

Economic Returns from the Beef Checkoff

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Generic advertising is the cooperative effort among producers to promote the attributes of their products for the explicit purpose of supporting the demand for the goods. In 1987, the first national beef promotion and information programs were started. The beef programs include a large number of activities and efforts, many of which are probably impossible to evaluate individually. Rather than looking at specific programs, the purpose in this analysis is to measure the total impact of the check off programs on the U.S. market for beef while recognizing that the impact of one or more specific programs may differ from conclusions drawn about the total.

What have been the major checkoff efforts that would lead to expected changes in the U.S. demand for beef? Significant events in the history of the beef checkoff include:

- Beef checkoff assessments of \$1 per head were collected and half of the total assessments were used to underwrite a national generic promotion program for U.S. beef.
- Beef checkoff programs were designed around using both direct consumer advertising and promotions, as well as efforts to disseminate information to those having contact with potential consumers.
- A specific theme and message content were adopted with the explicit purpose of conveying to consumers the attributes of beef, including product variety and use, nutritional education, product preparation, and product desirability.
- Most dollars were allocated to national television advertising as the primary mode of

message delivery, with the message content remaining fairly consistent over time and across markets. While the theme and creative content changed, the underlying message about beef remained much the same, with emphasis on variety, use, and health aspects.

Given the broad events and the several years of program experience, the obvious question is to determine if the programs have generated any economic benefit to producers.

Important Beef Trends

While the beef industry is complex, diverse and dispersed throughout the U.S., there are a few major trends in the industry that depict the underlying change in the demand for beef and beef products. It is these trends and the reasons for them that must be understood in order to measure the impact and importance of the beef checkoff to the U.S. beef industry.

Figure 1 shows the most important adjustment that has been occurring in the U.S. beef industry over the last decade since the early 80's. Beef, pork and poultry represent the three most importance sources of meat consumption in the U.S. and these products are substitutable to differing degrees. During 1979 (79:1) beef accounted for 51% of the total meat consumption for these three categories. Poultry stood at 20.3%; and pork totaled 28.7%. By the first quarter of 1993 (93:1), beef's share of the meat consumption dropped to 38.6% and poultry increased to 32.9%. Pork remained nearly fixed at 28.6% compared with 1979. Clearly, the 12% loss in beef's share of

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the consumer meat market was gained almost totally by the poultry industry. These percentages will differ from quarter to quarter, but the trend has been reasonably strong, with a downward shift away from beef relative to poultry.

Beef prices fluctuated throughout the study period with a general upward trend observed for the nominal price series. At the retail, beef prices increased by approximately 40% over those recorded for 1979 compared with 93:2. Poultry and pork prices increased by approximately 20% of the earlier levels. Over the quarters since 1979, poultry prices were approximately 32% of the retail beef prices and pork was 70.8% of the retail beef value. These relative retail price levels changed very little throughout the quarters. Hence, the downward trend in beef's share of the market cannot be attributed to changes in the relative value of beef compared to poultry and pork, since these relative prices were fairly stable. In fact, when calculating the relative degree of variation in retail prices among the three meats, the numbers point to almost identical relative levels of price change. While beef is more expensive in absolute terms, changes in beef prices relative to the pork and poultry are not becoming more expensive in relative terms. It is not the changes in poultry prices compared with beef that have led to the shift in beef's share of the market seen in the last several years.

How do the beef prices compare across the distribution system? Retail beef prices, boxed beef and live weight prices are generally used to represent beef value at the three major points of exchange. Usually, boxed beef and live weight are highly correlated, with the markup from live to boxed beef usually remaining around 54 to 58%. As a rule, the live to boxed beef price remained very stable. In contrast, the margin between boxed beef and retail beef prices was considerably higher and less stable. For the same quarters 79:2 through 92:2, retail beef prices were 129% above the boxed beef level. In 92:1 to 93:2, these percentages averaged approximately 140%. Variations in the retail to

boxed beef margins were nearly three times as great as the variations in the boxed to live weight margins.

