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Measuring the finishing performance of steers and heifers

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Abstract
This study examined improvements in the finishing performance of steers and heifers from 1990 to 1998 by measuring the rate of technological change. The rates of technological change were 0.58% per year for finishing steers and 1.01% per year for finishing heifers. The relatively higher rate for heifers indicates that technological change over the study period favored the performance of heifers.

Keywords
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MEASURING THE FINISHING PERFORMANCE OF STEERS AND HEIFERS

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Summary

This study examined improvements in the finishing performance of steers and heifers from 1990 to 1998 by measuring the rate of technological change. The rates of technological change were 0.58% per year for finishing steers and 1.01% per year for finishing heifers. The relatively higher rate for heifers indicates that technological change over the study period favored the performance of heifers.

(Key Words: Steer Finishing, Heifer Finishing, Technological Change.)

Introduction

The increase in production per unit of input for the cattle feeding industry has not kept up with that exhibited by the swine- and poultry-feeding industries over the last 15 to 30 years. This lack of growth in production per unit of input has impacted the relative prices among cattle, swine, and poultry and has contributed to changes in market shares. Given recent developments in the swine- and poultry-feeding industries, it is imperative that the cattle feeding industry continue to improve performance in the conversion of inputs to beef.

Several measures can be used to examine changes in the performance of finishing steers and heifers. For example, improvements in performance could be measured using growth rates in average daily gain; feed conversion; or the rate of technological change, which is commonly used to compare performance across industries. The rate of technological change represents the difference between output growth and input growth. A positive rate of technological change indicates that over time, the same level of output can be achieved with less input, or the same amount of input can produce more output. The rate of technological change can be used to measure the importance of changes in genetics, feeding systems, and management.

In order to gage the relative magnitude of future performance improvements, it is important to study past performance. Research that has examined improvements in cattle feeding performance over time is sparse. This study examines the improvements in the finishing performance of steers and heifers in Kansas from January 1990 to December 1998.

Experimental Procedures

The data in this study were obtained from monthly issues of *Focus on Feedlots*[2], a KSU newsletter that reports costs, performance data, and closeout data in the Kansas feedlot industry. Table 1 presents the summary statistics for feedlot gain, feed consumption, corn price, total feeding costs, average daily gain (ADG), and dry matter feed conversion efficiency (FCE) for steers and heifers during the study period. Total gain per head averaged 465 lb for steers and

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[2]The authors acknowledge the generosity of the feedyard managers who provided data for the Focus on Feedlots newsletter.

409 lb for heifers. On average, steers had an ADG of 3.20 lb and an FCE of 6.45, whereas heifers had an ADG of 2.85 lb and an FCE of 6.66.

The rate of technological change was determined using regression analysis. Regression models were specified for steers, heifers, and the difference between steers and heifers. Gain per head represented the output from finishing and was used as the dependent variable for steers and heifers.

Independent variables for the steer and heifer regressions included feed consumed, a time trend, monthly dummy variables, and a dummy variable for closeouts from February 1993 to May 1993. The gain per head and feed variables were expressed in natural logarithms to facilitate computations of the rate of technological change and to allow for a nonlinear trend. The time trend was used to measure the monthly rate of technological change over the study period. To approximate the annual rate of technological change, the coefficient on the time trend variable was multiplied by 12. Monthly dummy variables were used to capture seasonality in performance. For example, if steers or heifers were finished in February, the February variable would have a value of one and the March through December variables would have a value of zero. Because January was used as the base month for comparisons, there was no variable for January. The performance for February through December thus was compared directly to January performance. A dummy variable for the February 1993 through May 1993 period was used to account for the unusually poor performance during these four closeout months resulting from a series of major snow storms. This dummy variable had a value of one if the closeout month for steers or heifers occurred during the February 1993 through May 1993 period and a value of zero otherwise.

