The Effect of Retail Grocery Coupons for Breakfast Cereals on Household Purchasing Behavior

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Given the vast number of products available at grocery stores, it is essential that food manufacturers and retail grocery store chains advertise to both retain and attract new customers. Coca-Cola recognized this in 1887 when they introduced the first known coupon to market their new product (Geuss 2010). Coupons became prolific during the early part of the 20^{th} century, especially, during the Great Depression when consumers needed any support to survive. Since that time, coupons have become ubiquitous. Whereas coupons were traditionally acquired by way of Sunday newspaper ads, they are now offered via multiple sources including daily papers, direct mail, online sources and at retail locations. For a period of time in the late 90's, coupon use had been in decline; however, during the latest economic recession, they have seen a dramatic increase in use. In 2006, 2.6 billion coupons were redeemed, reversing a 15 year downward trend (CNN, accessed on February 25, 2011).

While the majority of research on coupons has examined their effect on purchases, there are important policy questions related to consumer health to be considered as well. Because coupons offer a price discount, they may encourage consumers to purchase items they normally would not given their budget and preferences. As such, coupons may motivate consumers to purchase more unhealthful products relative to their typical purchases. Alternatively, coupons might also encourage consumers to purchase more healthful products. Several authors find evidence that coupons do in fact encourage brand switching (Gupta, 1988; Neslin et al 1985; Bawa and Shoemaker 1987). To date, however, there has been no research investigating how coupon-induced brand switching or new product purchases impact the nutritional quality of household purchases.

In this article, we examine the affect of retail and manufacturer coupons on household purchases. Specifically, we examine the effect that coupons have on the nutritional quality of purchases made by households, where nutritional quality is measured in terms of fiber, sugar and protein. We focus explicitly on breakfast cereals as they are both an important contributor to healthful diets and are almost exclusively purchased from grocery stores.

We use household level purchase data for three years which includes information on household demographics and purchases. Using this data we have to deal with (at least) three estimation issues. As households do not purchase cereals in every period, we observe zero purchases for much of the panel. We use fixed effects model to account for zero purchase decisions, assuming that the decision to make purchases is determined by time invariant characteristics. If zero purchases are non-randomly determined for each household, however, fixed effects estimation will not be appropriate. As such, we use a two-staged model to test for sample selection as well as account for sample selection bias. We also face potential bias due to omitted variables. That is, unobserved household characteristics not specified in our estimation may be correlated with the decision to use coupons which would also lead to biased estimation. To deal with this, we estimate household level fixed effects. Finally, since the decision to use coupons is endogenous to the purchase behavior of households we use instrumental variables to deal with endogeneity.

In both our fixed effects models and our sample selection models we find that coupon usage has a significant impact on the nutritional quality of cereals purchased by households. Specifically, we find that the average sugar content decreases and the fiber content increases. This suggests that coupons have a positive impact on the nutritional quality of cereals purchased by households, holding all other factors constant. In addition, we find that there is a time variant sample selection issue which we control for in our sample selection model.

Given the prolific use of coupons by households and the fact that they offer both a price discount and an advertisement for products, they might be an effective way to help guide consumers to healthier food choices.

Data

In this article, we use household level AC Nielsen data which includes daily household grocery purchases of breakfast cereals by households in the greater New York area from 2006-2008. Breakfast cereal is generally purchased only at grocery stores. As such, our data will not lack a significant amount of missing cereal purchased away from home. In addition to household demographics and purchase characteristics, the data also includes information on household coupon use during purchase. This data includes the type of coupon used (retail vs. manufacturer) and the value of the coupon.

The AC Nielsen purchase data describes product brand name (or private label name), flavor characteristics and UPC. The data does not, however, provide extensive information on product nutritional quality. We rely on several sources to match products with their macronutrient profiles (calories, total fat, sodium, fiber, sugar and protein). The largest source of data comes from the USDA Agricultural Research Service's National

Nutrient Database (2006, 2007, 2008). This data is updated annually and contains the nutrient contents of most major brands of cereals. We supplement this data with the Canadian Nutrient File database provided by Health Canada (2010). Much of the Canadian data is derived from the USDA data, but provides some product information that the USDA does not. We also extract data from Nutribase 9 Nutrition and Fitness Software personal addition (purchased at www.nutribase.com) which provides similar detailed information on various cereal products.