Table 1 illustrates the general level of association among the three price levels. For the quarters 87:1 through 93:2, average prices are shown in the second column, followed with the association among the prices as measured with the correlation coefficient. Live weight and boxed beef prices have a correlation of .967, implying an almost perfect level of association at these levels. In contrast, the live weight and retail price correlation is .800 and the retail to boxed beef is .864. These results in Table 1 imply that changes estimated at the boxed beef level should be reflected at the live weight level or, similarly, with live weight changes at the boxed beef level. Clearly, prices at these lower points in the vertical market system nearer to producers are more strongly associated in comparison with the retail end of the distribution system.

Beef Checkoff Programs

The national beef checkoff's primary purpose is to convey information about the attributes of beef, with the objective to strengthen the demand for beef. For the quarters 87:1 through 93:2 a total of \$520.285 million was collected through the national assessment. By law, one half of these funds remains with the state programs for local and/or regional use. Allocation of these state funds is at the discretion of the local and/or state organizations. The remaining half of the funds is channelled to the national programs to underwrite the domestic and foreign market programs and to cover administrative and related expenses. In addition to domestic collections, beef imports into the U.S. are subject to an equivalent assessment. For the quarters through 93:2, total national funds allocated equaled \$278.417 million, and \$268.00 million of these funds were used for checkoff programs. Administrative and other expenses accounted for approximately 3.74% of the national funding, or the difference between \$278.4 and

\$268.00 million. Allocation of the \$268 million represents the expenditures on checkoff programs.

Figure 2 shows the allocation of the program funds across functional areas. Promotions, which are mostly national television, accounted for 69.19% of the total funds. Consumer information programs totaled 10.08% and industry information programs equaled 6.80%. The combined total of domestic promotions and information efforts accounted for 86.07% of the checkoff program funds, with the information share being 16.88%. It is these three programs that are considered the domestic demand-enhancing efforts from which measurable benefits should be directly seen.

Estimated Beef Checkoff Model

Using historical data and statistical techniques, it is possible to estimate the demand shifts for beef and the specific effects of the beef checkoff. Beef demand was estimated at the live weight and boxed beef levels with the primary purpose to:

- Determine if the beef checkoff programs for the period 87:1 through 93:2 have had a measurable impact on shifting the demand for beef, as illustrated in Figure 4.
- Determine if there is a measurable difference in the impact from the promotions versus the informational type programs.

Impact on Beef Prices Using an estimated checkoff model and the historical expenditures, how much did beef prices change in direct response to be checkoff activities? A useful way to show the estimated price gains is to calculate the average price adjustment for a specified period. For example, price changes in the 91:3–92:2 period and the 92:3–93:2 period represent times where program changes occurred. In order to show the price gains, prices with the checkoff must be compared to prices without the programs.

In Figure 3 for the first period, the results show that live weight average prices increased by \$1.12 per hundredweight over a base level. This price gain translates into a 1.73% increase in demand. For the increase over the base, the gain produced an upward

shift in demand and a price increase resulted, yielding the 1.73% increase.

Comparing the 92:3–93:2 season, live weight prices were higher because of other market conditions. At the base (without the checkoff) the live weight price averaged \$67.61 (net of by-product value), and \$69.42 with the checkoff programs. Again, demand shifted upward giving a price increase of \$1.81 per hundredweight and a 2.68% increase over the base price for those quarters.

Estimated Rate of Return While the gains and responses to the checkoff are revealing, they do not show the actual economic financial gains that can be attributed to the checkoff programs. Once the price gains reported in Figure 3 are known, then there are only a few additional steps required to estimate the rates of return to the beef checkoff. In Table 2, the estimated checkoff gains are shown for the quarters 87:1–92:2 and 87:1–93:2.

