New Economic Approaches to Consumer Welfare and Nutrition
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# New Economic Approaches to Consumer Welfare and Nutrition

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Commenting on the papers of the session "Applications and New Approaches to Understanding Food Demand"

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**Applications and New Approaches to Understanding Food Demand**

This session included three papers. LaFrance estimates nutrient demand using market level time-series data. McNamara, Ranney, and Wilde (MRW) estimate low income nutrient demand using the Continuing Survey of Food Intake by Individuals (CSFII). Finally, Unnevehr, Villamil, and Hasler (UVH) test a model of health demand using experimental economics. All three are interested in analysis of policy used to affect consumers' diets and arrive at fairly mixed assessments. LaFrance finds that the dairy program's effect on diets has been minimal. MRW find that the food stamp program increases consumption of meat amongst low income consumers, but also increases consumption of added sugars and of fats. UVH point out a potential market failure in the Food and Drug Administration's differential treatment of labeling on dietary supplements versus those appearing on foods handicaps investment in functional foods.

All three studies found that an important demographic factor in the demand for nutrients is age. LaFrance shows that the moments of the age distribution of the U.S. population are significant determinants of food (and nutrient) demand. MRW find that once age is included that income is not an important factor in nutrient demands amongst low-income consumers. UVH find that as age increases and health endowment decreases, consumers are willing to pay more for soy (a functional food) if they know of its benefits. Past this the papers have little in common, so each is discussed in turn.

LaFrance's goal is to develop a demand system which allows him to assess the impacts of U.S. agricultural policies on diets. To achieve this goal, a system is estimated for 21 food commodities using seventy-six annual observations. Highlights of the paper are as follows. The theoretical development of the link between micro and market demands which requires that both demands and compensating variations aggregate. A test of strict exogeneity of food expenditures in food demands is developed and applied. It is overwhelmingly rejected. Given the long time-series employed, LaFrance prudently looks for model instability and rejects the war years as belonging to the same data generating function. Finally, food demands are converted to their constituent nutrients using and constant linear relationship.

The resulting demand system is used to analyze the impact of U.S. dairy policy on the nutrient content of the U.S. diet. Because dairy policy has had only minor impact on food consumption, the effects on nutrient intake have been minor. Next, the welfare impacts of dairy policy are gauged. The average annual compensating variation is a billion dollars.

Suggestions for possible extensions of the work are: First, many studies have or will look at the impacts of policy on one or a subset of the nutrients which make up U.S. diets. Typically such an approach would be justified by assuming the nutrients of interest are separable from others. LaFrance appears to have the framework within which it is possible to test whether such assumptions are justified. Second, many other federal programs, such as the Food Stamp Program(FSP), the Women, Infants, and Children program (WIC), or the school meals programs are likely to have had a much larger impact on the nutrition of U.S. diets, especially amongst the poor. Examination of the impacts of these programs would make for a more interesting story. Third, LaFrance's demand model which allows for exact aggregation from the micro to the

market food demands requires that those demands be linear in a function of income, while Engel showed us that they should be a diminishing function of income. It would be of some use to gauge the sensitivity of results to the specification of income, possibly using the QUAIDS model of Banks, Blundell, and Lewbel. This would also have the added benefit of giving some indication of the sensitivity of results to the chosen functional form.

The second paper is by McNamara, Ranney, and Wilde. They develop a system of demands for nutrients combined as they are specified in the Food Guide Pyramid, except that the tip is broken out into added sugars and fat. The claim is that this is a better way to analyze things than the approach taken in the previous paper when interest focuses on nutrition rather than food consumption. Given that the authors use the Continuing Survey of Food Intake by Individuals (CSFII) this makes sense. Of course, if one had access to data which include not only consumption and demographics, but prices as well, the authors approach would require some rather stringent assumptions to move from prices of foods to prices of nutrients. However, given the federal government's approach to gathering diet information, as embodied in the CSFII, the question is moot.

