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Endogenous Environmental Variables

In Stochastic Frontier Models

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Abstract

This paper considers a stochastic frontier model that contains environmental variables that affect the level of inefficiency but not the frontier. The model contains statistical noise, potentially endogenous regressors, and technical inefficiency that follows the scaling property, in the sense that it is the product of a basic (half-normal) inefficiency term and a parametric function of the environmental variables. The environmental variables may be endogenous because they are correlated with the statistical noise or with the basic inefficiency term.

Several previous papers have considered the case of inputs that are endogenous because they are correlated with statistical noise, and if they contain environmental variables these are exogenous. One recent paper allows the environmental variables to be correlated with statistical noise. Our paper is the first to allow both the inputs and the environmental variables to be endogenous in the sense that they are correlated either with statistical noise or with the basic inefficiency term. Correlation of inputs or environmental variables with the basic inefficiency term raises non-trivial conceptual issues about the meaning of exogeneity, and technical issues of estimation of the model.

JEL Classification Codes: C10, C26, C36

Keywords: endogeneity, stochastic frontier, environmental variables

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