

Evaluating dynamic productivity change across different types of U.S. farm supply cooperatives

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Abstract

This article estimates the dynamic Luenberger productivity change and its components (i.e. technical inefficiency change, scale inefficiency change, and technical change) for a sample of 697 U.S. farm supply cooperatives over the period 2005-2017. This estimation is undertaken using a dynamic directional distance function that accounts for the presence of adjustment costs associated with investments in quasi-fixed factors of production. The sample cooperatives are then categorized into different groups, based on the inputs that make up most of their supply turnover (i.e., feed, crop-specific inputs, petroleum, other inputs, and multi-input), and their distributions of productivity scores (and its components) are compared using the Simar and Zelenyuk adapted Li test.

The dynamic Luenberger productivity measure shows an average of -0.2% decline in productivity for the sample cooperatives during the study period. The analysis of the productivity change decompositions suggests that productivity decline is mainly due to the contribution of scale inefficiency change, which averaged -1.4% for 2005-17. The negative scale inefficiency change result indicates that during the study period, U.S. farm supply cooperatives were on average unable to adjust their scale of operation to optimal size.

The adapted Li test results reveal significant statistical differences in the distributions of productivity change and its components across different cooperative types. All cooperative types exhibited productivity regress during the study period, with scale inefficiency being the most important contributor to this decline. Cooperatives with a higher share of petroleum products in their total supply value showed the least productivity loss (i.e. -0.05%) compared with the other types of cooperatives. The same type of cooperatives showed a higher ability to use existing technologies more efficiently. In terms of technological progress, cooperatives with a higher share of other inputs in their supply turnover engaged more in innovative activities than other types of cooperatives.