Do the Poor Pay More for Healthy Food? An Empirical Economic Analysis

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Do the poor pay more for healthy food? An empirical economic analysis

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Objectives

1) Determine whether the cost of a market basket composed of representative regional food items that meet the 2005 Dietary Guidelines for Americans (DGA) differs from that of a market basket developed by Pennsylvania State University researchers to meet the Thrifty Food Plan (TFP) menu, based on the 1995 DGA.
2) Determine whether neighborhood demographic characteristics influence the cost of a healthy market basket of foods in that neighborhood.
3) Determine whether neighborhood demographic characteristics influence supermarket competition in the neighborhood.
4) Determine whether store size, type, and competition influence the cost of a healthy market basket in Baton Rouge, LA.

Background

Achieving greater understanding of pricing in the retail food industry remains an important goal of researchers and policymakers. For example, Hayes mentions that the composition of a local food environment can impact the purchasing power of consumers, including Supplementary Nutrition Assistance Program (SNAP; formerly the Food Stamps Program) recipients. The allocation of food through the SNAP has particular pertinence in the Baton Rouge, LA, metropolitan area because the percentage of persons below the 2008 average poverty level in the area is higher than the national average:

- Average, for the nine parish Baton Rouge, LA, metropolitan area, 17.8 percent
- U.S. average, 13.2 percent(USA QuickFacts from the US Census Bureau).

Therefore, the allocation of SNAP benefits and the food environments in which SNAP beneficiaries live and shop are of particular concern to policymakers and health policy officials in Baton Rouge, LA, and other parts of Southeastern Louisiana.

In 2001, Louisiana was ranked 8th in the nation for both prevalence of obesity and diabetes (Mokdad et al.). One of the identified goals of the 2005 DGA is to encourage healthy eating habits to reduce the risk of chronic disease, such as diabetes, heart disease, and cancer.

Methods and models

Primary shelf price data were gathered for 208 food items at 60 large grocery stores in the Baton Rouge, LA, metropolitan area. Next, the costs of two separate market baskets were calculated:

- Thrifty Food Plan market basket, developed by Pennsylvania State University researchers based on the 1995 DGA.
- "representative" market basket constructed by Stewart that meets 2005 DGA.

Subsequently, econometric models were developed to analyze:

- demographic and store-specific factors influencing the market basket cost.
- demographic factors influencing competition.

The two models are shown below.

- Reduced-Form Model:

$$COSTMB_{ij} = \beta_0 + \beta_1 POPDEN_j + \beta_2 INCOME_j + \beta_3 HHSZ_j + \beta_4 CHAIN_i + \beta_5 SPRCTR_i + \beta_6 STRSZ_i + \beta_7 SERV_i + \beta_8 BLACK_j + \beta_9 OTRMIN_j + \beta_{10} COMP_i + \varepsilon$$

- Two-Equation Model

Equation 1:

$$COMP_{ij} = \propto_0 + \propto_1 POPDEN_j + \propto_2 INCOME_j + \propto_3 HHSZ_j + \propto_4 BLACK_j + \propto_5 OTRMIN_j + e$$

Equation 2:

$$COSTMB_{ij} = \beta_0 + \beta_1 CHAIN_i + \beta_2 SPRCTR_i + \beta_3 STRSZ_i + \beta_4 SERV_i + \beta_5 COMP_i + \varepsilon$$

where $COSTMB_{ij}$ is the cost of the market basket at store *i* in census tract *j*. The two-equation system tests whether the level of spatial competition of store *i* is impacted by demographic characteristics of its associated census tract *j*, and whether the cost of the TFP or 2005 DGA market basket for store *i* is influenced by the store-specific factors and the level of spatial competition. The two-equation model borrows from Stewart and Davis. The spatial competition gravity index is adapted from a retail gravity model (Bucklin) based on the assumption that consumers would more likely patronize stores that were geographically closer. The model included in this study creates a continuous retail gravity weight for competition as opposed to a probability function from the consumer perspective. The developed gravity model is:

$$COMP_{ij} = \sum_{j=1}^{n} \frac{DISTANCE_{ij}}{(DISTANCE_{ij})^2}$$

where *i* refers to store *i*, and *n* represents the number of competing stores, *j*, within a ten mile radius of store *i*.

Results

Reduced form analysis of the Thrifty Food Plan menu:

	TFP Market Basket Cost 60 Stores		TFP Market Basket Cost 59 Stores	
Variable	β	t-value	β	t-value
Intercept	345.933***	5.40	275.490***	5.63
POPDEN	-7.899	-1.55	-1.718	-0.44
INCOME	1.055*	1.90	0.437	1.03
AVHHSZ	-40.428	-1.67	-3.940	-0.21
CHAIN	-3.153	-0.26	-18.452*	-1.99
SPRCTR	-44.759***	-3.59	-50.905***	-5.46
SERV	-0.294	-0.07	-2.082	-0.71
STRSZ	0.259	0.41	0.653	1.38
BLACK	0.430	1.39	0.057	0.24
OTRMIN	-1.272	-0.80	-0.296	-0.25
COMP	-1.336	-0.85	-1.008	-0.86
R^2	0.3496		0.4384	
Model F-value	2.63**		3.75***	
White Test p-value	0.4392		0.4387	
Shapiro Wilk p-value	<0.0001***		0.3917	
Condition Index (highest value)	5.04836		5.17409	
Moran's I p-value	0.9965		0.7380	

Reduced form analysis utilizing the 2005 DGA menu developed by Stewart:

	2005 DGA MB Cost 60 Stores		2005 DGA MB Cost 59 Stores	
Variable	β	t-value	β	t-value
Intercept	338.053***	5.80	273.665***	6.18
POPDEN	-6.662	-1.44	-1.012	-0.29
INCOME	1.144**	2.27	0.579	1.51
AVHHSZ	-35.649	-1.62	-2.297	-0.13
CHAIN	-6.137	-0.56	-20.120**	-2.39
SPRCTR	-44.374***	-3.91	-49.991***	-5.92
SERV	-1.597	-0.45	-3.231	-1.21
STRSZ	0.190	0.33	0.550	1.28
BLACK	0.459	1.63	0.118	0.55
OTRMIN	-1.058	-0.73	-0.165	-0.15
COMP	-0.701	-0.49	-0.401	-0.38
R^2	0.3611		0.4655	
Model F-value	2.77***		4.18***	
White Test p-value	0.4392		0.4387	
Shapiro Wilk p-value	<0.0001		0.5785	
Condition Index (highest value)	5.04836		5.17409	
Moran's I p-value	0.8699		0.6407	

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

Note: one observation was much more expensive than the other market baskets and was thus excluded in some of the analyses for comparison because it was viewed to be affecting the normality of the residuals.

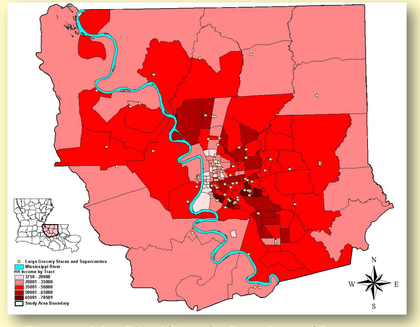

Figure 1: Map Identifying the Locations of Large Grocery Stores in the Baton Rouge, LA, Metropolitan Area.

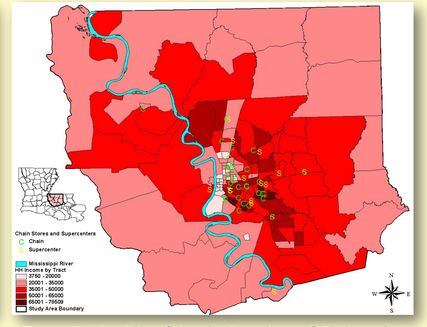

Figure 2: Map Identifying the Locations of Chain and Supercenter Stores in the Baton Rouge, LA, Metropolitan Area.

Results

The mean two-week 2005 DGA market basket cost of $272.71 was higher than the TFP market basket cost of $262.50. *INCOME* was positively related to TFP market basket cost and 2005 DGA market basket cost for regression including all 60 observations . *POPDEN, INCOME* and *BLACK* were positively related to spatial retail competition. *AVHHSZ* was negatively related to competition, attributed to larger households being in areas with less commercial saturation.

Conclusions

- A healthy market basket does not cost more, on average, at large grocery stores in low-income areas.
- Chain stores and supercenters were found to have the lowest average market basket costs.
- A visual assessment of the dispersion of chain and supercenter stores shows low-income populations may be disadvantaged by a low level of chain and supercenter investment, especially in rural areas. This finding is similar to that reached by Kaufman on a regional scale.

Dependent and independent variables with means

Variable	Mean
TFP COST Thrifty Food Plan two-week menu market basket cost; in ($)	262.50
2005 DGA COST Two-week menu for market basket cost that meet the 2005 Dietary Guidelines for Americans recommendations; in ($)	272.71
POPDEN Population density; residents per square mile; by census tract; in thousands	1.773
INCOME Median household income; by census tract; in thousands	40.704
AVHHSZ Average household size; number of residents per household; by census tract	2.61
CHAIN Binary dummy variable designating whether a variable belongs to a chain	0.383

Variable	Mean
SPRCTR Binary dummy variable designating whether a variable is a supercenter	0.183
SERV Discrete count of a number of services provided in a store	3.08
STRSZ Store size in square feet; in thousands	12.291
BLACK Percentage of residents self-identified as black; by census tract	32.53
OTRMIN Percentage of residents self-identified as being a member of a minority ethnicity other than black; by census tract	4.55
COMP Retail spatial competition gravity index	6.014

Literature cited

Bucklin, Louis P. 1971. Retail Gravity Model and Consumer Choice: A Theoretical and Empirical Critique. *Economic Geography* 47(4): 489-497.

Hayes, Lashawn Richburg. 2000. Are Prices Higher for the Poor in New York City? *Journal of Consumer Policy* 23:127-152.

Kaufman, Phil R. 1999. Rural Poor Have Less Access to Supermarkets, Large Grocery Stores. *Rural Development Perspectives* 13(3): 19-26.

Mokdad, Ali H., Earl S. Ford, Barbara A. Bowman, William H. Deitz, Victor Vinicor, Virginia S. Bales and James S. Marks. 2003. Prevalence of Obesity, Diabetes, and Obesity-Related Health Risk Factors, 2001. *Journal of the American Medical Association* 289: 76-79.

Stewart, Hayden and David E. Davis. 2005. Price Dispersion and Accessibility: A Case Study of Fast Food. *Southern Economic Journal* 71(4): 784-799.

Stewart, Laura. 2006. The Ability of Food Stamp Households in Southeast Louisiana to Meet the 2005 Dietary Guidelines for Americans. M.S. Thesis, Louisiana State University.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. *Dietary Guidelines for Americans, 1995*. 4th Edition, Washington, DC: U.S. Government Printing Office, November 1995.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. *Dietary Guidelines for Americans, 2005*. 6th Edition, Washington, DC: U.S. Government Printing Office, January 2005.

U.S.A. Quick Facts from the U.S. Census Bureau. http://quickfacts.census.gov/qfd/states/00000.html.