For the full period covering 87:1 through 93:2, an estimate of \$3.328 billion dollars in revenue is attributed to the beef checkoff programs. While this is a major level of dollars, it is still small when compared to the total industry revenues for the same period. For example, the \$3.3 billion gain due to the beef checkoff represents a 2.2% increase in revenue over the base of \$164.27 billion. Taking the revenue gains and subtracting the program costs and then dividing the results by these costs gives a direct estimate of the average rate of return. These gains are calculated relative to the total assessments because producers must pay that amount to support the programs. Using these assessments, the average rate of return for the full period is estimated to be \$5.40. Each dollar assessed, on average, produced \$5.40 of additional industry revenues at the live weight market level. Table 2 provides overwhelming evidence that the beef checkoff program has generated a positive economic return to producers, as measured at the live weight market level. It is again emphasized that the estimated gains are based on statistical models and are subject to some variation as revisions in the data are recorded.

Even with the normal types of variation seen from year to year in the evaluation, the overwhelming result is that the rate of return is generally always within the range shown in Table 2. Even if the models are off by a small factor, the strong conclusions about the total gains to the program will still be valid.

One final comment about the results in Table 2 needs to be emphasized again. While the rate of return to the industry is impressive, the gains relative to the total industry are still quite modest. Secondly, the rate is based on the average. With substantial increases in expenditures, this rate is going to drop accordingly since one would be moving out the checkoff response function where the marginal gains are declining. That is, with increasing expenditures, the average rate of return should be less.

An Index of Checkoff Gains Another way to illustrate the full impact of the programs would be to express beef demand (via price levels) over time and show the projected prices with and without the existence of the beef checkoff. If the beginning point were indexed to 1.0, and all subsequent prices expressed relative to that starting point, then the direction and magnitude of change in the series would provide clear insight into the relative adjustments in beef demand during all remaining quarters. For example, if by 85:1 the index were .85, that would imply that beef demand shifted down by approximately 15% over the initial period.

Figure 4 shows the above calculation covering the quarters 79:2 through 93:2, with the beginning point set to 1.0. The solid line represents predicted shifts in beef demand with the beef checkoff in place. Demand shifts associated without the beef checkoff are depicted with the starred line. Declining demand for beef is most apparent through the 80s and early 90s. By the first quarter of 89 (89:1), demand with the checkoff stood at 77.9% of the level in 79:2. That is, real demand declined by 22% over a ten-year span. During the latter quarters the decline leveled out, approaching 77% of the 79:2 level. Without the checkoff, this percent is closer to 73%. By the last quarter 93:2, the analysis shows beef

demand to be 77.28% of the 79:2 level with the checkoff and 73.68% without the checkoff. For that quarter, the checkoff added 3.68% to demand above what would have existed assuming no programs in place.

Checkoff gains are apparent in this figure, as is the strong downward trend in demand since 79:2. These two trends are useful to show that, even though the beef checkoff has proven beneficial, its impact clearly has not been strong enough to offset the downtrend in real demand for beef as measured with the price adjustments over time. Similarly stated, the beef checkoff has positively shifted the demand curve for beef, yet other economic and non-economic factors create a greater pressure in the opposite direction. The checkoff alone cannot be expected to offset those strong negative factors impacting the beef industry. What Figure 4 shows is how much worse offset the industry would have been without the presence of the beef checkoff.

Beef Checkoff and Health Concerns

In the previous sections gains from the beef checkoff were shown using models estimated for the U.S. demand for beef. All conclusions were based on these models and, of course, the results depended on the model values. Several factors beyond those of the checkoff programs have a potentially major impact on the level and changes in beef demand. One factor of particular interest to the evaluation is the impact of consumer health concerns on beef demand. Health concerns can influence consumer behavior and it was essential to the evaluation that conclusions about the checkoff not be confounded with health issues. That is, any impact from health concerns needed to be separated from the checkoff gains.