For cereals with no nutrition information available in these databases, we use online search methods to find nutrition facts panels. The majority of the products have manufacturer websites which provide this information. A large number of private label cereals also have online nutrition information available through grocery store websites. In cases where we can not find private label nutrition information, we substitute brand name equivalent nutrition information. For example, for a private label product labeled in our data ‘bite size shredded wheat (frosted)’, we would use Kellogg’s brand Bite-Size Frosted Shredded wheat nutrition information. While this is not always a perfect substitute, private label products are often equivalent to their name brand counterparts in terms of ingredients. There were 15 cereals (four private label) for which we could not find nutrition information. Three of these cereals were one-time promotional cereals (for example Jerome Bettis’ World Championship Crunch) and were purchased with low frequency. The remaining missing data were low-frequency purchases.

The nutrition data was all converted into per gram units. In the limited cases where we had two or more sources of varying nutrition information, we took the average of these nutritional values. While it is possible to link the year of the nutrition data with the year our products were purchased, we did not do this. Based on interaction with the USDA, we find that the nutrition information is not instantly (or even frequently) updated following a change in product. As such, any change in cereal over a three year period may not be reported in our data set. However, cereals that we observe with changes in their nutritional profile do not have drastic changes.

Importance of Breakfast Cereal

In this article, we focus on breakfast cereals for several reasons. For one, cereal is regularly consumed in the US and is a popular choice for breakfast among children and adults. Further, breakfast has been shown to be an important contributor to mental and physical health. After controlling for demographics and lifestyle differences, Smith (1999) found that those who consumed breakfast cereal every day reported better mental and physical health than those who consumed it infrequently. Additionally, cereal encourages complementary consumption of milk, which itself has important health benefits.

The type of cereal used in our data set varies largely from all-natural cereals to children's cereals as does the nutritional content. As such, it is relative easy to consume both healthful and unhealthful cereals. We present a summary of the nutritional content of the cereal in our data set (Table 1). The average serving size for our data is 37.9 grams[1]. There is a large variation in the calories per gram with the max roughly eight times as large as the min. These high calories per gram cereals tend to be either the granola cereals or children's cereals that have high levels of sugar per serving. Low

[1] The Canadian nutritional data provides their nutrition data in 100g serving size which does not reflect the true serving size. We calculate the average serving size for those cereals with actual serving size measurements.

calories per gram cereals are basic grain cereals (such as bran) that contain little added sugar. As expected, the level of sugar, fiber and protein varies quite a bit between cereals as well with several cereals having zero values. As expected, calories correlates highly with total fat and sugar content. Fiber negatively correlates with both sugar and calories, highlighting the overall quality of high fiber cereals.

There is debate regarding the overall nutritional benefit of breakfast cereals, particularly for children. Schwartz et al (2008) state that children's cereals contain more calories, sugar, and sodium and less fiber and protein than non-children's cereals. Further, they note that the majority of children's cereals fail to meet national nutrition standards and suggest that recommendations of ready-to-eat breakfast cereals should consider their full nutrient profiles. In fact, in an experiment, Harris et al (2010) find that offering children high-sugar cereals leads to them consuming both more total grams and more grams of sugar than children offered low-sugar cereal. In addition, children offered low-sugar cereal were more likely to put fruit on their cereal. Alternatively, research in the nutrition literature suggests that even sugar-sweetened cereals are beneficial to healthful diets as they *also* provide important shortfall micronutrients such that are often lacking in typical diets such as calcium, magnesium and potassium as well as a long list of other nutrients (Nicklas, O'Neil and Myers 2004, Morgan, Zabik and Leveille 1981, Frary, Johnson and Wang 2004).

The USDA data provides detailed nutritional information for a small selection of cereals. We compare the nutrients of cereals with greater than 10 grams of sugar (the average) with those that have less than 10 grams of sugar (Table 2). In general, the average value for nutrients per gram is higher for low-sugar cereals than for high-sugar cereals. The amounts of both vitamin A and D, however, are larger on average in the high sugar cereals which is likely due to cereals being fortified with these vitamins. That is, high sugar cereals tend to have lower amounts of nutrients with the exception of fortified vitamins. We find similar results when we compare cereals that are expected to be targeted at children versus other cereals[2].

As noted in the nutrition literature, most cereals do in fact deliver many important vitamins; however there is a clear difference in the amount of sugar provided. Further, high sugar cereals tend to provide fewer nutrients on average. The intention of this research is not to evaluate the overall nutritional quality of breakfast cereals, however, as this is beyond the scope of training and this paper. We are primarily interested in how coupons may impact the consumption of important nutrients (sugar, fiber and protein) acquired through breakfast cereals.

