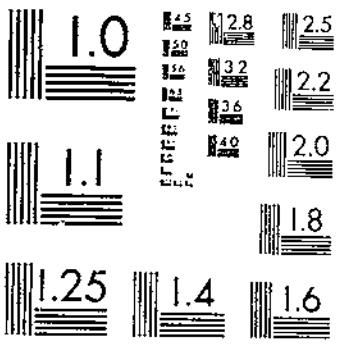
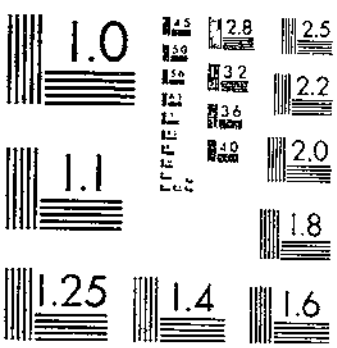
START



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963 A



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

Economic Effects of the 1976 Beef Grade Changes

Kenneth E. Nelson

Economic Research Service
U.S. Department of Agriculture

Technical Bulletin No. 1570

ECONOMIC EFFECTS OF THE 1976 BEEF GRADE CHANGES, by Kenneth E. Nelson. Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture. Technical Bulletin 1570.

ABSTRACT

Econometric analysis of price data indicates that the new beef grading standards adopted in early 1976 have accomplished one of their major objectives--the price differentials between quality-yield grade combinations have widened, but the overall demand for beef has not been affected.

KEYWORDS: Grade standards, beef, pricing.

CONTENTS

Washington, D.C. 20250 June 1977

SUMMARY

Econometric analysis of price data indicates that the new beef grading standards adopted in early 1976 have accomplished one of their major objectives. The price differentials between quality-yield grade combinations have widened, but the overall demand for beef has not been affected.

Four major points can be drawn from the analysis:

(1) According to covariance analysis of carcass price differentials for 24 carcass classes measured as deviations from a Choice Yield Grade 3 base, there has been a widening of premiums and discounts associated with yield grade. This is consistent with aims to improve pricing efficiency in beef marketing.

(2) The new standards have caused a significant redistribution of the volume of beef graded among the various grade classes. For the 8 months following adoption of the changes, redistribution of commercial production was found to be: Prime, +2.15 percentage points, Choice, +1.65 percentage points, Good, -3.49 percentage points, and other beef, -.31 percentage points.

(3) Graphic inspection of the data suggest no shift in the demand schedule for Choice carcass beef. Simple demand equations were estimated using an autoregressive scheme to test the hypothesis of no change in the overall demand for beef. No significant shift in demand concurrent with the grade change was found under the assumptions of the model.

(4) A symmetric demand matrix was estimated with restricted generalized least squares to measure predicted changes in the prices of carcass beef for four grade categories corresponding to estimated quantity redistributions. This technique yielded carcass price changes for: Prime, +$.00/cwt.; Choice, -$.23/cwt.; Good, -$.96/cwt.; and All other beef +$.13/cwt. The estimated weighted average carcass price change was -$.08 per cwt.--a negligible amount.

ECONOMIC EFFECTS OF THE 1976 BEEF GRADE CHANGES

by

Kenneth E. Nelson 1/

Revised USDA standards for USDA beef grades took effect February 23, 1976. Originally scheduled to become effective on April 14, 1975, legal proceedings delayed implementation for nearly a year. Considerable controversy has surrounded the grade change issue. This study analyzes the economic effects of the grade change in terms of actual quantity changes precipitated and the possible effects on carcass prices.

Three major features of the grade changes were considered likely to have important impacts.

First, the required degree of marbling to qualify a carcass for the Prime and Choice grades was reduced for all but the youngest cattle. This would be expected to increase the proportion of carcasses grading Choice and Prime from a given population or reduce the feeding necessary to qualify an animal for the Prime or Choice grade.

Second, the amount of marbling required to qualify a carcass for the Good grade was increased for young cattle and decreased for older cattle, in addition to a lowering of the maximum age allowed for cattle graded Good. Together, these changes should reduce the proportion of carcasses grading Good from a given population.

Third, it was specified that all beef carcasses and cuts graded by USDA must be identified for both quality and yield grade. Previously, carcasses and cuts could be identified for either quality, yield, or both.

For a more complete description of the changes see Peterson (5) 2/, or Nelson and Van Arsdall (4).

