ECON 5221:
EMPIRICAL ANALYSIS OF PRODUCTIVITY AND MARKET POWER

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National Taiwan University

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Description This course introduces empirical techniques for measuring firm-level productivity and market power using firm-level panel data. It is divided into three main parts.

Part one covers estimation techniques of production functions, which essentially measure firm-level unobserved productivity. We will explore classic approaches pioneered by Blundell and Bond (*Dynamic Panel Approach*) and Pakes and his followers (*Proxy Variable Approach*), addressing associated econometric challenges. We will then discuss their limitations, along with recent refinements to mitigate the resulting biases.

Part two delves into empirical applications of these techniques to one of the most influencing empirical topics: The Rise of Firm's Market Power. In particular, we will learn "production function approach" for measuring price markups and wage markdowns, discussing its pros and cons of this approach and recent applications. Students will appreciate how economists can utilize model-implied optimality conditions to estimate firm-level unobserved variables.

In Part three, we will study extensions of these methods to more general environments in which firms produce multiple products and exhibit heterogeneous production efficiencies across product lines. Students will learn how model-implied optimality conditions can be exploited to recover firm-product-level unobserved input allocations, which in turn enable the estimation of firm-product-level productivity.

Textbook and Reference There is no formal textbook for this course. Refer to the attached reading list.

Econometrics

- All students are expected to have solid understanding of undergraduate-level econometrics. Basic understandings of graduate-level econometrics are brownie points.
- Before chewing the main meat of this course, some basics of the generalized method of moments (GMM) will be covered, which is essential for production function estimation.
- Homework assignments will involve estimating a production function using provided datasets, which requests students to draft their own codes. Relevant MATLAB codes will be covered in class before the assignments are released.

Grading Policy Four components determine your grade: Attendance, in-class presentation, Homework assignments and take-home exam. The relative weights are as follows:

Attendance	20%
In-class Presentation	30%
Homework	20%
Two homework assignments, each accounting for 10%.	
Take-home Exam	30%

In-class Presentation Students are expected to present a well-published paper from the reading list throughout this semester. Presentation times range from 20 to 30 minutes. Students can freely choose which paper they wish to present. The selections are first come, first-served basis. During their presentations, students should emphasize the following aspects of a paper:

1. Research question
2. Empirical approach
3. Key empirical findings
4. Contribution

Course Outline

The schedule below is tentative. Any unexpected changes to the schedule will be announced in-class (as the course proceeds).

Digression - Generalized Method of Moments .....

Measuring Productivity I - Classical Methods: Dynamic Panel vs. Proxy Variable .....

Measuring Productivity II - Recent Refinements .....

Assignment 1 .....

Product-Setting Power I - Measuring Price Markups .....

Product-Setting Power II - Recent Studies on Price Markups .....

Assignment 2 .....

Wage-Setting Power I - Measuring Wage Markdowns .....

Wage-Setting Power II - Recent Studies on Wage Markdowns .....

Recent Progress: Multi-Product Productivity I - Methods Using First Order Conditions ...

Recent Progress: Multi-Product Productivity II - Transformation Approach .....

Take-Home Exam .....(DATE TO BE ADDED)

Reading List

We will cover papers with asterisks ∗∗ throughout this course.

A General Reference .....

- Ackerberg, Benkard, Berry, and Pakes (2007, Handbook of Econometrics), *Econometric Tools for Analyzing Market Outcomes*
- De Loecker and Syverson (2021; Handbook of IO), *An Industrial Organization Perspective on Productivity*
- Verhoogen (2023; Journal of Economic Literature), *Firm-Level Upgrading in Developing Countries*

Measuring Productivity - Classical Methods .....

- ** Blundell and Bond (2000, Econometric Review), *GMM Estimation with persistent panel data*
- ** Olley and Pakes (1996, ECTA), *The dynamics of productivity in the telecommunications equipment industry*
- Levinsohn and Petrin (2003, RESTUD), *Estimating Production Functions Using Inputs to Control for Unobservables*

Measuring Productivity - Recent Refinements .....

- Klette and Griliches (1996, Journal of Applied Econometrics), *The Inconsistency of Common Scale Estimators When Output Prices are Unobserved and Endogenous*
- Foster, Haltinwanger, and Syverson (2008, AER), *Reallocation, Firm Turnover, and Efficiency: Selection on Productivity or Profitability?*
- ** Ackerberg, Cavez, and Frazer (2015, ECTA), *Identification Properties of Recent Production Function Estimators*
- Gandhi, Navarro, and Rivers (2020, JPE), *On the Identification of Gross Output Production Functions*
- Grieco, Li, and Zhang (2016), *Production Function Estimation with Unobserved Input Price Dispersion*
- ** Collard-Wexler and De Loecker (2021, WP), *Productivity and Capital Measurement Error*

Measuring Price Markups and Applications .....

- Hall (1986, Brookings Papers on Economic Activity), *Market Structure and Macroeconomic Fluctuations*
- ** De Loecker and Warzynski (2012, AER), *Markups and Firm-Level Export Status*
- De Loecker, Goldberg, Khandelwal and Pavcnik (2016, ECTA), *Prices, Markups, and Trade Retorm*
- ** De Loecker, Eeckhout, and Unger (2020, QJE), *The Rise of Market Power and the Macroeconomic Implications*
- Bond, Hashemi, Kaplan, and Zoch (2021, JME), *Some unpleasant markup arithmetic: Production function elasticities and their estimation from production data*
- ** Raval (2023, RESTUD), *Testing the Production Approach to Markup Estimation*
- De Loecker and Eeckhout (2018, WP), *Global Market Power*
- ** De Loecker and Scott (2022, WP), *Markup Estimation using Production and Demand Data: An Application to the US Brewing Industry*
- De Loecker, Eeckhout, and Mongey (2022, WP), *Quantifying Market Power and Business Dynamism in the Macroeconomy*

Measuring Wage Markdowns and Applications .....

- Mertens (2020, IJIO), *Labor Market Power and the Distorting Effects of International Trade*
- ** Yeh, Macaluso, and Hershbein (2022, AER), *Monopsony in the US Labor Market*
- Rubens (2023, AER), *Market Structure, Oligopsony Power, and Productivity*
- Casacuberta and Gandelman (2023, IJIO), *Wage councils, product markups and wage markdowns: Evidence from Uruguay*
- Morlacco (2020, WP), *Market Power in Input Markets: Theory and Evidence from French Manufacturing*
- Rubens (2024, WP), *Labor Market Power and Factor-Biased Technology Adoption*
- ** Rubens and (2024, WP), *Colluding Against Workers*

Measuring Productivities Across Product Lines .....

- De Loecker, Goldberg, Khandelwal and Pavcnik (2016, ECTA), *Prices, Markups, and Trade Reform*
- Grieco and McDevitt (2017, Restud), *Productivity and Quality in Health Care: Evidence from the Dialysis Industry*
- ** Orr (2022, JPE), *Within-Firm Productivity Dispersion: Estimates and Implications*
- Valmari (2023, Restud), *Estimating Production Functions of Multiproduct Firms*
- Koh and Raval (2025, WP), *Economies of Scope from Shared Inputs*
- ** Caselli, Chatterjee, Li (2026, WP), *Productivity and Quality of Multi-product Firms*
- ** Cairncross, Morrow, Orr, and Rachapalli (2025, WP), *Multi-Product Markups*