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FEATURES AND INFORMATION



## Undergraduate research in the Dartmouth Economics Department

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### ABSTRACT

One of the key components to the undergraduate research enterprise at Dartmouth is the recognition that learning to do research requires both directed instruction and learning by doing. The economics faculty have tailored a fruitful undergraduate research program based on this philosophy, and this article describes these efforts while also offering advice to other programs as they strive to involve undergraduates in research.

### KEYWORDS

Curriculum; research; undergraduate

### JEL CODE

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The Economics Department at Dartmouth College is unusual in having the research profile of a top-20 graduate institution without having a graduate program.<sup>1</sup> The department has roughly 30 tenure-track faculty. Economics has the largest number of undergraduate majors of any department at Dartmouth. Over the last five years, the department has awarded an average of over 200 BA degrees per year, representing roughly 20 percent of the graduating class. Because there are no graduate students to act as teaching assistants, courses are taught in small sections. Introductory sections are capped at 45, intermediate and field courses at 35, and seminar courses at 15. The majority of the teaching is done by tenure-track faculty, with the balance taught by lecturers and short-term visitors.

The economics major at Dartmouth is structured much like graduate programs in economics. Students must first complete prerequisite courses in calculus, statistics, and introductory microeconomics. Beyond the three prerequisites, all students must take intermediate macroeconomics, intermediate microeconomics, and econometrics.

In addition to the core classes, students choose two fields from macroeconomics, development economics, industrial organization, finance, labor economics, public economics, and international economics. Students take a minimum of two courses each in their two chosen fields. For example, the international economics sequence can be satisfied by taking international trade and international finance.

### The culminating experience

In one of these fields, students are required to complete a seminar course (a “culminating experience” in the Dartmouth vernacular). Depending on the field, culminating experiences have either one or two prerequisite courses. The culminating experience introduces students to current research in their chosen field and engages them in research of their own. In each of our culminating experience courses, students are expected to produce and present a work of original economic research. The papers produced in these classes are similar in content and style to papers published in economics journals.

The major is organized around these seminars in much the same way that graduate programs are organized around the production of a dissertation. Beyond the prerequisite courses, all students in a seminar have the core classes and at least one standard field course in common. Students therefore enter

with the appropriate background to start reading and discussing current research papers in the field. The common preparation makes it easy to facilitate discussions about the key issues in a field.

Through our statistics prerequisite and the econometrics requirement, the students are familiar with basic regressions, fixed effects, instrumental variables, and other techniques commonly seen in research papers. The required econometrics course involves significant hands-on experience with Stata, including at least one project.<sup>2</sup> We expect students in the seminar courses to be able to obtain data and run basic analyses.<sup>3</sup> Throughout the entirety of the term, students present research papers and learn how to conduct their own research.

Typically, these courses require students to write and turn in sections of the paper over the course of the term. This might begin with a project proposal in the first few weeks, followed by an introduction and literature review after discussing the feasibility of the proposed project with the professor. The next step is a data analysis plan, data description, and summary statistics. These milestones help to structure the course and make sure that students are making progress throughout the term. In the last few weeks of the term, students produce results and provide a written summary and analysis. All courses require students to make a final presentation of their work to the class.

Through these seminars, all students with an economics major or minor have had some research experience before graduation. For most students this is the extent of their research exposure, but for some students these seminars can be a jumping off point for more independent research. Most full senior theses begin as a class paper in a senior seminar. If the student is willing and the instructor approves, students can extend and polish their class paper into a full honors thesis as an independent study.

## Advanced coursework

In addition to the culminating experience courses, the department offers an honors sequence of courses comprising advanced microeconomics, advanced macroeconomics, and advanced econometrics. In order to take these courses, students must have an A or A minus in each of the intermediate courses. The advanced econometrics and macroeconomics courses both require an empirical research paper and can serve as a culminating experience. These research papers are similar in scope to an economics journal article. The advanced microeconomics course has a stronger emphasis on theory but also includes an independent research project. The selection of students allows these courses to be taught at a very high level compared to typical undergraduate courses. Students completing all three courses graduate with honors in economics. Typically between 5 and 10 students per year complete these courses. Roughly half of these students go on to attend graduate school in economics, although there is a large amount of year-to-year variation.

## Outside the classroom

### *Students as research assistants*

Because the economics department lacks graduate students, economics faculty often hire undergraduate research assistants. There are several ways these students can receive compensation. At the institutional level, Dartmouth has a program called the James O. Freedman Presidential Scholars. This program provides funding for students to work as research assistants starting at the end of their second year with no cost to the faculty member. Students with a GPA in the top 40 percent of their class are eligible. Students may receive course credit or a stipend for 10 hours per week of work for two 10-week terms. On average, about 25 students per year work as Presidential Scholars for economics professors. Students in the program perform a diverse set of tasks such as literature searches or data cleaning. Professors with research agendas involving fieldwork have also engaged the students in controlled trials and conducting surveys.<sup>4</sup>

Students who are effective RAs under the Presidential Scholars program often can continue to work with the same professor. This program therefore serves as a low-cost way for faculty to audition potential longer-term research assistants. Many faculty members use their own grant funding to continue employing these students after the 20-week presidential scholar term has expired. The department also has been

attempting to develop programs that are not dependent on individual faculty grants. In addition to the presidential scholars, at any given time there are roughly 20 students working as research assistants for economics professors.