An obvious question is, how to measure consumers' concerns for health related issues? Since the USDA national disappearance data do not include information about consumer preferences or demographics, an alternative private data source was used. The National Panel Diary (NPD) Group is an

independent company that collects surveys of consumers across the U.S. with the purpose to gain insight into both consumption behavior and attitudes. Questions relating to consumers' expressed concerns for health issues provide the basis for developing an index of health concerns that can be incorporated into the beef checkoff model. Periodically consumers report a scaled expression of concern for several health questions. Consumers ranked their concerns on a scale of completely agree, agree mostly, agree somewhat, neither agree nor disagree, disagree somewhat, disagree mostly, or completely disagree for the types of questions, such as..."a person should be cautious about cholesterol."

Consumers' expressed concerns for cholesterol, fats, and preservatives were expected to be the most relevant to the beef industry. These consumer responses were totaled for each quarter and then the percent responding with the level of concern was derived. For example, if the response was 75% for cholesterol, then three-fourths of those consumers surveyed indicated a fairly strong expressed concern for cholesterol. Similar percentage calculations were made for fats and preservatives.

Expressed concerns about fats and cholesterol have changed over the last decade and these changes have a direct impact on the demand for beef. Figure 5 shows the changes in attitudes about both fats and cholesterol. Up to the start of the 90s, consumers continued to express strong concern about fats and cholesterol. By 90:1 concerns for both were around 77%. That is, 77% of those consumers in the NPD data expressed either *mostly* or *completely agree* with the concerns about fats and cholesterol. Starting after 90:1, the pattern changed. Concerns about fats began to level out, while concerns for cholesterol turned down dramatically.

In Figure 6 the calculated effects of consumers' concern for health attributes and general preference changes for beef are estimated. A general downward shift in beef demand is seen, with much of this downward shift being explained by shifts away from red meat to white meats. A major issue is how much, if any, of the downward shift can be attributed to

health related concerns. To address this issue, the beef checkoff model was estimated including the health index discussed above, along with a proxy measure to account for longer-term downward shifts in demand over time. The demand adjustments are illustrated with three lines in Figure 6. Line (a) represents the estimated impact of concerns for health on the demand for beef. All adjustments are indexed to 1.0 for 84:1 simply to give a starting point for quick reference. Line (a) was slightly below 1.0 for most of the quarters up to the end of the 80s. Starting in the 90s, this index increased as consumers began to register decreasing concerns for cholesterol, fats, and preservatives. As consumers became less intense about these health variables, the demand for beef, as measured with shifts in beef demand, began increasing. In Figure 6 the general upward trend in line (a) starts in 1991. Without question, health concerns and particularly a reduction in concerns have impacted the beef industry.

Secondly, beef demand has shifted downward net of any changes in health concerns, as illustrated with line (b) in Figure 6. Line (b) shows a persistent downward trend that is reflective of the known shifts away from red meats. The preference shift alone points to a level whereby 93:2 beef demand was only 82% of the 84:2 level. However, when combining the health and preference shift, the results are slightly different in the latter quarters. Line (c) in Figure 6 is the combination of the two (i.e., line (a) + line (b) = line (c)). Clearly, the downward trend dominates throughout, and for most earlier quarters points along (c) are below (b). By 91:1, line (c) is usually above line (b). The demand gains from declining concerns for cholesterol, fats and preservatives offset part of the negative trend in beef demand, as evident for those points in (c) above (b) in the later quarters. With the trend only, demand stood at 82% of the beginning value but with the inclusion of the health effects, the level increased to 86% (see the points for 93:2 in Figure 6.)

Figure 6 is important for two major reasons. First, the net effect of health concerns as measured

are separated from other factors depressing beef demand. Lower demand is a result of conditions other than health concerns. Second, and probably more important for the checkoff model, is that gains attributed to the beef checkoff are above and separate from health related concerns. Stated differently, the gains estimated for promotions and informational programs are not overstated since the health effects were accounted for in the analysis. Thus the beef checkoff responses and the rate of return truly represent advertising and information that are above any gains from lessening health related concerns.

Putting the Checkoff in Perspective

While the analysis shows the gains to be significant and the rate of return to the programs to be quite large, one must still put the impact of the checkoff in perspective with everything else that causes beef prices to change over time. Probably, the most meaningful way to express the relative gains is to calculate the variations in price over the period 87:1 through 93:2 and then show how much of the variation can be attributed to the beef checkoff versus all other factors affecting beef demand.

