

DEVELOPING AN UNDERGRADUATE RESEARCH PROGRAM IN ECONOMICS

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Abstract

Economics presents serious challenges for developing an undergraduate research program. Students must master statistics, econometrics and specialized computer applications for the most basic projects. Austin College has developed an active program for faculty/student research projects through a combination of innovative course offerings, encouraging and supporting student/faculty conference participation, publishing, and a little persuasion.

This paper will describe the components of our program, how they were developed and their impact on the curriculum. A key element of our curriculum modification was the introduction of an econometrics class. This allowed students to conduct independent research for class and beyond. The next step was to encourage student participation in conferences and writing for publication. Most recently, AC economics students have created a web site to publish their research. Our program proves that a few modifications to a traditional curriculum can result in the organic development of a quality undergraduate research program in economics.

INTRODUCTION

Thirty years ago, when I took my first course in economics, the discipline was largely based on the study of how institutions affected the overall economy. It had the “feel” of a social science not unlike Political Science or perhaps Sociology. There was plenty of rigor but one could succeed in studying economics without worrying too much about Calculus or Statistics. Little did I know, that the seeds for a major overhaul were already being sown. This change has transformed my discipline. Today, the study of economics requires a minor in mathematics, at a minimum, and most of the graduate students at the top twenty Ph.D. programs have a full major in mathematics along with courses in economic theory. As if we needed any more reasons for students to avoid taking a class in the “Dismal Science”, telling them that they will need strong quantitative skills to succeed can only make it a harder sell.

But wait. Recent data has indicated that economics is one of the fastest growing disciplines on campus.ⁱ Students are actually volunteering to subject themselves to the grind of calculus, differential equations and statistics. What can possibly explain such a strange phenomena? In a word, Jobs. Starting salaries for students with a bachelors degree in economics are approaching the starting salaries for accounting majors.ⁱⁱ At a liberal arts college, like the one I work for, economics has the highest starting salary for our students. Also, the demand for graduate students, particularly American students is high. My students who decide to pursue a Ph.D. in economics are given full funding with

a living stipend. At the end of their studies, they can choose between jobs in the academic, government, industry or consulting sectors. Many of these jobs pay salaries that are easily in the six figures.

As the benefits of a degree in economics grows, the competition for the best jobs or graduate school slots increases as well. Today, it is not sufficient for students to take the right courses, make good grades and ace the GRE. To set themselves apart, they need to have some experience with empirical research. Research has long been expected of graduate students but increasingly, good undergraduate programs are asking their students to tackle this challenge as well. This paper outlines the process of creating and maintaining an undergraduate program for empirical research.

IMAGINE THE POSSIBILITIES

The stereotype for college students in the US, is not very flattering. They are seen as seeking fun and entertainment rather than the accumulation of the necessary knowledge to make them productive adults. Admittedly, that characterization is true for many but it has been my experience that students respond to courses if it can be shown that the material has positive applications to their life both today and later. To teach the sometimes dry and grueling subject of statistics taxes our ability to convince these young people that this is important and can readily be applied to their lives. But take that subject one step further, into empirical research and you allow the students to find a creative way to apply what they learn. Young people are inquisitive by nature and what better way to tap their creativity than to ask them to find a problem and examine it using the skills they have been working hard to master. It is not necessary to ask them to produce research worthy of a doctoral dissertation (although I have read dissertations that appear to be written by undergrads) only a project that allows them to test drive their aptitude with statistics on a topic that they find interesting. The good news about economics is that it can be applied to a vast array of topics. Recent publications from rising stars in the profession are testimony to this fact. The runaway success of books like Freakonomicsⁱⁱⁱ is one example.

CHALLENGES

Student Interest

The challenges of creating an undergraduate research program begins with stimulating the interest of the students. At Austin College we have several tools that work to our advantage. First, research in the natural sciences has a long history here. We are blessed to have summer research programs endowed by generous foundations where the students are provided with summer stipends to conduct their project. These slots are competitive but the students get the opportunity to work with a professor throughout the summer in addition to their stipend. Recently, the Social Science and Humanities Divisions have received funding from the Mellon Foundation to allow 6 students each year and their faculty sponsors funding to do projects similar to what students in our Math and Science Division have been doing for years. The Social Science Division also has funding to allow 4 or 5 students to work on projects as work-study assignments.

These students are chosen carefully based on their expected ability to perform independent research assignments.

Second, we offer our best students the opportunity to do an Honors Thesis. This is by invitation only and expects the student to perform original research and defend a written thesis. The student does receive honors credit for approved and completed projects but does not receive any financial incentive. Each year, we have more students wanting to do an honors thesis than we can accommodate. While an honors project does not include student stipends it is possible for the student to receive funding to present their work at a conference. Each year the Honors Committee is allowed a budget for student travel.

