



AMERICAN UNIVERSITY  
WASHINGTON, D C

Department of Economics  
Working Paper Series

Don't Put the Cart before the Horse:  
Teaching the Economic Approach  
to Empirical Research

by

Bradley A. Hansen  
Mary Eschelbach Hansen

No. 2005-12  
October 2005

<http://www.american.edu/cas/econ/workpap.htm>

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# Don't Put the Cart before the Horse: Teaching the Economic Approach to Empirical Research\*

Bradley A. Hansen  
Mary Eschelbach Hansen\*\*

## Abstract

When students are taught how to do original research in courses outside economics, they are taught to begin with the collection of data. This is not the approach followed by economists, who typically begin an answer to a research question by developing a model. The model then guides the search for evidence. We argue that the economic approach is more likely to lead to the development of a persuasive argument, and that greater awareness of the contrast between the economic approach and its alternatives can enable economists to improve the teaching of the research process.

**Key words:** teaching economics, research methods

**JEL classification:** A20, A12

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\* We thank all of the students who have contributed to the development of our classes and this paper, whether knowingly or unknowingly.

\*\* Department of Economics, University of Mary Washington and Department of Economics, American University. Contact: Mary Eschelbach Hansen, Department of Economics, American University, 4400 Massachusetts Avenue, NW, Washington, DC 20016-8029. Email [mhansen@american.edu](mailto:mhansen@american.edu)

## 1. Introduction

*If you could have any data you wanted, what would it be?* Students of economics should dread this question. In general, the question is only asked if you are unlikely to be able to answer it. If you hear it, chances are you put the cart before the horse. You collected data, usually with considerable time and effort. You conducted some statistical analysis of the data. You may even have produced some statistically significant coefficients. But you wasted your time. You wasted your time because you put the collection of evidence before the development of an economic model. If you had a well-developed model, you would be able to answer the question. The model would tell you the answer.

Putting the empirical cart before the theoretical horse is a common problem for students conducting original research. Students often begin the research process with a search for data even though they cannot say precisely what data they are searching for. Students worry they will not be able to find the data they need for research, but they cannot say exactly what data they need. This may surprise the students' professors of economics, but it should not. It should not be surprising that students place the search for evidence first because this is what is taught in the college texts on research and writing that they read outside of their economics classes.

It is not, of course, the approach typically followed in research in economics. In economics the model plays the leading role in research and writing. The difference is a significant one. Students of economics need to learn the economic approach to research not just to be able to write papers that look like those of other economists, but because it is more likely to produce persuasive research.

Economics professors need to be aware of the way that the research process is presented in other disciplines. In order to counter the tendency of students to begin

research with a search for data, we need to be explicit about the differences between the economic approach and other approaches, and we need to demonstrate the benefits of the economic approach.

We begin by describing the approach to research that is presented in a number of college texts on research. Then we show how the approach presented in these texts differs from the economic approach. We argue that the economic approach is more productive, and we offer some suggestions on teaching the economic approach to research.

## 2. Conversations and Arguments

Being able to do good research is not just something that is important to graduate students or advanced undergraduates. The ability to search for the answer to an interesting question and to present that answer in a persuasive fashion is at the heart of what we teach—from the most elementary courses to the most advanced. Even if a student only takes Principles of Economics, she should feel equipped to answer novel questions when they arise rather than just being able to answer the questions that have already been asked of her. This is the heart of original research.

Conducting original research is the act of creating new knowledge. New knowledge is not created by an individual in isolation; it is a social activity. The social activity that leads to the creation of new knowledge is a conversation (Graff 2004; and McCloskey 1998). A researcher must listen to what others have said before and decide what he would like to try to add to the conversation. The process is analogous to a person arriving at a party. Just as a person enters the room and tries to find a conversation that seems interesting, the researcher tries to select a topic of personal interest. Just as the person at the party listens to the

conversation and tries to find a way to enter it, the researcher reviews the literature on the topic and tries to find something original to say.

When the student begins to think of research as taking part in a conversation, it becomes readily apparent to him that he will want to be able to say things that others will find persuasive. A mere assertion is unlikely to persuade. The student will need to be able to provide an argument. It follows that the ability to do research requires an understanding of what makes for a good argument.