Motivation

Coupons play an important role in food marketing as they have a dual effect on consumers (Ward and Davis 1978). First, coupons inform or remind consumers about a product, therefore advertising the product. Then they offer a price discount for that product. In their early paper, Ward and Davis (1978) find that even after accounting for consumer habit persistence, coupons have a positive impact on orange juice purchases. Lee and Brown (1985) find similar results, again using orange juice. Dong and Kaiser (2005) find coupons impact US cheese purchases and that coupon usage varies across ethnic groups. Finally, Dong and Leibtag (2010) find with fruit and vegetable purchases

[2] We categorize cereals as children's cereals if they have cartoon depicted characters on their boxes, have commercials targeted at children or have names seemingly intended to appeal to children.

that price discounts using coupons have more of an effect than just price discounts, providing support for the dual effect of coupons.

In addition, it seems evident that firms would not use coupons unless they were expected to have an impact on consumers. In fact Nevo and Wolfram (2002) find evidence that firms lower prices during periods of coupon availability and that coupons induce repurchase. As noted by Lu and Moorthy (2007), it is widely accepted that coupons are used as a way for firms to price discriminate, suggesting that they do impact consumer purchase behavior.

As coupons appear to have an effect on consumer choices, from a policy perspective, an important question is how do coupons affect the quality of purchases being made? Currently, there is much research regarding the effect of prices on food choice and the implications for obesity. At question is whether or not taxes can reduce consumption of unhealthful foods. Similarly, there is public concern regarding the effect of product advertising (particularly to children) on the purchase of unhealthful foods. Since coupons combine both price and advertising, it is important to consider their combined effect on the quality of purchases made by households. In general, it is assumed that low prices or heavy advertising for unhealthful foods leads to greater consumption, thereby reducing diet quality. With coupons, however, the effect is not as intuitively clear.

Assume that a household buys a vector of consumable goods x, with j = 1 to n elements such that each element in x is x_j. Given a vector of prices and income (w), each household has preferences $x_j\left(p_j, w\right)\cdot p_j \geq x_k\left(p_k, w\right)\cdot p_k$, relative to some other vector of goods x_k with k=1 to m where at least one element of x_j is different from x_k. Nutritional quality can be measured in many dimensions, but we can focus on a subset of relevant nutrients, *n*. From the vector of goods chosen, the household receives the nutritional value $n(x_j)$. The nutritional value is not unique to one vector of specific brands in the market. There are multiple vectors of goods that can produce similar nutritional value. In addition, household preferences are not necessarily inclusive of nutritional value.

Assume that there is some vector of coupon values c which affects elements of x_j and x_k such that the preference ordering changes to: $x_j(p_j(c), w) \cdot p_j \leq x_k(p_k(c), w) \cdot p_k$. This is not an unusual phenomenon as individuals have been found to switch brands because of coupons (Gupta 1988). Of interest in this article is what happens to the nutritional value the household receives after the coupon has been used.

In the first scenario, we may observe that $n(x_j) = n(x_k)$ so that there is no change in the nutritional value the household receives from their purchase of x_k. In this case, we would expect the household to be better off but we would not observe any change in the nutritional value received by the household. In the second scenario, we may find that $n(x_j) \geq n(x_k)$ (or alternatively, $n(x_j) \leq n(x_k)$) so that the nutritional value received from the vector of goods has become worse (better) nutritionally. In this case, we would observe some change in the nutritional value of the household for at least one element in *n*.

It is important to note that any change in the nutritional value received by some household, $n(x)$, could result from different types of behavior. In one instance, the change from $n(x_j)$ to $n(x_k)$ may be for only one element. This would likely correspond to there being only one element in the coupon vector c. Alternatively, one element in the coupon vector *c* might motivate a household to completely change its vector of purchases. Milkman and Beshears (2009) in fact find such behavior with coupons and refer to this as a windfall effect. Specifically, they find that households who receive a coupon of value $\$c$ often spend $\$c+\varepsilon$ extra on their total basket of goods where $\varepsilon > 0$. As such, coupons may alter single purchases of goods or it may alter entire baskets of purchases. Ultimately, the effect on the nutritional quality depends on the entire vector of purchases, which is an empirical question. To this end, we specify several empirical models to estimate this effect.

