

How can the beef industry recapture lost consumer demand?¹

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Abstract

Twenty years of declining demand has plagued the beef industry. Better understanding of beef demand determinants is essential to designing strategies to reverse declining beef demand. This article is a review of economic and demographic factors causing beef demand to decline, and strategies the beef industry could use to regain lost consumer demand are identified. Five major demand determinants are identified, including 1) relative prices of competing meats, 2) consumer income, 3) health and nutrition concerns, 4) food safety, and 5) product attributes relative to changing consumer preferences. The last three factors have had enough negative influence on beef demand during the past 20 yr to more than offset positive demand impacts associated with the first two factors. To revitalize beef demand, the industry must improve vertical coordination and provide a healthy, safety-assured product that offers consumers a desirable eating experience that fits their lifestyles.

Key Words: *Beef, Demand, Purchasing Habits, Food Prices*

Introduction

The beef industry has suffered a precipitous decline in demand for several decades. Moreover, beef demand declined every year from 1979 through 1998 but finally realized a small increase in 1999. USDA data indicate per capita beef consumption dropped 20% from 1970 to 1998, and inflation-adjusted retail beef price declined 25% (LMIC, 1999). From 1990 to 1998 alone, beef demand dropped by 18%.⁴ Such a dramatic decline in demand has caused considerable restructuring and downsizing of the beef industry. For example, from January 1975 (the peak of the U.S. beef cow inventory) to January 1999 the U.S. beef cow herd declined by 27% (LMIC). This decline in beef demand and the industry's response evokes several relevant questions. What precisely is beef demand, and why is it important? What has caused the downward spiral in beef demand? Can the industry appreciably regain its lost consumer market? Addressing these questions is the essence of this article.

The primary objective is to determine how to improve beef demand. Specific objectives include 1) clearly defining beef demand, 2) reviewing recent trends in beef and competing meat demand, 3) delineating major beef demand determinants, and 4) identifying factors the beef industry can substantially influence to enhance future beef demand.

Discussion

Defining Beef Demand

One challenge facing the beef industry is a lack of understanding of beef demand and factors influencing demand. Misunderstanding beef demand and its determinants has contributed to inefficient allocation of resources into efforts and investments that yield suboptimal returns.⁵ Demand refers specifically to the quantity of beef a consumer will purchase at a given beef price, holding other factors constant.

A demand curve is simply the schedule of quantities consumers will purchase over a range of beef prices.

In the short run, the amount of beef consumed is essentially the amount produced, aside from relatively small changes over time in beef cold storage stocks and changes in net exports. Because exports and imports each represent a small percentage of total production and roughly offset each other (i.e., net exports are small), essentially beef consumption closely follows annual domestic cattle production.⁶ This means beef demand depicts the price of beef necessary to entice consumers to purchase the quantity of beef product offered (i.e., produced). When beef supplies are plentiful, wholesalers and retailers discount price to induce product movement. Conversely, when supplies are tight, retail price increases to maintain retail margins.

Due to the confusion surrounding demand, it is useful to stipulate what is *not* beef demand. Beef demand is *not* per capita beef consumption. Per capita consumption, as just described, *is* beef production (net of changes in cold storage and imports and exports). Observing per capita consumption over time without consideration of price provides virtually no information regarding beef demand. Beef demand is also *not* beef's relative share of total meat consumption. Again, this simply reflects production of beef relative to production of competing meats. Relative, or absolute, production and consumption are not demand because they lack information regarding prices. Further, beef demand is *not* the share of consumer income spent on beef. Consumer income affects beef demand and share of income spent on beef reflects market symptoms, but the share of income spent on beef does not depict demand. Beef demand, then, *is* both the quantity of beef consumed *and* the price at which it is purchased.

Meat Demand Trends

In order to identify reasons for its decline, recent beef demand trends merit review. Figure 1 illustrates beef price-

quantity relationships (i.e., points on various demand curves) from 1980 to 1999 (each point represents the indicated year). From 1980 to 1986 the amount of beef offered for consumption increased about 1 kg per person. However, inflation-adjusted retail beef price (\$/kg) had to decline 26% to encourage consumers to consume this additional 1 kg. This large decline in retail price was reflected in a 35% decrease in inflation-adjusted fed steer prices over this same 7-yr time span.

The large fed-cattle price drop prompted considerable liquidation in the cow herd, starting gradually in 1983; noticeable declines in beef production were realized by 1987.⁷ From 1986 to 1993, beef consumption per person fell by 17% (Figure 1). Such a huge decline would bring considerably higher (i.e., about 25% higher based on typical estimated beef demand flexibilities⁸) retail prices in a market with stable demand. However, inflation-adjusted retail beef price increased only 4%. Since 1993, beef demand has continued a downward trend. Based on an estimated demand elasticity⁹ of -0.67 (Chavas, 1983; Eales and Unnevehr, 1988; Brester and Schroeder, 1995; Kinnucan et al., 1997), beef demand declined 10% from 1993 to 1998. During 1999 the beef industry realized the first demand increase in over 20 yr, increasing by just under 4% relative to 1998 (Schroeder et al., 2000).

To contrast with beef, price-quantity relationships for pork, chicken, turkey, and fish/seafood are illustrated in Figures 2 through 5. The pork price-quantity relationship (Figure 2) suggests a much more stable demand situation than that for beef over this time period. Although some decline in pork demand has occurred, it has not exhibited continual declines over time. For example, relative to 1995, inflation-adjusted retail prices and quantities consumed during 1998 and 1999 were both higher. This indicates stronger pork demand in 1998 and 1999 than in 1995. Further, pork demand in 1998 seems to have been close to the same level it was in 1988 (although it varied from year to year), a sharp contrast to beef demand's 22% decline during the same time.

The chicken (Figure 3) and turkey (Figure 4) price-quantity relationships show huge increases in poultry consumption and reductions in real prices from 1980 to 1999. From the graphs alone, one cannot conclude much about chicken or turkey demand over time because real prices declined as per capita consumption increased. These corresponding price-quantity relationships may or may not be on the same demand curves. However, demand elasticity estimates for poultry are generally -0.25 or smaller in absolute value (Brester and Wohlgenant, 1991; Brester and Schroeder, 1995; Kinnucan et al., 1997). This suggests fairly steeply sloped demand curves in Figures 3 and 4, indicating pronounced increases in chicken and turkey demand over time. In addition, from 1998 to 1999 chicken demand increased noticeably. Thus, the increase in beef demand during 1999 was not a result of a decline in poultry demand.

