Technical Change Adjusted for Production of Bad Outputs in Input-Output Models

Topic: Productivity and efficiency and economic growth
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tenRaa (1995) developed a model that calculated macroeconomic technical inefficiency using a single input-output table. Böhm and Luptáčik (2006) extended this framework to calculate technical inefficiency in the presence of a constraint on emissions of air pollutants (i.e., bad outputs). In their model, inefficiency is determined by the extent to which it is possible to proportionally contact primary input (i.e., capital and labor) use while maintaining the original final demand vector or proportionally expanding the final demand vector with the original level of primary inputs.

Recently there have been efforts to allow sectors to have access to more than one production process. Prieto and Zofío (2007) incorporated input-output tables into an activity analysis model that calculates technical efficiency. This can be viewed as a network data envelopment analysis (DEA) model that calculated technical efficiency. They operationalized their model with input-output tables from a set of OECD countries. In addition, Zofío and Prieto (2001) proposed an extension of their model to calculate technical change, which requires input-output tables from more than one year.

The models specified by Prieto and Zofío can be viewed as depicting an unregulated technology in which bad output production is ignored. In other words, producers are allowed to freely dispose of the undesirable byproducts of their production activity. However, in order to model the consequences of pollution abatement it is necessary to specify the regulated production technology.

We propose to augment the models specified by Prieto and Zofío by modeling bad outputs produced by an economy. Once we introduce bad outputs into the specification of the production technology (i.e., the regulated production technology), we will calculate adjusted measures of technical efficiency and technical change in which an economy is credited for the proportional expansion of marketed good outputs and contraction of bad outputs. A time series of input-output tables from Denmark linked to sector production of air pollutants enables us to conduct an analysis for 1990-2007.

References

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