effects in the results. Older individuals consume more fiber per capita from bread and fresh vegetables relative to younger households. There also appear to be regional differences in fiber consumption. Many of the regions are consuming less fiber than the base Pacific region. This may signal a possible issue with the data in that region or it may be possible that West Coast households consume more fresh fiber due to a healthier lifestyle.[4]

6. Implications and Limitations

This paper contributes to the literature by conducting a panel Tobit regression on nine separate per-capita fiber purchase categories: (1) bread (2) pasta, (*3*) tortilla, (*4*) fresh fruit, (5) fresh vegetables and beans, (6) frozen fruit, (7) frozen vegetables and beans, (8) canned fruit, (9)

[4] Those households that report the largest fiber consumption are all mostly located in California.

canned vegetables and beans. We performed the empirical analysis using a quarterly panel Nielsen Homescan data from 2004 through 2014.

A number of interesting finding results from the analysis. Those with a higher income or education report more consumption of fiber from fresh and frozen vegetables and less from pasta. Those living below 130 percent and 185 percent of the poverty level do not seem to purchase significantly less fiber per capita relative to those above these poverty levels. Households with an older head purchase more fiber per capita from bread and fresh vegetables relative to those with a younger head of household. Regional effects in fiber purchases are also evident in that the pacific region purchases a larger amount of fiber.

While we believe that we accounted for all possible sources of bias in our modeling procedure, limitations of still remain. The expected issues from self-reported data and the restriction to Nielsen households currently prevent generalization to all households.[5] As this is a cross-sectional approach, we cannot be sure that the results truly reflect causation.

Only nine categories of fiber were studied and adding additional categories would help capture more fiber consumption. The approach used in this research estimated the fiber content in the food item and this may be the cause of some error. More accurate data that includes the fiber content for each product would improve results. This study is also limited by the lack of data on weighed fresh produce items and this would leave out some fiber consumption. The focus of this paper is food purchased for consumption at home. Fiber consumed away from home would not be captured by this dataset. This may not be a major problem as eating meals away from home is usually associated with less healthy eating (Lin and Guthrie, 2012; Todd, Mancino and Lin, 2010) and this might not change overall fiber totals.

[5] Einay, Leibtag, and Nevo (2010) have formulated a method to help correct for possible entry errors in the dataset.

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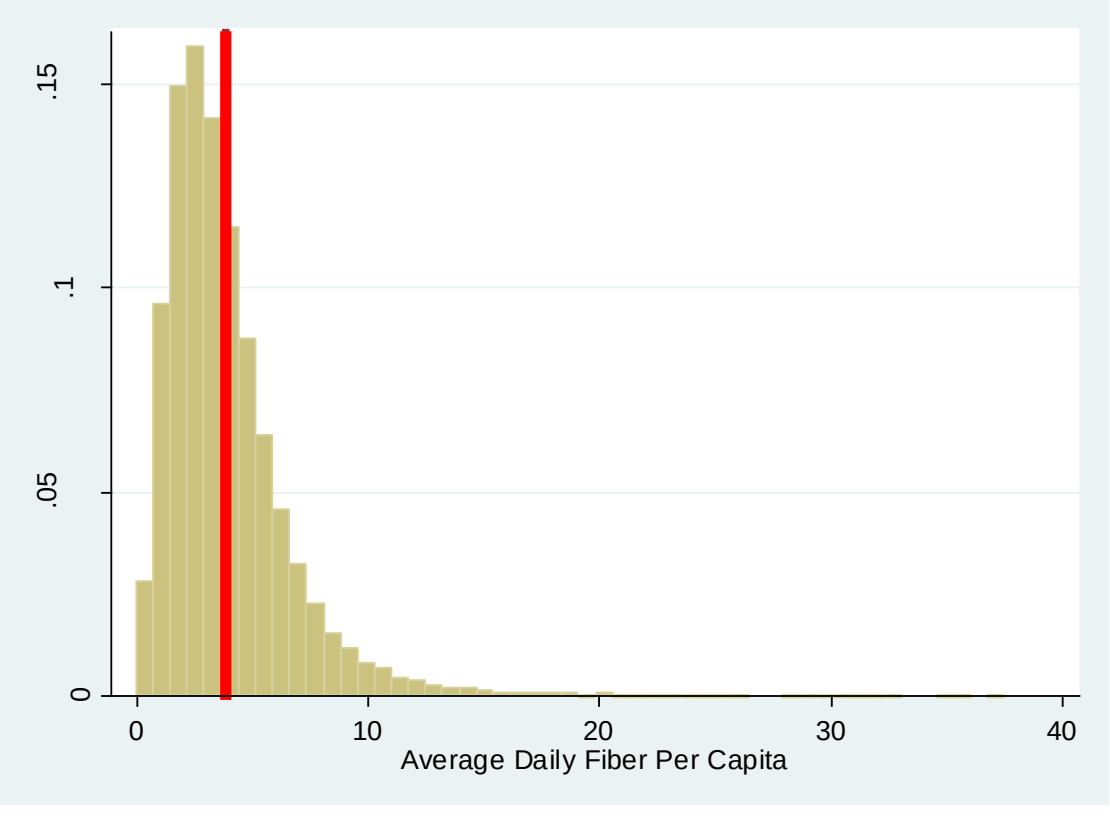
Figure 1. Distribution of average daily fiber per capita consumption



