

**关于调整“生产率理论与方法导论 (Introduction to Productivity Theory and Methodology)”课程工作量和作业要求的通知**

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考虑到目前研究生们所修课程的数量和相应的工作量，也根据以往这门课普遍较好的平时作业（阅读和讨论）表现，从今年开始，我决定取消教学大纲中提出的课程论文要求（见今年的 syllabus）。

然而，对于感兴趣使用这门课的数据进行中国经济增长研究的学生，可以将其作为课外的研究工作，并且可以得到我的专门指导。

# AN INTRODUCTION TO PRODUCTIVITY THEORY AND METHODOLOGY

Instructor: Professor Harry X. Wu

Teaching Time: [Thursday 18:40-21:30](#)

Office Hours: [Thursday 14:00-17:00](#)

**Spring 2025**

## **Course Description**

Fundamental economic problems, from observations of economic phenomena in time and space to tests of theories cannot be accomplished in the absence of appropriate measurement. Economists and policy makers can be misled by measurement without theory or consistency between theory, methodology, measurement, and data. However, measurement is often an overwhelming problem encountered by graduate students in economics.

In the conceptual framework of the neoclassical growth economics, extended to account for the industry origins of the aggregate economy via input-output networks, this course provides graduate students in economics with systematic training on solving the key measurement problems that are required by the productivity theory, specifically inputs and their services, and outputs and their costs in coherence with the system of national accounts.

The teaching emphasizes the principle of theory-methodology-measurement consistency in handling data problems and prepares students to deal with data problems in Chinese official statistics in the subsequent and complementary course “**Construction of Productivity Accounts with the China KLEMS Database**”.

The contents of this course are based on those regularly used for graduate studies on growth-related measurement problems in some of the world’s leading institutions. They are nonetheless often instructed individually by supervisors. After carefully selecting and organizing the contents, I am developing them into a systemic subject that aims to equip graduate students who are interested in growth economics. This also fills an important gap in the curriculum of graduate schools in economics.

## **Pre-course Knowledge**

This course is designed for graduate students who are strongly interested in measuring economic growth in general and in emerging economies such as the case of China that often encounters difficult data and measurement problems. To succeed in studying this challenging subject, students are required to have had a good grasp of intermediate or above level macroeconomics, microeconomics, and econometrics, and a strong ability to independently read and understand literature in English, and to solve and interpret theoretical, empirical, and computational models in the required readings.

## Teaching and Learning Approach

This course is taught through lectures, delivered in Chinese or English as appropriate, and learning activities through attending lectures, self-studies and in-class presentations and discussions. Topical lectures are guidance only by motivating students with major theoretical and methodological issues and challenging questions.

Students are required to write a short essay to critically review a theoretical or methodological problem, focusing on the significance of the topic, major contributions, and remaining problems.

## Assessment and Grade

There is no exam in this course. Students are assessed solely based on their attendance, reading homework, presentation, and participation in discussions in the form of study notes. Although this subject has no request for term papers, students who are interested in this subject are highly encouraged in developing their study notes into short essays or research papers.

## Lecture Topics and Required Readings

Based on the current design, there are five modules on each of theoretical and methodological topics. In addition, there are also introduction and conclusion weeks to prepare students for the subject and to arrange the term paper, respectively. The details are as follows:

### Orientation and Introduction

#### 1. Orientation

Why productivity? A theoretical, methodological, or measurement problem?

How to study it?

#### 2. Introduction (1): Theorizing and Measuring Productivity

Zvi Griliches 1996. The discovery of the residual: A historical note. *Journal of Economic Literature*, vol. 34 (September): 1324–1330

Charles R. Hulten. 2007. “Theory and Measurement: An Essay in Honor of Zvi Griliches”. In Ernst R. Berndt and Charles R. Hulten (eds), *Hard-to-Measure Goods and Services: Essays in Honor of Zvi Griliches*, 15-27. Chicago: University of Chicago Press.

#### 3. Introduction (2): Productivity Change as the Source of Growth

Angus Maddison. 1987. “Growth and Slowdown in Advanced Capitalist Economies: Techniques of Quantitative Assessment”. *Journal of Economic Literature*, XXV, (June): 649-698

Dale W. Jorgenson. 2001. "Information Technology and the US Economy". *American Economic Review*. 91(1): 1-32

## Module 1: The "Solow Residual" in the Neoclassical Growth Theory

### *The background reading:*

Charles R. Hulten. 2001. "Total Factor Productivity: A Short Biography". In *New Directions in Productivity Analysis*, ed. Charles R. Hulten, Edwin R. Dean, and Michael J. Harper, 1–47. Studies in Income and Wealth, vol. 63. Chicago: University of Chicago Press.

### 4. On Hulten's Potential Function Theorem

Charles R. Hulten. 1973. Divisia index numbers. *Econometrica* 41:1017–25.

Robert E. Hall. 1988. The relation between price and marginal cost in U.S. industry. *Journal of Political Economy* 96:921–47.

### 5. On Jorgenson-Griliches's Zero-TFP Hypothesis

Jorgenson, Dale W., and Zvi Griliches. 1967. The explanation of productivity change. *Review of Economic Studies* 34 (July): 349–83.

D. Usher. 1974. "The suitability of the Divisia index for the measurement of economic aggregates". *The Review of Income and Wealth*...

### 6. On Diewert's Exact and Superlative Index Numbers

Laurits R. Christensen, Dale W. Jorgenson, and Lawrence J. Lau. 1973. Transcendental logarithmic production frontiers. *Review of Economics and Statistics* 55 (February): 28–45.

Diewert, W. Erwin. 1976. Exact and superlative index numbers. *Journal of Econometrics*, 4:115–45.

