DISCUSSION: CHANGES IN DOMESTIC DEMAND FOR FOOD: IMPACTS ON SOUTHERN AGRICULTURE

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Professor Capps has done an excellent job of examining changes in food consumption in the United States and identifying implications of those changes for southern agriculture. There can be little doubt that expanded discussion about the relationship between diet and health has made consumers more aware of what they eat. For example, given our own taste preferences, we certainly cannot explain the sharp increase in yogurt consumption in recent years other than in response to an expanded preference for *health* foods.

However, we need to be careful in translating all observed changes in consumption patterns into conclusions about changes in consumer preferences. Capps correctly pointed out that changes in consumption patterns do not necessarily reflect changes in demand. However, there is quite often a tendency to forget this as we try to interpret changes in consumption patterns. For example, in 1974-75 there was a sharp increase in non-fed beef consumption relative to fed beef consumption. Many observers jumped to the conclusion that consumer "preferences" had sharply shifted in favor of lean beef away from well marbled beef. The facts are that consumers temporarily changed their consumption pattern in 1974-75 because beef producers abruptly changed the mix of fed and non-fed beef sent to slaughter in response to the sharp increase in feed grain prices that had occurred without corresponding increases in fed beef prices. Proponents of the shifting preference structure ignored the fact that during that time, fed beef continued to sell at a price premium relative to non-fed beef, as it does today, even though pounds of fed beef consumption exceeded pounds of non-fed beef consumed per capita.

As we observe changes in the total amount of meat consumption over time (and the mix of beef, pork, and poultry within the total meat category), we need to keep in mind that annual per capita meat consumption is basically determined by meat production. Frozen meat stocks and meat imports have historically accounted for a relatively small and fairly stable proportion of total meat consumption. (The recent influx of Canadian pork imports is a notable exception.)

In spite of our efforts to do so, we found nothing in Capps' paper to argue with, so we decided to expand on his set of research challenges. Capps points out that *"there exists the need to develop more complete theoretical and empirical analyses which permit clearer pictures of changing patterns of demand, their causes, and their likely longrun effects."* We agree.

The major research challenge regarding consumer demand for food is to determine whether observed changes in consumption patterns reflect changes in consumer preferences or shifts in demand caused by changes in supplies of competing commodities and therefore changes in relative prices.

What do we mean by a change in consumer preferences? There has been almost no research designed to test hypotheses about changes in consumer preference. Consumer preferences are defined by the consumer's utility function. Fred Waugh's award winning paper, *A Partial Indifference Surface for Beef and Pork,* provides a rich foundation for empirical research regarding the nature and stability of consumer preferences. Unfortunately, if Waugh's insightful paper was submitted for journal publication today, it would be rejected for using a mathematical form of the utility function that implies cardinal measurement of utility. Fear of being accused

of using cardinal measures of utility has apparently scared demand researchers away from using price and consumption data to develop and test hypotheses about consumer preferences. This fear certainly has not inhibited production economists from postulating all sorts of mathematical forms of farmer utility functions in efforts to explore farmer decisionmaking processes. Why have demand researchers not shown equal imagination and innovation in exploring consumer preferences for food products?

Let us examine some of the research implications of Waugh's insights. We do not have to assume anything about the measurement of utility to derive the first order conditions of utility maximization subject to an income constraint. That is,

$$(1) \quad \frac{MU_1}{P_1} = \frac{MU_2}{P_2} = \cdots = \frac{MU_n}{P_n} / I ,$$

where MU_i and P_i are the marginal utility and price, respectively, of the ith good and I is the consumer's disposable income. Thus, for any two goods i and j,

$$(2) \quad \frac{MU_i}{P_i} = \frac{MU_j}{P_j}$$

or

$$\frac{MU_i}{MU_j} = \frac{P_i}{P_j} .$$

Therefore, the observed price ratio is equal to the ratio of marginal utilities of the two goods at the observed level of consumption and prices.

The first and second order conditions for utility maximization require that the utility function be twice differentiable with respect to the quantity of goods being consumed. It therefore follows that,

$$(3) \quad \frac{MU_i}{MU_j} = \frac{P_i}{P_j} = f(Q_iQ_j) ,$$

where f is a continuous function. Equation (3) thus provides a basis for examining the stability of consumer preference structures with observable price and consumption data provided the marginal utility of each of these two goods is independent of the level of consumption of other goods. The compatibility of this latter condition with observed data can be empirically tested by adding observed consumption of other goods to the analysis and testing the hypothesis that the coefficient on these quantities equals zero.

Expansion of equation (3) to include other goods then provides an empirical test for appropriateness of alternative assumptions about the separability properties of the consumer utility function.[1] For example, we can not reject the hypotheses that goods i and j are separable from all other goods in their utility function, if we observe the following properties of coefficients estimated in equation (3):

$$(4) \quad \partial(P_i/P_j)/\partial Q_k = 0 \text{ for all } k \neq i, j.$$

See Bieri and de Janury (p. 13) for specification of other conditions of separability that could be tested by alternative specification and estimation of equation (3).

