Perceived Versus Actual Competitive Advantage

Michael Langemeier  
Purdue University, West Lafayette, Indiana, USA

Elizabeth Yeager  
Kansas State University, Manhattan, Kansas, USA

This paper examined the relationship between farm characteristics and perceived sources of competitive advantage, and cost-based and revenue-based efficiency indices. Gross farm income and the percentage of labor devoted to crop production were significant and positively correlated with cost and revenue efficiency, while the perception of the cowherd being the most important part of the operation was negatively correlated with efficiency. In general, perceived sources of competitive advantage were not significantly correlated with cost or revenue efficiency.

Keywords: cost efficiency, revenue efficiency, competitive advantage

Introduction

The notion of competitive advantage has been extensively discussed in the business and farm management literature (Hunt, 2000; Besanko, Dranove, Shanley, & Schaefer, 2010; Boehlje, 2013; Langemeier, 2019). To obtain a competitive advantage, a farm must receive relatively higher per unit prices and have average per unit costs; receive average per unit prices and have relatively lower per unit costs; or both. Competitive advantage can be related to cost minimization and/or product differentiation. Specifically, producers can outperform other operations by creating comparable value at lower cost (i.e., cost minimization), delivering greater value to customers (i.e., product differentiation), or both. Though the importance of obtaining and sustaining a competitive advantage is widely acknowledged, little research exists that compares a producer’s perceived competitive advantage to measures of actual competitive advantage, such as efficiency indices. For instance, does a producer’s perception that he or she is a low-cost producer match cost efficiency benchmark results? Similarly, if a producer perceives themselves to be a good marketer, does this perception match results examining revenue efficiency benchmarks?

The objective of this paper was to examine the relationship between farm characteristics and perceived sources of competitive advantage, and cost-based and revenue-based efficiency indices for a sample of farms. Results have implications for farm benchmarking and strategic management.
Materials and Methods

Farm-Level Data

Pope (2009) sent a survey to all Kansas Farm Management Association (KFMA) farms with a whole-farm analysis and a cowherd in 2008. The survey asked Kansas beef cow producers to indicate their perceived sources of competitive advantage. Specifically, the participants were asked to indicate whether they considered any of the following factors as their competitive advantage: analysis and use of technology, business planning skills, cattle genetics, high quality land and pasture, loan and interest rate management, low cost, machinery management, marketing skills, personnel management, and production skills. Participants could mark one or more of these items as a source of competitive advantage.

Another one of the survey questions in Pope (2009) pertained to the respondent’s perception of the importance of the cowherd to the operation. Specifically, participants were asked the following question: “economically, I view my cowherd as the most important part of overall farm income?” Survey participants had five choices ranging from strongly agree (index = 1) to strongly disagree (index = 5). On average, the participant’s answers landed between the neutral and disagree choices. Thus, even though every farm in the sample had a cowherd, the cowherd was not the most important enterprise on the farm for a large proportion of the farms.

Five questions in the survey were related to risk: how a respondent’s neighbor would describe their risk-taking behavior, retained ownership strategies, best and worst-case calf return strategies, and questions related to investing in an innovative business with the chance for a large gain, but a significant chance of loss (Pope, 2009). These questions were used to compute a risk preference score, which is more fully discussed below.

The 258 farms included in this study completed the survey reported in Pope (2009) and had a KFMA whole-farm analysis, which included beginning and ending balance sheets, an income statement, and key financial and production measures. Value of farm production was used as the output measure for the cost and efficiency estimation. Five inputs, obtained from each farm’s whole-farm analysis, were used in the cost and revenue efficiency estimation discussed below: labor, crop input, fuel, livestock input, and capital. All costs were annualized.

Labor was represented by the number of workers (paid and unpaid) on the farm and labor price was obtained by dividing labor cost by the number of workers. Implicit input quantities for the crop input, fuel, the livestock input, and capital were computed by dividing the respective input costs by USDA input price indices (USDA-NASS, 2020). Crop inputs consisted of seed; fertilizer; herbicide and insecticide; crop marketing and storage; and crop insurance. Fuel was comprised of fuel, auto expense, irrigation energy, and utilities. Livestock inputs included dairy expense; purchased feed; veterinarian expense; and livestock marketing and breeding. The capital input included repairs; machine hire; general farm insurance; property taxes; organization fees, publications, and travel; conservation; interest; cash farm rent; and interest charge on net worth (Langemeier, 2010).

