Productivity Divergence Across Kansas Farms

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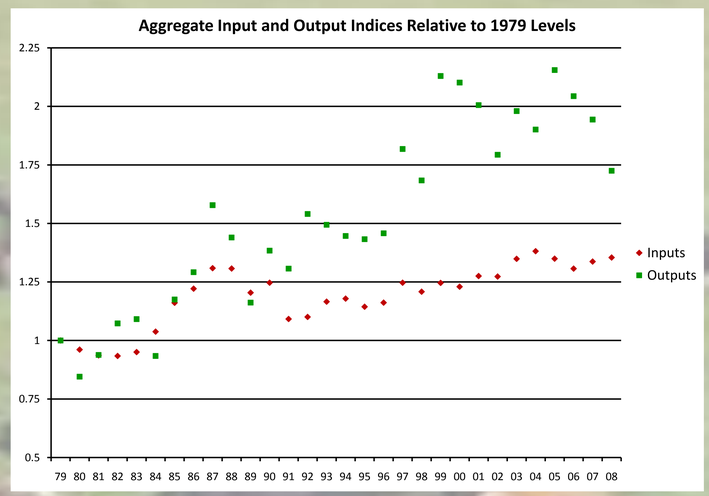
INTRODUCTION

- Productivity growth is one way to measure how well farms are doing over a period of time. Productivity measures the quantity of outputs relative to the level of inputs.
- This study examines productivity growth and convergence on a farm level. If the farms are converging, the greatest growth will be in the farms that are trying to catch-up to the levels of the most productive farms. If productivity is diverging, differences in productivity across farms are widening.
- **Objective:** Examine productivity differences across individual Kansas farms for a 30-year period and determine whether productivity is converging or diverging. Additionally, the sources of some of the differences in productivity in terms of farm size, sources of income, productivity indices, and financial ratios will be identified.

DATA

- The farms included in this study were all continuous members of the Kansas Farm Management Association from 1979-2008. There were 135 farms with the required data (Langemeier 2003).
- Inputs used in the analysis were labor, purchased inputs, and capital.
- Outputs used in the analysis were crop and livestock.

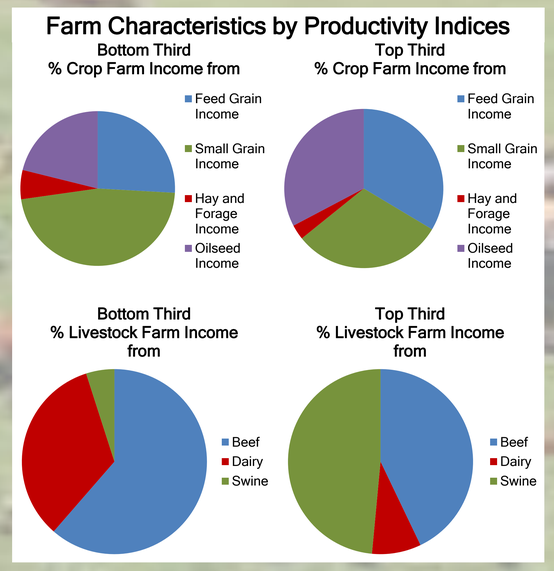


METHODS

- Input based Malmquist productivity indices (MPI) were calculated for each farm and year (Färe and Grosskopf 1996).
- The input oriented MPI concentrates on the level of inputs necessary to produce the observed outputs in the within time and adjacent time period under the technology at those time periods (Coelli et al. 2005).
- Improvement in productivity is indicated by an MPI greater than one. A value of less than one is an indication of deterioration in productivity. Unity indicates there has been no change in MPI.
- In order to indentify whether or not farms were experiencing β-convergence, the rate of growth of MPI over the entire time period was assumed to be a function of the natural log of the initial growth rate and the following ratios: capital to labor, purchased inputs to labor, and livestock to crop (Ball, Hallahan, and Nehring 2004).
- If farms are converging to the same level of productivity, the expected sign on the initial growth rate variable will be negative (Islam 2003). In the case of divergence, the sign on the initial growth rate variable will be positive.

RESULTS

- The average MPI over the 30-year period was 1.0050 resulting in an average annual change in productivity of 0.50 percent. The highest average change was 6.46 percent and the lowest average change was -7.99 percent.
- The average annual productivity increase for the top 45 farms in terms of MPI was 2.39 percent while the average annual productivity decrease for the bottom 45 farms was 1.46 percent.
- Regression results pertaining to convergence indicated a significant positive relationship between the average productivity levels and the log of the initial productivity levels; thus, the sample of farms experienced divergence.
- The purchased inputs to labor ratio was positive and significant indicating that as purchased inputs grow relative to labor the average MPI increases. The livestock to crop ratio was negative and significant indicating that as livestock outputs increase relative to crop outputs there is a decrease in the average MPI.



CONCLUSIONS

- This study used 30 years of continuous data for 135 farms in Kansas to explore changes in productivity at the farm level. The farms in the top productivity group were larger in terms of value of farm production, crop farm income, and livestock farm income. The farms in the top third also had significantly higher profit margin, asset turnover, and rate of return on investment ratios.
- The results showed that there was significant divergence among the farms. There was not a tendency for farms to catch-up to the same levels of productivity as the top farms in the sample.
- The fact that farms are not experiencing convergence is consistent with the notion of competitive advantage and the fact that the farms in the top third are taking advantage of unique resources or characteristics that allow them to consistently outperform their peers (Porter 1998; Barney and Clark 2007).
- The farms with a competitive advantage are more likely to survive and expand while those with a competitive disadvantage are more likely to transition out of agriculture.

REFERENCES

- Ball, V.E., C. Hallahan, and R. Nehring. "Convergence of Productivity: An Analysis of the Catch-up Hypothesis within a Panel of States." *American Journal of Agricultural Economics* 86 (Number 5, 2004): 1315-1321.
- Barney, J.B. and D.N. Clark. *Resource-Based Theory: Creating and Sustaining Competitive Advantage*. Oxford: Oxford University Press, 2007.
- Coelli, T.J., D.S.P. Rao, C.J. O'Donnell, and G.E. Battese. *An Introduction to Efficiency and Productivity Analysis*, Second Edition. New York: Springer, 2005.
- Färe, R., and S. Grosskopf. *Intertemporal Production Frontiers: With Dynamic DEA*. Kluwer Academic Publishers, USA, 1996.
- Islam, N. "What Have We Learnt from the Convergence Debate?" *Journal of Economic Surveys* 17(2003): 309-62.
- Langemeier, M.R. "Kansas Farm Management SAS Data Bank Documentation." Department of Agricultural Economics, Staff Paper No. 03-02, June 2003.
- Porter, M.E. *On Competition*. Boston: Harvard Business School Publishing, 1998.

FOR FURTHER INFORMATION

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- Please visit agmanager.info for additional information on the Kansas Farm Management Association.

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