ECONOMICS

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http://economics.yale.edu
M.A., M.Phil., Ph.D.

Chair
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FIELDS OF STUDY
Fields include economic theory, including microeconomics, macroeconomics, mathematical economics; econometrics; economic history; labor economics; industrial organization; financial economics; behavioral finance; public economics; public finance; international trade; international finance; economic development; behavioral economics; law and economics.

SPECIAL ADMISSIONS REQUIREMENTS
Please see http://economics.yale.edu/graduate/application-info.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Exceptions to the requirements described below may be obtained only by vote of the Economics faculty and will be granted only in recognition of extenuating circumstances.

Prior to Registration for the Second Year

(1.1) Students must have taken for credit and passed at least six economics graduate courses. (Courses in the International and Development Economics master's program do not satisfy this requirement.) (1.2) Students must pass written comprehensive examinations in microeconomics and macroeconomics. These are given in May and late August each year. One or both may be taken in the August just prior to the first year of study with permission of the director of graduate studies (DGS). Examinations not passed prior to the first year of study must be taken in the spring term of the first year. In the event of failure, the failed exam must be retaken the next time it is offered. Students may take each comprehensive exam no more than two times. Students who have not passed both examinations prior to the second year of study may register as master’s candidates for the following fall term for the purpose of completing enough courses to be eligible for the M.A. degree. The microeconomics and macroeconomics comprehensive exams will be given on two different days for at least three hours. The examinations scheduled in the spring term will occur approximately a week after the end of course exams. The questions on the comprehensive exams will be on topics taught in the first-year microeconomic and macroeconomic courses of the immediately preceding year. Each exam will be graded separately. In the event of failure, students will retake the only exam they did not pass. Comprehensive exams taken by students prior to their first year will be graded as a pass only if they are a “solid” pass rather than a “minimal” pass.

Students considering a combined degree with Economics and another department or program should consult the Economics department website: https://economics.yale.edu/graduate/combined-doctoral-degrees. The proposal for a combined degree should be submitted during the summer after the first year of study.

Prior to Registration for the Third Year

(2.1) Students must have met the Graduate School’s requirement of Honors in two courses. (2.2) Students must have taken at least fourteen term courses in economics and have received a grade of at least a P- in each of them. With the permission of the DGS, courses in related fields and independent reading courses can be used to fulfill this requirement. Workshops may not be used to satisfy it. (2.3) Students must have received an average of at least HP in the courses they have taken. The admissibility of courses for this requirement is the same as for the fourteen-course requirement. (2.4) Grades within the Economics department include pluses and minuses. The grade average is computed as follows. A failure counts as a zero, a P- as a 1, a P as a 2, a P+ as a 3, an HP- as a 4, and so on up to a 9 for an H+. 
The Economic department wishes to encourage collaborative research among students and between students and faculty, a dissertation should be completed in one or other of the workshops that they regularly attend. (4) Third-year students who have not yet satisfied the econometrics paper requirement must receive a grade of Satisfactory on an applied econometrics paper, which is evaluated by a faculty adviser of the paper and another faculty member. In the paper, the student should (a) specify an economic model useful for the investigation of an interesting economic problem, (b) select data and econometric methods appropriate to the question, (c) conduct proper statistical analysis, and (d) interpret the results in an intelligent way. The department’s posted description of the Applied Econometrics Paper Requirement should answer any questions about it. The paper may be written in the course ECON 556 or independently with the help of a faculty adviser, the standards for a satisfactory paper being the same in both cases. The paper is not expected to be of publishable or nearly publishable quality, but should demonstrate facility in the application of econometric methods to an economic question. Note: Jointly authored papers will not be accepted. (3.4) Students must complete with a grade of at least HP- a term of economic history, drawn from a list of courses approved by the DGS and the economic history instructors. (3.5) Students must pass two oral qualifying examinations given by committees of faculty members. These exams are discussed under (2.5) above.