Curriculum

Arousing the interest of the students is a huge hurdle. But once that is accomplished it is necessary to have the appropriate curriculum and available tools that will enable the students to perform research. A prerequisite to adopting research friendly curriculum is to enhance the quantitative skills of students interested in research. This usually means that they should take more math than the degree plan requires. Most business programs require 1 semester of calculus and a semester of statistics. We have found that increasing the calculus and adding the additional courses of linear algebra and differential equations is a big help. It is not that these courses deal with research directly but they develop the overall quantitative skills of the students and makes understanding of their research results more meaningful.

In addition to added math, one course is essential to creating a research environment, Econometrics^{iv}. Econometrics teaches a widely used statistical technique, regression analysis, and allows the students to use this procedure to find causal relationships among variables. At the graduate level, econometrics can fill 3 or 4 semesters. But at the undergraduate level, it is sufficient to use an applied course. Our class has two objectives. First, we want the students to be able to construct a simple, single equation, multi-variable OLS model and be able to perform basic diagnostics on their data. Second, we have the students learn how to program in SAS^v, a widely used program. Third, each student collects data on a project of his/her choosing, writes an empirical paper and finally, makes a presentation of his/her results to the class. The class begins with teaching the students to construct a regression model with one independent variable. At this level, all work is done manually so the students can see the calculations necessary to build the regression equation, standard errors and goodness of fit measures. It should be noted that we limit this part of the class to very small datasets so as to simplify the arithmetic. After the first mid-term, the class adds additional variables to our model and introduces methods to detect common data problems such as multi-collinearity, heteroskedasticity, and autocorrelation. This part of the class assigns datasets from our text and the students perform the regressions and diagnostics while programming in SAS. We schedule several labs where the students work on their projects with the professor and student helpers available to make suggestions.

Finally, each student is expected to perform a research project where they identify the research question, collect data, run regressions, perform diagnostics and write a report on their results which is presented to the class. I cannot overstate the impact this has on

the students. Some of their projects are amazing. I have had students successfully access large databases^{vi} and perform some very good projects. Some of the projects include, a study on the determinants of cancer survival, a study on the determinants of attendance at minor league baseball games, and a study on the factors which influence the spread of AIDS in sub-Saharan Africa. There is no limit to the creative ways that students find to apply their new skill. If we can attract juniors for the econometrics class, the student has a jump-start on a project that can be expanded to be an honors thesis or perhaps compete for one of the many funded research opportunities that Austin College provides.

Even without those opportunities, there are several professional conferences that encourage undergraduate papers. The Eastern Economic Association has sponsored sessions specifically for undergraduate papers for over a decade.^{vii} In 2006, there were 8 undergraduate sessions with more than 30 students participating. I took one of our students and it was pure joy to watch the interaction among these kids. They eagerly listened and critiqued each others work during the day and then socialized at night. Students from elite private schools as well as regional state institutions brought their projects. While some of the presentations needed work, there were some truly original papers that will likely find their way to publication. Other opportunities for undergrads can be found at the Southwest Social Science Assoc. Annual Meeting and the interdisciplinary National Council for Undergraduate Research. Some of these meetings are held in locations that appeal to young people, which adds additional motivation for the students to participate in a viable project.

Funding

Most of us work for institutions that are constrained by tight budgets. Despite the benefits, there is some expense associated with almost every aspect of developing an undergraduate research emphasis. The expense does not have to be a deal killer and some schools have used the undergraduate research program to solicit alumni donations targeted directly to the effort. In this section, I will outline the funding opportunities at Austin College and then describe other arrangements that I am aware of.

As mentioned earlier, AC is fortunate to have several foundation-supported programs that nurture our undergraduate research efforts. The effort began in our Math and Science Division with summer research programs for students and their faculty sponsors. Students selected for the program are provided a \$2,700 summer stipend and faculty sponsors can receive up to \$5,000 as summer support.^{viii} Students from other divisions are encouraged to apply if they can identify a project related to the sciences in some way. Last year, one of our majors won one of the awards in our Environmental Science program.^{ix} He spent the summer identifying hurricane-spawned tornadoes from a database provided by the Storm Prediction Center cataloging over 50,000 tornadoes since 1950.

Two years ago, the Mellon Foundation agreed to sponsor a summer research program for students in the Social Sciences and Humanities.^x This program provides a student summer stipend of \$3,000 and a faculty stipend of \$2,100. It also provides up to \$2,400 for expenses associated with travel for the student and faculty sponsor to conferences.

Students approved for an Honors Thesis have the option of applying for travel funds to present their paper. The committee typically has enough budgeted funds to allow each student about \$500 for each trip.

The Social Science Division has a permanent research lab for students. This lab is supported by a designated endowed fund and provides a room in the basement of our building for student workers as well as enough funding to provide 4 or 5 work-study supported students to work in the lab. Most of the students are assigned to a particular faculty member to help with his/her research but some of the more experienced students are encouraged to develop their own projects.