In his influential book the *Uses of Argument* (first published in 1958), the philosopher Stephen Toulmin argues that good arguments, regardless of what field they are made in, have common features. The common features are a *claim*, *evidence*, a *warrant*, and *qualifications*. The claim is the central statement of the argument. A claim is a statement that is disputable. If the claim was obviously true, there would be no need for argument. The evidence provides support for the claim. The warrant explains why the evidence should be persuasive. The qualifications are the limits of the argument: where it should apply and where it may not.

Toulmin presents the claim and the evidence as the leading elements in the argument. He explains that “the explicit appeal in this argument goes directly from the claim to the data relied on as foundation: the warrant is, in a sense, incidental and explanatory (Toulmin 2003, 92).” He goes on to state that “data are appealed to explicitly, warrants implicitly (Toulmin 2003, 92).” The researcher, Toulmin argues, should make a claim, present the evidence in support of the claim, and then explain why that evidence is persuasive. The approach is lawyerly: present piece after piece of evidence and then in summation explain why the jury must be persuaded by the evidence.

Toulmin's approach has influenced the fields of rhetoric and communication. A number of college texts on research and writing, including the *Harbrace College Handbook* and Booth, Colomb and Williams's *The Craft of Research* present versions of Toulmin's approach. They emphasize the evidence and de-emphasize the warrant.

The *Harbrace College Handbook* states that "critical readers expect writers to support their claims with ample evidence consisting of facts and other data (Hodges et al 1994, 293)," while "the warrant is often implied in arguments (Hodges et al 1994, 301)." That is, the evidence in an argument must be explicit and substantial, while the warrant may be implicit. The persuasiveness of an argument is believed to hinge more on the evidence.

Not surprisingly, then, students are taught to begin their research by searching for evidence. For Booth, Colomb and Williams the list of "things to do" starts:

- You must settle on a topic specific enough to let you master a reasonable amount of information.
  - Out of that topic you must develop questions that will guide your research and point you toward a problem you intend to solve.
  - You must gather data relevant to answering your question
- (Booth, Colomb and Williams 1995, 29).

Once the student has the data she can develop the argument. Again the claim and the evidence play the leading role. In contrast, the chapter on warrants begins by asserting: "This chapter raises issues more complex than beginning researchers might want to wrestle with (Booth, Colomb and Williams 1995, 111)." Development of the warrant is not even essential for beginning researchers.

In *The Elements of Rhetoric* Vincent Ruggiero does not refer to Toulmin, but places a similar weight on the role of evidence in a persuasive paper. The evidence is "the largest

part of the writing process, largest both in the sense of the space it occupies and in the sense of the time the writer spends doing it (Ruggiero 1971, 56).” Although he does not use the term “warrant,” he places less emphasis on the part of the paper that connects the evidence to the claim than he places on the evidence itself. He does admit that “it is often necessary or helpful to clarify the relationship between our evidence and our main [claim] by providing comments or interpretation (Ruggiero 1971, 75).” Interpretation of the data is often—but not always—necessary.

College students are likely to have been exposed to either Toulmin’s approach to argumentation or a comparable approach. Toulmin’s analysis of the necessary components of a good argument is useful in economics. Good research in economics will contain the four elements described by Toulmin: a claim, evidence, a warrant, and qualifications. Where the economic approach differs from the approach students already know is in the emphasis that economics places on each of the elements.

In economics, the warrant is the horse, the evidence the cart. In economics, the warrant comes in the form of a theory and a model. Rather than being implicit and following the data, the warrant is explicit and leads the search for evidence.

### 3. The Economic Approach

There is no universally accepted definition of the word theory. In general, however, theory is used to refer to an explanation. In some cases “theory” is reserved for an explanation that has received substantial support through repeated tests. In such cases it might be distinguished from the hypothesis that has yet to be tested. Theories are tested by evaluating the consistency of their implications with empirical evidence. The term test does not imply that a theory can “pass the test” and be established as proven. People can have

more confidence in a theory the more it has been tested and found consistent with the empirical evidence, but a theory cannot be proven to be true in an absolute sense.

