

## DEA Methodology for Measuring and Decomposing Profitability, Productivity and Efficiency

Profitability change (a measure of value change) can be written as the product of a terms-of-trade index (a measure of price change) and a productivity index (a measure of quantity change).

O'Donnell (2008) shows that the productivity index can be further decomposed into indexes of technical change (movements in the production frontier), technical efficiency change (movements towards the frontier), and scale and mix efficiency change (movements around the frontier to capture economies of scale and scope). The O'Donnell decomposition methodology can be applied in any multiple-input multiple-output setting, it makes no assumptions concerning the optimising behaviour of firms or the degree of competition in input or output markets, and it is exhaustive in the sense that it only involves components that can be unambiguously interpreted as measures of either technical change or efficiency change. Implementing the methodology involves estimating the production frontier using stochastic frontier analysis (SFA) or data envelopment analysis (DEA) methods. This paper shows how DEA can be used to decompose profitability change into the product of a terms-of-trade index and a spatially- and temporally-transitive Hicks-Moorsteen productivity index. The productivity index is then decomposed into technical change and various efficiency change components.