Empirical approach

To study the effect of household coupon use on the nutritional quality of cereal purchases made my households, we specify the following model:

$$NQ_{it} = \beta\, coupon_{it} + \gamma\, price_{it} + \mu_i + \varepsilon_{it} \qquad (1)$$

where *NQ* is the nutritional quality of the cereal being purchased (measured as sugar, fiber or protein) by household *i* at time *t*, coupon is the value of any coupon redeemed by the household at time of purchase, and *price* is the price of the cereal. ε is the idiosyncratic error term and μ_i is a household level fixed effect. Households in our data make infrequent purchases of cereal. Additionally, they often purchase several cereals per shopping trip. As such, we aggregate purchases to a monthly level and calculate *NQ*, *coupon*, and *price* as weighted averages for each of the values.

Even with aggregation, we still observe zero purchases for months in our data set. There are numerous ways to interpret the zero purchase data. At a basic level, we can consider these zeros to be the result of a selection process. Borrowing from Vella (1998), we have the following specification:

$$NQ_{it}^{*} = \beta\, coupon_{it} + \gamma\, price_{it} + \mu_i + \varepsilon_{it} \qquad (2)$$

$$d_{it}^{*} = \delta\, z_{it} + \alpha_i + v_{it} \qquad (3)$$

$$d_{it} = 1 \; if \;\; d_{it}^{*} > 0 \qquad (4)$$

$$NQ_{it} = NQ_{it}^{*} \cdot d_{it}\,. \qquad (5)$$

In equation (2), NQ_{it}^{*} and d_{it}^{*} are latent variables with observed counterparts NQ_{it} and d_{it}. We only observe NQ_{it} if d_{it} is equal to one which only occurs if d_{it}^{*} is greater than some threshold, in this case zero. In the case of our analysis, we have two stages to consider: the decision to make grocery store purchases and then the nutritional quality of the purchases. We only observe *NQ* if households decide to make grocery store purchases. This process is determined by individual characteristics *z*, individual fixed effects α_i and an idiosyncratic error v_{it}. Without correcting for this decision process, estimation on equation (2) using OLS will produce biased estimates.

It might be the case that certain types of households have specific, time-invariant shopping habits. If sample selection is due only to time-invariant characteristics of the individual, which may be observed or unobserved, then a fixed effects estimator is consistent and controls for sample selection. (Cameron and Trivedi 2005). Nijman and Verbeek (1992) and Verbeek (1990) consider the applicability of fixed effects methods. By transforming the data, generically represented as *x*, to its deviation from the means where we have *s* observations for household *i* over some panel *T* we have: $x_{it}^{D} = x_{it} - \sum_{s=1}^{T} x_{is} d_{is} \Big/ \sum_{s=1}^{T} d_{is}$. As long as $E\left[e_{it}^{D} \middle| x_{it}, d_{it}\right] = 0$, an unbalanced panel can be consistently estimated as:

$$\beta_{FE} = \left(\sum_{i=1}^{N} \sum_{i=1}^{T} x_{it}^{D'} x_{it}^{D} \right)^{-1} \left(\sum_{i=1}^{N} \sum_{i=1}^{T} x_{it}^{D'} NQ_{it}^{D} \cdot d_{it} \right). \quad (6)$$

Put simply, as along as the selection process described above operates purely through the individual specific term α_i, no bias will exist.

While equation (6) provides a simple method to estimate equation (1), the selection process may be time varying within households. Woolridge (1995) provides a method to both test for selection bias and adjust equation (1) for such potential bias. Under his approach, Woolridge assumes that the error term ε_{it} is mean independent of all parameters in equations (2) and (3) conditional on the scaled error in equation (3), ρv_{it}, such that $E[e_{it} | \mu_i, \alpha_i, z_{it}, d_i, v_i] = \rho v_{it}$ where v_i does not include current period *t*. Under this assumption, equation (2) can be written as:

$$NQ_{it} = \beta\, coupon_{it} + \gamma\, price_{it} + \mu_i + \rho v_{it}. \quad (7)$$

To estimate equation (7) Woolridge follows Chamberlain (1980) and defines $\alpha_i = \eta_0 + \theta_1 z_{i1} + ...\delta_T z_{iT} + c_i$, where *c* is assumed to be jointly distributed with *v*. Inserting this into the selection equation (3) produces:

$$d_{it}^{*} = \delta z_{it} + \theta_1 z_{i1} + ...\delta_T z_{iT} + h_{it} \quad (8)$$

where $h_{it} = c_{it} + v_{it}$ and h_{it} are independent of *z*. Equation (7) is then written as:

$$\begin{aligned} NQ_{it} &= \beta\, coupon_{it} + \gamma\, price_{it} + \mu_i + \rho(h_{it} - c_i) \\ &= \beta\, coupon_{it} + \gamma\, price_{it} + (\mu_i - \rho c_i) + \rho h_{it} \end{aligned} \quad (9)$$