1/ Agricultural Economist, CED, ERS, at the University of Illinois.

2/ Underscored numbers in parentheses refer to references listed at the end of the report.

Price Differences for Carcass Beef

The primary reason for combining quality and yield grades was to encourage price differentials which more accurately reflect carcass values. Accurate price signals to producers enable them to allocate resources more efficiently.

This portion of the study examines the magnitude of price deviation from Choice, 600-pound, Yield Grade 3 carcasses. Analysis is done for 25 carcass classes as reported weekly in the Midwest, East Coast, Amarillo, and Los Angeles markets before and after the grade change. The prices used were those reported in AMS's Livestock Meat and Wool Market News from January 1974 through August 1976.

Prices are reported for 25 classes of steer and heifer carcass beef with two categories of sex (steer and heifer), two categories of quality (Choice and Good), three categories of yield grade (1 and 2, 3, 3 and 4), and four categories of weight ranges (500-600, 600-700, 700-800, 800-900 pounds). The Choice 600- to 700-pound Yield Grade 3 steer carcass in the Midwest market is defined to be the base class. For each weekly set of prices the base class is subtracted from each of the other classes for each market, resulting in a set of price differentials that are positive for class prices greater than the base price and negative for class prices less than the base price.

Regression analysis using 0-1 "dummy" variables to explain the price differentials was performed to identify the three kinds of variation in the price differentials. First, a market "dummy" was defined for each of the three markets other than the Midwest. Second, a class "dummy" was defined for each of the 24 non-base carcass classes. And third, a class shift "dummy" was defined for each class; it is zero before, and one after, February 23, 1976.

The regression equation includes an intercept, 3 market coefficients, 24 class coefficients, and 24 shift coefficients. Although there are 52 coefficients in the equation, no more than 3 are relevant to a given price difference observation.

Carcass Class Price Differentials

Table 1 presents the results of the regression analysis. The estimated price difference for each class before the grade change and the estimated shift in each price difference after the grade change are displayed for each carcass class. The average price difference between the other three markets and the Midwest market are given at the botton of the table. The calculated price differentials before and after the grade change are also shown.

The class coefficient for a Choice, Yield Grade 1 and 2, 500-600 pound steer (variable no. 1) is 1.12, indicating that within the data period prior to the grade change, the average price per 100 pounds for this category was $1.72 (.60 + 1.12) greater than the price of the base (a Choice, Yield Grade 3, 600-700 pound steer). The shift coefficient is 1.77, indicating that, following the grade change, this average price differential increased by $1.77 per 100 pounds for a total difference of $3.49 (1.72 +1.77). The remaining class and shift coefficients are interpreted in the same way.

Table 1--Results of regression analysis on carcass weekly price differentials for 25 carcass classes in four markets, January 1974-August 1976

Variable identification number	Dependent variable is class price minus Choice-3, 600 pound steer price							
	Sex	Carcass class categories			Coefficient values		Estimated price differentials	
		Grade		Weight	Class 1/	Class shift 2/	Before grade change	After grade change
		Quality	Yield					
				Cwt.	----------$/Cwt.----------			
Intercept					0.60			
1	Steer	Choice	1&2	5	1.12**	1.77**	1.72	3.49
2	Steer	Choice	1&2	6	1.16**	.49	1.76	2.25
3	Steer	Choice	1&2	7	-1.16**	1.98**	-.56	1.42
4	Steer	Good	1&2	5	-6.02**	6.56**	-5.42	1.14
5	Steer	Good	1&2	6	-6.18**	6.61**	-5.58	1.03
6	Steer	Choice	3	6	Base	Base	Base	Base
7	Steer	Choice	3	7	-.56**	.16	.04	.20
8	Steer	Choice	3	8	-.69**	.37	-.09	.28
9	Steer	Good	3	5	-5.10**	3.91**	-4.50	-.59
10	Steer	Good	3	6	-4.99**	2.93**	-4.39	-1.46
11	Steer	Good	3	7	-5.42**	2.90**	-4.82	-1.92
12	Steer	Choice	3&4	6	-.83**	-.58	-.23	-.81
13	Steer	Choice	3&4	7	-1.35**	.01	-.75	-.74
14	Steer	Choice	3&4	8	-1.81**	.28	-1.21	-.93
15	Steer	Good	3&4	5	-5.05**	NE	-4.45	NE
16	Steer	Good	3&4	6	-5.23**	1.79**	-4.63	-2.84
17	Steer	Good	3&4	7	-5.23**	1.79**	-4.63	-2.84
18	Heifer	Choice	3	5	-1.92**	.29	-1.32	-1.03
19	Heifer	Choice	3	6	-2.01**	.39	-1.41	-1.02
20	Heifer	Good	3	5	-7.09**	2.96**	-6.49	-3.53
21	Heifer	Good	3	6	-7.08**	2.94**	-6.48	-3.54
22	Heifer	Choice	3&4	5	-1.97**	-.47	-1.37	-1.84
23	Heifer	Choice	3&4	6	-1.86**	-.86**	-1.28	-1.86
24	Heifer	Good	3&4	5	-6.38**	1.58**	-5.78	-4.20
25	Heifer	Good	3&4	6	-6.83**	2.38**	-6.23	-3.85
	Coefficients for average price differentials from midwest							
26	East Coast				2.32**			
27	Amarillo				-0.28**			
28	Los Angeles				1.96**			

