Assessing the Impact of the Great Recession on Healthfulness of Food Purchase Choices

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Abstract

Our paper examines the great recession's impact on households' food-at-home (FAH) purchase decisions. Specifically, we test if the percentage of consumers' FAH shopping baskets comprised of healthy food, as defined by the Center for Nutrition and Policy Promotion (CNPP), changed significantly as a result of the great recession. Controlling for a number of covariates associated with economic downturns, as well as rigorous household characteristics, we identify that the recession was responsible for a 4-8% increase in the dietary quality of U.S. grocery purchases. The finding is robust to specification and raises several important questions regarding consumer behavior.

Introduction

Consumers' food choices and dietary quality are central to the study of health outcomes and their related costs, longevity, food access, and food security. These concepts also inform price and demand analysis with respect to the food industry, behavioral economics, and marketing. Economists have studied the potential associations between macroeconomic conditions and consumer behavior (e.g. Becker, 1976). The Great Recession of 2007-2009 is therefore fertile ground for studying how U.S. households alter their food-at-home, or grocery, purchases during economic downturns. Researchers in health and nutrition are keenly aware of the importance of the recession as well. Ludwig and Pollack (2009) stated in their discussion of the potential for this recession to inform policy related to obesity that "the onset of a major recession places the economic correlates of obesity into sharp relief."

Our specific focus is on how grocery purchases during the recession may have changed with respect to dietary quality, as measured by adherence to the 2010 Dietary Guidelines for Americans (DGA). This study is motivated by the breadth of evidence suggesting that Americans' diets are out of sync with recommendations, as well as the prevalence of obesity, being overweight, diabetes, and other adverse health outcomes commonly associated with dietary quality. There are a number of reasons why economic downturns, and in particular the recent recession, could shape grocery purchases. Food prices increased sharply and not uniformly throughout the supermarket. Household income, and more importantly disposable income, stagnated or fell on average. Unemployment increased while many workers perceived job security decreased. Food retailing responded to these conditions as well, as nontraditional and lower-priced store formats ramped up store openings and food offerings while retailers

emphasized private labels and other products geared towards price-sensitive consumers. Most of these considerations, when taken individually, generate competing hypothesis with respect to dietary quality.

We construct an empirical model to test for changes in grocery purchases and adherence to the DGA, accounting for the multiple mechanisms by which this may have taken place during the recession. We apply our model to a household-level dataset of self-reported grocery purchases spanning the geography of the U.S. for the years 2004 through 2010. Overall, we find that during the recession grocery purchases became significantly healthier, with the average monthly shopping basket more closely abiding to the DGA by four to eight percent. Total grocery expenditures, per household, increased during the recession, indicating that in addition to buying healthier groceries, households substituted food-away-from-home for food-at-home. Therefore, the overall impact on dietary quality was likely even higher. The results are widely robust to model specification, but they demonstrate that measuring changes in food choices using highly aggregated data can result in misleading conclusions.

Background: Food Choices, Dietary Quality, and Economic Conditions

Nutritious food is essential for an individual's health and well-being. The consumption of less nutritious foods can lead to decreased health outcomes such as cardiovascular disease, diabetes, and obesity (World Health Organization, 2002). According to the Centers for Disease Control, over 35.7 percent of the adult U.S. population is obese. Some studies observe that high rates of obesity and a general decline in food purchasing decisions are, in part, the result of changes to the U.S. food system and environment; guided by technological advances, agricultural policies, as well as economic and lifestyle changes (Story et al., 2008). In particular, the economy has

long been thought to have an impact on the choices consumers make in the grocery store, as consumers attempt to purchase goods and services to maximize their utility given their budget constraint (Becker, 1976).

It follows that households will potentially change their purchasing behavior in response to shocks to their income. The great recession, which lasted from December 2007 to June 2009, represents such an income shock for many consumers. Prior to the recession, 1998 through 2006, the overall healthfulness of consumers' food purchases decisions were not improving noticeably over time. Specifically, while households were shifting from refined to whole grains, they were also allotting less of their spending on fresh fruits and vegetables and increasing their spending on processed and packaged foods (Volpe and Okrent, 2012).