Notes:
The red vertical line at 3.86 represents the sample average daily fiber consumption.

Table 1. Unconditional Summary Statistics for fiber consumption categories (daily grams per capita)

	Bread	**Pasta**	**Tortilla**	**Canned Fruit**	**Fresh Fruit**	**Frozen Fruit**	**Canned Vegetables**	**Fresh Vegetables**	**Frozen Vegetables**
Sample Mean	1.024	0.238	0.097	0.191	0.658	0.029	0.858	0.837	0.446
(std. dev.)	(1.14)	(0.401)	(0.388)	(0.42)	(1.19)	(0.20)	(1.35)	(0.97)	(0.74)
Min	0	0	0	0	0	0	0	0	0
Max	45.53	13.89	82.74	34.89	91.98	14.44	83.90	30.70	43.39
Percent Zero Observations	10.8	40.1	70.3	43.4	29.1	87.4	19.4	11.8	28.0

Notes:
This table lists summary statistics for the nine food categories. The percent of zero observations in each category is also listed.

Table 2. Summary Statistics for Explanatory Variables

Variable	Mean	Std. Dev.
Real Unit Prices ($/ 100 grams)		
Bread	0.18	0.02
Pasta	0.15	0.02
Tortilla	0.21	0.03
Canned Fruit	0.13	0.01
Fresh Fruit	0.19	0.04
Frozen Fruit	0.30	0.02
Canned Vegetables	0.11	0.02
Fresh Vegetables	0.17	0.05
Frozen Vegetables	0.17	0.01
Demographic characteristics		
Hispanic origin	0.05	0.21
Age of oldest head of household 65 plus	0.38	0.49
Age of oldest head of household 50-64	0.46	0.50
Age of oldest head of household 40-49	0.14	0.34
Age of oldest head of household 30-39	0.02	0.15
Age of oldest head of household 29 or less	0.001	0.03
Economic Characteristics		
Real household income	25,963	13,277
Income below 130% of poverty line	0.07	0.26
Income below 185% of poverty line	0.16	0.16
Education		
Less than HS degree	0.01	0.12
HS degree	0.20	0.40
Some college	0.28	0.45
Bachelor's or higher degree	0.50	0.50
Family Characteristics		
At least one child present	0.13	0.33
Household Size	2.08	1.10
Place of residence		
New England	0.05	0.21
Mid Atlantic	0.13	0.33
East North Central	0.16	0.36
West North Central	0.10	0.30
South Atlantic	0.18	0.39
East South Central	0.06	0.24
West South Central	0.11	0.31
Mountain	0.08	0.28
Pacific	0.14	0.34

Notes:
This table lists summary statistics for the explanatory variables. We report the mean for each characteristic and standard deviations. Categories may not sum to one due to rounding. Except for prices, family income, and household size, all characteristics are indicators.