Economics differs from many other disciplines in the social sciences in the degree to which theories are made explicit. Economists try to state all the assumptions of their theories and to demonstrate how their expectations about how people behave are logically derived from their assumptions. The attempt to make theories as explicit as possible is most clearly seen in the use of abstract models. Models are precise statements of theories. Models describe simplified versions of reality that enable us to explore the relationships between important variables. Models are often expressed using graphs or equations, but this is not essential. David Ricardo's model of trade with two countries and two goods did not use equations or graphs, yet clearly was a simplified version of reality that enabled him to explore the relationships between important variables.

Models are built on assumptions. Simplifying assumptions strip away the unimportant details and lay bare the important forces at work. Of course, as Robert Solow observed, "All theory depends on assumptions which are not quite true. That is what makes it theory (Solow 1954, 65)." To put it in Toulmin's terms: In their arguments, economists make claims that are derived from the qualifications to their warrants.

Economists recognize that if the critical assumptions of the model are violated, the claim may not apply. For example, when asked the question, "Why has the price of this good fallen while the quantity people purchase has increased?" an economist turns to the model of supply and demand. The economist answers that the changes are likely driven by an increase in supply because an increase in supply is the only change that produces the combination of a decrease in price and an increase in quantity. If pressed to go further and explain why supply increased, the model provides a guide to the forces that influence supply



and demand. Every principles text lists the things that shift supply (prices of inputs, technology, etc.). The model and the list guide the economist's search for evidence. But the careful economist notes that the model has a qualification. It describes a competitive market. If the market for the good is not competitive, the argument might not work.

That economists follow an approach to research that places theory and models at the center of the research process is evident in economics textbooks, in leading journals, and in the work of prominent economists.

Principles texts often begin with a section on "thinking like an economist" that introduces the importance of theories and models in economic research. The following question is from the computerized test bank accompanying N. Gregory Mankiw's *Principles of Economics* (Biederman et al 2004):

Which is the best statement about the way economists study the economy?

- a. They study the past, but do not try to predict the future.
- b. They devise theories, collect data, then analyze the data to test the theories.
- c. They use a probabilistic approach based on correlations between economic events.
- d. They use controlled experiments in much the same way a biologist or physicist does.

The correct answer is (b). Non-economists ask, "How can you develop a theory without data?" Economists ask, "How can you know what data to look for without a theory that tells you what is important?" It is well said by Paul Heyne, Peter Boettke, and David Prychitko: "It takes a theory about cause and effect to weed out the irrelevant facts from the relevant ones (Heyne, Boettke and Prychitko 2005, 15)."

The contrast between the economic approach to research and the approach described in college texts on research and writing is presented in a particularly stark fashion in Eugene Silberberg's classic graduate level text *The Structure of Economics*. Silberberg explains

that, “The testing of a theory involves two fairly distinct processes. First, the purely logical aspects of a theory are drawn out. That is, it is shown that the behavioral postulates imply certain behavior for the variables of the theory [a change in X implies a change in Y]. Then, at a later stage the theoretical constructs are applied to real data (Silberberg 1978, 11).” The economist begins by exploring the logical relationships between variables. In other words, the economist begins by developing the warrant. Only after determining what evidence will be persuasive does the economist turn to empirical work. The order of research in economics is precisely the reverse of that described by Booth, Colomb and Williams.

Silberberg observes that if a model does not have refutable implications then, “actual empirical testing is a waste of time, since no data could ever refute the theory (Silberberg 1978, 12).” Similarly, empirical work is a waste of time if the model has simply not been developed beforehand. Without a model, we do not know what data could answer our question or refute our hypothesis.

Statements in texts that models should guide empirical research are not just cheap talk. Published empirical research in economics transparently applies the economic approach. Many empirical papers simply use section headings such as *The Model*, *The Data*, *The Econometric Specification*, and *The Conclusion*. The ordering of the sections is a diary of the progress of the research.

Economists so expect the economic approach to be followed in empirical papers that they are surprised when papers do not follow this pattern. In a paper on the causes of sticky wages Alan Blinder departed from the standard economic approach and felt it necessary to acknowledge that: “The standard program of scientific research in economics is to (a) develop a theory of some phenomenon, (b) formulate it in econometric terms, (c) test it with actual data (Blinder 1991, 89).” Blinder perceived that his departure from the norm

required and explanation and justification. But even in this case Blinder did not just randomly search for evidence. He derived the claims in his paper from a number of theories that had been proposed previously.