Additional Requirements

(1) All students must give a dissertation prospectus to their advisory committee by the second Friday in May of their third year. (2) Students must provide the names of their advisory committee to the DGS’s office by February 1 of the third year. (3) In each academic year after the second, all students must regularly attend at least two workshops. At least one of them must be an “informal” prospectus workshop lunch or reading group, and at least one must be a “formal” research workshop. Each student must present at least once a year in one or other of the workshops that they regularly attend. (4) Third-year students who have not yet satisfied the econometrics paper requirement must submit an econometrics paper by February 1.

The Dissertation

The dissertation should make an original contribution to economics that demonstrates the student’s mastery of relevant resources and methods. Although the dissertation may cover several related topics, it should have a unifying theme. The dissertation may consist of one or more than one essay. The dissertation is guided by a committee of two advisers, at least one of whom must be a member of the Economics department. The second adviser need not be from the Economics department or even from Yale University. Second advisers from outside the Yale Economics department must be approved by the DGS. The two advisers serve as readers. After the student has completed a first draft of the dissertation, the DGS appoints a third reader. The student and the committee may recommend third readers, but the choice remains with the DGS, since the third reader serves as an independent referee.

Collaborative Work on the Dissertation

The Economic department’s objective regarding collaboration is to achieve a reasonable compromise between two goals. While the department wishes to encourage collaborative research among students and between students and faculty, a dissertation should
demonstrate the student’s ability to do independent research. A substantial part of a dissertation must present work done and written solely by the student. The dissertation committee and the DGS must approve the inclusion of collaborative work in the dissertation, and students must acknowledge and describe any collaboration in the preface to the dissertation.

**Expiration of Admission to Candidacy**

Advancement to candidacy expires ten years after the date it is granted, if no dissertation has been submitted and approved in the intervening period.

**Normal Sequence of Courses**

The following are recommendations, not requirements.

During the fall term of the first year, students usually take ECON 500 (General Economic Theory: Microeconomics), ECON 510 (General Economic Theory: Macroeconomics), and an economic history class that would satisfy the economic history requirement, (3,4) above, if a grade of at least HP- were obtained. In the following spring, they usually take ECON 501 (General Economic Theory: Microeconomics), ECON 511 (General Economic Theory: Macroeconomics), ECON 512 (Advanced Microeconomics), and ECON 550 (Econometrics I), and an advanced course in international trade, or public finance. These courses serve as preparation for the oral qualifying examinations. Students may also take courses related to economics from other departments. It is a good idea to satisfy the econometrics paper requirement in the second year and to locate a faculty adviser to advise them about their studies.

The third year is normally devoted to finding a dissertation topic and to beginning research on it. In this year, students are expected to make the transition from being a taker of classes to a participant in research. Important elements in achieving this transition are thinking critically about material learned, reading widely, choosing research topics that are feasible and of interest to the student, and gaining contact with faculty. Students can expect to take the initiative in making such contact.

**MASTER’S DEGREES**

**MPhil.** The MPhil. degree is awarded to students in the Ph.D. program upon completion of all the requirements for advancement to candidacy for a doctorate in economics except the prospectus and prospectus workshop requirements.

**M.A. (en route to the Ph.D.)** The M.A. degree is awarded upon completion of at least eight term graduate courses listed or cross-listed by the Department of Economics. At least six of these courses must be Ph.D. courses in the Department of Economics (not courses from the International and Development Economics master’s program). The average grade of all the graduate courses taken that are listed or cross-listed by the Department of Economics must be at least a High Pass, and at least two of these grades must be an Honors. Students must complete at least two of the three first-year two-course sequences in microeconomics, macroeconomics, or econometrics. In computing the grade average, the relevant grades are those reported to the registrar and so do not include pluses or minuses. A Fail counts as a zero, a Pass counts as a 1, a High Pass counts as a 2, and an Honors counts as a 3. To say that the average grade must be High Pass means that the arithmetic average of these numbers must be at least 2.

Students in doctoral programs other than Economics may earn an M.A. in Economics under the conditions listed in the previous paragraph. Such students automatically earn an M.A. in their own department when awarded a Ph.D., and Yale allows students to earn only one M.A. degree. Consequently, students must apply to have the M.A. in their own department replaced by the Economics M.A. This application must be made to the DGS of Economics and to the DGS of the student’s own department. Prior to this application, the student must have taken the first one-term course in at least one of the three first-year two-course sequences in microeconomics, macroeconomics, or econometrics and obtained a grade of at least High Pass. As part of the application, the student must submit a proposed list of economics courses, and this list must be approved by the two DGSs and by the appropriate dean of the Graduate School. The DGS of Economics must approve any deviation from this list, and this approval should be obtained before taking courses not on the list.

