Trading Down? The Impact of Recession on Meat Consumption

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Introduction

The U.S. economy has experienced two national recessions in the first decade of the 21st century (NBER). Economic theory and anecdotal evidence suggests that as consumers face tighter budget constraints, many may "trade down" regarding meat consumption in order to stretch their food budget with minimal loss in overall utility and volume. Trading down may come in various forms. For example, growth in U.S. sales of private-label fresh meat products (27%) more than doubled sales growth in branded fresh meat products (12%) in October 2008 as compared to October 2007 (Nielsen). Overall, private label products experienced 10% growth in sales during 2008. Beef offers the consumer a variety of quality grades, unlike competing meats. In recent years, the beef industry has also worked to provide "value cuts" from lower valued carcass components such as the chuck and the round.

Shifts in consumption of meat products occur due to changes in household budget constraints and relative prices of the products themselves. These choices become more evident in economic downturns as consumer budgets tighten and consumers modify their basket of goods. These changes reflect the desire of the consumer to feed the household as cost effectively as possible. In the case of beef, consumers have multiple options to consider in "rearranging" their shopping basket. Consumers may purchase the same cut but at a lower quality grade. Lusk et al. report that meat retailers have more elastic demand for lower quality graded beef and that choice and select are strong substitutes during the fall and winter – a result that likely reflects

consumer behavior. Another consumer alternative is to choose fewer premium products (e.g. loin-based steaks and other high end value cuts) and replace them with lower value cuts (e.g. roasts, chuck or round steaks and ground beef). Consumers may also choose to replace beef with specific pork or poultry cuts (see Eales and Unnevehr 1988).

How has the consumers' mix of meat purchases responded to financial pressures of a recession? Is the response to relative prices different than in other consumption periods, reflecting a changed consumer mindset and preference set during recession periods? Evidence from the current recession points to this fact as the Choice-Select spread not only has moved counter-seasonally in the spring of 2008 and 2009, but also temporarily inverted during April 2009. In this article, we examine whether elasticity measures become more elastic during a recession period reflecting increased price sensitivity on the part of consumers. Additionally, we examine whether less expensive protein sources become stronger substitutes for beef overall and whether Select beef becomes a stronger substitute for Choice beef during a recession period. We begin with a review of the relevant literature, discussion of the data, and estimation procedures. Empirical results are then discussed with a summary of major findings to conclude the paper.

Literature Review

Structural demand changes in U.S. consumer purchasing patterns for meat products has been a frequently researched topic due to the change in consumer's purchasing larger amounts of chicken relative to beef. Over the past thirty years, retail weight purchases of chicken, specifically broiler meat, has more than doubled as consumers sought leaner sources of protein as well as products convenient to prepare (Eales and Unnevehr 1988). The mid-1970s is generally viewed as a time when a structural change in beef demand began occurring (Eales and

Unnevehr 1988, Kinnucan et al., and Wohlgenant). Kinnucan et al. documented that this structural change seen was due in part to relative prices as well as health information and total meat expenditures.

Eales and Unnevehr (1988) found that consumer chooses among meat products rather than among meat aggregates from a particular species. Their data, although annual, covers four separate recessions and suggests that choosing meat products rather by species occurs even during recession periods. The underlying tastes and preferences of a consumer are not changed during a recession, only their ability to purchase goods to satisfy those preferences. Similar to structural changes in food manufacturing resulting from technological changes (Goodwin and Brester), food consumption patterns would slowly be altered as the full impact of a recession was felt by consumers through unemployment and loss of spending power. As the overall economy recovers, demand for meat products should return to the underlying preferences held by consumers.

Relative prices of products matter as the consumer's budget is tightened during a recession. Wohlgenant found that between 1947 and 1983, decline in beef consumption can be accounted for by relative prices and real income. This is in addition to reductions in poultry production costs that have made beef demand more sensitive to the price of poultry. The ability to lower beef production costs as suggested by Wohlgenant has been hampered in the past few years due to rapid increases in the cost of feedstuffs, fuel, and fertilizer that have not as adversely impacted the poultry industry due to the differences in the structure of the two industries.