Summary statistics related to farm characteristics and perceived sources of competitive advantage are reported in Table 1. The average value of farm production of the farms in the sample was $446,987. The average percentage of income derived from beef production was 23.5 percent and the average percentage of labor devoted to crops was 70.1 percent.
Cattle genetics, high quality land and pasture, low cost, and production skills were perceived to be a competitive advantage by over 50 percent of the survey participants. The average number of items identified (competitive advantage index in Table 1) was 4.2 and ranged from 1 to 8. The risk preference scores generated from the survey responses could range from 5 to 113 with a smaller risk preference score indicating more risk aversion. The scores for the 258 farms in the analysis ranged from 5 to 86. Pope (2009) broke the scores down further: 5 to 21, strongly risk averse; 22 to 38, slightly risk averse; 39 to 86, all other risk preference levels. The average risk preference score for the 258 farms was 25.8 indicating slight risk aversion.

The relatively high percent of producers (55.4 percent) that indicated that they were low cost producers is interesting. Using 20 years of farm level data, Yeager and Langemeier (2009) found that approximately 30 percent of the farms in the sample had significantly above average cost efficiency scores. A similar study pertaining to revenue efficiency and characteristics leading to higher prices (e.g., cattle genetics and marketing skills) has not been conducted.

Table 1
Summary Statistics for Sample of 258 KFMA Farms

| Variable                              | Average       |
|---------------------------------------|---------------|
| Farm characteristics                  |               |
| Value of farm production              | 446,987       |
| Percentage of income from beef cows   | 0.2348        |
| Crop labor percentage                 | 0.7014        |
| Cowherd most important part of farm business | 3.33        |
| Risk preference score                 | 25.8          |
| Competitive advantage                 |               |
| Analysis and use of technology        | 0.2674        |
| Business planning skills              | 0.2248        |
| Cattle genetics                       | 0.6202        |
| High quality land and pasture         | 0.5039        |
| Loan and interest rate management     | 0.3721        |
| Low cost                              | 0.5543        |
| Machinery management                  | 0.3798        |
| Marketing skills                      | 0.2054        |
| Personnel management                  | 0.3411        |
| Production skills                     | 0.7287        |
| Competitive advantage index           | 4.1977        |

Efficiency Analysis

Economic efficiency indices were the primary measure of interest in this study. Economic efficiency scores range from 0 to 1 where a score of 1 indicates a farm is producing on the production frontier, and using the optimal mix of inputs under the cost-based approach or producing the optimal output mix under the revenue-based approach.

Data envelopment analysis (DEA) was used to measure cost-based and revenue-based efficiency under variable returns to scale. DEA compares input use and output levels among the farms in the sample to construct a benchmark or best practice frontier. Information pertaining to the estimation of cost-based and revenue-based efficiency indices under variable returns to scale can be found in Fare, Grosskopf, and Lovell (1985) and Coelli, Rao, O’Donnell, and Battese (2005).
Once estimated, cost-based and revenue-based efficiency indices for each farm were sorted into quartiles. Comparisons among quartiles focused on the top and bottom quartiles, and involved comparisons of farm characteristics and perceived sources of competitive advantage. The bottom (top) quartile represented the farms with the lowest (highest) efficiency indices. Farm characteristics included gross farm income, percentage of income from beef cows, crop labor percentage (i.e., the percentage of unpaid and hired labor devoted to crop production), an indication of whether the cowherd was considered the most important part of the farm business, and a risk preference score.

Of the competitive advantage sources identified in Pope (2009), low cost was expected to be closely aligned with cost-based efficiency, so we expected the top quartile in terms of cost based efficiency to have indicated low cost as a competitive advantage. Conversely, the bottom quartile in terms of cost-based efficiency was expected to have marked low cost as a competitive advantage to a lesser degree. Cattle genetics and marketing skills were expected to be closely aligned with revenue-based efficiency. Thus, the top quartile in terms of revenue-based efficiency was expected to have a higher percent of producers that marked these items as a competitive advantage than the bottom quartile in terms of revenue-based efficiency.

T-tests were used to determine whether there were significant differences between efficiency indices, farm characteristics, and competitive advantage for farms in the bottom and top cost and revenue efficiency quartiles. The relationship between the bottom and top cost efficiency quartile and the perception of being a low-cost producer, and between the bottom and top revenue efficiency quartile and the perception of having good cattle genetics or marketing skills is of particular relevance to this study.

In addition to sorting the farms into quartiles, correlation coefficients between cost and revenue efficiency, and farm characteristics and perceived sources of competitive advantage were computed. A positive and significant correlation between cost efficiency (revenue efficiency) and low cost (cattle genetics and marketing skills) as a source of competitive advantage was expected.

