IMPACTS OF FOOD SAFETY ON BEEF DEMAND

T. L. Marsh[1] and N. E. Piggott[2]

Summary

This study investigates whether food safety incidents involving beef, pork, and poultry, and the accompanying publicity have impacted United States meat demand. Beef demand is modeled as a function of beef prices, competing meat prices, meat expenditures, and food safety. Food safety indices are constructed separately for beef, pork, and poultry.

Statistical tests reveal significant effects of food safety incidents on beef demand. The effect of an additional beef food safety incident on beef demand is negative, implying a detrimental impact on beef consumption. Spillover effects of pork and poultry safety incidents are positive and improve beef demand, revealing substitution away from pork and poultry towards beef. In other words, food safety incidents involving beef decrease beef demand and those involving pork or poultry increase beef demand. Overall, the demand responses to food safety incidents are small when compared to price effects and to previously reported estimates on health effects, such as information relating to beef and cholesterol.

(Key Words: Beef Demand, Food Safety, Spillover Effects.)

Introduction

Food safety concerns in the United States have increased dramatically in the past decade. Contaminated meat products can result in serious risk to consumers, and can cause disease outbreaks due to such pathogens as *Listeria monocytogenes*, *Escherichia coli* O157:H7 (E. coli), and *Salmonella*. Food safety problems are not isolated to the United States, as evidenced by the highly publicized outbreaks of Bovine Spongiform Encephalopathy (BSE) in Europe. The potential impacts of food safety incidents on consumer demand for meat products include effects on the demand for the contaminated commodity, as well as spillover effects for other meat commodities.

Experimental Procedures

Food safety indices were constructed separately for beef, pork, and poultry by searching the top 50 English-language newspapers from 1982 to 1999, using the academic version of the Lexis-Nexis search tool. Keywords searched were food safety or contamination or product recall or outbreak or salmonella or listeria or *E. coli* or trichinae or staphylococcus or food-borne. From this information base, the search was narrowed to collect beef, pork, and poultry

[1]Department of Agricultural Economics
[2]Department of Agricultural Economics, North Carolina State University, Raleigh, NC 27695.

information separately by using additional terms a) beef or hamburger, b) pork or ham, and c) chicken, turkey, or poultry, respectively. The newspaper articles were then counted to construct quarterly beef, pork, and poultry media indices.

To accurately assess meat demand shifts as a result of changes in media reports, meat demand was estimated in a systems model quarterly over the 1982 to 1999 period. The meat demand system accounted for prices of competing meats, total consumer expenditures on meat, food safety, and seasonality. Specifically, the beef equation included beef, pork, and poultry prices; total expenditure on meat; beef, pork, and poultry food safety indices; and seasonality and time trend variables.

Results and Discussion

Figure 1 shows the beef, pork, and poultry media article count quarterly from 1982 to 1999. The number of reported food safety articles for each series remained small, trending slowly upward from 1982 to 1988. From 1988 and through 1999 the number of articles increased markedly with some dramatic peaks dominated by the beef series. The beef series exhibits the highest mean and most variation in the number of articles, with a mean of 162.8 and standard deviation of 223.4. The poultry series has a mean of 151.3 and standard deviation of 126.8. The pork series has a mean of 41.9 and standard deviation of 40.9. The maximum number of reported articles per quarter for beef was 1158 in 1996, 571 for poultry in 1997, and 241 for pork in 1999. Not surprisingly, peaks in the beef series relate to such critical events as BSE concerns in 1990 and 1996 and *E. coli* outbreaks in 1993 and 1997.

Results from the meat demand system provide important insight and implications for beef producers and the beef industry. First, beef demand is inelastic with respect to beef price. From 1982 to 1999, on average, beef quantity demanded declined 0.91 percent for a 1 percent increase in beef price. Response of beef demand to competing pork and poultry price changes is less than one tenth of the response to beef price. Beef demand is highly responsive to changes in per capita meat expenditures. The beef demand model indicates that beef demand increases 1.06 percent for a 1 percent increase in per capita meat expenditures. This implies that beef demand mirrors meat expenditures, which is in turn directly related to disposable income.

Second, consumers perceive an increase in food safety articles about beef as an indicator of a decrease in "quality" of beef products. This leads to individuals consuming less beef. From 1982 to 1999, beef demand decreased on average 0.0004 percent for a 1 percent increase in beef food safety articles. Although this average response seems small, it is important to point out that the number of articles on beef safety increased from 110 in quarter three of 1995 to a high of 1158 in quarter two of 1996. During this period, the 1053 percent increase in number of articles translated to a dramatically larger decrease in beef demand. Alternatively, spillover effects of pork and poultry food safety articles were beneficial to beef, as consumers perceived increased pork or poultry food safety reports in newspapers to indicate a decrease in the "quality" of pork or poultry products and, as a result, they reallocated expenditure towards beef. The demand model indicates beef demand increases 0.0005 percent for a 1 percent increase in

pork food safety articles. The corresponding increase for poultry articles is .0008.

Overall the demand responses to food safety incidents are small, especially compared to price effects and expenditure, and compared to previously published estimates of health related issues relating to cholesterol. Nevertheless, policy-makers and other participants in the U.S. meat industry need to understand the adverse effects of food safety publicity on beef demand, and spillover effects among competing meats.

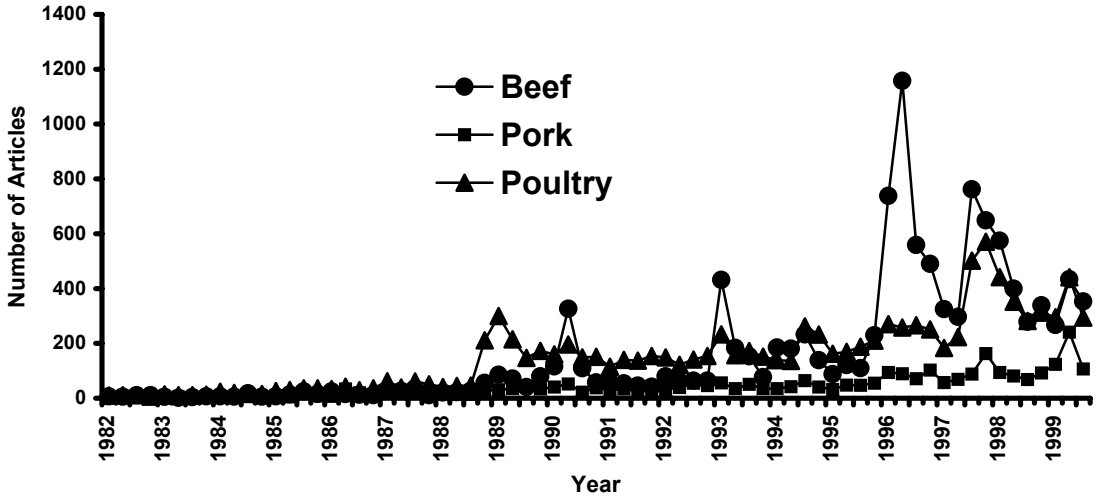

Figure 1: Beef, Pork, and Poultry Food Safety Media Articles 1982-1999.