### ***Dartmouth Economics Research Scholars***

Thanks to a short-term grant, the economics department is piloting a program aimed at students with interest in conducting research. The Dartmouth Economic Research Scholars (DERS) program encourages roughly 20 of our most promising students to get the most out of their studies in the department through enhanced advising and mentoring, and resources to deepen students' collaborations with faculty on faculty and student research. Students are invited to submit an application during the winter term of their sophomore or junior year. Selection is made on the basis of excellence in coursework, research aptitude, and faculty references. Students selected into the program receive enhanced advising from the program director and other faculty. The program provides enrichment events each term, ranging from information fairs about applying to graduate school to presentations by Dartmouth graduates who have gone on to become academic or industry leaders.

The program actively tries to match presidential scholars and research assistants to appropriate faculty. The program provides funding for continued research collaboration with faculty later in students' junior years with up to 250 hours of research assistant (RA) work at the wage level for an experienced RA. Students interested in pursuing research careers and graduate studies after graduation receive enhanced advising for those paths. There are flexible funds available that have been used to support student attendance at conferences such as the Carroll Round.

The program is seeking funding to make the program permanent and to provide faculty with credit for mentoring student research projects above and beyond the culminating experience, whether writing a senior thesis, coauthoring articles to be submitted to professional journals, or other research opportunities.

### ***The honors thesis***

Like most undergraduate institutions, Dartmouth allows students to graduate with honors through doing independent research culminating in an honors thesis. In the economics department, this generally occurs organically through our seminar courses. Students who write exceptional research papers in one of the seminar courses can be nominated for honors on the basis of that paper. This path to honors is relatively rare with only one or two students being nominated per year.

More commonly, students with promising projects in their seminar courses are encouraged to expand the project into a more fully developed honors thesis. Five to ten students per year take this course. Students on this path will receive independent study credit for working with one or more faculty members on their thesis. Before graduation, they present their findings at a public talk. Contingent on the quality of the project, these students are awarded High Honors in Economics.

The third way to graduate with honors in the economics department is to complete the three courses in the advanced sequence of courses. Students pursuing this path will have written two substantial empirical research papers. It is very common that the students on this path choose to expand one of these two papers into a full honors thesis.

All students engaged in honors research have completed substantial independent research projects. These projects are typically of high enough quality to be published in economics journals. Given the effort and time required to put a paper through the publication process, many of these papers remain unpublished. However, it is not unusual for graduate school-bound students to make this effort.<sup>5</sup>

The largest impediment to students interested in writing an honors thesis is timing. Many students currently complete their culminating experience in the spring of their senior year. These students lack the time to turn a successful project into an honors thesis. Students must take at least five courses in

economics before they have the preparation to engage in research projects through their seminar. For motivated students, this can easily be accomplished by the end of sophomore year, but it takes planning.

One of the goals of the DERS program is to get students to the point of doing research earlier in their careers. This requires planning, so an important goal of the program is to identify potential researchers and provide them with early advice about how to succeed as undergraduate researchers.

### Advice for other programs

One of the key components to the undergraduate research enterprise at Dartmouth is the recognition that learning to do research requires both directed instruction and learning by doing. Students without the necessary background will find it difficult to do research. We therefore are very deliberate in building a knowledge base to prepare students to be independent researchers. This is built into the curriculum so that all students can have a rewarding research experience, and interested students can build on this. This leads to some challenges, mostly involving timing. It is not unusual for seniors in their seminar course to discover a real passion for research just as they are finishing their undergraduate career.

### Conclusion

The Dartmouth Economics Department has a variety of programs designed to get students involved in research. First and foremost, all economics majors are required to produce a piece of original research as a major requirement. For many students, this is the endpoint of their formal research careers. We hope that this experience leaves them with the ability to coherently form a hypothesis and test that hypothesis using data analysis.

For more ambitious students, we work to prepare them for a future career as a researcher. Over the last decade, we have sent many students to top graduate programs, often after a year or two as full-time research assistants at the CEA, the Federal Reserve Board, one of the regional Feds, or the NBER. As a consequence, we have seen the number of Dartmouth undergraduates with tenure-track jobs at research institutions rise, with recent placements at MIT, Chicago-Booth, USC, Minnesota, and Harvard Business School.

### Notes

1. REPEC rankings of U.S. economics departments, <https://ideas.repec.org/top/top.usecondept.html>
2. These projects generally involve using standard data sources provided by the instructor to ask empirical questions. For example, students might be given a dataset of birth outcomes with explanatory variables like smoking by the mother and gestation age. The data typically require some manipulation and cleaning before analysis. Students work in small groups to formulate questions and choose appropriate techniques for their particular question. In this particular example, the instructor also included cigarette taxes in the dataset so that students could potentially employ an IV strategy if they were interested in the impact of smoking on outcomes.
3. There is obviously significant heterogeneity in the Stata skills among students in these classes. The economics department hires undergraduate Stata helpers to assist students in their work. These students hold office hours throughout the term. Typically the Stata assistants are drawn from the group of students writing honors theses.
4. One project that employed a number of students was a randomized trial on the effect of intensive college counseling on college attendance. Student research assistants traveled to high schools around the state to give advice to high school students on applying to college. Follow-up surveys were conducted to see if this changed college attendance behavior.
5. [1] Jagelka, T. 2013. Bilateral trade and the Eurozone: Evidence from new member countries. *The World Economy* 36 (1): 48–63; [2] La, V. 2015. Capitalization of school quality into housing prices: Evidence from Boston Public School District walk zones. *Economics Letters* 134 (September): 102–6; [3] Zhou, R. Forthcoming. Do low-price guarantees guarantee low prices? Evidence from competition between Amazon and big-box stores. *Journal of Industrial Economics*.