**Terminal Master’s Degree Program** Students working toward a J.D. in the Law School may earn an M.A. degree in Economics. The degree requirements that apply to these students are the same as those described above for the M.A. degree en route to Ph.D. for students in doctoral programs other than Economics. Students wishing to join this J.D./M.A. joint-degree program must apply for separate admission to the Economics graduate program. Students admitted to this program pay three years of tuition to the Law School and one year of tuition to the Graduate School. The Graduate School does not offer fellowship support to J.D./M.A. candidates.

The M.A. in International and Development Economics is described under International and Development Economics.
COURSES

ECON 500a and ECON 501b, General Economic Theory: Microeconomics  Truman Bewley and Larry Samuelson
Introduction to optimization methods and partial equilibrium. Theories of utility and consumer behavior production and firm behavior. Introduction to uncertainty and the economics of information, and to noncompetitive market structures.

ECON 510a and ECON 511b, General Economic Theory: Macroeconomics  Michael Peters and Fabrizio Zilibotti
Analysis of short-run determination of aggregate employment, income, prices, and interest rates in closed and open economies. Stabilization policies.

ECON 520a, Advanced Microeconomic Theory I  Larry Samuelson
A formal introduction to game theory and information economics. Alternative non-cooperative solution concepts are studied and applied to problems in oligopoly, bargaining, auctions, strategic social choice, and repeated games.

ECON 521b, Advanced Microeconomic Theory II  Marina Halac and Juuso Valimaki
Contracts and the economics of organization. Topics may include dynamic contracts (both explicit and implicit), career concerns, hierarchies, Bayesian mechanism design, renegotiation, and corporate control.

ECON 522a and ECON 523b, Microeconomic Theory Lunch  Staff
A forum for advanced students to critically examine recent papers in the literature and present their own work.

ECON 524a, Advanced Macroeconomics I  Giuseppe Moscarini and Ilse Lindenlaub
Heterogeneous agent economics, investment, scrapping and firing, nonquadratic adjustment costs, financial constraints, financial intermediation, psychology of decision making under risk, optimal risk management, financial markets, consumption behavior, monetary policy, term structure of interest rates.

ECON 525a, Advanced Macroeconomics II  Michael Peters and Anthony Smith
Macroeconomic equilibrium in the presence of uninsurable labor income risk. Implications for savings, asset prices, unemployment.

ECON 530a, General Equilibrium Foundations of Finance and Macroeconomics  John Geanakoplos
The course gives a careful mathematical description of the general equilibrium underpinnings of the main models of finance and the new macroeconomics of collateral and default. Part I is a review of Walrasian general equilibrium, including the mathematical techniques of fixed points and genericity, both taught from an elementary point of view. Part II covers general equilibrium with incomplete markets (GEI). Part III covers extensions to the capital asset pricing model (CAPM), including non-quadratic CAPM and multi-factor CAPM. Part IV focuses on the Modigliani-Miller theorem and generic constrained inefficiency. Part V describes collateral equilibrium and the leverage cycle. Part VI covers default and punishment and adverse selection and moral hazard in general equilibrium. Part VII describes monetary equilibrium.

ECON 531b, Mathematical Economics II  Nicolas Werquin
This course examines the foundations of money and finance from the perspective of general equilibrium with incomplete markets. The relevant mathematical tools from elementary stochastic processes to differential topology are developed in the course. Topics include asset pricing, variations of the capital asset pricing model, the “Hahn paradox” on the value of flat money, default and bankruptcy, collateral equilibrium, market crashes, adverse selection and moral hazard with perfect competition, credit card equilibrium, and general equilibrium with asymmetric information.

ECON 537a, Microeconomic Theory Workshop  Staff
Presentations by research scholars and participating students.

