NONPARAMETRIC ESTIMATES OF THE COMPONENTS OF PROFITABILITY CHANGE AND PRODUCTIVITY CHANGE IN U.S. AGRICULTURE

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Abstract: Profitability change can be decomposed into the product of a multiplicatively-complete TFP index and an index measuring changes in relative prices. O'Donnell (2008) shows that the TFP index can be further decomposed into a measure of technical change and measures of technical, scale and mix efficiency change. The decomposition methodology does not rely on any restrictive assumptions concerning the structure of the technology, it makes no assumptions concerning the optimising behaviour of firms or the degree of competition in product markets, and it only involves components that can be unambiguously interpreted as measures of either technical change or efficiency change. This paper uses the methodology to decompose Hicks-Moorsteen and Fisher indexes of TFP change in U.S. agriculture for the period 1960-2004. Variations in the components of TFP change are explained in terms of changes in R&D expenditure and relative output and input prices. The average annual rate of technical progress is estimated at 1.1%. TFP in California, for example, is found to have almost doubled over the sample period, due entirely to a combination of technical progress and improvements in mix and scale efficiency.