Coefficient of determination (r^2) = .76
Square root of error mean square ($\sqrt{ems}$) = 4.41

1/The class coefficient for each category is interpreted as the average price/cwt. difference from the base (variable No.6) for that class prior to the grade change. 2/ The shift coefficient is interpreted as the average change in the price/cwt. difference for the class for the period following the grade change.

*0.1 level of significance.
** .05 level of significance.

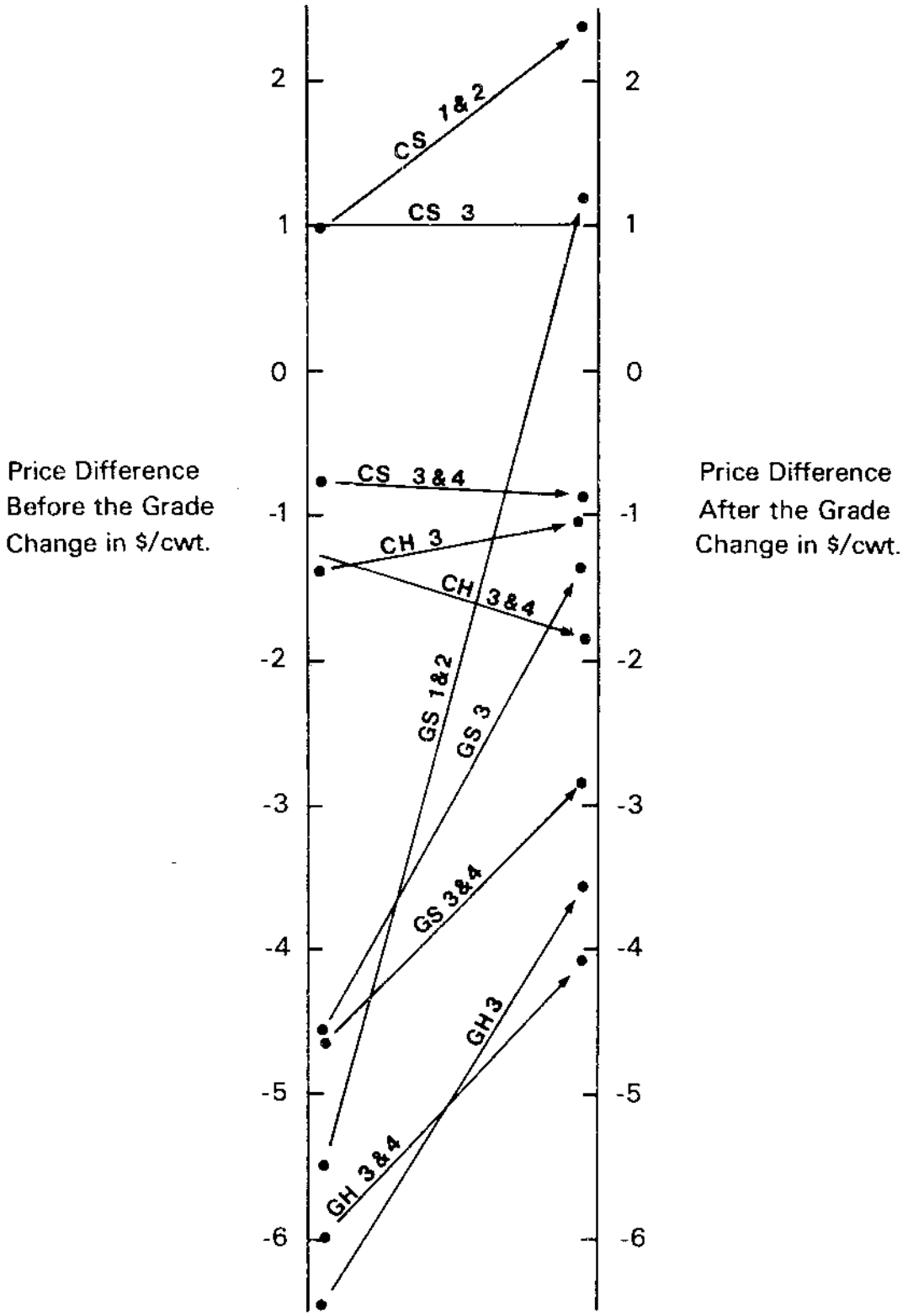


Figure 1. Estimated price difference before and after the Grade Change by Sex, Quality Grade, and Yield Grade. (Average over weight ranges.)

The market "dummy" coefficients simply give the overall average price differential from the Midwest market for the East Coast, Amarillo, and Los Angeles markets. For example, the average carcass in the East Coast market was priced $2.32 per 100 pounds above the Midwest, reflecting transportation costs from the Midwest.

Much research has indicated that yield grades are not properly considered in the pricing process and that lean carcasses (low yield grade) of a given weight tend to be underpriced and fat carcasses (high yield grade) overpriced. In addition, heavy carcasses of a given quality may be underpriced on the assumption that heavy carcasses will be fatter.

Prior reasoning suggests that the price differentials for yield grade within quality grade may widen. The analysis shows that the differentials for yield grade within quality grade widened following the grade change. The analysis shows that the differential for Choice 600 pound, 1 and 2, steers increased from $1.76 per 100 pounds before the change to $2.25 after the change. The negative differential for 3-4's widened only slightly. The price differences for 600 pound Choice, 3-4, heifers diverged. Prior to the change the estimated differential from the base was -$1.28 and after -$1.86, widening the discount for Yield Grade 3 and 4 heifer carcasses.