Fish and seafood demand increased substantially during the 1980s as consumption increased from 5.7 kg per person to in excess of 6.8 kg at the same time inflation-adjusted

prices were increasing (Figure 5). During the 1990s, fish and seafood demand has stabilized.

A summary of trends in selected meat demand from 1980 to 1999 is illustrated in Figure 6. Any commodity falling into quadrant II is in the desirable situation of increasing real prices and increasing per capita consumption. Of the five meat products, fish and seafood is the only one that realized both price and consumption growth over the past two decades. Turkey and chicken lie in quadrant IV, where real prices have declined as per capita consumption increased. This alone could indicate a move along a demand curve or movement to different demand curves; however, as discussed earlier, these undoubtedly both represent increases in demand (i.e., different demand curves).

Finally, beef and pork are located in quadrant III, the worst of the four, where prices and consumption both declined, indicating lower demand for these products. Comparing beef and pork, beef consumption declined 10% and pork consumption declined 5%, but to encourage consumers to purchase the respective products, beef price had to drop by 32%, compared with pork's price decline of only 5%. This clearly demonstrates beef demand declined more than pork demand. Comparing beef and turkey, both had similar percentage declines in real prices (beef price declined 32% and turkey price declined 39%), but this was in light of a 10% *decline* in beef consumption and a 77% *increase* in per capita turkey consumption. This indicates the beef industry has lost considerable market share to pork, turkey, chicken, and fish/seafood, implying it has failed to provide the product/price offering consumers demand.

Demand Determinants

Having described recent beef demand trends, the key question is, What factors influence how much consumers are willing to pay to consume the beef produced? In other words, what has caused the observed declines in beef demand? Numerous factors that jointly influence beef demand over time can be broadly categorized as 1) relative prices (or quantities), 2) consumer incomes, 3) health/nutrition concerns, 4) food safety concerns, and 5) consumer preferences for meat product attributes.

Relative Prices. In the short run, beef quantities are pre-determined; therefore, retail beef price adjusts up or down relative to competing meat prices to remove perishable product from inventory. Therefore, in the short run, prices react to quantities of beef and other meats produced. In the long run, however, retail prices reflect costs of production, processing, and marketing services (including economic returns to investment in these activities). Because meat products compete with each other, the price of beef relative to that of other meats is an important demand determinant. This illustrates one of the most basic economic concepts: relative prices of substitute goods (e.g., pork and poultry) affect demand for beef. Retail price of beef relative to pork, chicken, and turkey¹⁰ over 1980 to 1999 is illustrated in Figure 7. Beef became cheaper relative to chicken and pork over the past two decades. In 1980 retail beef price was 1.67 times retail pork

price and declined to 1.19 times as large in 1999. Similarly, retail beef price was 3.25 times retail chicken price in 1980 and declined to 2.73 times as large by 1998. Beef price increased only relative to turkey (beef/turkey price ratio went from 2.63 to 2.90) from 1980 to 1999. Beef price also decreased considerably relative to fish and seafood price over the past two decades (Figure 6). Since 1980, retail beef price has declined relative to that of chicken and pork, but consumers chose to purchase less beef. This reinforces the decline in beef demand over time described earlier.

Reducing the price of beef relative to competing meats, all else held constant, will improve beef demand. The fact that the relative price of beef has declined during the past two decades when beef consumption was also decreasing indicates beef demand would have dropped even further without its relative price declines over time. These relative price comparisons indicate that other factors have negatively influenced beef demand over the past two decades (others have made similar arguments, including Lamb and Beshear, 1998 and Purcell, 1999). In fact, these other non-price factors not only negatively affected beef demand, but they more than offset beef demand strengthening caused by reduced beef price relative to competing meats. Therefore, non-price factors have been major beef demand determinants since 1980.

Consumer Income. One non-price factor that affects beef demand is consumer income or expenditure (Capps et al., 1988; Brester and Wohlgenant, 1991; Schroeder et al., 2000). Beef is generally considered a normal good, that is, as consumer income increases, beef demand increases. Consumer income has trended upward over time, increasing at an annual average inflation-adjusted rate of 1.7% per year since 1980 (LMIC, 1999). Economic theory suggests that at low levels of income, most goods are normal, but as income increases, the likelihood that a good becomes inferior increases (Tomek and Robinson, 1990). Schroeder et al. (1995) estimated meat demand across a wide range of income levels and found that all meat products are normal goods at low-income levels. Poultry is an inferior good (an increase in income generates a decrease in demand) at moderate to high income levels. Pork and beef remain normal at all levels of income, although their demand increases progressively less as income approaches high levels.

However, not all beef products are normal across all income levels. For example, as income increases, ground beef becomes inferior, whereas steak remains a normal good. Based on estimates from Smallwood et al. (1994), for households with annual incomes less than \$25,000, ground beef is a normal good; however, for higher-income households, ground beef becomes inferior. In contrast, sirloin steak remains a normal good as household income continues to increase beyond \$80,000. Eales and Unnevehr (1993) concluded that whole chickens and hamburgers were inferior goods, and processed chicken parts and beef table cuts (steaks) were normal goods. Similarly, Brester and Wohlgenant (1991) concluded that beef from cattle not finished in a feedlot (usually hamburger) were an inferior good, whereas beef from grain-fed cattle (yielding more high-quality table cuts) were a normal good.

Health Concerns. Another important non-price issue of concern to beef consumers is perceived health and nutrition effects of consuming red meat. Brown and Schrader (1990) developed a cholesterol index that counted articles in English dealing with clinical links between cholesterol and heart disease or arteriosclerosis cited in Medline. The cholesterol index is the cumulative sum of articles supporting linkages between dietary cholesterol and heart disease minus the number of articles questioning the link. As illustrated in Figure 8, the number of articles published supporting the link, less those refuting it, has averaged 22 articles per quarter, although it has been increasing at a slightly increasing rate.