Since arriving at Austin College in 2003, I have been able to procure several external grants to assist my students. The first was a Dept. of Commerce – NIST^{xi} grant that enabled several students to design a survey that was mailed to participants in a state of Oklahoma program which provided grants to residents installing tornado saferooms. The grant only covered the cost of the survey and one of the students was able to make a presentation at a regional conference. Travel money for his trip was provided by our football team. (I'm not making this up!) Interest in the survey also came from the insurance industry and one of their research institutes in Toronto, Canada^{xii} provided a generous grant to perform a follow-up survey along with money for student/faculty travel.

There are many other ways to find funding. The National Science Foundation has an ongoing program to fund undergraduate research.^{xiii} I am aware of one professor at Minnesota State University^{xiv} who has contacted their alumni association and received an ongoing commitment to provide travel money for students that he takes to the Eastern Economic Association meeting mentioned earlier.

It is my belief that it is not necessary to have summer stipends to initiate a program for undergraduate research. All that is required is to include Econometrics in the curriculum, which will need software, but there are good, inexpensive alternatives to using SAS. A student version of STATA^{xv} is available for minimum cost and is used by most of the schools I have encountered. As far as student travel is concerned, there are enumerable ways to cut corners and make a trip to a conference possible. The moral of the story is that with some creative thinking and a generous amount of elbow grease, funding can usually be found to enable our students to have an opportunity to experience empirical research.

THE PAYOFF

Ultimately, the motivation for establishing an undergraduate research emphasis is to help our students maximize their success. My evidence is anecdotal but provides support that this is an investment in time and resources that does achieve that goal. By far, the majority of economics majors go directly to work for someone after graduating with their bachelors degree. Yet despite the fact that they are not planning on attending graduate school, at least not immediately, this knowledge appears to return positive rewards.

Econometrics was first added to our curriculum in Spring 2005. That semester we had 18 students enrolled in the class, 11 of which would graduate at the end of the semester. Graduating seniors would not be able to expand their research skills as

younger students would but even they appeared to benefit greatly. Three of the graduating seniors were hired by American Airlines in the Finance Dept., one went to work for IBM, and another was hired by a research institute in Washington D.C. That student emailed and shared with me that when they discovered she could program in SAS, the firm hired her on the spot. One student went directly into an MBA program and two more begin their graduate training next year. Among the younger students there were 5 rising seniors and 2 rising juniors. Three of the rising seniors plan to attend graduate school and one of them has had 2 publications since then. He had the enviable task to decide among the 4 Ph.D. programs that offered him full funding for his graduate degree. Ultimately, he picked Vanderbilt. The youngest of the group have continued their projects and are also adding more mathematics to their program. While it is too early to know exactly what options await them, they have watched the success of the older students and have outlined ambitious plans. One has been invited to intern for the Federal Reserve Board in Washington, D.C. in the summer between his junior and senior year. After graduation he is torn between graduate school and law school while the second student is leaning strongly toward graduate school.

The payoff is evident for my institution as well. Several of the students helped design a website to feature some of their working papers. This provides a way for Austin College to highlight the accomplishments of our students. In addition, every time one of our students makes a presentation at a regional or national conference, it is a living testimony to the exciting things that are happening at the “best little college in Texas”. Our President loves to talk about the things our kids do when he speaks to alumni and foundations. This is a tangible outcome that can be proudly shared with the various Austin College stakeholder groups.

CONCLUSION

Making a commitment to develop an undergraduate research program is an extensive one and should not be taken lightly. The institution and the related faculty are embarking on a journey that will require sacrifice in time and resources. It is my firm belief that at the end of that journey is a brighter future for the fortunate young people who are the direct beneficiaries of the effort.

ENDNOTES

ⁱ “The Hot Major for Undergrads Seeking High Pay is Economics”, Wall Street Journal, July 7, 2005.

ⁱⁱ National Association of Colleges and Employers

ⁱⁱⁱ Freakonomics: A Rogue Economist Explores the Hidden Side of Everything, by Steven D. Levitt and Stephen J. Dubner, published by Wm. Morrow.

^{iv} The Appendix includes the syllabus, sample exams, and an outline for the term paper/project.

^v Statistical Analysis System, SAS Institute, Cary NC.

^{vi} One accessed the Current Population Survey maintained by the Bureau of Labor Statistics and a second accessed a large (1.4 million observations) cancer file maintained by the National Institute for Health.

^{vii} These sessions are sponsored by *Issues in Political Economy*, a journal for undergraduate research in economics published by Elon University and the University of Mary Washington.

^{viii} This program is made possible by the Brittain Biology Student Research Endowment, The Andy and Narcadean Buckner Biology Scholars Program, and the Howard McCarley Biology Research Endowment.

^{ix} This program is made possible by the Priddy Foundation.

^x The initial phase of this program is a 3 year grant from the Mellon Foundation.

^{xi} Texas Tech University is the lead institution on this grant. Our funding was provided by the Wind Science and Engineering Research Center at Texas Tech University.

^{xii} Institute for Catastrophic Loss Reduction, Toronto, ON

^{xiii} Research Experiences for Undergraduates (REU) – National Science Foundation

^{xiv} Oscar Flores-Ibarra, Ph.D.

^{xv} STATA is a product of StataCorp LP, College Station, Texas.