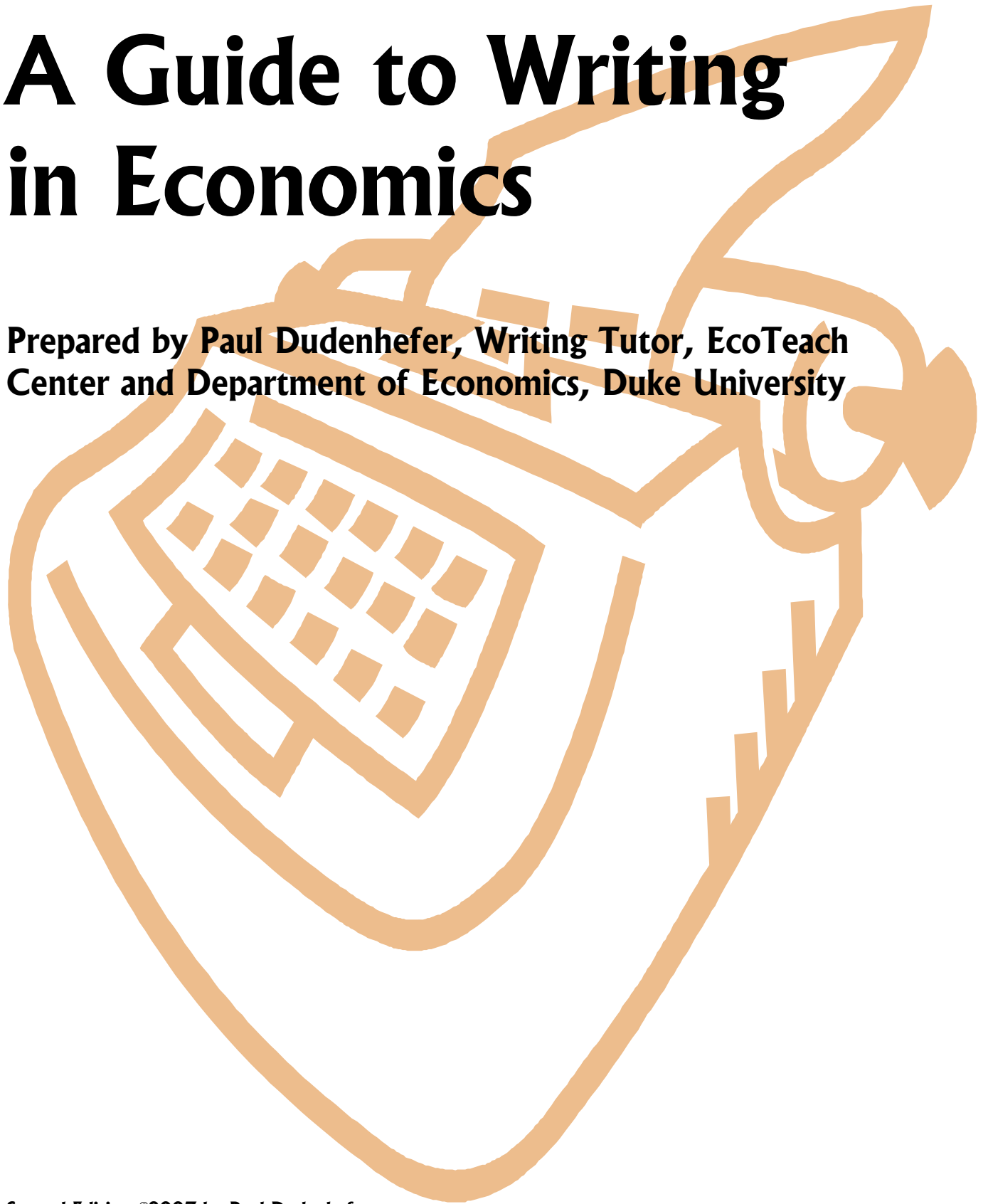


A Guide to Writing in Economics

**Prepared by Paul Dudenhefer, Writing Tutor, EcoTeach
Center and Department of Economics, Duke University**

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Introduction 4

Part I: Writing and Scholarly Argumentation 5

- 1. Writing a Paper—a Good Paper 6**
- 2. The Paper as a Whole 7**
- 3. Making Arguments: Claim, Reasons, Evidence—or, How to Ace that Essay Exam 8**
- 4. Making *Economic* Arguments 10**

Part II: The Writing of Economics: A Discipline-Specific Examination 12

- 5. Writing about Evidence 13**
 - 5a. Writing about Models 13**
 - 5b. Writing about Data 14**
 - 5c. Reporting Data and Results in Tables 15**
 - 5d. Tables and Text: Writing about Your Results 17**
- 6. Writing Literature Reviews 19**
- 7. Writing History-of-Thought Papers 20**
- 8. Writing Book Reviews 21**
- 9. Writing Abstracts 22**

