

ECONOMICS

Director of undergraduate studies: Giovanni Maggi (giovanni.maggi@yale.edu), 115 Prospect St., Rosenkranz Hall, Room 334; registrar: Qazi Azam, (qazi.azam@yale.edu) Room 101A, 28 Hillhouse Ave., 432-3574; economics.yale.edu/undergraduate-program

Economics is much broader than the study of recessions and inflation or stocks and bonds. Economists study decision making and incentives such as how taxes create incentives for labor market and savings behavior. Many current public policy debates concern questions of economics, including causes and consequences of inequality and gender and racial wage gaps; how to address poverty; the impact of immigration and trade on the well-being of a country's citizens; the cause of the Great Recession; and how to predict future downturns.

Those with economics training find employment in government agencies, nonprofits, and, of course, economic consulting and investment banking. In addition to pursuing advanced degrees in economics, economics majors also go on to do graduate work in law, medicine, and business.

INTRODUCTORY COURSES

Introductory courses in microeconomics, macroeconomics, and data analysis and econometrics serve students considering a major in Economics, as well as others who seek an introduction to the subject. ECON 115 is concerned with microeconomics and includes such topics as markets, prices, production, distribution, and the allocation of resources. ECON 116 covers such macroeconomic issues as unemployment, inflation, growth, and international economics. ECON 117 introduces students to basic aspects of working with data to answer economic questions, as well as to the fundamentals of statistical analysis. ECON 116 and 117 have microeconomics as a prerequisite. Despite the numbering, students may wish to take ECON 117 before or concurrently with ECON 116, as the data skills taught in ECON 117 may be helpful in ECON 116. ECON 115, 116, and 117 are lecture courses with accompanying discussion sections.

First-year students and sophomores looking for smaller, slightly more discussion-oriented versions of introductory microeconomics and macroeconomics may enter a lottery for admission to ECON 110 and 111. Those with little or no experience in calculus may be better served by ECON 108, which covers microeconomics with greater discussion of quantitative methods and examples. ECON 108, 110, and 115 are similar in substance; ECON 111 and 116 are similar in substance as well. A student may receive credit for only one course each in introductory microeconomics and introductory macroeconomics.

The department recommends that students interested in majoring in Economics take at least two introductory economics courses in the first year. In order to make the introductory courses available to all first-year students and to students majoring in other subjects, the introductory courses do not have a mathematics requirement.

PLACEMENT AND EXEMPTIONS FOR INTRODUCTORY COURSES

In the summer before they enter, all first-year students receive, through the University's electronic bulletin board, a personalized recommendation for a first course in economics, based on application data and AP (or equivalent) exam scores. In general, students who receive a score of 5 on the Microeconomics or Macroeconomics AP exam *and* a score of 5 on the AP Calculus BC exam are allowed to place out of the corresponding introductory course and instead enroll in intermediate-level courses (ECON 121 or 125 for microeconomics, ECON 122 or 126 for macroeconomics). Students who have the requisite AP Economics score but not the corresponding AP Calculus score may take calculus (e.g., MATH 112, MATH 115, 116, 118, or 120 or ENAS 151 / APHY 151 / PHYS 151), and then place out of the corresponding introductory economics course. Students may substitute a score of 7 on the International Baccalaureate higher-level Economics examination or A on the GCE A-level Economics examination for AP test scores of 5 in economics. In addition, a score of 7 on the International Baccalaureate higher-level Mathematics examination or A on the GCE A-level Mathematics examination may be substituted for a qualifying AP Calculus score.

Placing out of introductory courses does not decrease the number of courses required to complete the economics major. Students must substitute courses from which they place out of with higher-level courses.

Because of its emphasis on data analysis, the department recommends that even students with a background in statistics begin their econometrics and data analysis training with ECON 117.

REQUIREMENTS OF THE MAJOR

Students majoring in Economics are required to take twelve term courses. Two of these courses are introductory microeconomics and introductory macroeconomics. All majors must also take the following courses: one term of intermediate microeconomics (ECON 121 or 125) and one term of intermediate macroeconomics (ECON 122 or 126); a course in data analysis and econometrics, generally ECON 117; and one Yale mathematics course, usually selected from MATH 112, 115, 118, or 120. ENAS 151 may also be used to meet the math requirement. The department recommends that students also take ECON 123, a course in econometrics and data analysis at the intermediate level. All of the aforementioned required courses should be completed prior to the senior year. Students who wish to write a senior essay are also required to complete a second semester of econometrics either before or concurrently with writing the senior essay; at least one of the two econometrics courses should include work in data analysis. All majors must also take two courses numbered ECON 400–491, at least one of which must be taken in the senior year.

Subject to approval by the director of undergraduate studies (DUS), students may count toward the major one course related to economics but taught in another field, in addition to the required course in mathematics.

