

**Proceedings of the 2008  
College of Liberal Arts  
Forum on Faculty-Student  
Research**

**March 26, 2008**

**Rochester Institute of Technology**

## Some Recent Undergraduate Research in Economics

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*Economics*

I am pleased to introduce the following three papers by Christine Longo, Arthur Johnston, and Jonathan Thomas. Christine and Jonathan are economics majors, and Arthur is double majoring in economics and computer science. Environmental economics is my chief research area and I am particularly interested in the economics of waste management (municipal solid waste, hazardous waste, as well as radioactive waste). I teach environmental economics as well as a course entitled Industrial Organization. The latter course explores the particular reasons why some markets are characterized by one or a few large firms invested in significant plant, equipment and intellectual property while other markets feature quite a lot of firms and relatively little real or intellectual property. Christine, Arthur and Jonathan were students in one

or both of these courses last year who soon after expressed an interest in pursuing a research paper under my advisement. I was aware of the New York State Economics Association annual conference at which undergraduates could present their research and I encouraged the students to aim for the association's deadline (nine months or so later) and to plan for the four of us to attend the conference together. The students met the deadline and we had a very pleasant conference experience at Siena College in October 2007. Each student also prepared conference grant applications and the students and I are grateful for the funding we received (Christine from the Institute Honors Program and Arthur and Jonathan from the College of Liberal Arts). I am also pleased to report that Christine was declared a co-winner of the 2007 New York State Economics Association's "Best Undergraduate Paper/Presentation Award".

Let me now introduce each paper. Christine Longo was a student in my Industrial Organization and Intermediate Microeconomic Theory courses in the past year. Based upon our coursework together, I suggested that she work with me as my Research Assistant (RA) during the past academic year. I am working on a project regarding the efficient siting and operation of municipal solid waste landfills in the United States. Christine helped me sift through each state's law so that I could better understand state-level landfill regulations, including the types of disposal taxes each state levies and attempts by the states to keep waste from other states from entering. Such policies are designed, of course, to manage

negative impacts waste disposal may have upon local environmental quality.

While it is common (both in practice and in the research literature) for regulators to impose so-called Pigouvian taxes in markets in order to correct for pollution problems, there is also a research literature (and some real-world policy experience) concerning the merits of pollution permit markets. Perhaps the most famous example of such an approach is the current SO<sub>2</sub> permit market in the United States, established as part of the 1990 Clean Air Act amendments. During our research of state strategies to devise municipal solid waste disposal taxes, we began to wonder if a disposal permit market analogous to the national SO<sub>2</sub> market could be superior in any manner. Creating such a market essentially involves devising a new type of financial instrument that can be traded (similar to how the SO<sub>2</sub> permits are currently traded on the Chicago Board of Trade). Christine has a strong interest in finance, so pursuing this question further was a natural fit for her background and career interests. In her paper, she sets forth the concepts and institutional features necessary for such a permit market to succeed, and she analyzes the strengths and weaknesses of taking a permit approach instead of the landfill tax approach. I find much promise in her results thus far.

Arthur Johnston was a student in my Industrial Organization course last year. A key concept in that course is “path dependence”—a situation in which the early decisions firms make lock them into paths that are very costly to change. Most high-tech markets feature this concept, and awareness of its properties informs the government’s optimal design

of intellectual property rights, merger and acquisition rules, industry standards, and several other economic challenges. Mathematically, one can say that a decision process is path *independent* if the probabilities of various economic choices along the time path *do not* change over time. A classic example of path independence is a sequence of coin tosses. In this case, the probability that a fair coin will be heads or tails on the next toss is 50/50—that is, the odds are independent of how many heads or tails one has observed in previous tosses. However, in the case of desktop software selection—say, each additional consumer’s choice of either Word or WordPerfect—economists find that the probability that the next consumer will choose one or the other *does* depend on the choices previous consumers made. After all, one would want to choose a package with which one’s friends and colleagues are most familiar, so that one’s work can be shared across platforms and so that one’s colleagues and friends can help with the training. Economic research on this general question suggests that path-dependent processes need not converge to the most efficient outcome; early events—some planned and some by chance—can steer the process to an inferior result.

Arthur was intrigued by the conceptual structure of these models and the examples we studied in class, and he began to ponder the phenomenon by which a first-year student’s curricular choices unfold to the senior year. The research question is: Can first-year students become inefficiently locked into curricular paths? In short, the answer is yes. Since students base their decisions as to what to take next on their prior experiences (which are subsets of all possible experiences, largely

informed as well by the experiences of family members and close friends), they may underestimate the value of broadening their experience (by taking courses that are quite different from their immediate interest). Arthur's theoretical model shows how such path dependent processes unfold. The model therefore provides theoretical support for curricular distribution requirements (namely liberal arts and science requirements that are common at most universities). While such requirements are indeed common, and imposed amidst skepticism expressed by first-year students, we are not aware of published literature in economics or in education that sets forth theoretical arguments to support such requirements. So Arthur's work contributes important insights to a key aspect of university life and to the process of human development.

Jonathan Thomas studied with me in Industrial Organization, Environmental Economics and Intermediate Microeconomic Theory during the past year. During the Environmental Economics course, he developed a particular interest in the subject of global warming and economic arguments for and against utilizing taxes to curb such warming. He discovered a policy paper written by Harvard economist Gregory Mankiw that advocated applying an additional ten cent per gallon tax on gasoline and raising that by ten cents per year for an additional nine years. It struck Jonathan that there are many ways to tax goods and services so as to reduce global warming and that some of those ways could be superior to the Mankiw proposal. Thus, Jonathan proceeded to track down the published economic literature on such taxes and developed his theory that a "carbon-added tax", along the lines of a value-added tax on

carbon at each stage of a good's production, could be superior to Professor Mankiw's sequence of excise taxes on gasoline. Jonathan's basic premise is that as carbon emissions are the fundamental concern rather than the burning of gasoline per se, the optimal approach should be one in which carbon itself is targeted. A carbon-added tax would raise awareness to carbon at every stage in producing goods from carbon. Jonathan's theory is consistent with related literature on eco-labels and "green consumption" wherein we find that prices may not send a sufficient signal that motivates people to change their ways; if people *truly* care about global warming and related carbon emissions, they will change their production and consumption preferences when presented with direct information concerning carbon emissions and taxes precisely for their use of carbon. Jonathan assesses the strengths and weaknesses of taking an excise versus carbon-added tax approach, and I believe his pursuit of this approach constitutes a fruitful area for future research.

To summarize, each student found a seam in the existing published literature and formed one or more testable hypotheses that will keep them engaged for some time to come. Each of their research projects satisfy a personal interest in achieving answers to questions beyond the "textbook"; in addition, however, each of their projects help satisfy our social interest in sewing up gaps in our understanding of the human endeavor.