

## Comments

### *Selected Papers Session*

#### **Factors Affecting Demand for Food Items**

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The papers presented in this session consist of a series of econometric analyses of food purchase behavior. Table 1 provides a comparison in terms of data used, time period encompassed, econometric procedures and dependent variables of each model. The types of data used in these cover the breadth of the available today for conducting applied demand analysis. The Green and Park analysis is based on store level scanner data, the analysis of McNamara, Wilde and Ranney and of McDowell, Allen-Smith and Okafor are based on cross-sectional and Jekanowski, Binkley and Eales use pooled time-series/cross-sectional data set. Besides differences in the types of data used, econometric techniques employed in each analysis vary: 3 of the studies using some variant of a SUR specification and the remaining a single equation double-hurdle specification. The dependent variables investigated range from changes in per capita fast food consumption to the number of food servings consumed as defined by USDA's Food Guide Pyramid.

#### ***Dairy Product Demand: Where's the Fat?***

Two papers presented in this session examine the demand for dairy products. Green and Park examine fluid milk purchases using store level scanner data where fluid milk is differentiated by fat content. Unfortunately, this scanner data has been aggregated from the purchase occasion level to weekly purchase aggregates across three stores. The focus of their analysis is the measurement of price-based promotion efforts on fluid milk purchases. Store-level impacts can obviously be measured using this aggregate data. Consumer level responses can not be directly examined. For example, the use of aggregate data eliminates the potential for an analysis of the impact of such promotion of attracting new purchasers into the market. Given the store operator knows the number of milk/nonmilk transactions and the number of shopping occasions, the use of

a disaggregate form of the data would have allowed for some preliminary analyses of the how promotions impact the intensity of fluid milk purchases for individual purchasers. With price promotion, is the proportion of purchase occasions where milk is purchased relative to those when no milk is purchased, impacted by the presence of promotions?

On the whole I found the paper well written but the analysis left me wondering as to why the authors chose their model specification. First, what are the impacts of the price of other milks on a particular milk's consumption? Why are no cross-price effects of milks of differing fat types allowed (e.g., reduced fat milk prices in the whole milk equation)? Second, why do the authors use a static model to examine commodity promotion efforts? Previous analyses of scanner data have attempted to determine whether promotion efforts simply shift demand forward through time or in fact represent a true shifting out of the demand curve (Gould, 1997; Gupta, 1991).

Figure 1 provides one representation of the relationship between product promotion, quantity purchased and the dynamics of these purchases. With commodity promotion effort, there may be a direct positive impact on quantity purchased and a negative impact on the length of time between purchases. With less time between purchases, this implies that household stocks may be larger. With larger household stocks, the lower the amount purchased. The net effect of promotion, therefore depends on the direct purchase impacts and indirect stock effects. The possible conflict of the direct and indirect quantity impacts implies that unless shorter interpurchase time is recognized, comparing quantity consumed with and without product promotion may overestimate the true amount by which a particular promotion campaign increases demand (Neslin, Hendersen, and Quelch, 1985). Purchase acceleration may be viewed positively or negatively from the retailers view depending on marketing environment. For example, in a competitive marketing environment, purchase acceleration may be an explicit objective undertaken by retailers so as to counter-act anticipated marketing efforts of competitors. Alternatively, without such a predatory situation, purchase acceleration may result in consumers stockpiling the commodity that they would have purchased regardless of the promotion (Neslin, Hendersen and Quelch, 1985).

The research by McDowell, Allen-Smith and Okafor represent a second attempt at examining the determinants of dairy product demand. Unlike Green and Park, they use a national

household consumer survey, the BLS's Consumer Expenditure Survey (CES), for their analysis. The use of the CES requires that expenditures be the dependent variable as quantities and prices are not contained in the public version of the data. In their econometric specification the author's recognize the problem of having a censored dependent variable, dairy product expenditures. They use the double hurdle model to overcome this problem, a natural extension to the Tobit specification.