Figure 7 provides a breakdown of the percentage of each variable's effect included in the beef checkoff model. Changes in beef supplies are shown to account for 31.2% of the total variation in cattle prices over the 26 quarters since 87:1. In comparison, changes in pork and poultry supplies explain a relative small amount of the change in cattle prices. Similarly, the impact of incomes over the checkoff period was very small, approximately 2.2%. Shifts in preferences as illustrated in line (b) of Figure 6 produced 27.5% of the variation in prices, while seasonality in beef demand generated 11.2% of the total.

Health concerns accounted for 14% of the variation in prices over the designated period. Finally, while the beef checkoff was significant and beneficial in terms of returns, variations in the checkoff activities explained an estimated 4.8% of the total variation in prices for the 87:1–93:2 period.

Clearly, the checkoff in the overall scheme of factors influencing cattle prices is quite small. Among the factors included in the beef demand model, the checkoff expenditures ranked sixth in terms of their relative impact on live weight prices. Given the importance of other variables, it is unreasonable to expect the beef checkoff as a marketing tool to offset other factors than may depress cattle prices, such as increasing supplies. It is an effective program but small in terms of bringing about major adjustments in cattle prices. Equally important is the fact that the industry has been going through periods of strong cattle prices. At some point, the normal cycles point to a downturn and it would be impossible to expect the checkoff efforts to counter such strong and predominate trends.

Beef Checkoff Conclusions

What types of generalization can be set forth? While the evaluation is an ongoing process, the following general conclusions continue to hold:

- The economic impact of the beef checkoff can be modeled and the gains measured. Data and determining the impact from spending additional dollars or from allocations of existing dollars.
- An estimated rate of return showed that, on average, producers (at the live weight market level) received \$5.40 for each \$1.0 spent on promotions and information programs. These gains generated \$3.3 billion in additional industry revenues that would not have existed in the absence of the beef checkoff. These revenue gains, however, represent only a 2.2% increase over the \$164 billion in industry revenues calculated without the checkoff.
- Beef demand continued to decline throughout the last decade. However, the presence of the checkoff offset part of the decline in real prices between 3 to 4% , depending on the quarter.
- There have been some changes in the effectiveness of the programs, with a slight downturn in effectiveness starting in 1990. This small negative trend flattened out between 92:3

and 93:2. This was the same period that a new agency and theme were adopted. If the downward trend continues, then that provides a signal that new program strategies must be adopted.

- The analysis shows that the beef checkoff's consumer and industry information programs have contributed positively to the total measured gains. Approximately 28% of the total gains can be traced back to the information programs.
- The beef checkoff model includes a direct measure of consumer concerns about fats,

cholesterol, and preservatives. These concerns influenced beef demand. In the last several quarters, consumers' expressed concerns for these health variables declined and the beef industry benefited from the change.

- Finally, while the checkoff programs have proven successful, they still account for less than 5% of the total variation in cattle prices over the quarters studied. Advertising and information programs cannot be expected to offset other significant factors causing cattle prices to change over time.

Table 1. Correlation among retail, boxed beef and live weight prices.				
	Average Price 87:1 - 93:2	Correlation Among Prices		
		Live Weight	Boxed Beef	Retail Beef
Live Weight Price	74.23	1.000		
Boxed Beef Price	115.257	0.9670	1.000	
Retail Beef Price	270.227	0.8000	0.8640	1.000

Table 2. Estimated Beef Industry Revenues and Rate of Return to the Beef Checkoff Programs at the Live Weight Market Level.