Stable consumer preferences means that the utility function does not change over time. Shifts or changes in consumer preferences mean that the utility function has changed. A shift in consumer preference (utility function) will be reflected as shifts in the coefficients of equation (3). Thus, one has empirical evidence of shifts in consumer preference *only* if hypotheses about shifts in the parameters of equation (3) can not be rejected. Moreover, testing for shifts in the magnitude of coefficients of demand equations can be justified only if one has *a priori* evidence that there has been a shift in preference structures.

Stable consumer preferences imply that shifts in relative prices (consumption) of two goods can be explained by changes in relative quantities (prices) of the two commodities. This relationship is examined for pork and broilers in Figure 1. Casual observation of these data offers no indication of a change in consumer preferences between pork and broilers over the 1949-1979 period. A log linear regression of the ratio of retail pork price against the per capita consumption of pork, broilers, and beef explains 99 percent of the variation in the ratio of pork and broiler prices. Moreover, hypotheses that shifts in coefficients occurred in 1960 or 1970 are rejected at the 99 percent level of confidence (Bullock). In short, there is no empirical evidence to support the hypotheses that there has been a preference shift in favor of broilers and against pork during the 1949-79 period. Changes in the consumption mix between pork and poultry are fully explained by changes in relative prices and visa versa.

There has clearly been a downward shift in the demand for pork as larger quantities

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[1] Income is not an argument of equation (3) since the price flexibility with respect to income = 1 for all goods (Houck). Therefore, $\partial(P_i/P_j)/\partial I = 0$ for all prices of goods.
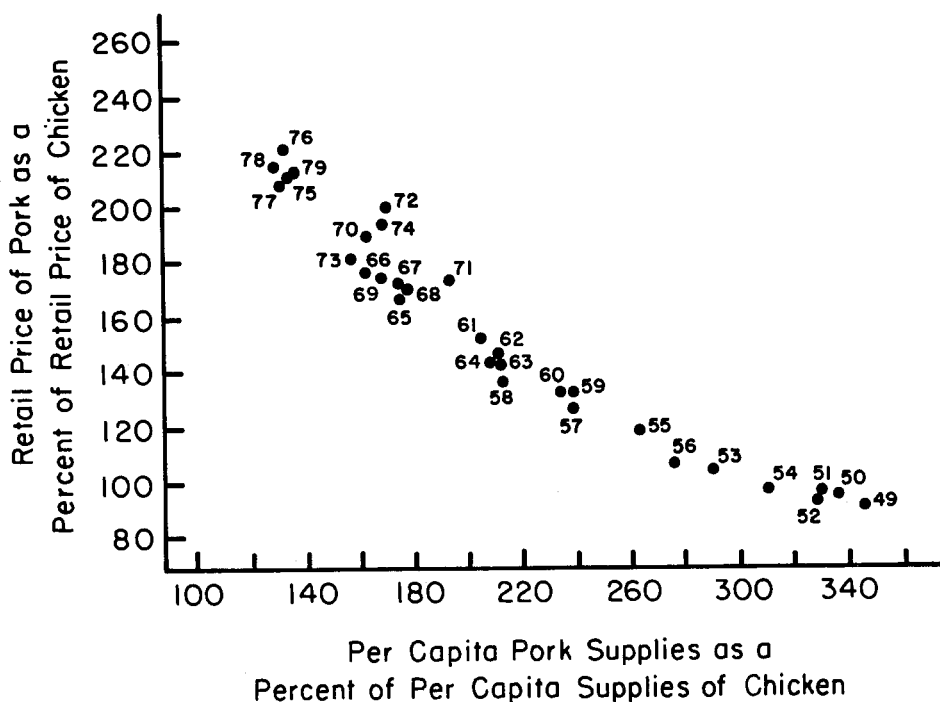
Figure 1. Relative Prices and Relative Quantities: Pork-Chicken, United States, 1949-79.

of poultry has been consumed at lower prices. However, there is no evidence to support the hypothesis that there has been a shift in consumer preferences of beef relative to pork. Prices of competing products and income are shifters in the demand for pork. Thus, demand can shift without a change in preferences. However, a change in preferences will, by definition, change the demand curve.

Capps correctly points out the significance of knowing whether observed changes in consumption patterns reflect preference changes or shifts in demand caused by changes in relative prices. The above analysis suggests that efforts to expand pork consumption relative to poultry consumption via advertising will not be productive. Rather, the effective approach to expanding the pork industry's share of the domestic meat market is to reduce the cost of producing pork relative to the cost of producing poultry. The 4:1 versus the 2:1 feed conversion for pork and poultry is the problem facing the pork industry share of the meat market not shifting consumer preferences.

The question about stability and nature of consumer preferences is not trivial. We join Capps in challenging demand researchers to expand research to provide improved information about the nature and stability of consumer preference structures.

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