Mathematics Students are advised to meet the mathematics requirement for the major during their first year. To fulfill the requirement, the department recommends that majors take MATH 118 or 120. Students who place out of these mathematics courses must take a higher-level mathematics course at Yale and should consult the DUS for help choosing a course. Students who intend to pursue a graduate degree in economics should take additional math courses, including linear algebra (MATH 222 or even better, a proof-based course such as MATH 225 or 226) and real analysis (MATH 255 or 256 or 300 or 301).

Data analysis and econometrics Students are strongly advised to take a two-term sequence of data analysis and econometrics courses, especially if they are interested in a research experience on or off campus. The statistical analysis of economic data has become central to the work of economists, and the ability to analyze large data sets is a skill that will serve students in the job market both inside and outside of academia. Most students should take ECON 117, followed by 123. Students with a stronger mathematics background, who prefer a more theoretical treatment of the material or who plan to pursue a graduate degree in economics, are encouraged to take either ECON 135 or S&DS 241 and S&DS 242, followed by ECON 136. (Note: S&DS 241 and 242 together count as one course towards the economics major. Further note that neither ECON 135 nor S&DS 241 and 242 fulfill the major's requirement of one econometrics course as they are courses in probability and statistics that are prerequisites for ECON 136, a course in econometrics. However, either ECON 117 or ECON 123 fulfills the econometrics requirement.) Prospective majors are urged to start their econometrics sequence by the fall of sophomore year.

Intermediate microeconomics and macroeconomics Two course options are available in both microeconomics and macroeconomics. The standard intermediate courses are ECON 121 and 122. Students with a stronger mathematics background who are interested in a more theoretical treatment of the material are encouraged to take ECON 125 and 126 instead. The intermediate courses need not be taken in sequence: in particular, ECON 125 is not required for 126; ECON 121 is not required for 122.

Field courses The department offers a wide selection of upper-level courses that explore in greater detail material presented in introductory courses. Advanced fields of economics include theoretical, quantitative, and mathematical economics; market organization; human resources; finance; international and development economics; public finance; health; labor; inequality; environmental economics; and economic history. Some field courses have no prerequisites or only introductory microeconomics as a prerequisite. Others apply intermediate-level theory or econometrics to economic problems and institutions, and for this reason list one or more of the theory or econometrics courses as prerequisites.

Advanced lecture courses Advanced lecture courses, generally numbered ECON 400–449, are limited-enrollment courses that cover relatively advanced material in more depth than regular field courses. Prerequisites usually include several courses in intermediate microeconomics, intermediate macroeconomics, and econometrics, or a mathematics course such as MATH 120. While these courses vary in approach, they share features of other Economics courses: like field courses, they devote some time to traditional lecturing, and like seminars, they emphasize class interaction, the writing of papers, and the reading of journal articles. Advanced lecture courses may be applied toward the senior requirement.

Seminars Although there is diversity in approaches in the various seminars (courses generally numbered ECON 450–489), all have in common an emphasis on class interaction, the writing of papers, and the reading of journal articles. Seminars represent an opportunity for students to apply and extend the economics they have learned through their earlier coursework. Seminars may be applied toward the senior requirement.

Enrollment in seminars and advanced lecture courses is limited. Senior Economics majors who have not yet completed the senior requirement for the major are given priority for these courses and may enter preference selection before the registration period for these courses; see the department website for instructions. Other majors and nonmajors may enroll in Economics seminars and advanced lecture courses as space permits, but they may not enter preference selection.

Distinction in the Major To be considered for Distinction, students must meet the appropriate grade standards as described in this bulletin under Honors and submit a senior essay to the Economics department. Only those majors who submit a senior essay earning a grade of A or A– are eligible for Distinction. Students who fail to submit an essay will not be considered for Distinction. Grade computation for Distinction does not include the introductory micro- and macroeconomics courses, the required mathematics course, or courses taken outside Yale. Economics courses taken beyond the requirements of the major are counted toward the Distinction calculation.

Credit/D/Fail Courses taken Credit/D/Fail and Residential College Seminars may not be counted toward the requirements of the major.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

Majors are required to take two departmental courses numbered ECON 400–491, at least one of which must be taken in the senior year. The senior requirement must be met by taking Yale Economics courses.

Senior essay There are four types of senior essays: (1) students may write a one-term essay in the fall of the senior year as an independent project on a topic of their own design under the close and regular supervision of a faculty adviser (ECON 491); (2) students

may write a two-term essay starting in the fall and continued into the spring of the senior year as an independent project on a topic of their own design under the close and regular supervision of a faculty adviser (ECON 491 and ECON 492); (3) students may write a one-term essay in an advanced departmental course (numbered 400–489) taken during the fall term of the senior year; or (4) students may write a two-term essay beginning in an advanced departmental course (numbered 400–489) taken during the fall term, and completed in the spring of the senior year as an independent project under the close and regular supervision of a faculty adviser (ECON 492). Under this final option the instructor of the advanced departmental course taken in the fall term typically serves as the faculty adviser for the full academic year.

