A Monte Carlo Study on Multiple Output Stochastic Frontiers: Comparison of Two Approaches

In the estimation of multiple output technologies in a primal approach, the main question is how to handle the multiple outputs. Often an output distance function is used, where the classical approach is to exploit its homogeneity property by selecting one output quantity as the dependent variable, dividing all other output quantities by the selected output quantity, and using these ratios as regressors (OD). Another approach is the stochastic ray production frontier (SR) which transforms the output quantities into their Euclidean distance as the dependent variable and their polar coordinates as directional components as regressors. A number of studies have compared these specifications using real world data and have found significant differences in the inefficiency estimates. However, in order to get to the bottom of these differences, we apply a Monte-Carlo simulation. We test the robustness of both specifications for the case of a Translog output distance function with respect to different common statistical problems as well as problems arising as a consequence of zero values in the output quantities. Although, our results partly show clear reactions to statistical misspecifications, on average none of the approaches is superior. However, considerable differences are found between the estimates at single replications. In the case of zero values in the output quantities, the SR clearly outperforms the OD, although this advantage nearly vanishes when zeros are replaced by a small number.