It is somewhat more difficult to interpret shifts in price differences for Good grade carcasses because of the general narrowing that has occurred between the Good and Choice grades in general. The differences from the base Choice 600-pound, 3, steer for a 600-pound Good, 3, steer before and after the change are -$4.39 and $1.46 respectively. Other price differences by yield grade must be interpreted within this perspective. The estimated price difference for a 600-pound Good, 1-2, shifted from -$5.58 to +$1.03, actually gaining a premium over the Choice base. The Good 600-pound 3 & 4, however, changed from -$4.63 to -$2.84. Before the change, the Good 3 and 4 was only 24 cents below the Good 3 and after the change was $1.38 below the Good, expressing a more pronounced discount for a fatter carcass.

In heifers, Good 3's and 4's were priced above 3's before the change, but assumed the expected position at a price lower than 3's after the change. Figure 1 is a graphical illustration of the changes in price differentials for each sex, quality grade, and yield grade category averaged over weight ranges. The left column of data points are price differentials before the grade change and the right column are those after the change, with an arrow connecting points of a given classification.

Thus, the evidence is strong that some realignment of price signals occurred by yield grade, and the realignments were consistent with expectations of the grade change.

Relative Quantity Adjustments by Grade

An important objective of this analysis is to estimate the magnitude of the shifts of quantities of beef from one grade to another. One source of such information is a carcass consist study in which 18,257 fed steer and

heifer carcasses, sampled between November 1973 and October 1974, were classified by USDA grades according to both old and new standards (Abraham, 1). The percentages of carcasses in each grade for old and new standards are shown in table 2.

Table 2.--Percentages of all carcasses surveyed in each quality grade under old and new standards

Grade Standard	Prime	Choice	Good	Standard	Utility
		Percent			
Old	4.5	54.1	39.9	1.4	.05
New	6.6	68.0	21.3	3.9	.2
		Percentage points			
Difference	+2.1	+13.9	-18.6	+2.5	.15

Source: (Abraham, 1976).