Looking specifically at food purchases, consumers spend a significant share of their overall food expenditures on groceries (commonly referred to as food-at-home in government statistics). According to the Bureau of Labor Statistics' Consumer Expenditure Survey, 2012 grocery purchases made up, on average, 7.6 percent of total consumer spending and 59.4 percent of the overall food spending. In addition to representing a large share of food spending, FAH purchases are also largest in terms of caloric intake, making up two-thirds of total calorie consumption (Guthrie et al., 2013). Given that FAH spending comprises a large portion of consumers' spending and dietary intake, the nutritional quality of households' FAH eating habits has an important effect on health outcomes.

Since FAH purchases provide the bulk of dietary intake, increasing grocery store prices in conjunction with shrinking household income creates concern that diet quality will decrease. Given the depth of the recent recession, there is a fear nutritional quality and physical activity levels declined and obesity as a result worsened (Ludwig and Pollack, 2009). Past studies using

the USDA's Healthy Eating Index (HEI) to analyze dietary quality and health in the population have found that a low HEI score was associated with an individual being overweight or obese (Guo et al., 2004). Further, Drewnowski and Darmon (2005) observe that the highest rates of obesity are found among those with lower income. One reason for increased obesity among those with a lower budget is that studies find lower-cost diets have higher fat and sugar contents, as well as lower quantities of recommended micronutrients (Miller and Branscum, 2012). While higher income households, on average, purchased slightly more healthful foods (Volpe and Okrent, 2012). Further, recession-driven local unemployment was found to correspond with increases in more caloric purchases (Ng et al., 2014).

While some studies find that health outcomes decrease during times of economic decline, other research uncovers that diet quality may improve during a recession. Todd (2014) finds that total daily calories actually decreased over the time period of the recession. Todd observes that the drop in calorie consumption may be the result of two factors, income and increased amounts of leisure time. During the great recession consumers began to shift their food away from home purchases to food at home purchase. The shift in where working age adults obtained their food was the result of not only income constraints but an increase in leisure time; time that allowed them to go to the grocery store and prepare the food at home. Other studies concur that increases in leisure time can lead to increased health outcomes. In fact, during times of economic decline individuals spend more time exercising and enjoying other physical activities and less time smoking, drinking, and overeating. Whereas, times of wage growth within the US are accompanied by long hours to ensure adequate income (Bezruchka, 2009).

Since 2008 food away-from-home (FAFH) spending fell by 11.5 percent, as reported by the Bureau of Labor Statistics' Consumer Expenditure (CE) survey. The CE finds a

corresponding three percent increase in FAH purchases, suggesting households were in part replacing FAFH purchases with FAH. Todd (2014) finds only 20 percent of the diet quality improvement was attributable to the shift in household spending from FAFH to FAH purchases. Therefore, other factors must have played an important role.

In addition to unemployment being high during the recession, food prices also saw substantial increases during the early part of the economic downturn. Moreover, food prices peaked in 2008, with an annual rate of food price inflation of 5.5 percent. In an effort to deal with the increasing prices and potentially shrinking income, American households began to adapt by finding ways to save on their at-home food spending. Cost saving methods include taking advantage of sales, promotions, and coupons; substituting to cheaper, but comparable products; and switching to lower-cost supercenters and dollar stores (Kumcu et al., 2011). Additionally, private labels typically take hold during recessionary times as a way to ease the pain of higher prices (Lamey et al., 2007). This highlights the need to control for the role of increasing food prices in order to isolate the impact of the recession on food purchasing decisions.

Our paper examines the great recession's impact on households' FAH purchase decisions. Specifically, we test if the percentage of consumers' FAH shopping baskets comprised of healthy food, as defined by the Center for Nutrition and Policy Promotion (CNPP), changed significantly as a result of the great recession. As Todd (2014) mentions income shocks and unemployment both play vital roles in shaping households' food purchasing decisions. Our preliminary results indicate that the CNPP score is positively associated with the unemployment rate and other indicators of economic health. This suggests households' adherence to CNPP guidelines for FAH purchases improved during the recession. While total FAH expenditures stagnated or even fell for many income groups during the recession and immediate aftermath,

households slightly increased the proportion of their expenditures on foods such as vegetables and canned beans and decreased their purchases of prepared and packaged foods.