Assumptions	87:1 92:2	87:1 93:2
Revenue with Checkoff (\$ million)	\$140987.38	\$167601.20
Revenue with Base Programs	\$138511.80	\$164262.44
Total Gains	\$2475.59	\$3328.77
Checkoff Expenditures	\$188.10	\$230.69
Checkoff Assessments	\$439.01	\$520.29
Average Rate of Return	\$4.64	\$5.40

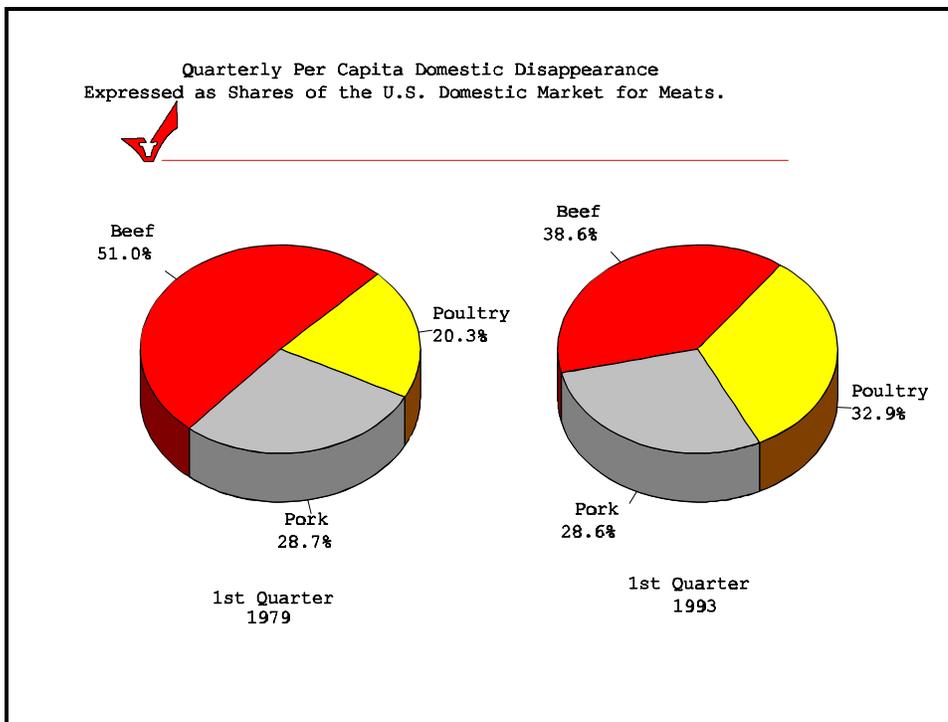


Figure 1. Beef Share of Domestic Disappearance of Meats.

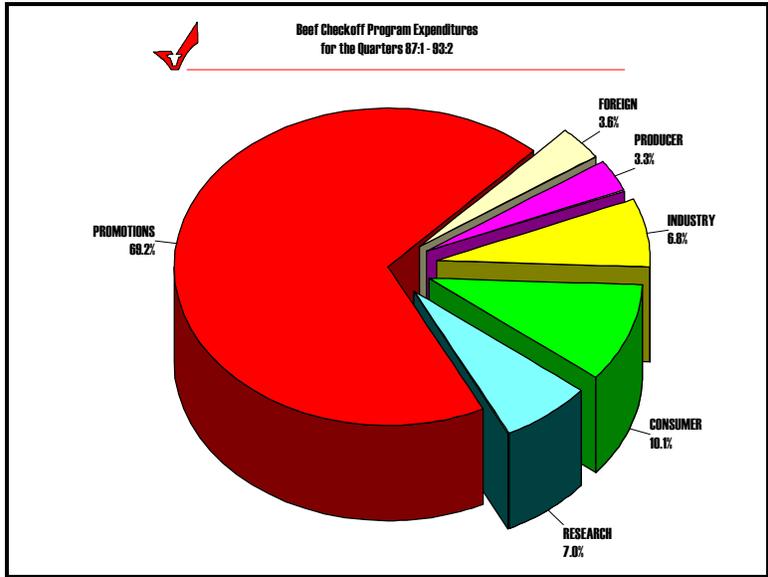


Figure 2. Allocation of Beef Checkoff Dollars across Program Areas (i.e., shares of \$268 million).

