

**Syllabus**  
**Duke University**  
**Economics 567.**  
**Computer Modeling for Economic Policy Analysis**  
**Professor Ed Tower**  
**Tuesday Thursday 10:05am-11:20am.**  
**Room 113, Social Sciences**  
**Spring 2013**

Email: [Tower@econ.duke.edu](mailto:Tower@econ.duke.edu)

Phones: (919) 660-1818, cell (919) 332-2264. Office hours are right after class and right before class Tuesday and Thursday 930-10am and 1120-1200am in Room 227A and by appointment.

**Please bring your laptop to class, so you can duplicate during class what I do.**

Your teaching assistant is Tevy Chewwa.

Her email is [tc130@duke.edu](mailto:tc130@duke.edu). She took the class last spring. She will have o

This is a draft of the syllabus. I will email you updates from time to time.

**Introduction to the use of computer techniques in economic policy evaluation; policy applications to**

- **international economics,**
- **public finance,**
- **development economics,**
- **economic growth, and**
- **environmental economics**

**computer analysis of linearized and nonlinear models using Excel and GAMS. Students required to complete a series of modeling exercises, leading up to two major modeling projects. Prerequisites: intermediate micro and macroeconomics.**

This course is a blend of intuition, graphical analysis, and computer modeling. I don't understand an economic issue until I can explain it intuitively, see it work out in a graph, and build a computer model where I combine all the equations to see how economic forces work out. This is a skill that I teach in this course.

I have taught this course at Duke; The University of Zagreb in Croatia; the University of Auckland in New Zealand, The Economics Institute in Boulder Colorado, Chulalongkorn University in Bangkok, and to government economists in Kuala Lumpur, Malaysia. Here is the structure of the course.

First we discuss the strategy of economic modeling. How does one find an interesting problem, select the appropriate degree of complexity, and select the tools to analyze the problem?

My expertise is primarily in international economics, so I will draw many examples from that area. I will show you how I built a series of models to deal with some simple macro

issues and lots of international trade issues. Your task is to do something similar in your area of choice. For example, you might want to start by illustrating important ideas in labor economics, or taxation, or macro, or other issues in international trade and international finance that I have not explored.

We see:

- How does the effect of money supply changes depend on whether wages are sticky or flexible?
- How does the international sector work under fixed and flexible exchange rates? Do tariff cuts cause unemployment? Does immigration lower wages? Does international trade shrink real US wages?
- How does tax policy affect economic growth?

We demonstrate some important theorems such as, why an income tax is better than a consumption tax that covers only some goods, some theorems in international trade regarding income distribution, economic growth and the pattern of trade.

We examine some examples of computer modeling from the United Nations, the U.S. International Trade Commission, and leading scholars. All of these use computer modeling to calculate the costs and benefits of alternative policies.

Students will complete weekly assignments. Sometimes these will be essays. More frequently, they will be modeling exercises, starting with toy models. These are very simple models designed to illustrate principles of economics and model building. Then we gradually add complexity to get a richer picture of the economy.

Students will use Microsoft Excel to build models and calculate the effects of economic policies, such as changing exchange rates, money supplies and tariffs as well as allowing immigration and emigration and economic growth. Students will also use the General Algebraic Modeling System, GAMS to determine the effects large changes in economic policy and to solve for optimal systems of taxation. Microsoft Excel uses matrix algebra to solve for the effects of small changes in circumstances on the economy. It is easy to understand. GAMS solves for optimum policies subject to a set of non-linear equations. Thus it is generally the tool of choice for economic modelers.

Modeling by yourself is lonely. Working with someone else means that you can both share in the joy of figuring things out and reduce the frustration by having another eye look at the problems that pop up.

Each week you will build a model. You will give a presentation with your teammate on one capstone project half way through the term and another capstone project at the end of the term. These projects will be on issues of interest to you and your partner.

I will compile your modeling exercises into a mini-text on examples of computer modeling. I will post these on my web page if you give me permission to do so, so students in future years can see what you did.

Grading will be based on

Homework weekly (generally done with a partner) to be emailed to Tevy Chewwa	20%
Model using Microsoft Excel, Due February 21, 2013	20%
Model using GAMS, Due Tuesday April 16, 2013	20%
Midterm exam Thursday March 1, 2013	20%
Final Exam Wednesday May 1, 2013 7-10pm.	20%

### [Major textbook](#)

John Gilbert and I just finished writing a textbook on CGE modeling which is due to be published in January 2013, just in time for the course. Here is its description.

### **Introduction to Numerical Simulation for Trade Theory and Policy**

By (author): **John Gilbert** (*Utah State University, USA*), By (author): **Edward Tower** (*Duke University, USA*)

# Introduction to Numerical Simulation for Trade Theory and Policy

John Gilbert  
Edward Toyer



 World Scientific

This volume provides a practical guide to building and using simulation models for international trade theory and policy. Through a sequence of carefully constructed and fully documented programs, the volume illustrates how numerical simulation can be used to analyze a wide array of problems. Modern computable general equilibrium (CGE) models for trade policy are challenging in their complexity, but can be thought of as constructions of much simpler building blocks. By developing the building blocks in a consistent manner, and gradually putting them together in more complex and interesting ways, the volume makes CGE accessible to anyone with a background in microeconomics/trade theory. The volume will be useful to graduate students and researchers in international trade looking

for a detailed guide to building simulation models and to developing the skill set necessary to enter into the world of CGE modeling.