Data and Methods:

Our paper uses self-reported monthly household food purchase and demographic data from Nielsen Homescan for 2004 to 2010. These data are comprised of self-scanned food purchases from a sample of over 100,000 U.S. households. Additionally, the data include comprehensive information on product names and characteristics.

We largely follow Volpe and Okrent (2012) to assess the healthfulness of grocery purchases. Product-level purchases for each household in the dataset were categorized among 24 comprehensive and non-overlapping food categories as defined by the Center for Nutrition Policy and Promotion (CNPP) and described in Carlson et al. (2007).[1] These food groups are the foundation for measuring the healthfulness of consumer's food purchases. The CNPP groups are categorized as either "recommended" or "limited," following the 2010 executive summary of the DGA.[2] We assess overall grocery purchase healthfulness by comparing household's expenditures for these categories with the recommended expenditure shares for each CNPP category.[3]

The overall dietary quality of monthly grocery shopping baskets for household *i* is assessed using three scores:

[1] The universe of foods in the Homescan data have been organized into the CNPP categories with the aid of the 54 Quarterly Food-at-Home Price Database groups. These were devised as a part of an ERS data product by Todd et al. (2010) A complete list of the 24 CNPP Categories, matched with the QFAHPD categories, can be found in table A.1.

[2] For some CNPP groups the classification was not entirely clear, based on the DGA. We follow the classification scheme of Volpe and Okrent (2012) and interested readers are referred to that study to understand the decision-making process for the more ambiguous CNPP categories.

[3] Recommended expenditure shares are tailored to individual households. CNPP provides specific recommendations according to the age and gender of individuals. The total recommended expenditure for each household was calculated by combining the recommended expenditures for each household member.

(1)
$$USDAScore1_{icm} = (\sum_{c}(expshare_{icm} - CNPPexpshare_{ic})^2)^{-1}$$

$$USDAScore2_{icm} = \left(\sum_{c}(expshare_{icm} - CNPPexpshare_{ic})^2 \middle| expshare_{icm} > 0\right)^{-1}$$

$$USDAScore3_{icm} = \left[\left(\sum_{c}(expshare_{icm} - CNPPexpshare_{ic})^2 \middle| expshare_{icm} > CNPPexpshare_{ic}, c \in limited\right) + \left[\left(\sum_{c}(expshare_{icm} - CNPPexpshare_{ic})^2 \middle| expshare_{icm} < CNPPexpshare_{ic}, c \in increased\right)\right]^{-1}$$

All three metrics assume that households abiding by the CNPP expenditure recommendations will meet the DGA perfectly. They are loss functions, whereby penalties accrue with deviations from the CNPP recommendations on a per-category basis. We invert these scores to aid with interpretation, such that higher scores mean greater adherence to the DGA. Each score has no direct interpretation and, much like a price index, is only meaningful when values are compared across households or other dimensions of interest. USDAScore1 and USDAScore2 are drawn directly from Volpe and Okrent (2012). The former assigns penalties for any deviation from CNPP recommendations, while the latter does not include CNPP categories for which no purchases are recorded in a given month. USDAScore3 assigns penalties only when households exceed recommendations for limited categories or falls short of recommendations for recommended categories.

Figure 1 here.

Figure 1 shows the means for all three USDAScores over time, with the dates of the recession (as defined by NBER) marked by vertical lines. Even averaging these scores across more than 100,000 households, we see a great deal of volatility from month to month throughout the time series. It appears as if seasonality plays a role in shaping overall grocery shopping decisions, with respect to dietary quality. All three scores spike at very beginning of the recession and appear to trend somewhat downward for the duration of the economic downturn. With no obvious exceptions, the three scores are highly correlated and tell the same story in terms of food choices over time. This is encouraging, as it indicates that factors such as the underreporting of selected foods among Homescan participants are unlikely to have an important impact on our findings.