ECON 540a, Student Workshop in Macroeconomics  Staff
A course that gives third- and fourth-year students doing research in macroeconomics an opportunity to prepare their prospectuses and to present their dissertation work. Each student is required to make at least two presentations per term. For third-year students and beyond, at least one of the presentations in the first term should be a mock job talk.

ECON 542a, Macroeconomics Workshop  Staff
A forum for presentation and discussion of state-of-the-art research in macroeconomics. Presentations by research scholars and participating students of papers in closed economy and open economy macroeconomics and monetary economics.

ECON 545a, Microeconomics  Michael Boozer
A survey of the main features of current economic analysis and of the application of the theory to a number of important economic questions, covering microeconomics and demand theory, the theory of the firm, and market structures. For IDE students.

ECON 546a, Growth and Macroeconomics  Fabrizio Zilibotti
This course presents a basic framework to understand macroeconomic behavior and the effects of macroeconomic policies. Topics include consumption and investment, labor market, short-run income determinations, unemployment, inflation, growth, and the effects of monetary and fiscal policies. The emphasis is on the relation between the underlying assumptions of macroeconomic framework and policy implications derived from it.

ECON 550a, Econometrics I  Donald Andrews
Probability: concepts and axiomatic development. Data: tools of descriptive statistics and data reduction. Random variables and probability distributions; univariate distributions (continuous and discrete); multivariate distributions; functions of random variables
and transformations; the notion of statistical inference; sampling concepts and distributions; asymptotic theory; point and interval estimation; hypothesis testing.

**ECON 551b, Econometrics II** Staff
Provides a basic knowledge of econometric theory, and an ability to carry out empirical work in economics. Topics include linear regression and extensions, including regression diagnostics, generalized least squares, statistical inference, dynamic models, instrumental variables and maximum likelihood procedures, simultaneous equations, nonlinear and qualitative-choice models. Examples from cross-section, time series, and panel data applications.

**ECON 552b, Econometrics III** Xiaohong Chen
The treatment of the subject is rigorous, attentive to modern developments, and proceeds to research level in several areas. Linear models from core curriculum. Topics include linear estimation theory, multiple and multivariate regressions, Kruskal's theorem and its applications, classical statistical testing by likelihood ratio, Lagrange multiplier and Wald procedures, bootstrap methods, specification tests, Stein-like estimation, instrumental variables, and an introduction to inferential methods in simultaneous stochastic equations.

**ECON 553a, Econometrics IV: Time Series Econometrics** Myung Seo
A sequel to ECON 552, the course proceeds to research level in time series econometrics. Topics include an introduction to ergodic theory, Wold decomposition, spectral theory, martingales, martingale convergence theory, mixing processes, strong laws, and central limit theory for weak dependent sequences with applications to econometric models and model determination.

**ECON 556a, Topics in Empirical Economics and Public Policy** Yuichi Kitamura, Edward Vytlacil, and Yusuke Narita
Methods and approaches to empirical economic analysis are reviewed, illustrated, and discussed with reference to specific empirical studies. The emphasis is on learning to use methods and on understanding how specific empirical questions determine the empirical approach to be used. We review a broad range of approaches including program evaluation methods and structural modeling, including estimation approaches, computational issues, and problems with inference. Open only to doctoral students in the Department of Economics. Exceptionally, doctoral students from other departments may take the course for credit if a faculty member, normally from their department, can supervise and grade their term paper.

**ECON 558a, Econometrics** Michael Boozer
Application of statistical analysis to economic data. Basic probability theory, linear regression, specification and estimation of economic models, time series analysis, and forecasting. The computer is used. For IDE students.

**ECON 559b, Development Econometrics (IDE)** Michael Boozer

**ECON 561b, Computational Methods in Economics** Anthony Smith
How to use computational methods to solve and analyze dynamic economic models. The first part of the course covers standard tools of numerical analysis that are useful in economics (minimization of functions, root-finding, interpolation, approximation of functions, integration, simulation). The second shows how to use these tools to study dynamic economic problems in macroeconomics, finance, labor economics, public finance, and industrial organization, paying special attention to methods for solving stochastic dynamic programming problems and for computing equilibria in economic models with heterogeneous actors.