These figures, applying only to fed beef for the sample period, are difficult to apply to a period with a different composition of slaughter. Therefore, an effort was made to characterize the period of the grade change and to identify any part of the observed consist changes attributable to the grade changes.

Subjective Measures

Data were supplied by AMS for tonnage and percentages of beef graded by 4-week periods from January 1965 to October 1976. (For some periods data were not available and were estimated). These data were converted to a monthly basis by means of weighted averages and then plotted in several forms to visualize the period after the grade change in relation to past data. Average weights for steers and heifers are higher after the grade change than in previous months and the percentage of nonfed slaughter is lower. Both of these factors should increase the proportion of Choice grade beef.

When the proportion of beef graded Prime is observed over time, it is clear that following the grade change a large relative increase occurred in the proportion of beef graded Prime. Although there also was an increase in the percentage of commercial slaughter grading Choice at the time of the grade change, that shift was not out of the range of historical values for either series, leaving open the possibility that some of the increase in beef grading Choice after February 23, 1976, resulted from an increase in average weight and an increase in fed cattle slaughter, and that some beef moved from Choice to Prime as well as from Good to Choice.

It is evident from examination of the percentage grading Good that no combination of weights and nonfed slaughter prior to March 1976 produced percentages as low as those seen after that date. The grade change apparently caused a sharp drop in the proportion of carcasses grading Good.

Objective Measures

The next step in the analysis was to estimate the changes in grade consist due solely to the grade change, separate from the effects of higher slaughter weights and a decreased proportion of nonfed slaughter. Regression analysis was again the method chosen to make these estimates.

For the variables considered most important in the determination of grade consist, monthly data for the 145 months ending October 1976 were used. A four-equation model contained four dependent variables--the percentage of graded beef graded Prime, Choice, Good, and low grade. Low grade included all categories below Good. The independent variables were: (1) the average weight of steer and heifer carcasses (WTSTHF); (2) the percentage of nonfed steer and heifer slaughter (NONFED); (3) the percentage of slaughter composed of steers and heifers (SHSLP); the percentage of cow slaughter (COWS); and (5) a "dummy" (DUMMY) variable to represent the period following the grade change. The four equations were estimated jointly using generalized least squares with the "dummy" variable coefficients restricted to add to one. The results are displayed in table 4. The net changes in the percentages of beef graded in each category are:

Prime	+3.89 percentage points
Choice	+2.41 percentage points
Good	-6.28 percentage points
Low-grade	-.03 percentage points

A similar analysis was performed with the dependent variable defined to represent the share of each grade category in commercial beef production for each month. The fourth dependent variable in this model is other beef, all commercial production grading below Good. These regression results are given in table 5. The changes in category relative to commercial production are:

Prime	+2.15 percentage points
Choice	+1.65 percentage points
Good	-3.49 percentage points
Other	- .31 percentage points

The net changes estimated by regression analysis are smaller (in absolute terms) for the Good and Choice Grades and those indicated by the survey data in table 2. The survey data are for number of head of all steers and heifers sampled regardless of whether they were actually selected to be graded by the packing plant during a period of low nonfed steer and heifer slaughter.

The regression data are for carcasses officially graded at the discretion of packers. Many carcasses, especially those expected to grade other than Choice or Prime, are not selected for grading by the packer. If all steer and

Table 3 A Summary of the Variables and the Mnemonics Representing Them

PPRIMCPI = The monthly average price of Prime 700-pound steer carcasses in the eastern market divided by the Consumer Price Index.
PCHOICPI = The monthly average price of Choice 600-pound steer carcasses in the eastern market divided by the Consumer Price Index.
PGOODCPI = The monthly average price of Good 500-pound carcasses in the eastern market divided by the Consumer Price Index.
PUTILCIP = The monthly average price of Utility breaker carcasses in the eastern market divided by the Consumer Price Index.
PCPRIME = Per capita consumption (production) of Prime beef in the month.
PCCHOIC = Per capita consumption (production) of Choice beef in the month.
PCGOOD = Per capita consumption (production) of Good beef in the month.
PC = U.S. per capita consumption of beef in the month.
PC-CH = U.S. per capita consumption of beef - PCCHOIC in the month.
PCPRCHGD = PCPRIME + PCCHOIC + PCGOOD
PCLOWGR = PC - PCPRCHGD.
PCOTHER = U.S. per capita commercial beef production - PCPRCHGD.
PCPOUL = Per capita production of poultry in the month.
PCPORK = Per capita consumption of pork in the month.
INCOMCPI = Per capita monthly personal income divided by the Consumer Price Index.
PCLAG = Price of Choice beef lagged 1 month.
PHOGCPI = Price of hogs divided by Consumer Price Index.
PPOULCPI = Index of poultry prices divided by the Consumer Price Index.

