

# Estimating Production Functions in Differentiated-Product Industries with Quantity Information and External Instruments

**Abstract:** This paper develops a new method for estimating production-function parameters that can be applied in differentiated-product industries with endogenous quality and variety choice. We take advantage of data on physical quantities of outputs and inputs from the Colombian manufacturing census, focusing on producers of rubber and plastic products. Assuming constant elasticities of substitution of outputs and inputs within firms, we aggregate from the firm-product to the firm level and show how quality and variety choices may bias standard estimates. Using real exchange rates and the national minimum wage, we construct external instruments for materials and labor choices. In the spirit of established panel-data approaches, we implement a simple two-step instrumental-variables method, first estimating the materials and labor coefficients in a difference equation and then estimating the capital coefficient in a levels equation. Our estimates differ from those of existing methods and our preferred productivity estimate performs relatively well in predicting future export performance.