**ECON 567a and ECON 568a, Econometrics Workshop** Donald Andrews
A forum for state-of-the-art research in econometrics. Its primary purpose is to disseminate the results and the technical machinery of ongoing research in theoretical and applied fields.

**ECON 570a and ECON 571b, Prospectus Workshop in Econometrics** Edward Vytlacil
A course for third- and fourth-year students doing research in econometrics to prepare their prospectus and present dissertation work.

**ECON 580a, General Economic History: Western Europe** Timothy Guinnane
A survey of some major events and issues in the economic development of Western Europe during the eighteenth and nineteenth centuries, stressing the causes, nature, and consequences of the industrial revolution in Britain and on the Continent, and the implications of the historical record for modern conceptions of economic growth. Prerequisites: simultaneous enrollment in or successful completion of ECON 500 and ECON 510; permission of the instructor.

**ECON 588a, Economic History Workshop** Staff
A forum for discussion and criticism of research in progress. Presenters include graduate students, Yale faculty, and visitors. Topics concerned with long-run trends in economic organization are suitable for the seminar. Special emphasis given to the use of statistics and of economic theory in historical research.

**ECON 600a, Industrial Organization I** Philip Haile and Mitsuru Igami
Begins by locating the study of industrial organization within the broader research traditions of economics and related social sciences. Alternative theories of decision making, of organizational behavior, and of market evolution are sketched and contrasted with standard neoclassical theories. Detailed examination of the determinants and consequences of industrial market structure.

**ECON 601b, Industrial Organization II** Steven Berry
Examination of alternative modes of public control of economic sectors with primary emphasis on antitrust and public utility regulation in the U.S. economy. Public policy issues in sectors of major detailed governmental involvement.
ECON 606a and ECON 607b, Prospectus Workshop in Industrial Organization Staff
For third-year students in microeconomics, intended to guide students in the early stages of theoretical and empirical dissertation research. Emphasis on regular writing assignments and oral presentations.

ECON 608a, Industrial Organization Seminar Staff
For advanced graduate students in applied microeconomics, serving as a forum for presentation and discussion of work in progress of students, Yale faculty members, and invited speakers.

ECON 630a and ECON 631b, Labor Economics Konstantinos Meghir
Topics include static and dynamic approaches to demand, human capital and wage determination, wage income inequality, unemployment and minimum wages, matching and job turnover, immigration and international trade, unions, implicit contract theory, and efficiency wage hypothesis.

ECON 638a, Labor and Population Workshop Staff
A forum primarily for graduate students to present their research plans and findings. Discussions encompass empirical microeconomic research relating to both high- and low-income countries.

ECON 640a or b, Prospectus Workshop in Labor Economics and Public Finance Staff
Workshop for students doing research in labor economics and public finance.

ECON 670a / MGMT 740a, Financial Economics I Jonathan Ingersoll and Stefano Giglio
Current issues in theoretical financial economics are addressed through the study of current papers. Focuses on the development of the problem-solving skills essential for research in this area.

ECON 675a, Models of Operations Research and Management Vahideh Manshadi
The course exposes students to main stochastic modeling methods and solution concepts used to study problems in operations research and management. The first half of the class covers analysis of queuing models such as Markovian queues, networks of queues, and queues with general arrival or service distributions, as well as approximation techniques such as heavy traffic approximation. The second half focuses on control of stochastic processes; it covers finite and infinite-horizon dynamic programming problems, and special classes such as linear quadratic problems, optimal stopping, and multi-armed bandit problems.

ECON 680a, Public Finance I Cormac O'Dea
Major topics in public finance including externalities, public goods, benefit/cost analysis, fiscal federalism, social insurance, retirement savings, poverty and inequality, taxation, and others. Applications are provided to crime, education, environment and energy, health and health insurance, housing, and other markets and domains. The course covers a variety of applied methods including sufficient statistics, randomized control trials, hedonic models, regression discontinuity, discrete choice, spatial equilibrium, dynamic growth models, differences-in-differences, integrated assessment models, applied general equilibrium, event studies, firm production functions, learning models, general method of moments, and propensity-score reweighting estimators.

