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## Estimating the production function, productivity and markups

### 1. Production theory

Production sets, production function, marginal rates.

Properties of production sets.

Profit maximization and cost minimization.

Geometry of the single-output case.

### 2. Production function

Uses of the production function

Estimation problems:

(Time changing) Heterogeneity

Simultaneity

Selection

Example: Selection in growth

Sample selection in estimating the pf

Measurement

### 3. Traditional approaches to estimation

Controlling for unobserved heterogeneity

Fixed effects models

Differences

Within groups estimation

Robust standard errors for WG estimation

GMM

Arellano and Bond (1991) estimator

The Blundel and Bond (2000) model

Exercises

#### **4. Structural approach to estimation**

Basic structural framework: Olley and Pakes (1996), Levinshon and Petrin (2003)

Criticism and alternatives: Akerberg, Caves and Frazer (2015)

Parametric identification: Doraszelski and Jaumandreu (2013)

Nonparametric identification under perfect competition: Gandhi, Navarro and Rivers (2020)

A discussion on identification: Ways to identify

Exercises

#### **5. Productivity**

Hicks-neutral productivity, endogenous productivity.

Multidimensional productivity: biased technical change.

#### **6. Markups and markdowns**

Productivity, markups and markdowns

A popular method to estimate markups: De Loecker and Warzinsky (2012)

Biases in estimation

Markdowns, aggregation, a nonparametric bound

Alternatives and pending issues

Exercises

## 7. Topics in production functions estimation

Firm-level prices

Demand heterogeneity

Input heterogeneity

Utilization

Intangible assets

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