Robert Fogel's work on railroads, cited in his Nobel Memorial Prize award, provides an illustration of the economic approach applied. Fogel begins by observing that, "The idea of a crucial nexus between the railroad and the forward surge of the American economy following 1840 appears to be supported by an avalanche of factual evidence (Fogel 1962, 164)." But he goes on to point out that this avalanche of evidence is not as persuasive as it at first appears because the persuasiveness of the evidence depends on numerous implicit assumptions made by earlier scholars. Rather than simply throwing more evidence at the question of the importance of railroads to American economic growth, Fogel's first step is to develop a model of the problem that enables him to determine what evidence will be persuasive.

The economic approach is particularly clear in Fogel work on railroads because he was not only using it, but advocating it. Fogel writes that he is interested not only in railroads *per se* but in the "feasibility of applying the analytical techniques of contemporary economics to the re-evaluation of one of the major questions in American history (Fogel 1971, 6)."

Cliometricians like Fogel have been especially aware of the contrast between the economic approach and other approaches to research. In Cliometrics economic theory disciplines the study of history by guiding the search for evidence, making the search for evidence more efficient and the presentation of the evidence more persuasive. When economists began to make explicit use of theory and econometrics to analyze history they had to defend not just their results, but their methods.

The methodology of empirical economists clearly places the warrant, in the form of explicit theories and models, at the center of the research process. The differences between the economic approach and the approach presented in texts on research are significant because the economic approach to research and writing is more efficient.

#### 4. The Efficiency of the Economic Approach

If the researcher starts without any warrant, he only arrives at persuasive evidence by pure chance. Consider that the *Economic Report of the President, 2005*, presents 112 statistical tables. The *U.S. Statistical Abstract, 2004-05* presents 1,385 tables. Where does the researcher begin if he does not have some idea what evidence will be effective in persuading his reader that his claim is correct?

It is not possible to begin the search for evidence without some preconception of what evidence is likely to persuade. Without at least an implicit theory, the temperature of Lake Michigan in 1958 is just as good a piece of evidence as the price of microchips for explaining why the price of computers fell in the 1990s. The choice, then, is not whether the researcher has a theory, but to what extent the researcher develops his theory before beginning the search for evidence.

Often economic models lead the researcher directly to the relevant data. Again, questions about changes in prices or changes in quantities bring to mind the theory of supply and demand. The researcher becomes familiar with the list of variables that can affect supply and demand. Then she applies this list to the specific case: What are the relevant substitutes and complements and what has happened to their prices? What are the measures of income of the consumers, and has income gone up or down?

Sometimes the role of the model in guiding the search for evidence is less obvious, but even more important. Suppose we are not able to obtain the data necessary for a direct evaluation of the theory, but the model has implications that enable us to evaluate the theory. We provide illustrations of such cases from macroeconomics, microeconomics and economic history.

Expectations play an important role in macroeconomics, and there are different theories for how people form their expectations: adaptive expectations and rational expectations, for example. Expectations, however, are not directly measurable. Although expectations themselves are not directly measurable, models that incorporate different theories of expectation formation have different predictions of how people behave. Rational expectations theory suggests that people use all the available information to form expectations about the future. Their expectations respond to new information, such as a change in political regimes. Michelle Garfinkel and Amihai Glazer (1994) build an argument about labor contract negotiations that is based on the theory of rational expectations. They argue that if different political parties have different preferences over monetary policy and there is uncertainty about the outcome of an election, then rational economic actors wait until after elections to change wages and prices. It follows that people are less likely to renegotiate contracts in the months immediately before the election and more likely to renegotiate contracts in the months immediately after the election. In addition, firms that are most strongly affected by the change in monetary regime are the ones most likely to change their behavior during an election year. They assessed their model using evidence from over 6,000 labor contracts that were signed between 1960 and 1992. They found that many firms made changes during election years, and that the ones most likely to be affected by differences in monetary policy were the ones most likely to make changes.

