

Economics 594: Applied Economics
Course Outline: March 28, 2021.

Summer 2021

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Lectures will be online; Time: 10-11:45 am for all days scheduled below.

The goal of the course is to acquaint students with a variety of useful tools used in applied economics. There are three main models used in economics:

- Consumers maximizing a utility function subject to a budget constraint;
- Producers minimizing cost subject to a production function constraint and
- Producers maximizing profits subject to a production function constraint.

Solutions to these optimization problems generate systems of consumer demand equations and systems of producer supply and demand equations. These systems of supply and demand equations are used as building blocks in a wide variety of general equilibrium models and macroeconomic models that are based on microeconomic theory. These empirically based models are then used for a wide variety of policy purposes. But how exactly can these derived demand and supply equations be estimated using econometric techniques? And how exactly should we determine the functional forms for these supply and demand equations? Answering these questions will be a large part of the course. In order to answer many policy questions, it is necessary to have accurate estimates of elasticities of supply and demand. But the most widely used functional forms for utility and production functions (Leontief, Cobb-Douglas and Constant Elasticity of Substitution or CES) restrict all elasticities of substitution between any pair of commodities to be the same, and so accurate elasticities cannot be estimated using these functional forms. Thus we will study various *flexible functional forms*, which allow for an arbitrary pattern of elasticities (consistent with economic theory). It turns out that deriving estimating equations that are linear in the unknown parameters which characterize the flexible functional forms is easy if we make use of *duality theory* and so we will spend some time on this topic as well.

Real life consumers and producers consume and produce thousands of products. But our macroeconomic models generally involve only a small number of commodity classes (often only $C+I+G+X-M$ and L,K). How exactly are the millions of commodities in an economy aggregated up into 10 or so commodity groups? How to do this aggregation is the subject matter of *index number theory*. As an applied economist, you will eventually have to aggregate up some disaggregated data to suit some purpose. What index number formula should you choose, and why should you choose it? The course will spend some time addressing these questions.

The source of macroeconomic data in all countries is the *national accounts* of the country. But when we try to use the national accounts data for a country in order to

estimate the welfare of households or the productivity of the economy, we find that there are many problems associated with using national accounts data for these purposes. We will spend some time in the course discussing these accounting problems and how to solve them (at least approximately!). A key measurement problem is associated with the treatment of durable inputs.

A major source of improvements in the standard of living of a country is *productivity growth*; i.e., more output is produced with the same amount of input over time. Each student will pick an OECD country and develop a suitable productivity data base for his or her country. The student will then measure the productivity performance of his or her country using three different techniques for measuring productivity growth:

- Econometric methods (involving the estimation of producer supply and demand equations)
- Index number methods (no econometric estimation is required for this measurement method) and
- Nonparametric methods (based on revealed production analysis, an approach pioneered by Farrell and Afriat and widely used in business applications). This method requires a knowledge of linear programming and so the theory associated with linear programs will be presented. These nonparametric methods are called benchmarking methods in the regulatory literature.

It turns out that all three methods will generate similar results, which is somewhat reassuring. It should be noted that regulators are very interested in measuring the productivity performance of the firms that they are regulating. Thus a knowledge of how to measure productivity is useful for gaining employment as a consultant, either for the regulator or for the regulated firms.

In general, this course should equip you for employment as an applied economist working for a consulting firm, a regulatory body or a government department concerned with measuring economic performance (such as the finance department or the central bank) or with the national statistical agency. The material in this course will also be useful in applying to international agencies that have a measurement focus, such as the OECD, the IMF, the World Bank, Eurostat or the Asian Development Bank.

A more detailed course outline follows.

The main topics to be covered are:

- How to aggregate price and quantity series into aggregates
- Problems with national accounting data
- The measurement of productivity
- The measurement of capital and income
- Estimation of elasticities of demand and supply using flexible functional forms
- The construction of small macro models based on microeconomic theory
- Benchmarking and the nonparametric approach to efficiency analysis.

Each student will pick an OECD country (or an Asian country covered by the Asian Productivity Organization, APO), collect data for it, estimate systems of supply and demand equations for it, compute its productivity performance over the 60 years 1960-2020 (for the more recent OECD countries, the data will start later and for APO countries, the data start at 1970) and present a 15 to 20 minute talk to the class on his or her country's performance. By listening to the other student's presentations, one can obtain a very good idea of how the various OECD and Asian countries grew over the past 50 or so years. Lecture notes and computer programs will be distributed. However, the computer programs will require a considerable amount of editing on the part of the student. (I will choose Canada as my country and do the computations for Canada). Problem sets will be assigned after most classes and they will be due at the start of the following class. Please note: if you do not hand in the work on time, you will get no credit for the homework. Hence if you plan to miss classes, you should make some arrangement to get the homework handed in. Note also that each student must work independently; joint work is not allowed.

Distribution of grades

Homework	50%	
Classroom presentation		10%
Final paper	40%	

The class will meet on a variety of days (see the schedule below) 10:00-11:45 AM. A schedule of classes follows. **Please note that there are 2 introductory chapters on inequalities and concave and convex functions which students should read beforehand.** This material is posted as Chapters 1 and 2 on my website: go to:

<https://economics.ubc.ca/faculty-and-staff/w-erwin-diewert/>

and then go to the Teaching Tab, Economics 594, and you will find the lecture notes for the course there.

I will expect all students to have read these basic mathematics chapters before the start of classes.

Wednesday May 5: Duality theory 1

Thursday May 6: Duality theory 2

Friday May 7: Duality theory 3

Monday May 10: Collection of data for an OECD or APO country

Tuesday May 11: Index number theory 1

Thursday May 13: Index number theory 2

Friday May 14: Index number theory 3

Monday May 17 Productivity measurement and growth theory 1

Tuesday May 18: Productivity measurement and growth theory 2

Thursday May 20: The measurement of capital and income 1

Friday May 21: The measurement of capital and income 2

Tuesday May 25: Data construction 1

Wednesday May 26: Data construction 2

Thursday May 27: Data construction 3

Tuesday June 1: Flexible functional forms 1

Wednesday June 2: Flexible functional forms 2

Thursday June 3: Flexible functional forms 3

Tuesday June 8: Producer computer programs 1

Wednesday June 9: Producer computer programs 2

Thursday June 10: Consumer computer programs 1

Tuesday June 15: Consumer computer programs 2

Wednesday June 16: Linear programming 1

Thursday June 17: Linear programming 2

Tuesday June 22: Linear programming 3

Wednesday June 23: Benchmarking and the nonparametric measurement of efficiency 1

Thursday June 24: Benchmarking and the nonparametric measurement of efficiency 2

Monday-Wednesday June 28-30: Question periods

Wednesday-Thursday July 7-8: Early class presentations

Monday-Friday July 12-16: Later class presentations

Note: Students will be able to choose the date of their class presentation (unless too many students choose the same day).

For your final paper, you need only write up your class presentation into a more polished paper. This paper is due on Thursday August 19, 1 pm via email. Your final paper should be emailed to me as a pdf file. Please ask me to confirm receipt of your paper.