The test for and estimation of bias now occurs through the term ρ. Vella (1998) outlines the steps to estimate equation (9). In the first step, we estimate a cross sectional probit of the selection variable d_{it} on the explanatory variables z_{it} for each time period and calculate an inverse Mills ratio $\hat{\lambda}_{it}$. In the second step, we estimate an unbalance fixed effects panel corresponding to d_{it}=1 with the inserted ratio:

$$NQ_{it} = \beta\, coupon_{it} + \gamma\, price_{it} + \zeta_i + \rho\hat{\lambda}_{it} + \eta_{it} \qquad (10)$$

with $\zeta_i = \mu_i - \rho c_i$. Sample selection is then tested using a t-test on ρ.

Finally, the decision to use coupons is clearly endogenous to the choice of nutritional quality that is purchased. To control for endogeneity we use data on coupon usage in other markets as instrumental variables. Specifically, in a first stage equation, we estimate coupon usage as a function of aggregate coupon usage in other markets. Similar to the Hausman and Leonard (2002) approach to deal with price endogeneity, we assume that coupon use in other markets will be a function of the same factors that affect the overall supply of coupons. These factors are likely to affect the availability, and therefore use of coupons in our study market, but not the purchase of cereal by households within our market.

In this framework, we are omitting the initial decision households make to acquire coupons. For one, we have inadequate data regarding the number of coupons a coupon has (versus their use) and the supply of coupons by manufacturers and retailers.

Results

We estimate equation (1) following two procedures. In the first, (referred to as the fixed effects model) we use instrumental variables to account for endogenous coupon use and estimate our model using the difference from the mean as shown by equation (6). In the second procedure, (referred to as the sample selection model) we first estimate the sample selection process using a probit model, calculate the inverse mills ratio for each cross-section in the panel and estimate a fixed effects unbalanced panel using equation (10).

We estimate robust standard errors for the fixed effects model and clustered standard errors by households for the sample selection model.

We estimate the fixed effects model using three different dependent variables: sugar (g) per serving, fiber (g) per serving, and protein (g) per serving (Table 3). We find that the amount of sugar in the cereals purchased by households goes down significantly as households use more coupons to make purchases. At the same time, we find that the amount of fiber in the cereals purchased increases significantly, whereas the amount of protein remains unchanged. Taken together, this suggests that the use of coupons by households in our study leads to the purchase of cereals with higher nutritional quality (in terms of sugar and fiber). A possible explanation for this is that higher quality cereals also tend to be higher in price per gram, especially those that are high in fiber. As such, households may tend to purchase these cereals when they have a price reduction such as that provided by a coupon. Holding all else constant, we might interpret this as a positive impact of coupons. Clearly, we do not know how household behavior changes for other products.

There appears to be some seasonal variation with cereal purchases as well. The amount of sugar purchased increases during the summer and the amount of fiber decreases. This is consistent with the fact that children are home more during the summer months and are likely to consume more cereal products. As children’s cereal tends to be higher in sugar and often lower in fiber, we would expect greater amounts of sugar and lesser amount of fiber purchased.

As previously discussed, the factors that affect the sample selection process (to shop or not) may be time variant within households. As such, the fixed effects estimation will be biased. We therefore estimate the sample selection model over the same dependent variables. In the first stage probit (not presented here) we estimate the decision to make a purchase or not as a function of income, number of children, number of teens, race indicators and an indicator for Hispanic households. From this, we calculate the inverse Mills ratio to include in our estimation. The results of the sample selection model (Table 4) are similar for the sugar model, indicating that coupons do have a negative effect on the sugar content purchased. The effect on fiber is no longer significant, but the sign is similar as the fixed effects model. Importantly, we find that there does appear to be sample selection bias in the sugar and protein models, as identified by the significant inverse Mills ratio. As such, it appears that the decision to shop or not is time variant and the fixed effects model does not adequately account for such bias.

We also evaluate the first stage instrumental variable estimates for each one of our models. We calculate Hansen's J test for overidentification and fail to reject the null hypothesis which suggests that our instruments are satisfactory. Our first stage estimates all have F-values greater than 10—a rule of thumb for weak instruments. Further analysis of the strength of our instrumental variables is required in the future.