Table 3.A Unconditional Elasticities

	Bread	Pasta	Tortilla	Canned Fruit	Fresh Fruit	Frozen Fruit	Canned Vegetables	Fresh Vegetables	Frozen Vegetables
Ln Bread unit price	**-0.101**	**0.006**	**0.025**	0.003	**0.036**	**0.113**	**0.021**	**0.009**	**0.009**
Ln Pasta unit price	**-0.028**	**-0.091**	**0.010**	-0.002	**0.008**	**0.110**	-0.002	**-0.005**	0.001
Ln Tortilla unit price	**-0.024**	-0.002	**-0.231**	0.003	**0.007**	0.056	**-0.012**	**-0.013**	**-0.007**
Ln Canned Fruit unit price	**-0.027**	**-0.005**	0.005	**-0.114**	**-0.020**	**-0.074**	**-0.017**	**-0.009**	**-0.013**
Ln Fresh Fruit unit price	**-0.022**	**-0.005**	-0.003	**-0.015**	**-0.291**	**-0.083**	**-0.020**	**-0.017**	**-0.011**
Ln Frozen Fruit unit price	-0.010	0.004	**-0.018**	0.001	0.002	**-0.705**	**0.037**	-0.001	0.007
Ln Canned Vegetables unit price	**-0.028**	**-0.006**	**-0.010**	**-0.017**	**-0.011**	0.021	**-0.323**	**-0.015**	-0.003
Ln Fresh Vegetables unit price	**-0.037**	**-0.008**	-0.002	**-0.012**	**-0.009**	0.012	**-0.027**	**-0.203**	**-0.013**
Ln Frozen Vegetables unit price	**-0.026**	-0.004	**-0.009**	**-0.007**	-0.001	0.029	**-0.010**	**-0.015**	**-0.136**
Ln Real Income	-0.005	**-0.004**	0.004	-0.005	**0.018**	-0.022	0.002	**0.005**	**0.005**
Table 3.A Unconditional Marginal Effects									
130% Poverty Level	**-0.013**	-0.004	0.009	-0.006	0.001	**-0.111**	-0.005	0.004	-0.001
185% Poverty Level	0.002	**-0.009**	0.004	-0.003	-0.010	-0.002	-0.005	**-0.005**	**-0.010**
Hispanic	0.019	**-0.014**	**0.130**	**-0.025**	0.005	-0.033	**0.019**	**0.017**	-0.003
Age of oldest head of household 65 plus [a]	**0.147**	-0.009	0.066	**0.078**	**0.147**	2.352	**0.133**	**0.065**	-0.017
Age of oldest head of household 50-64	**0.160**	0.002	0.084	0.066	**0.109**	2.297	**0.123**	**0.062**	-0.011
Age of oldest head of household 40-49	**0.149**	-0.001	0.093	0.047	0.042	2.204	**0.098**	**0.043**	-0.014
Age of oldest head of household 30-39	**0.118**	-0.012	**0.111**	0.031	-0.024	2.168	**0.069**	0.008	-0.029
HS grad [b]	-0.025	-0.014	-0.009	-0.002	**0.038**	**0.373**	-0.015	**0.014**	-0.003
Some college	**-0.034**	-0.008	-0.001	-0.006	**0.051**	**0.488**	**-0.029**	0.007	0.012
College grad or more	**-0.050**	-0.001	-0.004	-0.011	**0.088**	**0.557**	**-0.028**	0.011	0.015
Child present	**0.019**	**0.009**	0.006	0.005	**0.018**	-0.147	**-0.013**	-0.002	**0.013**
Household size	**-0.250**	**-0.062**	**-0.067**	**-0.073**	**-0.163**	**-0.402**	**-0.111**	**-0.111**	**-0.105**
New England [c]	0.045	**0.079**	**-0.127**	**-0.037**	0.033	**-0.394**	-0.011	**0.075**	**0.052**
Mid Atlantic	-0.008	**0.066**	**-0.156**	**-0.015**	**0.048**	**-0.301**	0.002	**0.043**	**0.076**
East North Central	**-0.045**	**0.012**	**-0.164**	-0.011	**0.095**	**-0.238**	**0.024**	**0.041**	**0.037**
West North Central	**-0.059**	**-0.012**	**-0.132**	-0.004	**0.097**	**-0.199**	-0.002	**0.023**	**0.026**
South Atlantic	**-0.052**	**0.010**	**-0.137**	**-0.028**	**0.047**	**-0.399**	**0.054**	**0.033**	**0.086**
East South Central	-0.023	**-0.035**	**-0.155**	-0.007	0.015	**-0.343**	**0.080**	**0.033**	**0.059**
West South Central	**-0.088**	**-0.035**	**-0.090**	**-0.029**	**-0.021**	-0.065	**0.050**	**-0.019**	0.014
Mountain	0.005	**0.016**	**-0.042**	-0.006	**0.030**	**-0.121**	**0.032**	0.010	**0.024**
Guidelines 2010	**-0.087**	**0.005**	-0.005	**-0.031**	0.076	**0.179**	**-0.012**	**-0.005**	**-0.018**

Notes:

These tables present the estimated unconditional elasticities and marginal effects of the panel Tobit model. Bold represents significance at the 5% level.

