Applying Data Envelopment Analysis (DEA) to Productivity Evaluation among Data Derived Peer Groups in Delaware Cost Study Participants 1998 - 2014

Principal Investigators: John Sawyer, Ti Yan - University Delaware

The productivity of departmental faculty in higher education is often measured by student credit hours taught and research funding obtained. However, attempting to evaluate the efficiency of productivity by using quantitative optimization methods is far less well studied. Using data from the 1998 through 2014 cycles of the Delaware Cost Study, data envelopment analysis (DEA) is applied to define and examine efficiency at disciplinary level. Prior to use of the DEA model, peer groups are selected to establish focused comparisons using a structural equation latent growth curve model and subsequent cluster analysis. In many benchmarking studies, comparisons are made by selecting institutional peers. This project will use the data from two decades of the cost study to identify discipline level peers based on a model that includes Carnegie class the NCES classification of instructional program (CIP) designation and regional characteristics. For disciplines that are not operating at the efficiency frontier, DEA may be used to identify the efficient peers for comparison, and this peer group can be further used to suggest future performance improvements. Our initial model results based on the 2014 cost study data for public, research high and very high Carnegie class participants indicate that the disciplines found most likely to be classified as inefficient are in the social sciences and humanities, while disciplines most likely to be found efficient are in natural sciences and interdisciplinary technology-oriented fields such as Library Science and Transportation Management. These initial results also helped us to define necessary refinements to develop. Future expansion of this research will focus on the following directions: (1) refining the output variables used as the efficiency criteria in the DEA model that will allow us to focus on differentiated institutional missions for the different Carnegie Class participants, (2) exploring the addition of an instructional quality productivity metric that would include an assessment of student learning, (3) expanding the DEA model to include additional input variables form external data sources including IPEDS data that will be used to the quantify resources available to disciplinary units of analysis.