Note that the essay must be written during the senior year and that students may submit a senior essay only if they have an approved prospectus and a senior essay adviser. Late essays will not be accepted without a dean's note.

Students are required to complete a second semester of econometrics either before or concurrently with writing the senior essay; at least one of the two econometrics courses should include work in data analysis.

Only those majors who submit a senior essay earning a grade of A or A– are eligible for Distinction in the Major.

Meetings for seniors to discuss the senior essay guidelines and requirements will be held just before the start of the academic year. Time and format are to be announced. Senior essay prospectus forms are due Monday, October 4, 2021. Students who fail to turn in a prospectus with adviser's signature by that date will not be permitted to write a senior essay.

ADVISING

The Economics department has faculty representatives/advisers for each residential college. Students majoring in economics should consult with an economics adviser for their college during course enrollment. Questions concerning the major or programs of study may also be directed to the college representative. College representatives can be found on the department website.

Transfer credits Students who take a term abroad or take summer courses outside of Yale may petition the DUS to count at most two courses from outside Yale toward the requirements of the major. Students who take a year abroad may petition to count at most three courses. Many economics courses taken outside Yale do not meet the requirements of the Economics major; students should consult with the DUS before taking such courses. Courses taken outside of Yale's Economics department may not be counted toward the major requirements in introductory microeconomics, introductory macroeconomics, intermediate microeconomics, intermediate macroeconomics, econometrics, mathematics, or the senior requirement. See the department website section on transferring credits.

Graduate courses Well-qualified students who have acquired the requisite background in undergraduate courses may, with written permission of the instructor, the DUS, and the director of graduate studies, be admitted to graduate courses and seminars. Descriptions of courses are available on the department website.

Students who are planning graduate work in economics should take additional mathematics courses beyond the one-term course required for the major. Many graduate programs in economics require courses in multivariate calculus, linear algebra, and real analysis. Please see the department website on Ph.D. program preparation. Students are urged to discuss their plans for graduate work with the DUS as early in their college careers as possible.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior req)

Distribution of courses 2 introductory classes, one in microeconomics and one in macroeconomics; 3 core courses (intermediate micro ECON 121 or 125, intermediate macro ECON 122 or 126, and a course in data analysis and econometrics); 1 math course; 4 electives (one of which may be a second semester of econometrics)

Substitution permitted 1 related course in another dept, with DUS approval

Senior requirement 2 senior seminar/lectures, numbered ECON 400–491, at least 1 in senior year, as indicated

Economics is much broader than the study of recessions and inflation or stocks and bonds. Economists study decision making and incentives, such as the incentives for a firm to stop polluting and how taxes create incentives for labor market and savings behavior.

Many current public policy debates concern questions of economics. What are the causes and consequences of inequality and gender and racial wage gaps? How should we address poverty? How does immigration or trade impact the well-being of a country's citizens? What caused the Great Recession and how can we predict future downturns? These are some of the questions that economics can help answer.

At Yale, economics is regarded and taught as part of a liberal arts education, not as a preparation for any particular vocation. It can, however, provide a good background for several professions. The economics major strengthens critical reasoning skills and gives students experience manipulating and analyzing data, skills that will serve students well on the job market both inside and outside academia. Recent majors have pursued careers in business, government, and nonprofits. Others have entered law, medical, or business school, or have gone on to graduate work in economics, often after working in related fields for two or three years.

Many Yale students, regardless of what major they later choose, take introductory courses in economics. The department offers introductory courses in microeconomics, macroeconomics, and data analysis and econometrics. Microeconomics examines how individuals, firms, markets, and governments allocate scarce resources; macroeconomics studies growth, unemployment, inflation, and

international economics; data analysis and econometrics teaches students statistical fundamentals and how to manipulate data in order to answer economic questions. Students must take introductory microeconomics before taking either introductory macroeconomics or data analysis and econometrics. Some students may wish to take introductory data analysis and econometrics before or concurrently with introductory macroeconomics, as data skills may be useful in the latter class. The department advises prospective majors to take at least two of these introductory courses in their first year. Students may also wish to explore field courses early in their career at Yale to learn more about the applications of economic theory and tools. The department offers several field courses with only introductory microeconomics as a prerequisite.

