Using Stochastic Frontier Approach to Assess Technical Efficiency in Brazilian Agriculture

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Abstract

Brazil is one of the most important countries in relation to agribusiness. Agribusiness represents about 25 % of Brazilian GDP, 36 % of exports in 2008 and 37 % of jobs in 2008. The states of the South and Southeast historically, and more recently, the Center West use more technology, such as improved varieties of plants, fertilisers, irrigation (Center West), mechanisation and chemicals. Brazilian agriculture differs regionally, due, primarily, to the differences in geographical area, such as climate and natural resources, and thus production characteristics. The objective of this study was to assess the technical efficiency of the agricultural sector in the 27 Brazilian states in the years 1995/96 and 2006. The data on land and labour were obtained from the agricultural census of the two considered years. Data on credit for investment and running costs were obtained at the Brazilian Central Bank. In the analysis we used a DEA CCR-O model and a stochastic frontier model. The second model better adjusted the data with 99 % of correlation between predicted and observed values. The results show Distrito Federal with the highest technical efficiency in agriculture in 2006 and the second highest in 1995/96. The lowest technical efficiency was found in Piauí in 2006 and in Tocantins in 1995/96. The estimated elasticities show that increases of 1 % in per capita income would increase the technical efficiency by 0.77 % in the North, by 0.76 % in the Northeast, by 0.59 % in the Center West, by 0.56 % in the South and by 0.49 % in the Southeast region. We fitted a DEA Model (CCR-O) and a stochastic frontier model to state agricultural production data in Brazil. The second fit was very good as measured by a correlation of about 99 % between observed and predicted values. The technology seems to show constant returns to scale.

Keywords: Agriculture, stochastic frontier production, technical efficiency

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