Robert Fogel and Stanley Engerman (1974) build an argument about the role of expectations that contributed significantly (if controversially) to the history of slavery in America. Their research questions are: Would slavery have ended without the Civil War? Did people believe that slavery was a declining system that could not compete with capitalism? Of course, they could not look directly into peoples' heads and see what they thought. They could look at the historical record of what people said, but some contemporary observers said that slavery would disappear and others said it would persist. Fogel and Engerman (1974) argued that the information about what people really believed should be apparent in the price of slaves. They observed that slaves were capital for slaveholders. The price someone is willing to pay for capital should be the discounted present value of the future earnings from that investment. In other words, the price must reflect peoples' best forecasts of what will happen in the future. If people thought that slavery was on the verge of disappearing, the value of slaves would fall. Fogel and Engerman found instead that the price of slaves was increasing before the Civil War.

Radwan Ali Shaban (1987) uses implications to test competing theories of the origins of sharecropping. One theory is that share contracts are a response to imperfect information and costly monitoring. The other theory assumes that effective monitoring is possible and explains share contracts as a form of risk sharing. The theories have different implications regarding productivity. The risk sharing theory implies that, other things equal, land should be equally productive whether it is owner operated or farmed under a share tenancy contract. The imperfect information theory implies that land farmed under share tenancy should have lower productivity. Evidence from farmers in India who work on both their own land and sharecropped land showed that productivity is higher on the land that

they owned. Shaban argues that the evidence is therefore more consistent with the theory that sharecropping is a response to costly monitoring.

Given the effectiveness of the economic approach at generating fruitful empirical analysis, it should not be surprising to find that this approach is what business executives value most about economists. In a survey of 500 corporate executives Giuseppe Forgiione found that 86 percent said the major benefit of economic concepts was that “the analysis generates useful data and...forces the decision maker to define the problem clearly and concisely (quoted in Maital 1994, 3).” In a world filled with data, useful data are still scarce commodities. A clear statement of the problem and a well-developed model precede useful data. Horse first, then cart.

## 5. Qualifications

We have argued that economists use a different approach to research than the approach presented in many college texts on research, and we have further argued that the economic approach is more efficient. The claim that the economic approach is different is warranted by evidence from text books, economic journals, and the work of particular economists. The claim that the economic approach is likely to be more effective is warranted by evidence that, given the vast quantity of data available, a search for good evidence without a prior warrant is not feasible. What then are the qualifications to our claims?

The main qualification is that giving the model the leading role in economic analysis can lead to overemphasis on the model to the neglect of empirical work (Mayer 1993). The use of models in empirical research is very different than the role of models in what Deirdre McCloskey (1997) refers to as blackboard economics. In blackboard economics, the model is the final good. In empirical research, the model is an intermediate good. In empirical

research, the model itself does not answer the central question. Instead the model tells the researcher what relationships are important, thereby pointing towards the evidence that will answer the question most persuasively.

## 6. Teaching the Economic Approach to Research

The origin of this paper lies in our quest to understand why students are so eager to put the cart before the horse. We found that the first step in becoming better teachers of the economic approach to research is to plan in advance to counter the temptation of students to place the evidence ahead of the warrant. The next step is to integrate self-awareness of the economic approach into the teaching of our courses. We contrast the economic approach to the competing approach that students already know and we emphasize the merits of the approach.

To introduce students to the economic approach to research in the principles and intermediate theory courses, we give substantial attention to discussing how economic theory is used to try to answer real empirical questions. Most textbooks contain boxed examples meant to enhance student awareness of the application of the theory; we spend time discussing these examples. We have asked students to read and write from supplementary texts such as the *Economics of Public Issues* (Miller, Benjamin and North 2003), *Economics of Social Issues* (Sharp, Register and Grimes 2004), and *Economics is Everywhere* (Hammermesh 2004). As an alternative to text-based learning, we have asked students to find evidence in current newspapers and the popular press of economic models in action.

Many departments sense that students need special instruction in the economic approach to research, and they therefore offer a course that focuses on conducting original research. The course may be a seminar, a capstone, or a thesis option for seniors or for



honors students. Other departments have a course designated for sophomores or juniors that is intended to impart the skills necessary to conduct original research in the field courses they take during the senior year. In some departments, the quantitative methods or econometrics course plays this role.