We subject (1) to regression analysis. The model that serves as the centerpiece of our empirical analysis is

$$\widehat{USDAScore} = \alpha + \overrightarrow{\beta^T}\,\overrightarrow{HHCharacteristics} + \delta_2\Delta GDP + \delta_3 RDI_percapita + \delta_4 Savings_Rate + \delta_5 REC + \delta_6 UI_local + \delta_7 UI_National + \delta_8\Delta CPI_FAH + \overrightarrow{\gamma^T}\,\overrightarrow{month} + \overrightarrow{\theta^T}\,\overrightarrow{year} + e_t + \varepsilon_{i,t} \quad (2)$$

where e_t represents the time invariant error and $\varepsilon_{i,t}$ the random error varying over time and household.[4] The healthfulness of monthly shopping baskets, as measured by the array of USDAScores, is modeled as a function of the macroeconomic conditions, household characteristics, and food prices. Recall that our data are monthly. The recession is accounted for using a dummy variable equal to one for the months of December 2007 through June 2009.

To identify the impact of the recession on food choices, it was vital to account for key macroeconomic indicators that may serve as mechanisms to shape shopping behavior. Central to this effort is the question of whether recessions have a unique impact on households or if

[4] The model assumes random, uncorrelated, and normally distributed error terms.

economic fluctuations alone can explain behavior and choices. Thus we include quarterly changes in GDP, as available from the Bureau of Economic Analysis (BEA). Typical recessions are marked by decreases in labor force participation, which itself can influence households' shopping decisions. Therefore we include two measures of the unemployment rate, both drawn from BLS. The first is the national unemployment rate and the second is the local, which pertain to the MSA in which household *i* is situated. Green et al. (1994) showed that local business-cycles explain a significant portion of local labor market fluctuations, even after controlling for national business-cycle trends. We also include per-capita real disposable income (RDI) and the personal savings rate, both drawn from BEA.

A major advantage of the Nielsen Homescan data is the extensive array of demographic information that describe the characteristics of the participating households in rich detail. Calculated directly from the Homescan data, we include household annual income in 1,000s $USD, race (white, black, Asian, or other), the employment status of the household head, geographic region (Northeast, South, Midwest, West), and the marital status of the household head. We also include vectors of month and year fixed effects.

Finally, we include the monthly percentage change in the FAH Consumer Price Index. Changes in food prices necessarily impact demand. In the U.S. the demand for food-at-home, measured by overall quantity, is highly inelastic (Piggott, 2001). However, evidence abounds that as food prices rise many consumers make adjustments and substitutes, for example, buying in bulk (Griffith, et al., 2009) or switching to less expensive private labels (Lamey, et al., 2007). These changes can have impacts on eating habits and overall adherence to the DGA. Changes in food prices are particularly salient for our purposes, as this recession was marked by a substantial surge in retail food prices, which is uncommon for economic downturns. It is uncommon,

historically, to see consumer prices rise for major spending categories as the economy contracts and unemployment rises.

We exploit the panel nature of the dataset in several ways. First we utilize the entire dataset using an unbalanced panel, as some households do not have food purchases reported in all time periods. Additionally, we examine only those households in the dataset over the entire time-frame. Both methods allow the use of multivariate panel regression methods. Controlling for unobserved time-invariant geographic fixed effects will aid the effort to determine the causality of the great recession's role in shaping food purchase decisions.[5] When applicable, transformations are conducted to ensure all variables are stationary.

Some outliers were found to exist within the data. Therefore, the probabilistic outliers were removed by testing whether any data point was more than three interquartile ranges below the first quartile or above the third quartile.[6] Once the outliers were removed, we used the methods described above to run our regression.

Results

We estimate (2) for all three USDAScores as well as total monthly expenditures. In each case we run a limited version of (2) that excludes monthly fixed effects and household-level controls on monthly averages across the entire Homescan sample. This regression has a total of 84 observations. We run the full version of (2) on the entire dataset and control for household fixed effects (FE). The samples size for these estimations is approximately 4.2 million. We also estimate slight variations of (2) on the full sample, excluding the recession dummy or changes in GDP to highlight the relative importance of these factors and the potential for omitted variable

[5] Hausman test rejects the consistency of random effects.

[6] Lower outlier $=$ first quartile $- 3 \cdot$ IQR; Upper outlier $=$ third quartile $+ 3 \cdot$ IQR, where IQR $=$ third quartile $-$ first quartile

bias to affect our understanding of the relationships between the economy and consumers' food choices.