Table 4--Regression analysis of four grade categories--percent of beef graded as a function of variables measuring slaughter composition 1/

Independent variables	Dependent variables percent of beef graded falling into--			
	Prime	Choice	Good	Low grades
Intercept	-12.17	43.4	37.51	-1.31
Average weight of steers and heifers, WTSTHF	.031**	.040**	-.062**	
Percent of nonfed steer and heifer slaughter, NONFED	.032**	-.139	.073**	.008
Percent of steer and heifer slaughter, SHSLP	-.146**	.150**	.217**	
Percent of commodity product graded, BFGRD	.155	-.093**	-.043**	
Percent of cow slaughter, COW				.111**
Grade change dummy, DUMMY	3.89**	2.41**	-6.28**	-.031
Approximate r^2	.76	.64	.76	.41
Approximate ems	.474	2.12	1.28	.35

**0.05 level of significance.

1/ Coefficients were jointly estimated with restricted generalized least squares, with the sum of the dummy variables = 1.

Table 5--Regression analysis of four grade categories--percent of beef graded as a function of variables measuring slaughter composition 1/

Independent variables	Dependent variables percent of beef graded falling into--			
	Prime	Choice	Good	Other beef
Intercept	-9.03	-15.65	14.20	14.44**
Average weight of steers and heifers, WTSTHF	.019**	.019**	.036**	
Percent of nonfed steer and heifer slaughter, NONFED	.017**	-.095**	.042**	-.028
Percent of steer and heifer slaughter, SHSLP	.075**	.140**	.133**	
Percent of commodity product graded, BFGRD	.136**	.676**	.097**	
Percent of cow slaughter, COW				.135**
Grade change dummy, DUMMY	2.15**	1.65**	-3.49**	-.31
Approximate r^2	.81	.97	.87	.57
Approximate ems	.16	.74	.42	.20

**0.05 level of significance.

1/ Coefficients were jointly estimated with restricted generalized least squares, with the sum of the dummy variables = 1.

heifer carcasses had been quality graded, the sample would have had a larger proportion of Good grade carcasses than if only those selected by packers are graded. Thus the survey data contain more carcasses grading Good. When combined with high average weights, the number likely to move from Good to Choice under the new standards increases.

A possible effect of changes in grading decisions by packers was examined by omitting the variable BFGRD (percentage of commercial production graded) from the regression. These re-estimations produced only a small and unimportant change in the values of the "dummy" variables.

These two regression analyses indicate that significantly more carcasses graded Prime and Choice after the grade change, and fewer graded Good. This is consistent with expectations about the effects of changing the grade standards, separate from the effects associated with heavier slaughter weights and a decreased proportion of nonfed slaughter.

Demand Factors Related to the Grade Change

There are two important demand-related questions involving the grade changes. First, was there a shift in the demand schedule for beef that reflected a change in the consumer acceptability for Choice beef under the new standards? Taste panel data suggest there should not have been. (Campion and Harrison, 2, p. 42). Second, what changes in the price relationships among the grades should be the result of the redistribution of beef among grades described earlier?

It would be desirable to pursue these questions with a complex dynamic simultaneous commodity model such as those described by Labys (3). But with the use of such complex methods, given the added complications of demand estimation for graded commodities, the method would not guarantee conclusive results.

An alternative, simpler approach was taken. First, available demand data were assembled, plotted, and examined. Second, single equation, derived demand equations for Choice carcasses were specified and examined to test for demand shift. And third, a symmetric demand matrix was estimated in order to predict the simultaneous price changes for graded carcasses associated with an instantaneous redistribution of carcasses among grades.