**Contents of the book:**

- - Introduction
  - Getting Started With GAMS
- ***Theory of Consumption, Production and Trade:***
  - Utility Maximization
  - Cost Minimization
  - Long-Run Production
  - Short-Run Production
  - Dual Approach
  - Transition
  - Higher Dimensions
  - Intermediate Inputs
  - Autarky
  - Small Country Trading Equilibrium
  - Non-traded Goods
  - Large Country Trading Equilibrium
  - Two Country Trading Equilibrium
  - Higher Dimensions and Trade
  - Reciprocal Dumping
  - Monopolistic Competition
- ***Commercial Policy and Distortions:***
  - - Tariffs and Other Trade Interventions
    - Domestic Taxes and Subsidies
    - Factor Market Distortions
- ***Computable General Equilibrium:***
  - - Multiple Households and Other Sources of Demand
    - Armington Preferences
    - Joint Production
    - Social Accounting Matrices
    - Closure
    - Single Country Competitive CGE
    - Concluding Comments

**Readership:** Graduate students and researchers in international trade theory and policy.

I have not ordered textbooks for this course, other than the book above. That is because you do much better to order books from Amazon. All books are also on reserve in Perkins.

Optional texts:

*Economical Writing*, Diedre McCloskey. Waveland Press, 2000, \$11.90 from Amazon. I start with this book, because I expect you to write well in this course. This book is a breezy and clever introduction to how to write well in economics.

[World Trade and Payments: An Introduction \(10th Edition, International Edition\)](#) by [Richard E. Caves](#), Jeffrey A. Frankel and Ronald W. Jones (2007) ([5 customer reviews](#))

<b>Formats</b>	<b>Price</b>	<b>New</b>	<b>Used</b>
<b>Paperback</b>		\$124.99	\$73.88
<b>Hardcover</b>		\$24.00	\$1.81

Older editions are available from Amazon for as little as one cent plus 3.99\$ shipping. The older editions will work quite well. I mainly use the mathematical appendixes and those do not change much from edition to edition. These new editions are mainly a rip off. The major ideas in international economics do not change much from year to year. To the used prices add \$3.99 for shipping. I use this book in part because Kent Kimbrough uses it in his international monetary economics course, and I do not want you to buy too many books.

Douglas A. Irwin, *Free Trade Under Fire*, Princeton University Press. Third Edition, 2009. \$16 (including shipping) from Amazon used.

R. T. Roberts, *The Choice: A Fable of Free Trade and Protectionism*, Paperback 2006. Older editions are \$7.50 used from Amazon including shipping. No significant difference between the old and the new.

W. M. Corden, *Trade Policy and Economic Welfare*, second edition, Oxford University Press, 1997. \$17.25 including shipping used from Amazon.

I love the Corden book, but others may not be as fond of it as I am.

#### Structure of the course

- The logic of computable general equilibrium modeling. (Tower and Loo paper)
- The simple macroeconomic model: the hat calculus, matrix algebra, endogenous versus exogenous variables. (three classes)
- Macroeconomic modeling. Macroeconomic policy with flexible wages, sticky nominal wages and sticky real wages (two classes)
- Simple growth models: Tobin and Solow. Long run equilibrium analysis. (one class)
- Macroeconomic modeling in an open economy. Adjustment under fixed and flexible exchange rates. Flexible wages, sticky nominal wages, sticky real wages, all with no capital mobility. (one class).
- Macroeconomic modeling in an open economy. Adjustment under fixed and flexible exchange rates with varying degrees of capital mobility. (one class).
- The effects of import tariffs under fixed and flexible exchange rates, with sticky and flexible prices (one class).
- Inflation, the welfare cost of inflationary finance and steady state equilibrium. (one class)

- The small country endowment model: Tariffs and the Lerner Symmetry Theorem under fixed and flexible exchange rates (one class).
- On the symmetry between an import tariff and a production subsidy combined with a consumption tax (one class).
- The terms of trade effect in an endowment model (tariffs for a large country) (one class).
- The magical spreadsheet of John Gilbert for the 2 factor model.
- The Rybczanski effect (one class)
- The Stolper-Samuelson Theorem (two classes)
- The Specific Factors Problem, tariffs, migration and capital flows (two classes).
- John Gilbert's magical spreadsheet for the specific factors model. (one class)
- The transfer problem, with a flexible real wage, an inflexible real wage (one class)
- Immizerizing growth (one class)
- Input output analysis and the economic effects of disarmament (one class)
- Macroeconomic Consequences of Farm Support Policies  
<http://www.thecie.com.au/publications.asp> (two classes)
- Shadow Prices: Tower and Han on Sudan (one class)
- A series of international trade problems (Tower's University of Auckland Series of problems) (several classes)