Kinnucan et al. (1997) found that beef demand was adversely affected by the health information this index represents, indicating that consumers have reduced beef consumption as additional information on cholesterol has been discovered and become publicly available. They suggested that poultry benefited from dissemination of cholesterol health information at the expense of beef, whereas pork and fish/seafood demand was unaffected by cholesterol information. Kinnucan et al. (1997) reported that health information elasticities were generally greater (in absolute value) than price elasticities, indicating that a relatively small percentage of change in health information leads to larger changes in meat consumption than an equivalently small percentage of change in relative prices. Health and nutrition concerns have had a long-term gradual downward influence on beef demand. This underscores the importance of industry efforts to provide balanced health information to consumers via consumer, nutritionist, and health advisor education. In addition, continued support of research to better understand these linkages and how the industry can address them will provide long-run benefits.

Food Safety Concerns. The beef industry must improve the safety of its products (as well as consumers' perceptions regarding safety) to stimulate consumer confidence and increase demand. Schroeder et al. (2000) found that beef recalls by the Food Safety Inspection Service (FSIS) caused declines in beef demand, especially in years when a relatively large number of recalls occur (e.g., beef demand would have increased even more in 1999 had the large number of recalls not occurred). Bruhn et al. (1992) found that 77% of consumers surveyed at a California supermarket had food safety concerns, and over half of them indicated they had changed their buying practices as a result. Increased reading of labels, nutrition-related changes, purchasing organic products, and avoiding products were among the changes cited by consumers. Several studies have addressed consumer willingness-to-pay for food products with safety features or benefits (Shin et al., 1992; Hayes et al., 1995; Buzby et al., 1998). For example, in an experimental auction, Hayes et al. (1995) found that the average undergraduate Iowa State University student would pay approximately \$0.70 per meal for safer food (i.e., food screened for pathogenic bacteria).

Although limited quantitative measures are available on the impact of food safety on beef demand, the issue merits consideration. The beef industry has experienced sizable food safety problems in recent years. The FSIS (2000) meat

product recall records from 1982 through 1999 demonstrate the magnitude of this problem (Table 1). Beef has had more recalls due to bacterial contamination than any other meat, with 82 recalls compared to 59 for pork and 34 for chicken and turkey combined. Perhaps even more alarming is that the first *E. coli* O157:H7 FSIS recall (beef's most common bacterial contamination problem) recorded since 1982 did not occur until 1988. Thus, detection of *E. coli* has been much more common in recent years than during the early and mid-1980s. Beef and pork also tend to have more frequent extraneous material contamination of products compared to competing meats. Overall, beef had the highest number of total recalls over this time frame with 169, followed by 157 for pork, 73 for chicken, and 44 for turkey. An integrated system whereby producers, packers, processors, and retailers ensure product safety and reduce potential contamination will strengthen demand. However, rebuilding consumer confidence will require considerable time and effort.

Consumer Preferences for Meat Product Attributes. Consumer preferences have changed dramatically over time. Preference changes have occurred due to numerous demographic factors (Henneberry and Charlet, 1992). Aging population is one factor causing changes in meat consumption. The median age in the United States has been rising for nearly 50 yr, and predictions indicate by the year 2010 persons 65 and over will comprise 16% of the U.S. population. Older people tend to consume more poultry and less beef (Blaylock and Smallwood, 1986). These trends offer the beef industry the opportunity to target leaner cuts of beef to older people because they typically indicate a desire for leaner beef (Capps et al., 1988).

Female labor force participation is another factor affecting meat demand. Since 1964, the number of women employed in the labor market has more than tripled, and total employment has doubled (USBLS, 1999). This increase in women's participation in labor markets has led to increased household income and increased demand for more convenient food products. Teenage labor force participation may also influence beef demand. Increased teenage labor provides additional household income and more meals consumed away from home (Kinsey, 1983). Other demographic factors have also contributed to food product demand changes over time, including declining household size and changing ethnic population mix (Henneberry and Charlet, 1992).

Consumers have increased food-away-from-home consumption. Over the past decade, real foodservice sales have increased at a rate of 1.7% per year, whereas real retail food sales have increased at 1.1% annually. Expenditures on food-away-from-home increased from \$170 billion in 1986 to over \$286 billion in 1996 (Price, 1997). In 1996, about 40% of all U.S. beef consumption occurred in foodservice establishments, according to the American Meat Institute (Putnam and Gerrior, 1997). In 1996, the largest foodservice sector, fast food outlets, represented 41% of total foodservice sales, and restaurants, the second-largest sector, represented 38% (Price, 1997). This is important because these two segments demand significantly different beef products. Fast food out-

lets demand ground or reconstituted beef, whereas restaurants demand high-quality table cuts.

What Can Be Done to Improve Beef Demand?

After summarizing beef and competing meat demand trends and reviewing primary demand determinants, the remaining question is, Can anything be done by the industry to increase beef demand? The answer is yes. Several opportunities exist to increase beef demand. However, it will require major changes regarding how the industry produces beef that meets consumers' desires. Although the beef industry cannot change many of the demand determinants (e.g., consumer incomes, population demographics, or consumer preferences), the industry can influence its destiny by responding to consumer demands for healthy, safe, convenient, and competitively priced beef products. Trying to generate demand for old-fashioned, traditional products (e.g., roasts) through strategies such as generic advertising has not, and will not, appreciably enhance demand (Brester and Schroeder, 1995; Kinnucan et al., 1997). Producing beef without consideration for how it will meet consumer preferences placed the industry in its current position. Developing products consumers desire sounds easy, but forming adequate and practical solutions to the problem is a complicated and formidable task. Determining how to solve beef demand problems requires identifying the problems.

Beef Problems and Solutions

One significant problem with beef demand lies in beef quality variability. The top five ranked beef quality concerns identified from surveys of beef purveyors, packers, restaurateurs, and retailers in the 1995 National Beef Quality Audit (Smith et al., 1995, p 3), were 1) low overall uniformity and consistency; 2) inadequate tenderness; 3) low overall palatability; 4) excessive external fat; and 5) high price for the value received. These are not new problems to the beef industry. In fact, most of these same problems were among the top 10 concerns determined from surveys conducted during the 1991 National Beef Quality Audit (Smith et al., 1992).