**Results**

**Cost and Revenue Efficiency**

The average cost-based and revenue-based economic efficiency indices were 0.5691 and 0.6735, respectively. Using individual farm cost-based and revenue-based efficiency indices, farms were sorted into quartiles. Table 2 contains comparisons for the top and bottom cost-based efficiency quartiles and Table 3 presents results for the top and bottom revenue-based efficiency quartiles. The last column in both tables reports t-test results.

| Variable                                | Bottom quartile | Top quartile | Significance (p-value) |
|-----------------------------------------|-----------------|--------------|------------------------|
| **Efficiency indices**                  |                 |              |                        |
| Cost efficiency                         | 0.3918          | 0.7704       | < 0.0001               |
| Revenue efficiency                      | 0.4782          | 0.8802       | < 0.0001               |
| **Farm characteristics**                |                 |              |                        |
| Gross farm income                       | 200,928         | 715,721      | < 0.0001               |
| Percentage of income from beef cows    | 0.3190          | 0.2167       | 0.0229                 |
| Crop labor percentage                   | 0.6377          | 0.7306       | 0.0182                 |
### Table 2 (to be continued)

| Variable                        | Bottom quartile | Top quartile | Significance ($p$-value) |
|--------------------------------|-----------------|--------------|--------------------------|
| Cowherd most important part of farm business | 3.87            | 3.11         | 0.0002                   |
| Risk preference score           | 23.2            | 29.0         | 0.0062                   |

### Competitive advantage

| Variable                        | Bottom quartile | Top quartile | Significance ($p$-value) |
|--------------------------------|-----------------|--------------|--------------------------|
| Analysis and use of technology  | 0.2187          | 0.2969       | 0.3181                   |
| Business planning skills        | 0.2031          | 0.2969       | 0.2261                   |
| Cattle genetics                 | 0.6719          | 0.5938       | 0.3649                   |
| High quality land and pasture   | 0.5000          | 0.4844       | 0.8613                   |
| Loan and interest rate management | 0.3594      | 0.4219       | 0.4739                   |
| Low cost                        | 0.4844          | 0.5625       | 0.3819                   |
| Machinery management            | 0.3437          | 0.2656       | 0.3427                   |
| Marketing skills                | 0.2031          | 0.2344       | 0.6726                   |
| Personnel management            | 0.3281          | 0.3437       | 0.8533                   |
| Production skills               | 0.8281          | 0.7344       | 0.2049                   |
| Competitive advantage index     | 4.1405          | 4.2345       | 0.6599                   |

### Table 3

**Variable Averages for Top and Bottom Revenue Efficiency Quartiles**

| Variable                                      | Bottom quartile | Top quartile | Significance ($p$-value) |
|-----------------------------------------------|-----------------|--------------|--------------------------|
| **Efficiency indices**                        |                 |              |                          |
| Cost efficiency                               | 0.4108          | 0.7225       | < 0.0001                 |
| Revenue efficiency                            | 0.4377          | 0.9433       | < 0.0001                 |
| **Farm characteristics**                      |                 |              |                          |
| Gross farm income                             | 224,622         | 678,705      | < 0.0001                 |
| Percentage of income from beef cows           | 0.3211          | 0.2047       | 0.0126                   |
| Crop labor percentage                         | 0.6270          | 0.7291       | 0.0099                   |
| Cowherd most important part of farm business  | 3.78            | 2.98         | 0.0001                   |
| Risk preference score                         | 24.3            | 27.8         | 0.1091                   |
| **Competitive advantage**                     |                 |              |                          |
| Analysis and use of technology                | 0.2344          | 0.2656       | 0.6866                   |
| Business planning skills                       | 0.1875          | 0.2656       | 0.2968                   |
| Cattle genetics                               | 0.7031          | 0.5938       | 0.2003                   |
| High quality land and pasture                 | 0.5937          | 0.3906       | 0.0231                   |
| Loan and interest rate management             | 0.3281          | 0.3437       | 0.8533                   |
| Low cost                                      | 0.4375          | 0.5469       | 0.2213                   |
| Machinery management                          | 0.2656          | 0.2812       | 0.8446                   |
| Marketing skills                              | 0.2344          | 0.2187       | 0.8347                   |
| Personnel management                          | 0.3125          | 0.3750       | 0.1441                   |
| Production skills                             | 0.8281          | 0.7187       | 0.4620                   |
| Competitive advantage index                   | 4.1249          | 3.9998       | 0.5794                   |

Farms in the top quartile (both in terms of cost and revenue-based efficiency) were significantly larger and devoted more of their labor to crops than farms in the bottom quartile. Farms in the top efficiency quartiles also had a lower percentage of income from beef and indicated that the cowherd was less important to the overall operation than farms in the bottom efficiency quartiles. Farms in the top quartile with respect to cost-based efficiency also tended to be less risk averse. There was not a significant difference between revenue efficiency quartiles with respect to the risk preference score. With the exception of land and pasture quality, which was significantly lower for the top revenue efficiency quartile, none of differences in the sources of competitive...
advantage between the top and bottom efficiency quartiles were significantly different. In particular, unlike prior expectations, the low-cost strategy was not significantly different between the two cost-based efficiency quartiles; and cattle genetics and marketing skills were not significantly different between the two revenue-based efficiency quartiles.