Their analysis raises several questions that could have been easily answered. First, are the purchase decision stages implied by their specification independent? The authors **impose** decision-stage independence whereas there is ample evidence from previous analyses that this assumption may not be appropriate (Jones). Second, is heteroscedasticity present? Similar to the estimation of Tobit (truncated) regression models and in contrast to standard OLS, heteroscedasticity has the potential for creating major problems for researchers estimating the LDV models that are in common use today. As Maddala and Nelson (1975) and Hurd (1979) show, when estimating a censored or truncated regression heteroscedasticity can result in inconsistent parameter estimates in contrast to consistent (albeit inefficient) estimates under OLS. The degree of censoring tends to be an indicator of inconsistency seriousness (Greene). The authors do not give an indication of the proportion of the survey respondents that did not purchase dairy products over the survey period. Therefore, the question remains as to the degree to which their parameter estimates are inconsistent.

Recent extensions to the double-hurdle model have been used to account for the Infrequency-of-Purchase (IOP) phenomenon (Gould, 1992; Su and Yen). That is, the survey period may be shorter than the purchase cycle and the use of a double-hurdle model of *expenditures* to measure the impacts on *consumption* may be misleading, zero expenditures may not mean zero consumption. Although unclear in the paper, if the authors use 1 week CES diaries for their analysis, then the shelf-life of most dairy products are greater than the survey period and an analysis of expenditures may provide an over-estimate of conditional demand and underestimate of consumption probabilities. Given the data used and definition of dependent variable, the authors need to carefully differentiate expenditures from consumption. Throughout the paper the authors confuse the two.

Besides the obvious econometric issues pointed out above the authors left me wondering how their analysis of the discrete purchase and [expenditure] decisions could "be valuable in providing information for developing marketing and public awareness programs".

### ***Fast Food Consumption: How Fast is it Growing?***

As noted by Jekanowski, Binkley and Eales, almost half of U.S. food expenditures are associated with food-away-from-home. Given this importance, it is surprising how little data and associated research has been undertaken to identify important determinants of this segment of food consumption. To fill this gap, the authors present an applied demand analysis of the fast food industry. As one can anticipate data is a problem. How does one define consumption? The authors do an admirable job in addressing this issue by using a weighted average price of the three largest categories of fast food and dividing this average into per capita fast food expenditures for 85 U.S. metropolitan areas.

As specified in the paper, the authors use a first difference formulation for both dependent and independent variables. Given this formulation and the fact that the analysis was for 5 years, I was surprised to see significant female labor force participation and race variables given that these variables move in a glacial manner. The question is whether these variables are included in first difference form or are for one of the two time periods. Besides price, I found the authors use of the "density" variable interesting. As an extension, would it be possible to include some measure of the possible number of consumers in addition to land area?

### ***Dietary Adequacy and Program Participation: Does it Matter?***

With the demise of USDA's Household Food Consumption Survey series, researchers have been at a loss as to how to conduct detail nationwide food consumption analyses. Although not a perfect substitute, USDA's Continuing Survey of Food Intake by Individuals (CSFII) is now being used to examine the adequacy of diets in the U.S. The paper by McNamara, Wilde and Ranney continue in the use of the CSFII by applied economists. The unique characteristic of their research is the use of the number of Food Guide Pyramid servings as their dependent variables.

I found the econometric procedures used very interesting but have one criticism concerning the author's presentation, I want more details. There are a number of areas of my own research where their approach would be useful. For example, could a traditional demand system

such as AIDS, Translog, etc., be used? This criticism is not meant to be a negative comment but rather an indication how useful I think their methodology could be in other applications.