Solving problems related to beef quality and consistency requires the ability to measure the magnitude of the particular quality problems at various stages of the production and marketing chain as well as distinguish among cattle and beef possessing different levels of the desired traits. For example, tenderness has been demonstrated as one of the most important palatability attributes of beef (Dikeman, 1987; Savell and Shackelford, 1992; Miller et al., 1995). Huffman et al. (1996) found that consumers accurately evaluate meat tenderness. Consumers have demonstrated a willingness to pay for steaks they are assured are tender (Boleman et al., 1997). In a recently completed study, Lusk et al. (1999) found that when consumers were provided information regarding steak tenderness and a taste sample of the steak, 90% of them preferred a steak known to be tender based on a slice shear-force test relative to a tough steak. Further, 51% were willing to pay an average premium of \$4.06/kg for the tender relative to

the tough steak. They found older, more highly educated consumers preferred the tender steak over the tough steak. With the aging population noted earlier, this suggests considerable future opportunities for identifying, sorting, and labeling steaks by degree of tenderness.

As consumer incomes continue to increase and consumers' demand for steak increases relative to other beef products, tenderness will become increasingly important. Steak consumption in the United States has become a form of entertainment, and demand for assured quality is part of consumer expectations (von Alvensleben, 1997). Steak that does not meet with expectations will result in lost customers.

Beef tenderness problems have been well known for several years (Morgan et al., 1991; Morgan, 1992). Historically, the industry assumed federal beef quality grades differentiated steak tenderness. However, beef quality grades inadequately identify tenderness attributes (Wheeler et al., 1994). Meat tenderness has not been identified, sorted, and marketed differentially, apparently because perceived returns have not exceeded perceived costs of implementation. Better identification of tenderness attributes and improved targeting of tender products and less tender products to appropriate outlets are essential. In addition, to encourage production of tender beef, producers must be paid different prices that accurately reflect value differences for beef of varying levels of tenderness. Without better coordination and cooperation in transmitting such signals to producers, the industry will not experience demand growth.

A second major impediment to beef demand has been lack of innovative product development. High consumer incomes, increased numbers of women in the workforce, and increased demand for leisure have increased demand for food processing and preparation services outside the home. Capps et al. (1985) argued that convenience foods are one of the major factors shaping the modern food industry. The beef industry has lagged behind competing meats in development of new products. Ritchie et al. (1997) cited the number of prepackaged, consumer-ready meat product items listed by a major supermarket chain at the 1996 Meat Marketing Conference in Phoenix: poultry, 70; pork, 58; veal, 7; lamb, 6; and beef, 5. The beef industry desperately needs additional research and development into products that are convenient and easy for consumers to prepare and offer a desirable eating experience. A small part of the modest increase in demand for beef realized in 1999 may be attributable to recent product developments in the beef industry. However, considerably more product development is needed.

The beef industry must develop healthier products without compromising quality. Consumers have reduced demand for beef partially as a result of cholesterol and fat concerns. Unnevehr and Bard (1993) found that consumers negatively value external fat on table cut beef. The industry has made significant strides in reducing external fat (Value Based Marketing Task Force, 1990); it must continue to develop lean products that are low in saturated fat and cholesterol for consumers concerned about these attributes.

Safer beef is essential. Consumers have zero tolerance for contaminated food products. All levels of the industry have

responsibility to ensure increased levels of beef product safety. Continued efforts must be made to improve detection and traceability of source and to determine scientific cause and effect in food safety assurance.

Finally, and perhaps most importantly, the entire cattle and beef industry needs to improve vertical coordination. The beef industry, for numerous reasons, has failed to transmit consumer demand information to producers in the form of price signals. Most of this problem originates from lack of information regarding beef quality attributes and the resulting lack of adequate price signals linked to beef quality. When fed cattle are sold to packers for average prices (live or dressed) without regard for quality, the pricing system does not send economic signals of what consumers demand.

This practice of average pricing has been the subject of considerable discussion (e.g., Fausti et al., 1998; Schroeder et al., 1998). Schroeder and Graff (1999) estimated the pricing error for carcasses of varying quality averaged \$30/animal for cattle priced on an average live or dressed weight basis relative to those priced on quality and yield grade values (i.e., the amount by which higher-quality cattle subsidize lower-quality cattle). If market coordination is not improved and stronger economic signals sent to producers in the form of price differentials, many of the beef demand problems documented here will persist. When the pricing signal deteriorates before reaching the fed-cattle market, no consumer demand signals are sent to cow-calf and seedstock producers. This is a stark contrast to the vertically integrated poultry industry, in which consumer signals are rapidly sent throughout the vertical production and marketing chain.

The beef industry must maintain its current relative price competitiveness with other meats, regardless of the efforts employed to improve beef demand. Significant improvement of beef product quality, convenience, nutrition, and safety without controlling costs will be self-defeating. The wealth of research on beef demand indicates price of beef relative to competing meats is the most important long-run determinant. Cost-efficient production and processing remain essential for beef competitiveness.

Signs for Optimism

The most encouraging aspect of the beef demand problem is that many industry participants recognize the existence of the problem. Improved pricing systems, popularly referred to popularly as *grid pricing*, have evolved that pay much greater premiums and discounts for fed-cattle carcasses based on quality and yield grade factors (Ward et al., 1999). Although not a sufficient solution to the pricing signal problem, such systems move in the right direction. Schroeder and Graff (1999) estimated that the value to producers of identifying their cattle's quality and targeting individual carcasses toward the pricing method (live, dressed, or grid) offering the highest revenue was worth as much as \$35 per animal. This indicates significant value of improved information and associated management, even under the current market environment.

Because traditional cattle and beef markets have failed to send economic signals, numerous vertical beef alliances and partnerships have developed that include cow-calf producers, cattle feeders, beef processors, wholesalers, and/or retailers (Sartwelle, 1996; Lamb and Beshear, 1998). These alliances provide a means to ensure a supply of particular quality beef be targeted to appropriate consumer segments.

Strategic alliances that vertically integrate the beef production and marketing chain and enable cow-calf producers or stocker/grower operators to retain ownership of their cattle through slaughter are gaining interest. Alliances increase information sharing among producers, processors, retailers, and consumers. Therefore, economic signals relating to consumer demand are more clearly translated to beef producers.