ECON 681b, Public Finance II Joseph Shapiro
This course covers social insurance, health care, charitable giving, externalities, crime, and an introduction to political economy. Students are expected to participate actively in class discussion and to write and present a short empirical research paper.

ECON 706a and ECON 707b, Prospectus Workshop in International Economics Staff
This workshop is for third-year and other advanced students in international economic fields. It is intended to guide students in the early stages of dissertation research. The emphasis is on students’ presentation and discussion of material that will eventually lead to the prospectus.

ECON 720a, International Trade I Konstantinos Arkolakis and Giovanni Maggi
The first part of this course covers the basic theory of international trade, from neoclassical theory where trade is the result of comparative advantage (Ricardo, Heckscher-Ohlin) to the “New Trade Theory” where trade is generated by imperfect competition and increasing returns to scale. Particular emphasis is placed on the implications of the different theories concerning the aggregate gains or losses from trade and the distributional implications of trade liberalization. The second part of the course explores new advances in the field. It covers the Eaton-Kortum (2002) and Melitz (2003) models; extensions of these models with many countries, multiproduct firms, and sectors; methods of quantitative trade analysis to revisit classic questions (gains from trade, distributional effects of trade, trade policy); and new advances in dynamic trade theory.

ECON 721b, International Trade II Samuel Kortum and Lorenzo Caliendo
The course covers empirical topics in international trade with particular emphasis on current research areas. Topics include tests of international trade theories; studies of the relationship between international trade, labor markets, and income distribution; recent trade liberalization episodes in developing countries; empirical assessment of various trade policies, such as VERs and Anti-Dumping; productivity (and its relation to international trade liberalization); and exchange rates, market integration, and international trade. Methodologically, the course draws heavily on empirical models used in the fields of industrial organization and to a lesser degree labor economics; taking these courses is thus recommended though not required.
ECON 724a, International Finance  Konstantinos Arkolakis
A study of how consumers and firms are affected by the globalization of the world economy. Topics include trade costs, the current account, exchange rate pass-through, international macroeconomic co-movement, multinational production, and gains from globalization. Prerequisite: intermediate macroeconomics or equivalent.

ECON 728a, Workshop: International Trade  Staff

ECON 730a, Economic Development I  Mark Rosenzweig and Nicholas Ryan
Development theory at both aggregate and sectoral levels; analysis of growth, employment, poverty, and distribution of income in both closed and open developing economy contexts.

ECON 731b, Economic Development II  Staff
Analysis of development experiences since World War II. Planning and policy making across countries and time. Models of development, growth, foreign trade, and investment. Trade, capital, and technology flows and increasing interdependence. The political economy of policy making and policy reform.

ECON 732b, Advanced Economic Development  Michael Boozer
Examines the models of classical and modern economists to explain the transition of developing economies into modern economic growth, as well as their relevance to income distribution, poverty alleviation, and human development.

ECON 737b, Economics of Natural Resources  Robert Mendelsohn
Linking of abstract economic concepts to concrete policy and management decisions. Application of theoretical tools of economics to global warming, pollution control, fisheries, forestry, recreation, and mining.

ECON 750a, Trade and Development Workshop  Staff
A forum for graduate students and faculty with an interest in the economic problems of developing countries. Faculty, students, and a limited number of outside speakers discuss research in progress.

ECON 756a or b, Prospectus Workshop in Development  Staff
Workshop for students doing research in development to present and discuss work.

ECON 790b, Political Economy I  Ebonya Washington
An overview of the field of empirical political economy. While students are expected to familiarize themselves with the most prevalent models in the field, the emphasis in this course is on the applied work. Students attain a working knowledge of the literature, learn to critically evaluate the literature, and most importantly develop the skills to come up with interesting, workable, and theoretically grounded research questions that will push that literature forward.

ECON 794b, International Trade Policy  Giovanni Maggi
Theoretical and empirical research in international trade policy. The course focuses on welfare analysis of trade policies under perfect completion and under oligopoly; the political economy of trade policy; and the economics and political economy of international trade agreements. Prerequisites: ECON 500 and 501.

ECON 899a or b, Individual Reading and Research  Staff
By arrangement with faculty.