The use of the CSFII by myself and others are subject to a number of criticisms, the main one being that the survey encompasses only *two* days of diet recall (a reduction from the 3-day diaries of earlier CSFII's. Think about your own diets. I am sure that you can identify a couple of days where your food intake could not be considered typical. What about weekends versus workdays, special occasions, etc.? Have you every arrived at work and forgotten your lunch and therefore skipped lunch that day? Given the shortness of the survey period, one or two atypical days can have an extreme impact on your consumption. Under the previous Household Food Consumption Surveys, at least we observed household food consumption behavior for a week. Another obvious shortcoming with the use of the CSFII is the lack of price information. This may be especially important in the analysis of low income households given the lack of reasonable priced food stores in many urban settings. Again, we have to use what data we have available for our analyses but the interpretation of the results need to be made in light of the limitations of this data.

Given the emphasis of my work on the problems of censoring when trying to characterize food demand, are the presences of zeros a problem in this analysis? What percent of the observations have zero values for the dependent variables. From the table of mean intakes, the sample had a mean intake of 1.29 fruit servings and 1.41 dairy servings. What are the standard deviations of these servings? Are there significant numbers of individuals with zero intakes for these two groups? With approximately a quarter of the sample being black and the level of lactose intolerance in this racial group, my hypothesis is that there are significant zero dairy intakes. If so, how can one control for this censoring? Are we assured that the parameter estimates are consistent in the presence of such censoring?

The authors found rather limited impacts of income maintenance program participation on the number of food servings with the WIC dummy variable not having statistically significant coefficients and the food stamp dummy variable having a significant coefficient in two of five serving equations. Using the estimation results, the authors simulate the impact of program participation on the number of servings. Given the above estimates, are the simulated impacts of

program participation statistically significant?

Is the fact that food stamp program participation increases fat consumption necessarily a benefit? This result has some obvious implications given the public health objective of reducing dietary fat intake and may indicate a need to tie in food stamp participation with some type of education effort as to the benefits of having a diet low in dietary fats.

### *Summary*

All of the papers included in this session represent good first steps in extending our understanding of food purchase behavior. I have several recommendations that could improve these research efforts. Given the competitiveness of the fast food industry, information as to the degree of promotion activities should be included in the analysis of Jekanowski, Binkley and Eales. For example, one variable could be the some sort of weighted average of the percent of months when there was special pricing promotions available. Green and Park should examine the potential of obtaining a disaggregated version of the data used in their analysis and examine more household level adjustments to promotion efforts or at least at the purchase occasion level. As noted by the authors, McNamara, Wilde and Ranney may want to examine program participation endogeneity. A natural extension of their analysis would be to include those households that are included in the Diet and Health Knowledge Survey component and incorporate respondents health/nutrition attitudes and knowledge into the intake equations. Do households more concerned about their health have different intake patterns when compared to households with meal planners less concerned or having little knowledge of the relationship between diet and health. Finally, McDowell, Allen-Smith and Okafor may want to disaggregate dairy product expenditures. Though limited, the CES does allow for a limited disaggregation of dairy products into subgroups such as fluid milk, cheese, butter, etc. Given the infrequency-of-purchase issues associated with cheese and butter versus fluid milk, it may be worthwhile to disaggregate the dependent variables. The authors should also explore the possibility of not imposing the independent structure of the purchase process and whether IOP is an important characteristic for these commodities.

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**Table 1. Comparison of Paper Characteristics**

<b>Study</b>	<b>Data</b>	<b>Time Period</b>	<b>Estimation Procedures</b>	<b>Dependent Variable</b>
Jekanowski et al.	Pooled T.S./C.S. Census, ACCRA	1982/87, 1987/92	SUR: first differences	Change in Per Capita Fast Food Consumption
Green and Park	Weekly Store Level Scanner Data	9/96-10/97 (61 weeks)	SUR: double log	Amount of Milk Sold (by Fat Type)
McNamara et al.	CSFII: Low Income Sample ( $\leq$ 130% of poverty line)	1994/96: 2-day recall of food intake	Modified SUR/Error Component Model	Number of Food Servings, Total Sugar and Fat Intake
McDowell et al.	CES:1 (2?) week diary of food expenditures	1994	Independent Double-Hurdle Model	Expenditure on Dairy Products



Figure 1. Relationship Between Interpurchase Time, Quantity Purchased and Commodity Promotion

