Thesis Abstract

Production Function Estimation with Measurement Error in Capital (Job Market Paper)

Capital is notoriously hard to measure, and measurement error in capital can substantially bias estimates of production functions and productivity. But while the potential for measurement error in capital to bias these estimates has been discussed for decades, no consensus exists on how best to correct for it. I develop a firm-level production function estimator that corrects for capital measurement error. Applied to Chilean manufacturing data, it shows that standard approaches systematically understate the output elasticity of capital and overstate how much productivity varies across firms. My sieve-nonparametric estimator leverages a "perpetual inventory" assumption on capital accumulation that is standard in the production function literature. Monte Carlo simulations show that it performs well even when capital is severely mismeasured. In the Chilean data, standard approaches also bias correlations between firm productivity and firm characteristics, in either direction. These biases are particularly severe under nonlinear production functions.

Estimating Production Functions in Continuous Time (In Progress)

Firm data commonly record output and intermediate inputs as annual totals, even though firms adjust inputs within the year. For instance, if inputs are slow to adjust, or if firms must rapidly react to price shocks, input usage may vary substantially within the year. I show that discrete-time production function estimators are inconsistent when input levels vary within the period of observation, and I propose a consistent estimator. I develop a model in which the firm adjusts intermediate inputs flexibly in continuous time, while capital and labor change only gradually over the year. Aggregating output and intermediates discards information on input timing and introduces an aggregation error correlated with inputs, making standard estimates of the labor and capital elasticities inconsistent. My correction relies on piecewise interpolation, performs well in Monte Carlo exercises, and readily incorporates data observed at mixed frequencies, such as when prices can be observed at higher frequency than spending.

Inventories and Risk Aversion (In Progress)

The common assumption of firm risk-neutrality is a convenient mathematical simplification but may not accurately reflect firm behavior. For instance, even if firm owners are risk-neutral, the principal-agent problem could result in risk-averse firm behavior if management is risk-averse. One way to infer firms' risk preferences is to examine their decisions over how much inventory to hold. Risk-averse firms uncertain about future prices and productivity can hedge against future negative shocks by building up inventories. I develop a model of firm inventory behavior under which a risk-averse firm's production function can be identified from the firm's first-order condition on inputs. Risk aversion itself can then be estimated using the firm's first-order condition on inventory quantity.