Short-run supplies of meat products are fixed leading to inelastic prices for these commodities. Recession induced changes in demand (leading to more elastic prices) would

differ from a structural change as occurred with the beef industry in the 1970s. Goodwin, Harper, and Schnepf modeled gradual shifts of the demand system for fats and oil through a smooth, continuous transition function. This type of analysis also allows the "demand system to vary in accordance with structural shifts that may have affected short-run demand relationships" (Goodwin, Harper, and Schnepf). Aggregating data into longer time intervals tends to smooth variability present in the data (Capps) and advertising studies have shown that annual data overstate changes as consumers respond to advertisements (Duffy and Clarke). Thus, scanner data is an important tool in analyzing short-run relationships that are temporarily changing as a result of a recession. These changes may include higher quality meat cuts, specifically beef, becoming more sensitive to relative prices and substitution effects. The changes in budget allocations of a household still reflect prior structural shifts, but would also reflect temporary changes in preferences driven by reduced income levels, even the expectation of reduced income in the short-run. Unlike consumer responses to advertising and health information, we do not assume that the underlying preferences of a household are altered during a recession, only their ability to maintain those levels.

During the two most recent recession periods, government issued tax rebates were used to help stimulate the economy to end the recession. In both recession periods, the money distributed to households had a larger effect on spending and non-food, non-durable goods than food expenditures (Johnson, Parker, Souleles; Broda and Parker). Although not statistically significant, purchases of food away from home rose faster than expected (Johnson, Parker, and Souleles). Analysis of the 2008 stimulus showed that expenditures on food were included in a category of goods that consumers spent the least of their rebate check to purchase (Broda and

Parker). This suggests that consumers were making purchases of meat products based on their relative prices, regardless of the presence of stimulus checks.

In 2007, fifty one cents of every dollar spent on food was for home consumption and 9.7% of U.S. disposable income was spent on food purchases (ERS 2008). From 2001 to 2008, disposable personal income grew by 12% (BEA) with food inflation rising at 24% (BLS). During that same period, prices for meat, poultry, fish, and eggs rose by 27% (BLS). U.S. food safety concerns regarding *E. coli* and BSE also affected retail beef demand since the turn of the century. Per capita consumption of beef has declined since 2004, but this masks how consumers have changed consumption of beef products within their consumption bundle.

Eales and Unnevehr (1988) suggest the importance of demand models accounting for disaggregated meat products but few studies have followed this suggestion of looking at specific cuts of meat as opposed to the meat type as a whole (e.g. poultry versus chicken breast or leg; ground and table beef versus steaks, roasts, and beef for stews). The implementation of mandatory price reporting provides price data on more specific cuts of meat and the opportunity to more fully understand consumer purchasing decisions. The frequency of reporting period allows for changes in consumption patterns to become apparent whether this is due to factors including price shocks, food safety concerns, or a decrease in consumer spending power.

Data

Retail price information was collected from the Livestock Marketing Information Center (LMIC). Specifically, we use monthly average prices and quantity indices for choice and select beef sirloin steaks, hamburger, boneless pork chops and boneless chicken breasts for the period January 2001 through April 2008. The data is compiled from scanner data obtained from

supermarkets that account for 20% of U.S. sales and represent a national sample. Reported

information was collected under the Livestock Mandatory Reporting Act of 1999. Other

components of this data were also used in Pritchett et al. (2007) and Ziehl et al. (2004). Key

economic indicator data is obtained from the Federal Reserve Bank and the National Bureau of

Economic Research.

Methods

The almost ideal demand system (AIDS) developed by Deaton and Muellbauer is a commonly

used demand estimation technique that has the form

(1) $w_i = \alpha_i + \sum_j \gamma_{ij} + \ln(p_j) + \beta_i \ln \left(\frac{X}{P}\right)$

where w_i is the expenditure share of the ith commodity, p_j are prices, X is the total expenditure on

all commodities in the system, and P is a price index defined as

(2) $\ln(P) = \alpha_0 + \sum_i \alpha_i \ln(p_i) + \frac{1}{2} * \sum_i \sum_j \gamma_{ij} \ln(p_i) \ln(p_j).$

An AIDS model accounts for the basic demand restrictions

(3) $\sum_i \alpha_i = 1$ $\sum_i \gamma_{ij} = 0$ $\sum_i \beta_i = 0$ (adding up)

(4) $\sum_j \gamma_{ij} = 0$ (homogeneity)

(5) $\gamma_{ij} = \gamma_{ji}$ (symmetry)

which are expressed in terms of the model's coefficients in order to be imposed or tested. The

AIDS model allows for correction of the total expenditure variable to reflect changes in the

distribution of expenditures (Eales and Unnevehr 1988). Quarterly dummy variables are

incorporated to adjust for seasonality. Consumer preferences are not always stable and the AIDS model is flexible enough to allow for structural change to be examined. The possible impact of recession is nested in the model by appending own price, cross-price, and expenditure parameters with an additive parameter that interacts with a recession dummy variable.