An example of such an alliance is Certified Angus Beef (CAB, 2000).¹¹ The CAB product sales have grown exponentially from 1,814,369 kg in 1986 to 184,008,158 kg in 1999. By 1999, 4,000 licensed restaurants and 4,000 licensed retailers in 46 countries sold CAB products (Ishmael, 2000). Another example is Certified Hereford Beef (CHB, 2000), which focuses on high-quality, consistent beef products with less intramuscular fat (marbling) than CAB. The CHB product continues to expand its presence in the beef market, having added its second licensed packer in the fall of 1999 and marketing CHB products worldwide. Coleman Natural Beef is an alliance that differentiates its products by using only beef from cattle that receive no antibiotics or hormones and are fed on rangeland. Coleman Natural Beef has over 600 ranchers in 17 states, represents 55% of the natural beef market, and generates more than \$55 million in sales revenue (Ishmael, 2000). Laura's Lean Beef (2000) markets all-natural beef with low levels of marbling to appeal to health-conscious consumers. Currently, Laura's Lean Beef is present in markets in 30 states and approximately 2,400 retail outlets, with sales of \$55 million. Such alliances are promising for improving beef demand.

New product development is starting to occur in the beef industry. For example, the Cattlemen's Beef Board has partnered with several firms in development and promotion of new beef products (National Cattlemen's Beef Association, 1999). By successfully recognizing the problem, the industry can continue to develop products that meet contemporary consumer demand.

Food safety concerns have the attention of policy makers as well as many beef industry participants. The difficulty associated with assigning levels of responsibility to beef safety warranted public policy intervention. Innovations such as Hazard Analysis Critical Control Point (HACCP) are designed to alleviate many of the microbial food-borne problems the beef industry faces (Unnevehr and Jensen, 1996). In addition, although adoption rates are not apparent, recent approval of ground beef irradiation may further curtail future FSIS recalls of contaminated beef.

Implications

The demand for beef has declined dramatically over the past 20 yr. Numerous factors have led to this decline, includ-

ing product quality concerns, product inconvenience, fat and cholesterol concerns, and food safety problems. Many of these factors are associated with changing consumer lifestyles and preferences. To increase beef demand, the industry needs enhanced vertical coordination. The industry cannot supply the kinds of beef demanded without improved price signals to producers. This includes the need for better beef quality identification, sorting, and marketing. Intense product development targeting specific products to diverse consumer segments is essential. The industry is far from matching consumer demands and transmitting information to all stages of production, processing, and marketing. Despite the dismal state of beef demand, there is considerable opportunity for improvement, and strengthening beef demand in 1999 and early 2000 suggests modest progress already.

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Notes

1. Helpful review comments of M. Koohmaraie are acknowledged.
2. Correspondence: Waters Hall (phone: (785) 532-4488; fax (785) 532-6925; E-mail: Tschroed@agecon.ksu.edu).
3. Professor and USDA National Needs Fellow.
4. Demand decline estimate is the percentage decline in real retail price (from 1990 to 1998) holding per capita quantity constant at the 1990 level and assuming a demand elasticity of -0.67 .
5. Examples of this include 1) adoption of animal genetics designed primarily for lean growth efficiency without consideration for the market's willingness to pay for more lower or variable quality meat, 2) spending millions of dollars annually on generic beef advertising for products that were not new and provided little information for consumers, and 3) expending large amounts of money and time debating, lobbying, and litigating short-run issues such as the perceived impacts on fed cattle prices of various cattle procurement methods used by beef packers that were a result of changing beef demand and supply.
6. As a percentage of U.S. beef production, imports (including live cattle) have averaged roughly 14% and exports roughly 7 to 8% on a volume basis over the past couple of years (LMIC; Brester and Marsh, 1999).
7. From 1982 to 1986 the U.S. beef cow herd size declined by 14% and liquidation continued until 1990 when the size of the cow herd was 17% smaller than in 1982 (LMIC).
8. Demand flexibilities are the percentage change in price for a one percent change in quantity demanded. A reasonable beef demand flexibility is approximately -1.5 (Dahlgran, 1987; Eales and Unnevehr, 1993).
9. The elasticity of demand is the percentage change in quantity of beef consumed for a one percent change in retail beef price. Or, equivalently, elasticity is the slope of the demand curve in logarithmic space.
10. Because fish and seafood prices are available only in index form they were excluded from this discussion.
11. Trade names are used purely to exemplify industry trends and do not represent any implied endorsement of these programs.

Table 1. Meat product food safety inspection service recalls, 1982–1999^a

| Recall type | Beef | Pork | Chicken | Turkey | Other Meat ^b | Processed products ^c |
|--------------------------------|------|------|---------|--------|-------------------------|---------------------------------|
| <i>Salmonella</i> | 16 | 10 | 3 | 0 | 1 | 2 |
| <i>Listeria</i> | 24 | 39 | 15 | 4 | 36 | 4 |
| <i>E. Coli</i> O157:H7 | 35 | 3 | 0 | 0 | 0 | 0 |
| <i>Staphylococcus</i> | 1 | 3 | 0 | 0 | 0 | 0 |
| <i>Trichinae</i> | 0 | 3 | 0 | 0 | 0 | 0 |
| Other bacteria | 6 | 1 | 4 | 8 | 1 | 3 |
| Hepatitis A | 0 | 1 | 1 | 0 | 0 | 0 |
| Extraneous matter ^d | 40 | 49 | 31 | 23 | 18 | 12 |
| Species problem | 23 | 4 | 1 | 0 | 11 | 0 |
| Other reasons ^e | 24 | 44 | 18 | 9 | 17 | 10 |
| Total recalls | 169 | 157 | 73 | 44 | 84 | 31 |