Results and Discussion

Table 2 reports the regression values for steers, heifers, and the difference between steers and heifers. As expected, seasonality was quite pronounced, and the dummy vari-able for the early 1993 period was significant. Steer and heifer performance from the May to December closeouts was higher than performance from January. As evidenced by the significant coefficient on the early 1993 variable (2/93 to 5/93), that period had a large negative impact on performance. The regression results in the third column can be used to evaluate differences in seasonality between steers and heifers. Compared to heifer performance, steer performance tended to be higher for June, July, and August closeouts and lower in February.

The time trend was significant in each of the regressions. The regression that examines the difference between steers and heifers indicated that the rate of technological change was relatively higher for heifers than for steers during the study period. The annual rate of technological change can be found by multiplying the coefficient on the time trend variable by 12. The rates of technological change over the study period were 0.58% per year for finishing steers and 1.01% per year for finishing heifers. The cumulative rates over the entire study period were 5.3% for finishing steers and 9.4% for finishing heifers.

Even though technological change was significant over the study period, it was considerably lower than that experienced in U.S. agriculture as a whole. Relatively slow technological change in cattle finishing may have contributed to the deterioration in the competitive position of the beef industry during the 1990's. Research that directly compares technological change in the cattle, swine, and poultry industries is needed to address the relative competitiveness issue.

Table 1. Summary Statistics for Finishing Steers and Heifers

Variable	Unit	Mean	Standard Deviation
Steers			
Gain	lb/head	465.21	33.56
Feed	lb/head	2988.10	156.83
Corn price	$/bu	3.12	0.48
Total feeding costs	$/head	281.13	27.86
Average daily gain	lb/day	3.20	0.26
Feed conversion efficiency	lb feed/lb gain	6.45	0.45
Heifers			
Gain	lb/head	409.27	26.34
Feed	lb/head	2718.90	152.90
Corn price	$/bu	3.12	0.48
Total feeding costs	$/head	258.12	24.32
Average daily gain	lb/day	2.85	0.23
Feed conversion efficiency	lb feed/lb gain	6.66	0.46

Source: *Focus on Feedlots* newsletter, monthly issues from January 1990 to December 1998.
Note: Financial variables were converted to real 1998 dollars.

Table 2. Regression Analysis Examining Technological Changes for Finishing Steers and Heifers

Variable	Steers	Heifers	Difference
Intercept	-1.056785**	0.996367*	0.047894***
	(0.438195)	(0.517672)	(0.008337)
Feed consumed	0.880748***	0.583371***	0.895083***
	(0.060851)	(0.073189)	(0.043468)
Time	0.000485***	0.000843***	-0.000173***
	(0.000092)	(0.000106)	(0.000062)
February	-0.015129	0.003973	-0.016145**
	(0.013954)	(0.014840)	(0.008075)
March	-0.022245	0.001067	-0.011904
	(0.014061)	(0.015083)	(0.008075)
April	0.017246	0.027178*	0.007173
	(0.014221)	(0.015403)	(0.008083)
May	0.053396***	0.054597***	0.013034
	(0.014158)	(0.015233)	(0.008078)
June	0.066118***	0.051511***	0.025973***
	(0.013924)	(0.014970)	(0.008022)
July	0.071026***	0.056280***	0.022202***
	(0.014017)	(0.014836)	(0.008033)
August	0.067868***	0.045375$^{** *}$	0.026803***
	(0.014065)	(0.014766)	(0.008100)
September	0.066755***	0.049666***	0.010346
	(0.013832)	(0.014808)	(0.008100)
October	0.063233***	0.055151***	-0.000996
	(0.013836)	(0.014882)	(0.008150)
November	0.043317***	0.038133**	-0.006662
	(0.013944)	(0.015015)	(0.008039)
December	0.026427*	0.032444**	-0.012527
	(0.013856)	(0.014826)	(0.008046)
2/93 to 5/93	-0.203049***	-0.174439***	-0.010479
	(0.015665)	(0.017154)	(0.009152)
Adjusted R^2	0.8471	0.7777	0.8839

Notes: Numbers in parentheses are standard errors. Single, double, and triple asterisks (*) denote significance at the 10%, 5%, and 1% levels, respectively.