Simple Demand Equations

Single equation demand models were estimated to test the hypothesis generated in the graphic analysis. Assumptions implicit in this approach are: (1) Quantities of graded carcass beef at the market in a given month are the result of production decisions made according to prices in previous months, thus allowing the model to be recursive in demand. (2) Demand for carcass beef is a derived demand and the variables appearing in the carcass demand equations are those appearing in a retail demand equation. (3) The carcass market is a price-clearing market and prices adjust to clear the quantity of beef available. (4) Month-to-month variations in stocks of beef are small

enough to not materially affect market quantities. (5) A lagged dependent variable follows the "partial adjustment" assumption (see Labys, 3, p. 140). Both the nature of the questions to be answered and the assumed nature of the market suggest that models should be specified in terms of price as functions of quantities and consumer income.

Several regression models were specified with the real price of Choice beef as the dependent variable, and selected demand-related independent variables. Since a "dummy" variable was defined to equal zero before the grade change and one after, a significant coefficient on this variable would indicate a shift in demand after the grade change of the dates.

Models, which regressed the real price of Choice upon only the quantity of Choice consumed and the "dummy" variable, yielded a significant negative coefficient on the "dummy". However, when other important economic and statistical requirements are met, the grade change "dummy" coefficient is not significant.

Two such regression model specifications are presented in table 6. The real carcass price of Choice beef is the dependent variable in both Model I and Model II. The exogenous variables in Model I and II include the monthly per capita consumptions of Choice beef, beef other than Choice, pork, and poultry, monthly real per capita income (annual rate), a lagged dependent variable, and the grade change shift "dummy". Model I also includes 11 monthly "dummy" variables which Model II does not.

Both specifications suffered from autocorrelation of the residuals. Durbin's transformation coefficient equalled the estimated autocorrelation coefficient. The Durbin-Watson statistic indicates that autocorrelation was successfully removed, although it is not conclusive when a lagged dependent variable is in the equation.

The coefficients on the beef quantity variables are reasonable and significant in both models. The coefficients on pork and poultry quantities are positive and significant when monthly "dummies" are included, but poultry becomes negative and both are not signficant in Model II. Findings of positive signs on pork consumption are not unusual in beef demand studies. The income and lagged dependent variable coefficients are also reasonable and significant in both models. The variable of greatest interest is the "dummy" for grade change. It is not significantly different from zero in either model. In other words, no significant shift was found in the demand schedule for Choice carcass beef.

Earlier we concluded that the quantities of beef in each grade category were redistributed as a result of the grade change, and here that the basic demand schedule for Choice beef did not shift. Economic logic then implies that prices must change if quantities change for given demand schedules. The type of models specified in table 4 are not adequate for analyzing the effects on prices of several grades, given an instantaneous and simultaneous redistribution of those graded quantities.

Table 6--Two regression models with the price of Choice carcasses as function of demand variables 1/

Independent variables	Dependent variable = PCHOICPI	
	Model I	Model II
Intercept	20.37	9.47
PCCHOIC	-3.67**	-1.38**
PC-CH	-2.00**	-.62**
PCPORK	1.15**	.62
PCPOUL	1.90**	-.27
INCOMCPI	.99**	.94**
PCLAG	.61**	.74**
DUMMY	-1.63	-1.36
FEBRUARY	-2.29**	
MARCH	-1.86**	
APRIL	-2.17**	
MAY	-.99	
JUNE	-1.61*	
JULY	-2.01*	
AUGUST	-3.09**	
SEPTEMBER	-3.28**	
OCTOBER	-4.50**	
NOVEMBER	-5.20**	
DECEMBER	-3.71**	
Coefficient of determination (r^2) =	.80	.73
Error mean square (ems) =	3.03	3.69
Durbin-Watson 2/ (DW) =	1.61	1.61
Transformation coefficient (r) =	.2	.19
Autocorrelation coefficient (P) =	.2	.19

*0.1 level of significance
**0.05 level of significance

1/ Both models were estimated with Durbin's transformation for autocorrelation and iterated until P=r.

2/ The Durbin-Watson statistic lacks power because a lagged dependent variable is included in the model.

For this purpose a symmetric demand matrix was estimated, as suggested by Waugh (7, p. 45). This technique restricts the cross price coefficients to be symmetric as is consistent with economic theory (see Waugh, p. 84). In this model each of the prices of the four beef classifications, pork, and poultry are regressed on their per capita quantities and per capita income in six separate equations. The six equations were estimated jointly using restricted generalized least squares.