It is interesting to note that 48 percent of the farms in the bottom cost-based efficiency quartile indicated that low cost is a competitive advantage. Similarly, 70 percent of the farms in the bottom revenue-based efficiency quartile indicated that cattle genetics is a competitive advantage.

**Correlation Coefficients**

To further examine the relationship between cost and revenue efficiency, correlation coefficients between the two efficiency indices, and farm characteristics and perceived sources of competitive advantage are presented in Table 4. Gross farm income and the percentage of labor devoted to crops were significant and positively correlated with cost-based and revenue-based efficiency. The percentage of income from beef was significant and negatively correlated with revenue-based efficiency, and the perception of the importance of the cowherd to whole farm income was significant and negatively correlated with cost-based and revenue-based efficiency. Consistent with the $t$-test results, the only significant correlation coefficient for the perceived sources of competitive advantage was between revenue efficiency and the quality of land and pasture.

**Table 4**

*Correlation Coefficients for Cost and Revenue Efficiency Indices*

| Variable                                | Cost efficiency | Revenue efficiency |
|-----------------------------------------|-----------------|--------------------|
| Efficiency indices                      |                 |                    |
| Cost efficiency                         | 1.000           | 0.772              |
| Revenue efficiency                      | 0.772           | 1.000              |
| Farm characteristics                    |                 |                    |
| Gross farm income                       | 0.466           | 0.408              |
| Percentage of income from beef cows     | -0.091          | -0.162             |
| Crop labor percentage                   | 0.142           | 0.154              |
| Cowherd most important part of farm business | -0.223         | -0.237             |
| Risk preference score                   | 0.217           | 0.152              |
| Competitive advantage                   |                 |                    |
| Analysis and use of technology          | 0.070           | 0.046              |
| Business planning skills                | 0.067           | 0.080              |
| Cattle genetics                         | -0.048          | -0.082             |
| High quality land and pasture           | -0.078          | -0.129             |
| Loan and interest rate management       | 0.089           | 0.036              |
| Low cost                                | 0.090           | 0.070              |
| Machinery management                    | -0.032          | -0.013             |
| Marketing skills                        | 0.045           | 0.027              |
| Personnel management                    | 0.013           | 0.034              |
| Production skills                       | -0.029          | -0.065             |
| Competitive advantage index             | 0.067           | -0.005             |

**Conclusions and Implications**

This paper compared farm characteristics and perceived sources of competitive advantage with cost-based and revenue-based efficiency estimates. Gross farm income and the percentage of labor devoted to crop
production were significant and positively correlated with cost-based and revenue-based efficiency while the
perception of the cowherd being the most important part of the business was negatively correlated with both
measures of efficiency. In general, perceived sources of competitive advantage were not significantly correlated
with cost or revenue efficiency.

The lack of significance between efficiency indices and perceived sources of competitive advantage has
important implications regarding the use of benchmarking and strategic management by farms and ranches.
Perceived sources of competitive advantage certainly did not match actual competitive advantage measures
using efficiency indices in this study. Ironically, the group of farms included in this study had a whole-farm
analysis which included benchmarks pertaining to profitability, financial efficiency, and specific enterprises
including the cowherd. The results imply that additional study of the relationship between benchmarks and
competitive advantage is warranted.

References
Besanko, D., Dranove, D., Shanley, M., & Schaefer, S. (2010). Economics of strategy (5th ed.). Hoboken, New Jersey: John Wiley & Sons.
Boehlje, M. (2013). Strategies for success in turbulent times: Ten strategic initiatives. Center for Commercial Agriculture, Department of Agricultural Economics, Purdue University.
Coelli, T. J., Rao, D. S. P., O’Donnell, C. J., & Battese, G. E. (2005). An introduction to efficiency and productivity analysis (2nd ed.). New York: Springer.
Fare, R., Grosskopf, S., & Lovell, C. A. K. (1985). The measurement of the efficiency of production. Boston: Kluwer-Nijhoff.
Hunt, S. D. (2000). A general theory of competition: Resources, competences, productivity, economic growth. Thousand Oaks, California: Sage Publications.
Langemeier, M. R. (2010). Kansas Farm Management Association SAS data bank documentation. Department of Agricultural Economics, Kansas State University, Staff Paper No. 11-01.
Langemeier, M. R. (2019). Assessing strategic positioning skills. farmdoc daily, (9), 142. Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, August 2.
Pope, K. F. (2009). Cow-calf risk management among kansas producers. M.S. Thesis, Kansas State University.
United States Department of Agriculture, National Agricultural Statistical Service (USDANASS). (2020). Quick Stats. Available online: https://www.quickstats.nass.usda.gov/ (accessed September 4, 2020).
Yeager, E., & Langemeier, M. (2009). Measuring sustained competitive advantage for a sample of Kansas farms. Journal of the American Society of Farm Managers and Rural Appraisers, 72, 112-123.