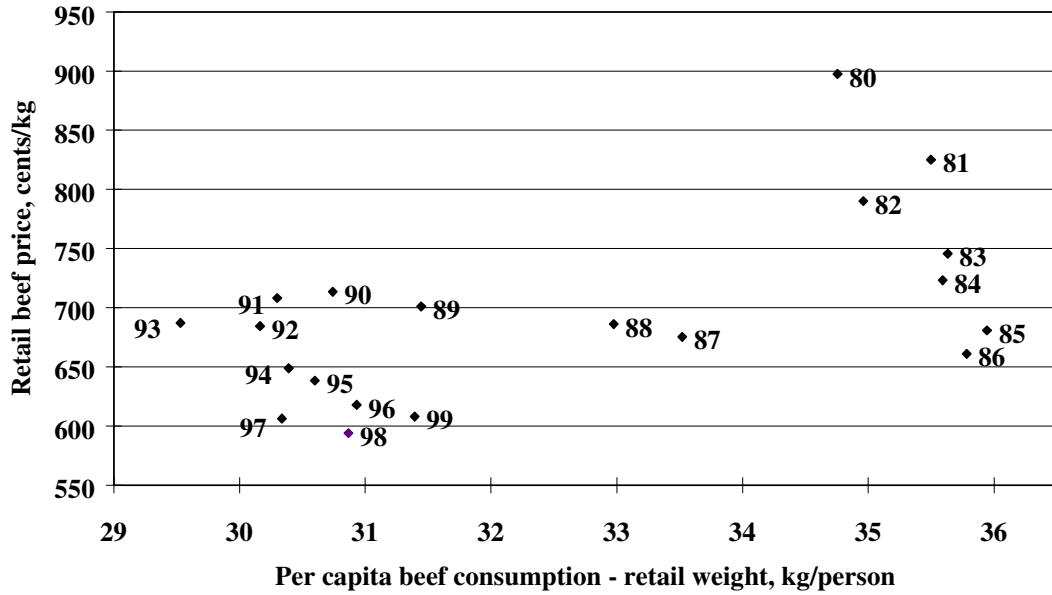
^aSource: Food Safety Inspection Service, USDA.

^bIncludes products such as hot dogs, luncheon meats, spreads, etc. that are not identified by species.

^cIncludes processed products such as soups, ravioli, stews, etc. not identified specifically as containing meat or by meat species.

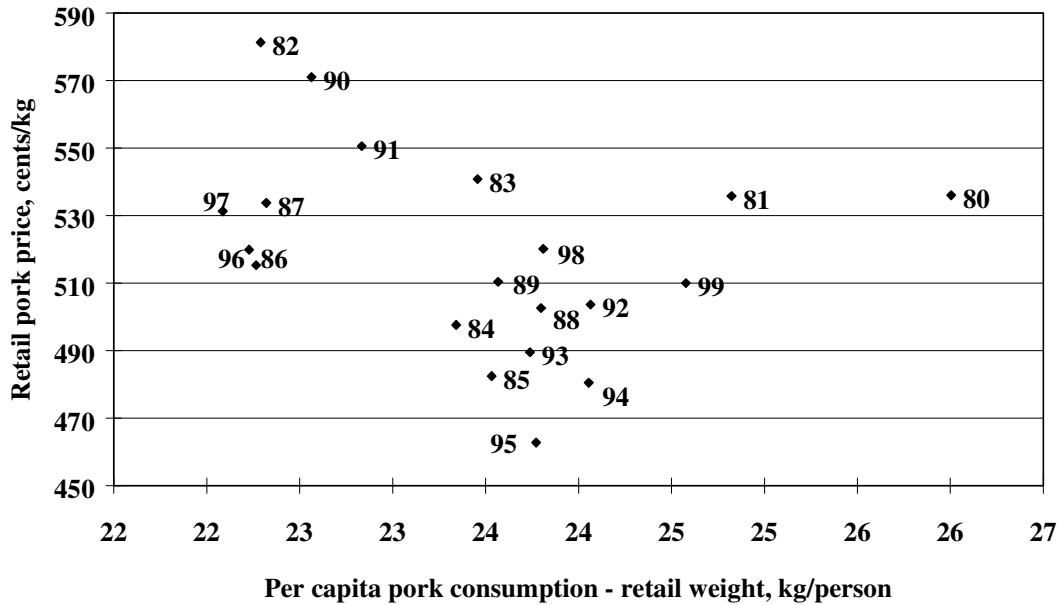
^dIncludes extraneous materials, drugs, chemicals, rodent and insect contamination, etc.

^eIncludes primarily product labeling, package damage, underprocessing, odors, etc.



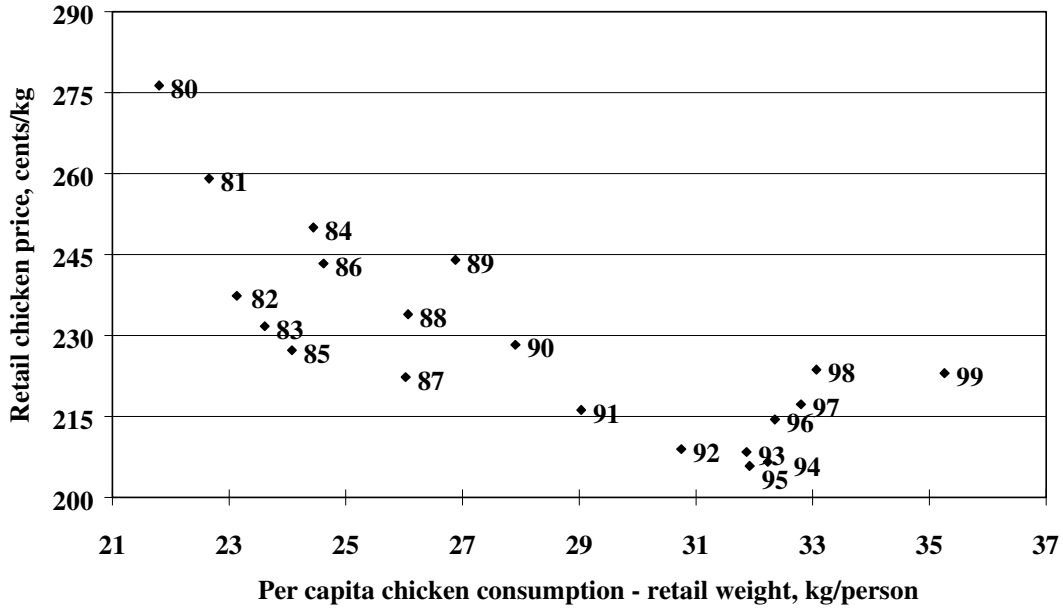
Source: USDA & Commerce Dept.
 Price Deflated by GDP Implicit Price Deflator 1999=100

Figure 1. Annual beef price - quantity relationships, 1980-1999.