Introductory microeconomics is offered in three forms: ECON 115 is a large lecture open to all students; ECON 110 is a smaller course that mixes lecture with discussion and is only open to first-year students and sophomores and ECON 108 is a small course, containing greater discussions of quantitative methods, designed for students who need additional mathematics support. Students may enroll in ECON 108 if they receive a departmental recommendation to do so in the summer prior to their first year. ECON 108, 110 and 115 cover the same material. Students may take only one of the three courses during their time at Yale.

Introductory macroeconomics is offered in two forms: ECON 116 is a large lecture open to all students. ECON 111 is a smaller course that mixes lecture with discussion and is only open to first-year students and sophomores. ECON 111 and 116 cover the same materials. Students may take only one of the two courses during their time at Yale.

Spaces in ECON 108, 110 and 111 are allocated by lottery.

Some students enter Yale with some knowledge of economics from high school. However, in such cases an introductory microeconomics course is often still the best place to start. The level of analysis in these courses greatly exceeds that in most high school courses. Some exceptions do apply.

In the summer before they enter Yale, all first-year students receive, through the University's electronic bulletin board, a personalized recommendation for a first course in economics at Yale based on application data and AP (and equivalent) exam scores.

The department recommends that students with little or no calculus enter the lottery for, and if successful enroll in, ECON 108. Those with a stronger background should enroll in ECON 115 or ECON 110 (if successful in the ECON 110 lottery).

Students who receive a score of 5 on the Microeconomics or Macroeconomics AP exam *and* a score of 5 on the AP Calculus BC exam are allowed to place out of the corresponding introductory course and instead enroll in intermediate-level courses (ECON 121 or ECON 125 for microeconomics, ECON 122 or ECON 126 for macroeconomics). First-year students who have the requisite AP Economics score but not the corresponding AP Calculus score may take calculus (e.g., MATH 115, MATH 118, or MATH 120) and then place out of the corresponding introductory economics course. Students may substitute a score of 7 on the International Baccalaureate higher-level Economics examination or A on the GCE A-level Economics examination for AP test scores of 5 in economics. In addition, a score of 7 on the International Baccalaureate higher-level Mathematics examination or A on the GCE A-level Mathematics examination may be substituted for a qualifying AP Calculus score.

Because of its emphasis on data analysis, the department advises even students with a statistical background to begin their econometrics training with ECON 117.

Students who enroll directly in intermediate-level courses should note that placing out of introductory economics does not reduce the number of courses required for the Economics major. For more detailed information regarding placement in economics courses, visit first-year placement on the department website.

Regardless of their mathematics background, all Economics majors must take one term course in mathematics at Yale. Typically, this requirement is met by taking one term of MATH 112, MATH 115, MATH 116, MATH 118, or MATH 120. Students who place out of these courses must take a higher-level mathematics course at Yale, selected in consultation with the director of undergraduate studies (DUS). Prospective majors are advised to take a mathematics course in the first year.

For more information about the program in Economics, see the department undergraduate website.

FACULTY OF THE DEPARTMENT OF ECONOMICS

Professors Joseph Altonji, Donald Andrews, Costas Arkolakis, Orazio Attanasio, Dirk Bergemann, Steven Berry, Xiaohong Chen, Ray Fair, John Geanakoplos, Pinelopi Goldberg, Timothy Guinnane, Philip Haile, Marina Halac, Johannes Horner, Gerald Jaynes, Yuichi Kitamura, Alvin Klevorick, Samuel Kortum, Naomi Lamoreaux, Giovanni Maggi, Konstantinos Meghir, Giuseppe Moscarini, Kaivan Munshi, William Nordhaus, Gerard Padró i Miquel, Rohini Pande, Benjamin Polak, Mark Rosenzweig, Larry Samuelson, Anna Sanktjohanser, Katja Seim, Robert Shiller, Anthony Smith, Aleh Tsyvinski, Edward Vytlačil, Ebonya Washington, Fabrizio Zilibotti

Associate Professors Mitsuru Igami, Ilse Lindenlaub, Michael Peters, Philipp Strack

Assistant Professors Eduardo Dávila, Jose-Antonio Espin-Sanchez, Mira Frick, Charles Hodgson, John Eric Humphries, Zhen Huo, Ryota Iijima, Yusuke Narita, Cormac O'Dea, Nicholas Ryan, Anna Sanktjohanser

Senior Lecturers Marnix Amand, Michael Boozer, Evangelia Chalioti, William Hawkins, Tolga Koker, Guillermo Noguera, Soenje Reiche, María Saez Martí, Rebecca Toseland

Lecturers Jaime Arellano-Bover, Daniela Morar, Katerina Simons

Introductory Courses Core Courses Environmental Courses History Courses Industrial Organization Courses International Relations Courses Methodology Courses Microtheory Courses Poverty Courses Public Courses Development Courses Education Courses Finance Courses Health Courses Labor Courses Macroeconomics Courses Neuro Courses Political Economy Courses Law Courses