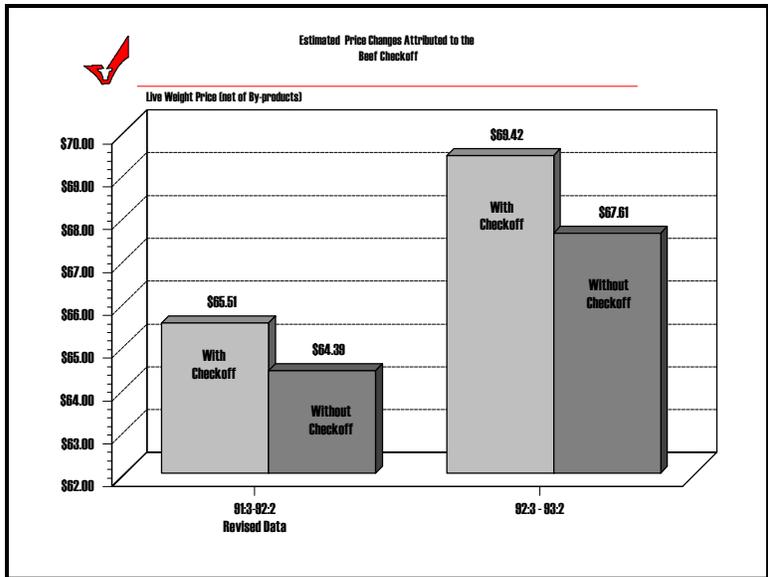


Figure 3. Live Weight Beef Price Changes Attributed to the Beef Checkoff.

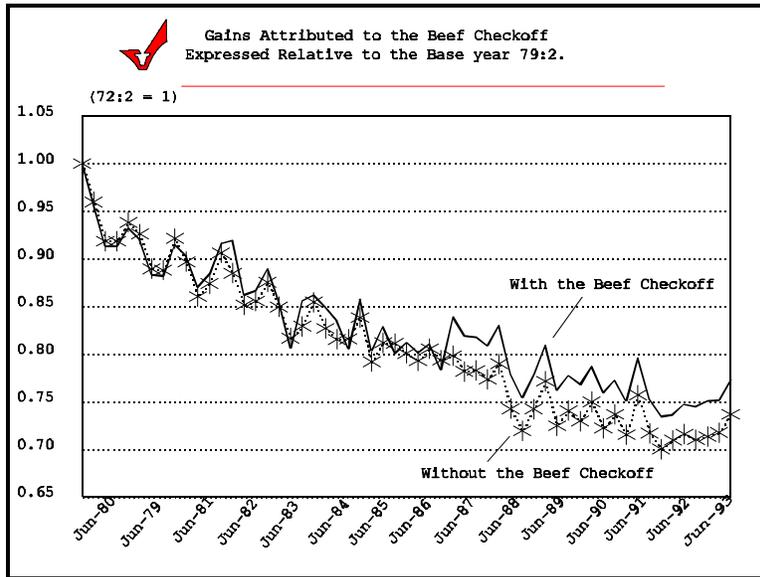


Figure 4. Index of Gains Attributed to the Beef Checkoff Over Time.