The FE model consistently indicates that during the recession the grocery purchases of U.S. households were significantly more healthful than in the period before or during the early recovery. A meaningful way to assess the magnitude of this impact is to take the estimated USDAScore coefficients as a share of the averages for these scores across the sample. By that measure, monthly shopping baskets were between four and eight percent more closely in line with the DGA during the recession. We argue that this finding is significant economically as well as statistically. The recession coefficients, across FE models, are slightly smaller when changes in GDP are removed from the model. Thus failing to control for changes in the economy when modeling recession impacts on diet leads to underestimating the role of economic downturns. Interestingly, the coefficient on GDP changes is considerably smaller and even insignificant when the recession dummy is excluded.

The signs of the monthly average models are generally in agreement with those of the FE models. However, the estimated coefficients are uniformly insignificant. We conclude in this regard that too much granularity in the data is lost through the aggregation across households. Though many household characteristics are suppressed from table 2, they are highly significant throughout the results. Income, employment status, ethnicity, and geographic location all shape both dietary choices and likely the impact of the recession on those choices. To the extent that these characteristics have varying and even opposing impacts across households can lead to the effective non-results of the monthly average models. We focus our remaining discussion on the FE models.

The estimated impact of the recession is particularly meaningful given the significance of many of the other model covariates. Increases in GDP are associated with increased healthfulness, while increases in the FAH CPI are associated with significant decreases. The recession was marked by a sharp drop in GDP coupled with a sharp rise in the CPI, meaning that ex ante we should expect a decrease in adherence to the DGA. Moreover increases in both the national and local unemployment rate are associated with increases in healthfulness, but the estimated impact of the recession is robust to their inclusion. These results strongly suggest that economic recessions have a unique and important impact on households' choices.

Household income is associated with increased healthfulness, a finding echoed by a long literature on dietary quality and nutrition among sociodemographic groups (Darmon and Drewnowski, 2008, Patrick and Nicklas, 2005) as well as Volpe and Okrent (2012), who also used the USDAScores and the Homescan data.

The month and year effects, while usually small in magnitude, are consistently statistically significant. The USDAScores, and food purchases in general, exhibit a great deal of noise over time that is partially seasonal and is not well-explained by the model covariates. The extent to which dietary quality shifts in the long run in response to increased information or policy initiatives is worth exploring. We find that all three USDAScores are usually at or near annual maxima in December, which runs somewhat counter to intuition, given the fact that most Americans increase their caloric intake during the holiday season.

We include a FE regression on total expenditures to confirm that FAH, or supermarket, spending increased during the recession. We estimate that the average monthly grocery basket was $65 larger during the recession, controlling for all of the covariates in (2), including food prices. This represents a 45% increase over the average monthly expenditure in the sample of

$145. Thus, as Todd (2014) also found, we establish that consumers very likely shifted their food expenditures away from restaurants and towards supermarkets, which is an additional mechanism by which dietary quality may have improved during the recession.

Concluding Remarks

June 2009 represented the greatest inflation-adjusted decline in aggregate food spending recorded by the Bureau of Labor Statistics' Consumer Expenditure survey since the survey began in 1984. Food spending saw this decline due to a recession coupled with higher food price inflation. This not only prompted households to shift food spending from FAFH to FAH but also to economize their purchases. Under normal economic conditions, ERS studies have found that American consumers purchase too few fruits, vegetables, and whole grains and too many refined grains, fats, and sugars and sweets. Therefore, understanding what this decline means for the healthfulness of food purchases is meaningful across a range of disciplines. The results of our paper will provide beneficial insights into the food-at-home purchasing behavior of households during recessionary periods. Helping to identify possible triggers of healthy or unhealthy food consumption habits is integral to solving many of the negative externalities associated with it.

Our study uncovers encouraging findings with respect to the food choices of Americans during the recession, but raises an important economic puzzle. There are a number of mechanisms by which a major recession can shape food choices and dietary quality. These include changes in food prices, employment status, income, and consumer confidence, as well as retail behavior. In each case, predictions can be made in either direction - towards increased or decreased healthfulness. Our results are broadly consistent with a number of previously explored findings, notably that during downturns Americans are inclined to purchase more groceries in

favor of food outside the home, and to prepare food at home, and these factors lead to a better adherence to the DGA.