The authors innovations are in the area of estimation. As is typical, they allow the errors across nutrient equations for an individual to be correlated as in the usual Seemingly Unrelated Regression framework. In recognition of food consumption within a household, they also allow the errors between individuals within the same household to be correlated, as well. This effectively recognizes the fact that many households have one meal planner and if broccoli is on the dinner menu you either eat it or you don't.

The results suggest that program such as the FSP and WIC have differing impacts on the quality of low income consumers' diets. Specifically, they find that FSP increases consumption of meats, which is beneficial, but it also increases the consumption of added sugars and fats, which is not. The WIC program, which is specific about foods which may be purchased with program funds, decreased added sugar.

The paper could benefit from more careful explanations in several places. In particular, two variables are treated more carefully than the rest, age and income. Both are allowed to have nonlinear effects on the consumption of each of the nutrients, but in totally different ways. Some explanation of why the linear splines are used for age, but a quadratic term is included for income would help the reader. In table 1, the percentage of zero observations is given. Often with survey data, like the CSFII, this is a significant problem which must be considered in estimation. Because of the level of aggregation employed in their study, I suspect that it is not a problem as Woodland found that sample with under 20% zeros were estimated well by standard techniques which did not account for the zeros. In table 2, maximum likelihood estimates of the model coefficients are presented, as are chi-square test statistics of the significance of each of the seven demands and OLS $R^2$. I would rather see the squared correlation between the observed and predicted from the maximum likelihood estimates of the model. In table 4, the variances and correlations of the errors are reported. The variances suggest the authors might rescale their added sugar variable, as its variance is about two orders of magnitude greater than the others. Another key for the authors is given by the correlations between errors across individuals and households. Indeed if the household component of the errors were unimportant then OLS on

each equation separately would be fully efficient. The significance of the household component of the error can be tested and if strictly individual errors is rejected (as it appears it would be) it would strengthen the authors' case.

The final paper in this section is by Unnevehr, Villamil, and Hasler. They have a great story to tell. They develop a theoretical model of the demand for health which they use to produce hypotheses about the impacts of health endowments and access to information on the demand for functional foods. The theoretical model shows that thresholds separating discount rates which lead to no functional food consumption versus constrained functional food consumption and that from unconstrained functional food consumption increase with health endowments and decrease with access to information about the advantages of functional foods. These hypotheses are then tested by auctioning regular and soy cookies to college students and seniors. Soy consumption has been shown to lead to a 50% reduction in cholesterol. Auctions are held and then the participants are given information on the benefits of soy. The pre- and post-information bids are not significantly different for the students, but are for the seniors. This is precisely what the authors' health theory suggests. This is the type of story that we should be telling.

I have only a few comments for the authors' consideration. First, the model of health is based on additively separable utility function of a consumption good and a health good. In discussing this set up with a colleague, Jim Binkley, he reminded me of an old Jack Benny routine. Jack is approached by a gun-wielding robber who exhorts, "Your money or your life!." The robber is confronted by nothing but silence. "Your money or you life!" he repeats. Again, silence. "For the last time...Your money or your life!" To which Jack responds, "I'm thinking. I'm thinking." So let's characterize the utility function as Jack Benny preferences. An extra unit of health or an extra unit of consumption are the same to the young and the old alike. I think the authors must make some argument that these preferences may be far fetched at the extremes of the age distribution, but may represent tradeoffs between health and consumption fairly well in between.

The authors also employ a perceived production function for health which relates health to an input of which the consumer has an endowment and more of which may be purchased. The production function differs from the usual in two ways. The effect of the input in producing health depends on the consumer's knowledge (soy consumption reduces cholesterol). Second, health production depends directly on the cost of purchasing any of the health-producing input on the open market. This needs more careful explanation as it seems, as it stands, that the authors are double counting the cost of the health-producing input in their theoretical development.

It was a pleasure to read these three thought-provoking papers.

Banks, James, Richard Blundell, and Arthur Lewbel. "Quadratic Engel Curves and Consumer Demand." *The Review of Economics and Statistics* 79 (November, 1997): 527-539.

Woodland, A.D. "Stochastic Specification and the Estimation of Share Equations." *Journal of Econometrics* 10 (1979): 361-383.