a Base category is age of oldest head of household less than 29

b Base category is less than high school completed

c Base category is pacific region

Table 4.A Conditional Elasticities

	Bread	Pasta	Tortilla	Canned Fruit	Fresh Fruit	Frozen Fruit	Canned Vegetables	Fresh Vegetables	Frozen Vegetables
Ln Bread unit price	**-0.078**	**0.007**	**0.024**	0.004	**0.026**	**0.088**	**0.017**	**0.007**	**0.007**
Ln Pasta unit price	**-0.022**	**-0.096**	**0.009**	-0.002	**0.006**	**0.086**	-0.002	**-0.004**	0.001
Ln Tortilla unit price	**-0.019**	-0.002	**-0.223**	0.003	**0.005**	0.043	**-0.009**	**-0.011**	**-0.005**
Ln Canned Fruit unit price	**-0.021**	**-0.005**	0.004	**-0.116**	**-0.015**	**-0.058**	**-0.013**	**-0.007**	**-0.010**
Ln Fresh Fruit unit price	**-0.017**	**-0.006**	-0.003	**-0.015**	**-0.209**	**-0.065**	**-0.016**	**-0.014**	**-0.009**
Ln Frozen Fruit unit price	-0.007	0.004	**-0.017**	0.001	0.001	**-0.550**	**0.029**	0.000	0.005
Ln Canned Vegetables unit price	**-0.022**	**-0.007**	**-0.010**	**-0.017**	**-0.008**	0.017	**-0.253**	**-0.012**	-0.002
Ln Fresh Vegetables unit price	**-0.029**	**-0.009**	-0.002	**-0.012**	**-0.006**	0.009	**-0.021**	**-0.164**	**-0.011**
Ln Frozen Vegetables unit price	**-0.020**	-0.004	**-0.009**	**-0.007**	**-0.001**	0.023	**-0.008**	**-0.012**	**-0.112**
Ln Real Income	-0.004	**-0.004**	0.003	-0.005	0.013	-0.017	0.002	**0.004**	**0.005**
Table 4.B Conditional Marginal Effects									
130% Poverty Level	**-0.010**	-0.004	0.009	-0.006	**0.000**	-0.086	**-0.004**	0.003	-0.001
185% Poverty Level	0.002	**-0.010**	0.004	-0.003	-0.007	-0.002	-0.004	**-0.004**	**-0.008**
Hispanic	0.015	**-0.014**	**0.125**	**-0.025**	0.003	-0.026	0.015	**0.014**	-0.002
Age of oldest head of household 65 plus [a]	**0.114**	-0.010	0.063	**0.079**	0.106	**1.833**	0.104	**0.053**	-0.014
Age of oldest head of household 50-64	**0.124**	0.002	0.081	0.067	0.078	**1.791**	0.097	**0.050**	-0.009
Age of oldest head of household 40-49	**0.115**	-0.001	0.089	0.047	0.030	1.718	0.077	**0.035**	-0.012
Age of oldest head of household 30-39	**0.091**	-0.012	**0.107**	0.031	-0.017	1.690	**0.054**	0.007	-0.024
HS grad [b]	-0.019	-0.015	-0.009	-0.002	0.027	**0.291**	**-0.012**	**0.011**	-0.003
Some college	**-0.026**	-0.009	-0.001	-0.006	0.037	**0.381**	**-0.023**	0.006	0.010
College grad or more	**-0.039**	-0.001	-0.004	-0.011	0.063	**0.435**	**-0.022**	0.009	0.012
Child present	**0.014**	**0.009**	0.006	0.005	0.013	**-0.115**	-0.010	-0.001	**0.011**
Household Size	**-0.193**	**-0.065**	**-0.065**	**-0.073**	-0.117	**-0.313**	**-0.087**	**-0.089**	**-0.086**
New England [c]	0.035	**0.083**	**-0.122**	**-0.037**	0.024	-0.307	**-0.009**	**0.061**	**0.043**
Mid Atlantic	-0.006	**0.069**	**-0.150**	**-0.015**	0.034	**-0.235**	**0.001**	**0.035**	**0.062**
East North Central	**-0.034**	**0.013**	**-0.158**	-0.011	0.068	**-0.186**	**0.019**	**0.033**	**0.031**
West North Central	**-0.046**	**-0.013**	**-0.127**	-0.004	0.070	**-0.155**	**-0.001**	**0.019**	**0.022**
South Atlantic	**-0.040**	**0.011**	**-0.132**	**-0.029**	0.034	**-0.311**	**0.042**	**0.027**	**0.071**
East South Central	-0.018	**-0.036**	**-0.149**	-0.008	0.011	-0.267	**0.063**	**0.026**	**0.048**
West South Central	**-0.068**	**-0.036**	**-0.087**	**-0.030**	-0.015	**-0.050**	0.040	**-0.016**	0.011
Mountain	0.004	**0.017**	**-0.041**	-0.006	0.022	**-0.094**	**0.025**	0.008	**0.020**
Guidelines 2010	**-0.067**	**0.005**	-0.005	**-0.031**	0.054	**0.139**	**-0.009**	**-0.004**	**-0.015**

Notes:

These tables present the estimated conditional elasticities and marginal effects of the panel Tobit model. Bold represents significance at the 5% level.

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