We find that the impact of the recession is statistically and economically significant, even controlling for these established mechanisms. We control for economic growth, unemployment, food prices, and an array of household characteristics. This indicates that during recessions, particularly large ones, Americans purchase more healthful groceries due to the recession itself. This may reflect largely unmeasurable characteristics such as consumer confidence or increased storage on the part of the households. There may be factors at play that can be explored using product-level data matched to nutritional attributes, for example, perhaps increased private label purchases plays a role. More work is required to investigate food purchases during the recession to understand what drove better average adherence to the DGA and to inform policy or educational efforts that may encourage these better choices at all times.

Table 1: Summary Statistics for the Key Food Expenditure Variables

	Mean	St. Dev.	Min	Max
USDAScore1				
Overall	5.949	2.357	0.898	16.364
Recession	5.996	2.395	0.898	16.365
Not Recession	5.932	2.343	0.898	16.364
USDAScore2				
Overall	7.996	3.440	0.971	22.808
Recession	8.059	3.483	0.971	17.874
Not Recession	7.972	3.424	0.990	22.808
USDAScore3				
Overall	6.430	2.685	0.915	17.875
Recession	6.487	2.728	0.915	17.874
Not Recession	6.410	2.669	0.915	17.875
Healthshare				
Overall	0.299	0.157	0	1
Recession	0.304	0.159	0	1
Not Recession	0.297	0.157	0	1
Total Expenditure	$145.96	$107.77	$0.01	$4,202.22
Expenditure Shares				
Whole Grain Products	0.022	0.040	0	1
Non-Whole Grain	0.172	0.108	0	1
Potato Products	0.020	0.032	0	1
Dark Green Veg	0.005	0.017	0	1
Orange Veg	0.005	0.015	0	1
Beans, Lentils, etc	0.003	0.013	0	1
Other Veg	0.029	0.042	0	1
Whole Fruits	0.037	0.058	0	1
Fruit Juice	0.026	0.050	0	1
Whole Milk Products	0.033	0.057	0	1
Low Fat Dairy	0.038	0.061	0	1
Cheese	0.052	0.062	0	1
Beef, pork, veal, lamb, game	0.050	0.066	0	1
Chicken, turkey, game birds	0.005	0.022	0	1
Fish and fish products	0.016	0.043	0	1
Bacon, sausages, lunch meats	0.012	0.029	0	1
Nuts, nut butters, seeds	0.025	0.051	0	1
Eggs, egg mixtures	0.014	0.025	0	1
Fats and condiments	0.030	0.045	0	1
Soft drinks, sodas, fruit drinks, ades, rice bevs	0.061	0.091	0	1
Sugars, sweets, candies	0.162	0.127	0	1
Soups	0.035	0.051	0	1

Frozen or refrigerated entrees	0.131	0.124	0	1

Source: Authors' calculations using Nielsen Homescan data.

Table 2. Results for Estimating (2) for USDAScores1-3 and Total Grocery Expenditures.

	USDAScore1				USDAScore2			
	Monthly Avg.	Household FE	Household FE	Household FE	Monthly Avg.	Household FE	Household FE	Household FE
Recession	0.120	0.451***	0.413***		0.074	0.286***	0.258***	
	(0.222)	(0.005)	(0.006)		(0.139)	(0.009)	(0.008)	
Δ GDP	0.030	0.049***		0.007***	0.024	0.036***		0.009***
	(0.064)	(0.002)		(0.002)	(0.047)	(0.003)		(0.003)
Unemp. Rate (US)	0.128	0.398***	0.413***	0.306***	0.118	0.336***	0.347***	0.278***
	(0.090)	(0.006)	(0.005)	(0.005)	(0.065)	(0.009)	(0.009)	(0.008)
Unemp. Rate (Local)		0.007**	0.007***	0.007***		0.006	0.006	0.005
		(0.003)	(0.003)	(0.003)		(0.004)	(0.004)	(0.004)
HH Income		0.007***	0.007***	0.007***		0.006***	0.006***	0.006***
		(0.001)	(0.002)	(0.002)		(0.002)	(0.002)	(0.002)
Δ FAH CPI	-0.004	-0.032***	-0.037***	-0.009***	-0.003	-0.020***	-0.024***	-0.005***
	(0.223)	(0.001)	(0.001)	(0.001)	(0.010)	(0.001)	(0.001)	(0.001)
Intercept	-2.734	-6.962***	-7.669***	-11.619***	-0.770	-6.112***	-6.628***	-9.064***
	(6.471)	(0.340)	(0.339)	(0.336)	(4.713)	(0.540)	(0.539)	(0.534)
Month Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Overall R^2	0.102	0.053	0.053	0.053	0.269	0.024	0.024	0.024
N	84	4,187,017	4,187,017	4,187,017	84	4,187,017	4,187,017	4,187,017
	USDAScore3				**Total Monthly Expenditures**			
	Monthly Avg.	Household FE	Household FE	Household FE	Monthly Avg.	Household FE	Household FE	Household FE
Recession	0.122	0.425***	0.394***		19.617	65.080***	57.455***	
	(0.205)	(0.006)	(0.006)		(35.622)	(0.279)	(0.246)	
Δ GDP	0.026	0.040***		0.001	7.339	9.937***		3.908***
	(0.061)	(0.002)		(0.002)	(9.242)	(0.075)		(0.068)
Unemp. Rate (US)	0.123	0.377***	0.389***	0.291***	13.904	51.783***	54.687***	38.509***
	(0.085)	(0.006)	(0.006)	(0.006)	(12.654)	(0.242)	(0.260)	(0.230)
Unemp. Rate		0.008**	0.008**	0.007**		-0.167	-0.154	-0.230**