We have found that teaching the economic approach to research in the methods courses effectively means asking students to follow a specific sequence of tasks in order to head off their drive for data. The first tasks in the sequence establish the idea that research is a conversation and the next tasks require the student to build an appropriate model. Only in the final tasks do we free students to hunt for data and run them down with regressions.

We have used with success the following sequence of assignments to teach the economic approach to research to undergraduates:

1. Research preliminary bibliography;
2. Write literature review;
3. State the research question;
4. Develop of a (graphic) model to address the question;
5. Describe of the ideal data set;
6. Find and assess evidence;
7. Present the research, verbally and in writing.

The first step, again, is to urge the student to identify a conversation in research in which she would like to participate. The next step is to send her out to find out what other people in the conversation have already said. In other words, the student selects a topic that interests her and reviews the literature. At this point, the student identifies a place she can enter the conversation: a flaw in someone's argument or an overlooked point. She can then write a statement of her research question.

Writing a statement of the research question is best done with model-building in mind. At the stage of developing a many students first suggest questions like: *How much is the United States helped by biodiesel?* Or *How much does outsourcing harm American workers?* Or *Would the United States be better off if we used more nuclear energy?* Early attempts at a research question often involve vague terms such as *help* and *hurt*, *better off* and *worse off*. The teacher of the economic approach to research must prompt the student to be more specific. When the student is asked to think about how she might model her question, it becomes apparent to her that she must define what she means by *help* or *hurt*, *better off* or *worse off* before she can proceed.

One way to help the student be specific is to press her about her motivation to do the research. For example, the student interested in biodiesel might be most interested in preserving American farms, and thus will want to define the benefits of biodiesel in terms of the increase demand for agricultural products. The student interested in outsourcing might really be interested in explaining unemployment in his home town. His research question will be different from the research question of a student mainly interested in trends in union membership.

After the student defines the research question, she must articulate an economic model that captures the salient parts of her research problem. This is a crucial juncture for the teacher. Again, the teacher confronts the student's desire to following the traditional approach; the teacher must counter the student's instinct to pile up evidence like a prosecuting attorney. The teacher must persuade the student that a good model simplifies and guides her search for persuasive evidence.

We find a graphic model is useful for students at all levels, from principles to ABD, because a graphic model requires the student to be rigorous yet to keep it simple. If the

student is instead encouraged to develop the model mathematically, she frequently confuses the economic model with the econometric model. The student falls prey to the temptation of letting the search for available data lead her research.

Moreover, the graphic model ensures that the student can explain the theory behind her research to a wide audience. We require that students make both informal and formal presentations of their research in class. Students are then prepared to present their work at department and college student research conferences. Eventually the student—especially the graduate student—may need to develop an elaborate model, but with graphic model in mind she will always be able to give the ubiquitous five-minute verbal explanation of her research.

The fifth assignment, defining the ideal data set, recalls the opening sentence of this paper. The student must answer the question: *If you could have any data you wanted, what would it be?* Only after the student can answer this question she is ready to tackle the job of finding, collecting, processing, regressing, analyzing, assessing, and obsessing over actual data. In most instances, of course, the ideal data are not available. The search for evidence becomes a search for proxies for the ideal data.

The method the student uses in the step of assessing the evidence usually depends upon the point the student is at in her studies of quantitative methods. For principles students as well as economics majors in their sophomore and junior years our expectations are rather limited. For graduating seniors and writers of undergraduate theses, who have more knowledge of econometrics, we require more thoughtful specifications and hypothesis tests. For graduate students, of course, the choice of the appropriate econometric technique is critical to the success of the research.

Finally we require that each student makes a formal presentation of her research at the end of the semester. First, the presentation motivates the student to do a good research

project because she knows the result is not for the eyes of the professor only. Second, we encourage the students to write papers with the presentation in mind. We find that when students write with an audience of their peers in mind, they are more careful to be clear and less likely to feign pretentiousness. Finally, and most importantly from a pedagogical point of view, the presentation re-emphasizes the point that doing research is really taking part of a conversation. The research is not complete until the researcher has communicated her argument to others.

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