Results

The base model is estimated as a system using Generalized Method of Moments and correcting for first order autocorrelation. Parameter estimates and fit statistics are reported in Table 1. The resulting own-price elasticities are negative as expected, and are reported in Table 2 , along with own-price and expenditure elasticities. Cross price elasticity estimates, however, exhibit mixed signs. In fact, half of the cross-price elasticities would suggest complementary relationships rather than that of substitutes. Model estimates with the nested recession shifters included are presented in Table 3. Few parameters are significant and fit statistics are poor. The results of Tables 1 and 3 together suggest a degrees of freedom issue. A chi-square test was conducted to determine whether the recession parameters as a group were different from zero. The hypothesis test failed to reject that the recession parameters were jointly zero, which would suggest that consumers did not change purchasing patterns during periods of recession. However, given that monthly data are used here, it is possible that weekly data would give improved parameter estimates and model results.

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Table 1. Parameter Estimates for Base Model

	Sirloin Steak Choice	Hamburger	Boneless Chicken Breasts	Boneless Pork Chops
Intercept	.248 (.262)	.097 (.376)	.474 (.001)	.018 -----
Q2	.142 (.001)	.009 (.545)	-.094 (.003)	
Q3	.157 (0.00)	-.028 (.000)	-.086 (.000)	
Q4	.080 (.030)	.024 (.066)	-.078 (.002)	
γ_{i1}	.106 (.046)	-.015 -----	-.087 -----	-.253 -----
γ_{i2}	-.015 (.806)	-.015 (.904)	.032 -----	.035 -----
γ_{i3}	-.087 (.009)	.032 (.386)	-.042 (.249)	.218 -----
γ_{i4}	-.253 (.000)	.035 (.412)	.218 (.000)	.354 -----
β_i	.007 (.838)	.008 (.695)	-.016 (.526)	.0002 -----
R^2	.63	.58	.48	

Note: p-values are in parantheses.

Table 2. Own and Cross Price Elasticities for Base Model

Own and Cross Price Elasticities	Boneless Sirloin Steak - Choice	Hamburger	Boneless Chicken Breasts	Boneless Pork Chops	Expenditure Elasticities
Boneless Sirloin Steak – Choice	-0.72	-0.05	-0.24	-0.70	1.02
Hamburger	-0.11	-1.11	0.20	0.22	1.05
Boneless Chicken Breasts	-0.30	0.13	-1.14	0.81	0.94
Boneless Pork Chop	-1.21	0.17	1.05	-1.00	1.01

Table 3. Model Estimates with Nested Recession Shifters

	Sirloin Steak Choice	Hamburger	Boneless Chicken Breasts	Boneless Pork Chops
Intercept	.545 (.321)	-.072 (.949)	.309 (.570)	.219 -----
Q2	.122 (.176)	.058 (.755)	-.158 (.093)	
Q3	.189 ((.000)	-.020 (.750)	-.122 (.004)	
Q4	.093 (.219)	.064 (.636)	-.130 (.090)	
γ_{i1}	.181 (.518)	-.144 -----	.19 -----	-.366 -----
γ_{i2}	-.144 (.799)	.284 (.831)	.109 -----	.017 -----
γ_{i3}	-.19 (.381)	.109 (.770)	-.289 (.139)	.510 -----
γ_{i4}	-.366 (.070)	.017 (.974)	.510 (.044)	.629 -----
β_i	.044 (.657)	.035 (.873)	.034 (.720)	-.024 ----
σ_{i1}	-.0005 (.998)	.232 -----	-.336 -----	.823 ----
σ_{i2}	.232 (.697)	-.370 (.918)	-.308 -----	.165 -----
σ_{i3}	-.336 (.216)	-.308 (.828)	1.07 (.214)	-1.198 -----
σ_{i4}	.823 (.026)	.165 (.920)	-1.198 (.205)	
R^2	.59	.16	.308	

Table 4. Elasticity Estimates with Recession Variable Included

Own and Cross Price Elasticities	Boneless Sirloin Steak - Choice	Hamburger	Boneless Chicken Breasts	Boneless Pork Chops	Expenditure Elasticities
Boneless Sirloin Steak – Choice	-0.72	-0.05	-0.24	-0.70	1.02
Hamburger	-0.11	-1.11	0.20	0.22	1.05
Boneless Chicken Breasts	-0.30	0.13	-1.14	0.81	0.94
Boneless Pork Chop	-1.21	0.17	1.05	-1.00	1.01