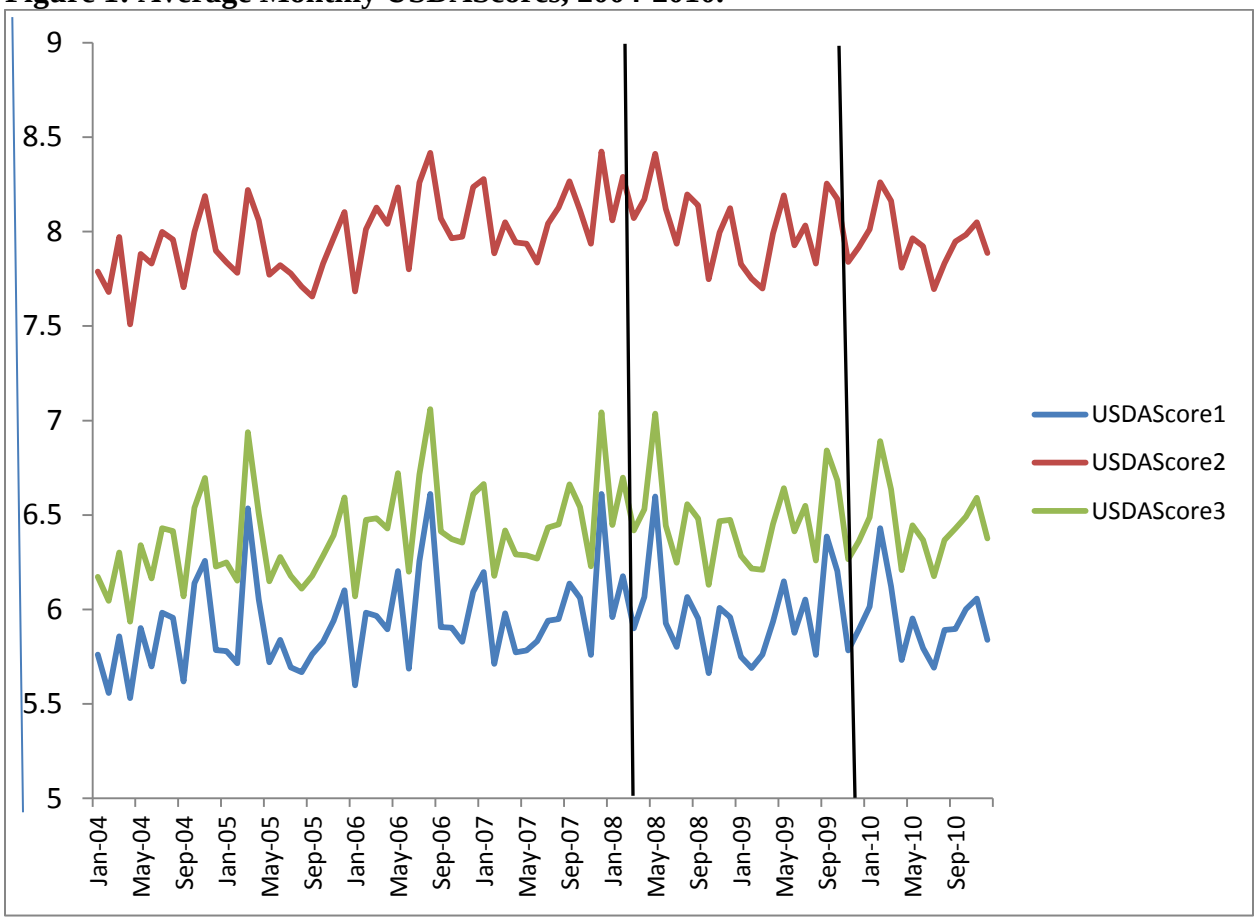
(Local)		(0.003)	(0.003)	(0.003)		(0.109)	(0.109)	(0.110)
HH Income		0.009***	0.010***	0.010***		0.019***	0.019***	0.019***
		(0.002)	(0.002)	(0.002)		(0.001)	(0.001)	(0.001)
Δ FAH CPI	-0.004	-0.031***	-0.035***	-0.008***	-0.288	-4.111***	-5.142***	-0.639***
	(0.012)	(0.001)	(0.001)	(0.001)	(1.564)	(0.024)	(0.024)	(0.020)
Intercept	-2.813	-7.052***	-7.632***	-11.442***	-450.164	-1102.8***	-1245.7***	-1774.6***
	(6.254)	(0.402)	(0.400)	(0.398)	(913.078)	(12.155)	(13.947)	(13.916)
Month Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Overall R^2	0.154	0.037	0.037	0.037	0.077	0.130	0.130	
N	84	4,187,017	4,187,017	4,187,017	84	4,187,017	4,187,017	4,187,017