Conclusions

The use of coupons has increased greatly over recent years, particularly during the latest economic recession. Coupons play an important role in the retail environment as they have become widely accessible through many different sources. While there is evidence that coupons affect product choice, there has been no research to date on how coupons affect the quality of the choices made, which has important implications. Our preliminary results suggest that coupons do have an impact on the nutritional quality of breakfast cereals purchased by households.

Given our results, an important question is what this means for food marketing policy as it pertains to helping consumers. As healthful cereals are often more expensive, they may prohibit some consumers from purchasing them. Coupons not only offer a price discount, but also an advertisement for a specific product. Promoting healthful foods using coupons may be an effective way, therefore, to motivate consumers to make better choices. It may be worth developing ways to incentivize firms or retailers to provide more coupons for healthful products and to avoid coupons for less healthful products.

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Tables

Table 1. Nutritional content of breakfast cereal in sample

	per gram				
Variable	**N**	**Mean**	**Std. Dev.**	**Min**	**Max**
Serving Size (g)	1052	37.900	12.040	13.000	94.000
Calories	1081	3.832	0.486	0.909	8.581
Total Fat	1081	0.051	0.047	0.000	0.381
Sodium	1081	4.210	2.575	0.000	13.333
Fiber	1081	0.074	0.060	0.000	0.500
Sugar	1081	0.257	0.131	0.000	0.679
Protein	1081	0.085	0.048	0.000	0.500

	correlation				
	Calories	**Total Fat**	**Sodium**	**Fiber**	**Sugar**
Total Fat	0.55	--	--	--	--
Sodium	0.05	-0.17	--	--	--
Fiber	-0.38	0.05	-0.18	--	--
Sugar	0.31	-0.04	0.16	-0.46	--
Protein	-0.04	0.13	-0.19	0.37	-0.44

Table 2. Micro nutrient characteristics of sub-sample of cereals

	sugar > 10 g, 95 obs				sugar <= 10 g, 79 obs			
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
calcium	1.581	2.312	0.0300	18.180	2.439	5.235	0.0200	33.330
iron	0.149	0.084	0.0130	0.400	0.226	0.154	0.0150	0.621
magneisum	0.518	0.296	0.0400	1.420	1.003	0.725	0.0700	3.620
potassium	2.248	1.513	0.5900	7.870	3.417	2.371	0.7900	10.500
zinc	0.097	0.071	0.0018	0.302	0.098	0.119	0.0018	0.525
copper	0.002	0.001	0.0004	0.007	0.003	0.003	0.0007	0.021
vitamin A	15.506	10.300	0.0500	41.300	15.003	9.264	0.0200	43.100
vitamin D	1.140	0.410	0.0600	2.300	1.101	0.381	0.7300	2.960
vitamin C	0.271	0.174	0.0010	0.703	0.362	0.423	0.0010	2.070
thiamin	0.013	0.007	0.0006	0.033	0.015	0.013	0.0012	0.054
riboflavin	0.016	0.008	0.0003	0.048	0.016	0.013	0.0005	0.059
niacin	0.177	0.095	0.0030	0.400	0.189	0.159	0.0104	0.690
vitamin B2	0.020	0.011	0.0003	0.047	0.023	0.022	0.0006	0.120
vitamin B12	0.053	0.024	0.0002	0.120	0.072	0.054	0.0212	0.240
folic acid	4.491	3.056	0.0200	15.370	6.033	3.660	1.2200	13.710

Table 3. Fixed effects model results

variables	**sugar**	**fiber**	**protein**
coupon	-20.01***	6.216*	-0.813
	-7.496	-3.244	-1.914
seasonal	0.00276**	-0.00146**	-0.000133
	-0.00134	-0.000581	-0.000343
price	0.576	-0.206	0.196**
	-0.381	-0.165	-0.0974
Constant	-0.0109*	0.00438	-0.00278*
	-0.00628	-0.00272	-0.0016
Observations	23,887	23,887	23,887

Standard errors provided below estimates

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

Table 4. Sample selection model results

variables	**sugar**	**fiber**	**protein**
coupon	-21.89*	6.206	-1.861
	-11.58	-4.871	-3.023
seasonal	0.00102	-0.00167***	-0.00047
	-0.00162	-0.000629	-0.000401
price	0.847	-0.282	0.352
	-0.818	-0.352	-0.216
imr	-0.151**	-0.0164	-0.0294**
	-0.0609	-0.0245	-0.0144
Observations	23,887	23,887	23,887
Household FE's	967	967	967

Standard errors provided below estimates

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