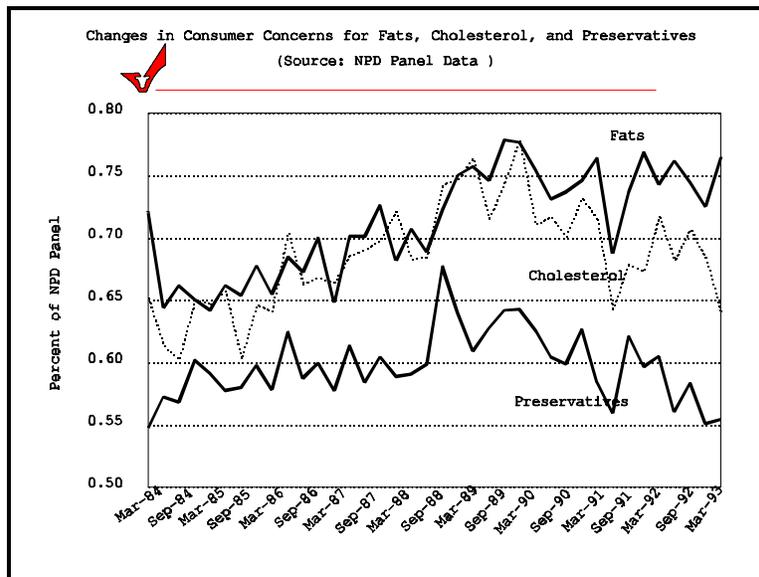


Figure 5. Shifts in Beef Demand Associated with Preference Changes and Health Related Concerns.

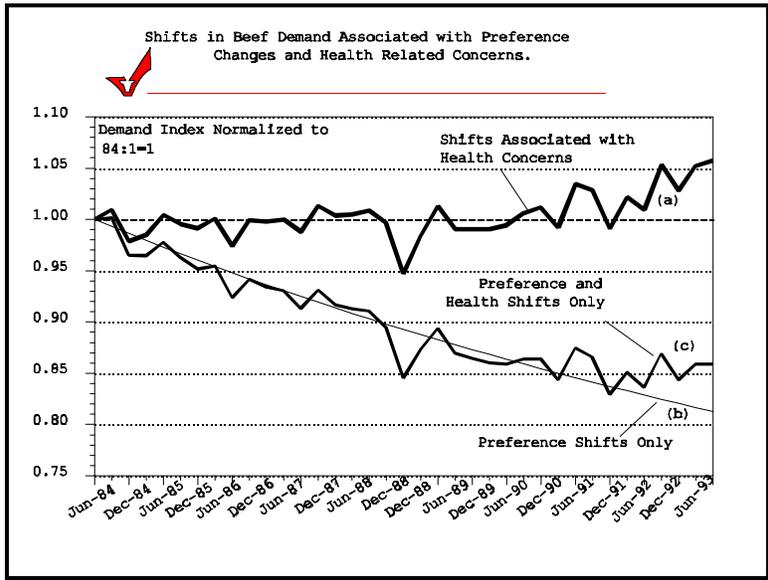


Figure 6. Expressed Concerns About Health Variables.

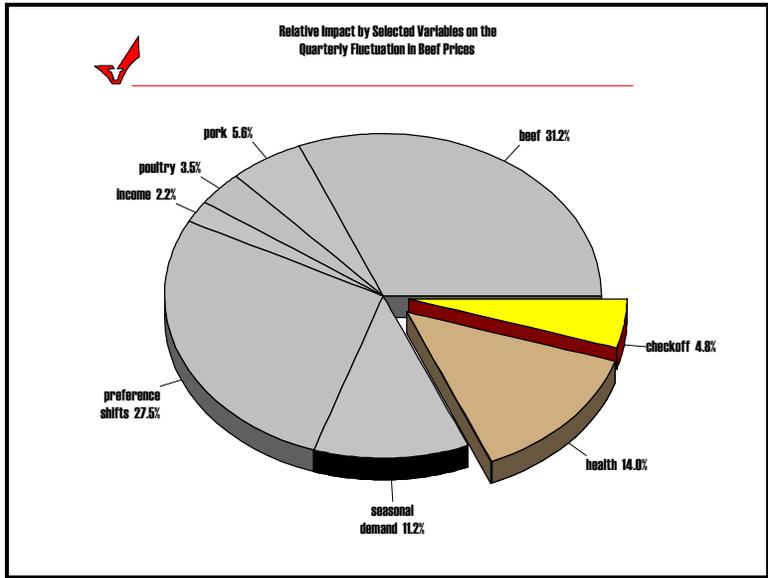


Figure 7. Relative Impact of Demand Variables on Changes in Live Weight Prices for the Quarters 87:1 - 93:2.