Standard errors are in parentheses.

The reported R^2, in the case of the FE regressions, corresponds to the overall model fit of the data. The R^2 values for the time-series and cross-sectional components of the regression are not reported but they are available from the authors.

***: Significant at the 0.01 level. **: At the 0.05 level. *:At the 0.10 level.

Figure 1: Average Monthly USDAScores, 2004-2010.



The recession dates, as defined by NBER, are marked by the vertical lines.

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Appendix A

Table A.1:

CNPP Food Category	QFAHPD Food Groups
Grains	
All whole-grain products	16, 17, 18
Whole grain breads, rice, pasta, pastries (incl. whole grain flours) (H)	
Whole grain cereals (incl. hot cereal mixes) (H)	
Popcorn, other whole grain snacks (H)	
Non-whole grain breads, cereals, rice, pasta, pies pastries, snacks, and flours	19, 20, 21, 50, 51
Vegetables	
All potato products (H)	8, 9
Dark-green vegetables (H)	4, 5
Orange vegetables (H)	6, 7
Canned and dry beans, lentils, and peas (legumes) (H)	14, 15
Other vegetables (H)	10, 11, 12, 13
Fruits	
Whole fruits (H)	1, 2
Fruit juices (H)	3
Milk products	
Whole milk products	25, 27
Whole milk, yogurt, and cream	
Milk drinks and milk desserts	
Lower fat and skim milk and low-fat yogurt (H)	22, 24
All cheese (including cheese soup and sauce)	23, 26
Meat and beans	
Beef, pork, veal, lamb, and game	28, 29
Chicken, turkey, and game birds (H)	31, 32
Fish and fish products (H)	33, 34
Bacon, sausages, and luncheon meats (including spreads)	30, 52
Nuts, nut butters, and seeds (H)	35, 36
Eggs and egg mixtures (H)	37
Other foods	
Fats and condiments	38, 39
Table fats, oils, and salad dressings	
Gravies, sauces, condiments, and spices	
Coffee and tea (H)	N/A
Soft drinks, sodas, fruit drinks, and aids (including rice beverages)	41, 42
Sugars, sweets, and candies	40, 44, 45, 46, 47
Soups	49

Ready-to-serve and condensed soups	
Dry soups (dry)	
Frozen or refrigerated entrees (including pizza, fish sticks, and frozen meals)	48