## Module 2: Theorizing the Real Output of Market-Based Economic Activities

### 7. The Measurement of Output, Intermediate Inputs and Value Added

Paul A. David. 1966. "Measuring Real Net Output: A Proposed Index". *The Review of Economics and Statistics*, Vol. 48 (4): 419-425

Paul A. David. 1962. "The Deflation of Value Added", *The Review of Economics and Statistics*, Vol. 44 (2): 148-155.

Christopher A. Sims. 1969. "Theoretical Basis for a Double Deflated Index of Real Value Added." *The Review of Economics and Statistics*, Vol. 51 (4): 470-471

Sato, Kazuo. 1976. "The Meaning and Measurement of the Real Value-Added Index", *The Review of Economics and Statistics*, Vol. 58 (4): 434-442

## 8. On the Systems of Aggregative Index Numbers

Richard Stone and S. J. Prais. 1952. "Systems of Aggregative Index Numbers and Their Compatibility". *The Economic Journal*, Vol. 62 (247): 565-583

Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh. 2005. "The Changing Structure of Output and Intermediate Inputs." [The theoretical and methodological part of Chapter 4](#) in Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh. *Information Technology and the American Growth Resurgence*, Productivity Volume 3, The MIT Press, Cambridge, Massachusetts, London.

## Module 3: The Capital Theory and Capital Input

### 9. The Capital Theory

Dale W. Jorgenson. 1963. "Capital Theory and Investment Behavior". *The American Economic Review*, Vol. 53 (2): 247-259

Dale W. Jorgenson. 1966. The embodiment hypothesis. *Journal of Political Economy* 74 (1): 1-17.

### 10. The Measurement of Capital

Charles R. Hulten. 1990. "The Measurement of Capital". In Ernst R. Berndt and Jack E. Triplett (eds.), *Fifty Years of Economic Measurement*, 119–52. Studies in Income and Wealth, vol. 54. Chicago: University of Chicago Press.

Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh. 2005. "Capital Services and Information Technology". [The theoretical and methodological part of Chapter 5](#) in Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh. *Information Technology and the American Growth Resurgence*, Productivity Volume 3, The MIT Press, Cambridge, Massachusetts, London

## Module 4: The Labor Theory and Labor Input

### 11. Labor Input in the Productivity Theory

Peter T. Chinloy. 1980. "Sources of Quality Change in Labor Input", *American Economic Review* 70 (1), 108-19

Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh. 2005. "Labor Input and the Returns to Education". [The theoretical and methodological part of Chapter 6](#) in Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh. *Information Technology and the*

*American Growth Resurgence*, Productivity Volume 3, The MIT Press, Cambridge, Massachusetts, London

## 12. Human Capital vs. Physical Capital: Need for A Consistent Theory?

D. W. Jorgenson and B. M. Fraumeni. 1989. "The Accumulation of Human and Non-Human Capital, 1948-1984," in R. Lipsey and H. Tice eds., *The Measurement of Saving, Investment and Wealth*, Chicago, University of Chicago Press, NBER, pp. 227-282

Barbara M. Fraumeni, Michael S. Christian, and Jon D. Samuels. 2015. *The Accumulation of Human and Nonhuman Capital, Revisited*. NBER Working Paper No. 21284

## 13. Can Education Be the Best Proxy for Human Capital?

Robert Barro & J. Lee. 2013. "A New Data Set of Educational Attainment in the World, 1950-2010," *Journal of Development Economics*. 104 (C): 184-198

## Module 5: The APPF vs. APF Models in Growth Accounting

### 14. The Jorgensonian APPF Model with Domar Aggregation, and the Case of China

Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh. 2005. "The Industry Origins of the American Growth Resurgence". [The theoretical and methodological part of Chapter 8](#) in Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh. *Information Technology and the American Growth Resurgence*, Productivity Volume 3, The MIT Press, Cambridge, Massachusetts, London

### 15. What Do We Need to Substantiate the Jorgensonian APPF against APF?

Preparing for the China Case ...

## Conclusion with Further Challenges

Challenging questions raised by students and in-class discussions

Arrangement for the term paper.

## Basic and Extended Reference Books

There is no standard textbook for this course. As introduced below, a book by Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh (2005) on the measurement of the contribution of information and communication technologies in productivity growth is used as the basic reference book because of its nearly full coverage of the major issues in productivity measurement that well serve the objectives of the course. Besides, three NBER volumes of

Studies in Income and Wealth are used as extended reference books to expose students to more topics in economic measurement.

### *Basic Reference*

Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh. 2005. *Information Technology and the American Growth Resurgence*, Productivity Volume 3, The MIT Press, Cambridge, Massachusetts, London.

### *Extended References*

Dale W. Jorgenson, Frank Gollop, and Barbara Fraumeni. 1987. *Productivity and U.S. Economic Growth*, Harvard University Press, Cambridge, MA

Ernst R. Berndt and Jack E. Triplett. 1990. *Fifty Years of Economic Measurement: The Jubilee of the Conference on Research in Income and Wealth*. National Bureau of Economic Research, Studies in Income and Wealth Vol. 54. Chicago and London, The University of Chicago Press.

Charles R. Hulten, Edwin R. Dean, and Michael J. Harper. 2001. *New Development in Productivity Analysis*. National Bureau of Economic Research, Studies in Income and Wealth Vol. 63. Chicago and London, The University of Chicago Press.

Dale W. Jorgenson, J. Steven Laudefeld, and William D. Nordhaus. 2006. *A New Architecture for the U.S. National Accounts*. National Bureau of Economic Research, Studies in Income and Wealth Vol. 66. Chicago and London, The University of Chicago Press.