Coefficients estimated in this way are subject to strong limitations: (1) The assumed monthly recursive nature of demand may be false for some or all the commodities. (2) Only 104 of the 142 months had no missing data and could be included in the analysis. (3) The missing data also precluded assessment of, or correction for, autocorrelation. The use of lagged dependent variables was impossible for the same reason. The large number of highly significant and reasonable coefficients allows some confidence in the results.

The estimated symmetric coefficients are presented in table 7. Estimates of the price changes for each of the four beef classes owing to the grade change may be obtained by inserting quantity changes for each of the beef classes into the beef equations. In round numbers, the monthly per capita commercial production of beef was approximately 10 pounds per person per month during the 8 months of data following the grade change. Applying the redistribution coefficients for quantity changes from table 3, here are the average monthly quantity increases or decreases in pounds per person per month: +.215 pound for Prime; +.165 pound for Choice; -.349 pound for Good; and other beef, -.031 pound. The predicted price changes resulting from the quantity redistribution are:

Prime	= +$.00/cwt.;
Choice	= - .23/cwt.;
Good	= - .96/cwt.;
All other beef	= + .13/cwt.

The decrease in price of Choice with an increase in its quantity is not surprising. The decrease in the price of Good, even though the quantity change in Good is negative, is explained by examination of the coefficients for the quantities of Prime and Choice (-3.53 and -3.02) (whose quantity changes are positive) in the Good price equation. These cross-flexibility coefficients are much more negative than the coefficient for the quantity of Good itself (-.60).

If each beef class is weighted by volume of production, the average change in carcass price is $.08/cwt.--a negligible amount. Each of these price figures can be considered only suggestive within the stated limitations of the analysis and not as highly refined estimates. However, <u>all evidence points to no shift in the demand for beef as a result of the grade change</u>.

Table 7--Symmetric demand matrix for four classes of beef, pork, and poultry variables are defined in table 3. 1/

Item	Intercept	PCPPRIME	PCCHOIC	PCGOOD	PCLOWGR	PKPCC	PCPOUL	PCPERINC
PPRIMCPI	47.50	-3.25**	-3.73**	-3.53**	-2.57**	0.76**	-.50	3.50**
PCHOICPI	44.36	-3.73**	-3.44**	-3.02**	-2.63**	.69**	-.53	3.83**
PGOODCPI	39.41	-3.53**	-3.02**	-.60	-2.68**	.10	-.15	3.97**
PUTLICPI	15.88	-2.57**	-2.63**	-2.68**	-5.87**	1.07**	.20	7.24**
HGPRICPI	15.66	.76**	.69**	.10	1.07**	-4.88**	-.86**	3.89**
POUPRCPI	35.52	-.49	-.53	-.15	.20	-.86**	-3.20	10.86**

**0.05 Level of significance

1/ The six equations were estimated jointly using generalized least squares. Only 104 of the 142 months in the data period contained data for all 13 variables. The missing price quotes are often from periods of high or low prices.

REFERENCES

1. Abraham, Herbert. "Grade Consist of Fed Beef (Before and After Revisions)". Livestock and Meat Situation. USDA, ERS, LMS-211, October 1976, pp. 34-35.

2. Campion, Dennis R. and Virden L. Harrison, "The New Beef Carcass Quality Grade Standards: What the Changes Mean," Livestock and Meat Situation, USDA, ERS, LMS-208, April 1976, pp. 41-47.

3. Labys, Walter C., Dynamic Commodity Models: Specification, Estimation, and Simulation. Lexington Books, Lexington, Maine, 1973.

4. Nelson, Kenneth E. and R.N. Van Arsdall, "A Comparison of Present and Proposed Beef Grades." Supplement to Livestock and Meat Situation, USDA, ERS, Dec. 1974.

5. Peterson, E. L., "Grades of Carcass Beef: Slaughter Cattle," USDA, AMS. Federal Register, Vol. 40, March 12, 1975, pp. 1,535-47.

6. Tomek, William G. and Kenneth L. Robinson, Agricultural Product Prices. Cornell University Press, Ithaca, New York, 1972.

7. Waugh, Frederick V., Demand and Price Analysis--Some Examples from Agriculture. USDA, ERS, Tech. Bull. 1316, Nov. 1964.

8. Waite, Warren C., and Harry C. Trelogan. Agricultural Market Prices. 2nd Ed. John Wiley & Sons, New York, 1951. (Chapter 12).

END