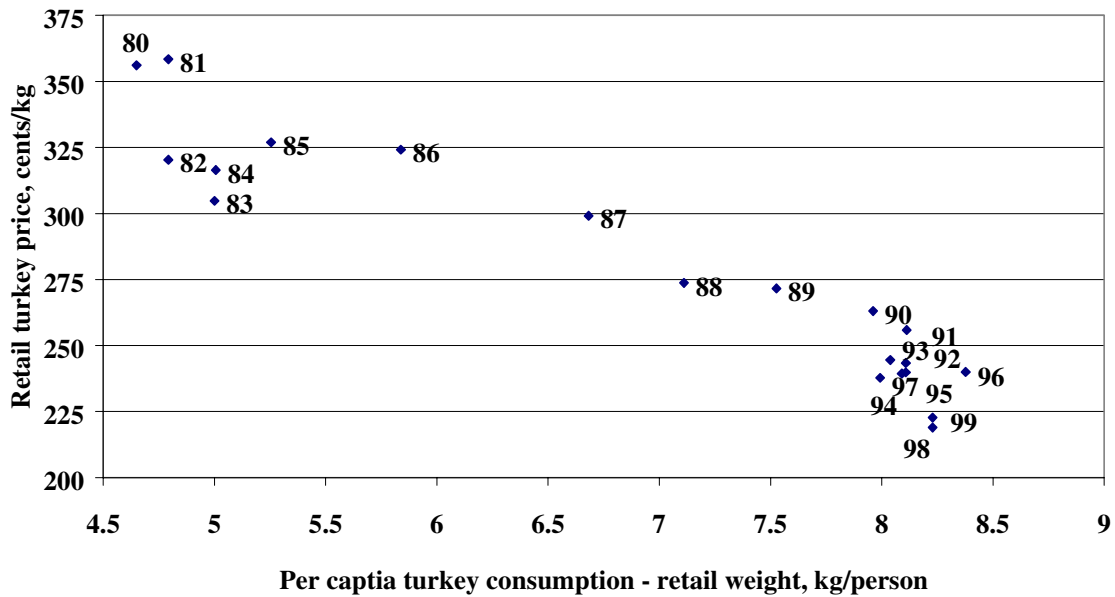
Source: USDA & Commerce Dept.
 Price Deflated by GDP Implicit Price Deflator 1999=100

Figure 2. Annual pork price - quantity relationships, 1980-1999.



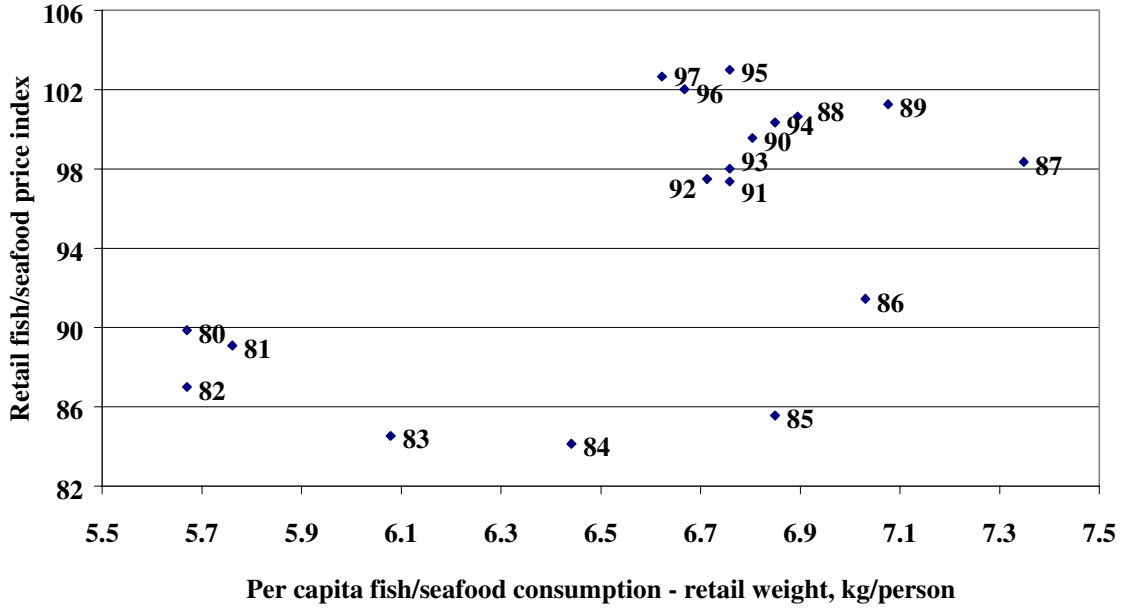
Source: USDA & Commerce Dept.
 Price Deflated by GDP Implicit Price Deflator 1999=100

Figure 3. Annual chicken price - quantity relationships, 1980-1999.



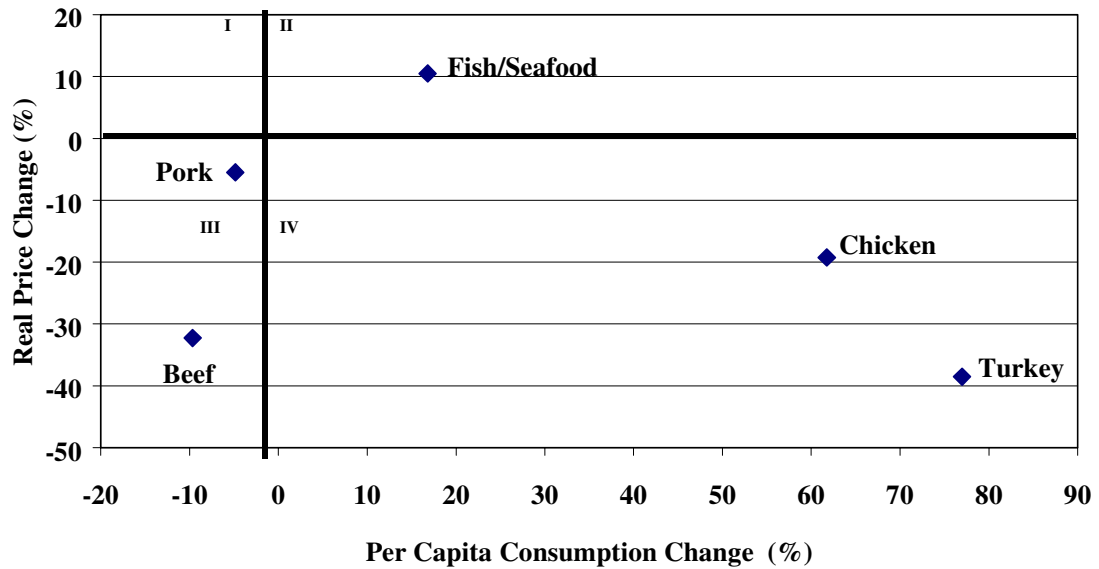
Source: USDA & Commerce Dept.
 Price Deflated by GDP Implicit Price Deflator 1999=100

Figure 4. Annual turkey price - quantity relationships, 1980-1999.



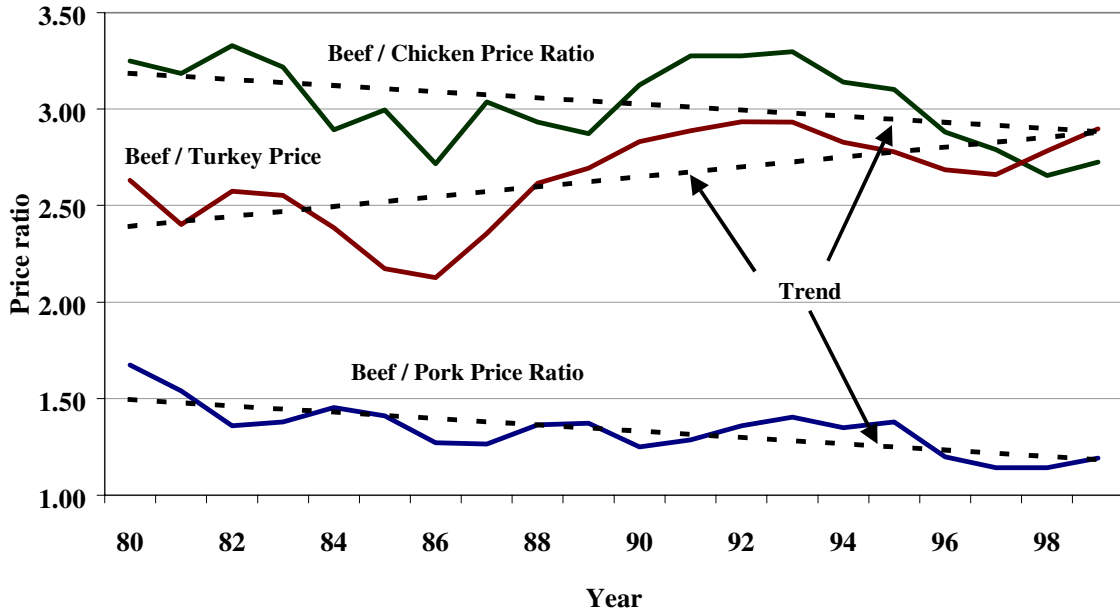
Source: USDA & Commerce Dept.
 Nominal Price Index (1997=100) deflated by GDP Implicit Price Deflator 1999=100

Figure 5. Annual fish and seafood price - quantity relationship, 1980-1997.



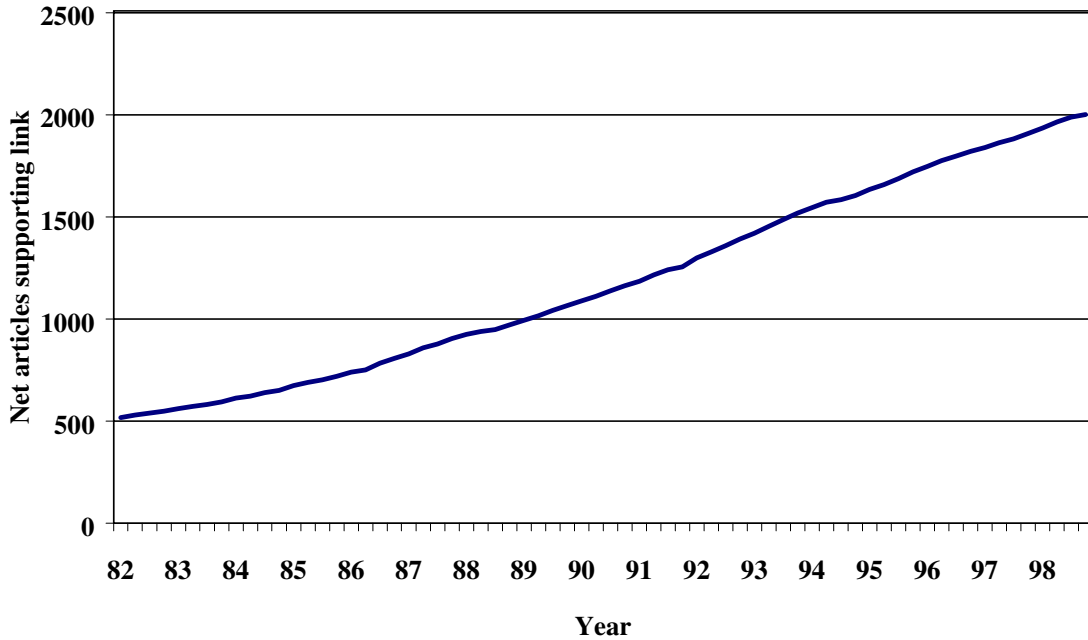
Source: USDA & Dept. of Commerce.
 Price Deflated by GDP Implicit Price Deflator 1999=100, Fish/Seafood is for 1980-1997.

Figure 6. Percentage change in real price vs. percentage change in per capita consumption, selected meats, 1980-1999.



Source: USDA

Figure 7. Retail beef price relative to pork, chicken, and turkey prices, 1980-1999.



Source: Brown and Schrader and own collection

Figure 8. Cumulative net number of articles supporting cholesterol and heart disease linkage, 1982-1998.