Part III: Bookends: Introductions and Conclusions 24

- 10. Introductions 25**
 - 10a. General Content of Introductions 25**
 - 10b. Yes, But How to Actually Begin a Paper? 28**
 - 10c. Introductions: Summing Up 31**
- 11. Conclusions 31**

Part IV: Economists Do It With . . . *Style*? 34

Part V: Eight Principles of Clear, Cohesive, and Coherent Writing 37

Part VI: Final Words 44

Appendices

Genres of Economics Writing 46

Sample Model Section 48

Sample Data Sections 52

Sample Literature Review 55

Sample Book Review 57

Sample Introduction 59

Introduction

When I tell people that I am the writing tutor for the economics department, I am usually met with a surprised reaction. And why not? Most people associate writing with the English department and, only to a slightly lesser extent, with the other disciplines in the humanities; they do not normally associate writing with economics and the other sciences. You may be one of them. You may be asking yourself, What does writing have to do with economics? Well, a lot, as it turns out. Economists, as much or even more than other scholars and analysts, write. Although we may think of economics as involving problem sets or mathematics, the fact nevertheless remains that the results of economic research are “written up.” At least three-fourths of economics articles, especially empirical papers, is text, not equations or tables. Assistant economics professors must publish articles to earn tenure; economic staffers at research institutes and other financial organizations write reports and other documents; economists hired as research consultants produce written reports detailing their results; members of the president’s Council of Economic Advisers write reports and briefings. The list could go on. “In talking about the economist’s craft,” says Richard Schmalensee, an economist at MIT, “it is almost impossible to overstate the importance of clear and persuasive writing.” Writing is as much a part of economics as models and data sets.

What follows is a writing manual for the Department of Economics at Duke University. As such, it responds to the writing demands of the undergraduate curriculum at Duke. But it also discusses writing in a more general way, for writing in economics involves a mix of general principles of writing and discipline-specific conventions of writing. The manual is divided into six parts. The first part, “Writing and Scholarly Argumentation: A Broad View,” addresses aspects of paper writing in general, including a discussion of how to make economic arguments. Part II, “The Writing of Economics: A Discipline-Specific Examination,” looks at how to write certain genres of economics papers: empirical papers (in the discussion about evidence), literature reviews, abstracts, and so forth. The third part examines introductions and conclusions. What kinds of information are usually contained in an introduction, and how is it organized? How should one end a paper? In part IV we consider style: its virtues and vices. Part V offers a few principles that can promote good writing. A few closing remarks are presented in Part VI.

You’ll find examples of economics writing in a series of appendices at the end of the manual. Most of these samples have been annotated in an effort to point out clearly the conventions and features that are present in economics writing.

Part I

Writing and Scholarly Argumentation

- 1. Writing a Paper—a Good Paper**
- 2. The Paper as a Whole**
- 3. Making Arguments: Claim, Reasons,
Evidence—or, How to Ace that Essay
Exam**
- 4. Making *Economic* Arguments**

Part I: Writing and Scholarly Argumentation: A Broad View

Writing a paper is one of the most intellectually exciting, satisfying, and challenging enterprises you will undertake as a student at Duke. It is also a highly complex cognitive and scholarly task that requires planning and a felicitous attitude. Our writing problems often arise when we fail to acknowledge and respect the writing process for the sophisticated, unpredictable, and time-consuming endeavor that it is. In this part of the manual, I will offer a few tips that I hope will help you write a successful paper—or at least help you retain your wits as you go through the process.

1. Writing a Paper—a Good Paper

Let's begin by addressing the two most important things that should be kept in mind about writing papers.

First, writing a paper—a good paper—takes time. By *good*, I don't mean an "A" paper: lots of papers get A's that are not necessarily good. (The relationship between the grade a paper receives and the quality of the paper is a separate issue that I will not discuss here. Any good paper is quite likely to earn an A; but not all A papers are good.) By a good paper, I mean a paper that most fully fulfills its potential, meets the expectations established by the paper itself, and, most important, communicates with its intended reader. To produce a good paper takes time. How much time? Probably more than you may realize. To give you the right order of magnitude, for a term paper of twenty pages or so, I'm talking dozens of hours here: hours spent thinking about the paper, researching the paper, trying things out on paper (brainstorming, or freewriting, or just plain noodling around), writing a first draft of the paper, revising the paper, revising the paper again, proofreading the paper—and not necessarily in the order listed here. I'm not saying that you can't pull an all-nighter and write a paper that will get an A; chances are, you have already done that, maybe several times. But I am saying that you cannot pull an all-nighter and write a good paper, a paper that represents the best that you can do.

Second, writing a paper is a *recursive* process: it often involves one step forward, two steps back, in which certain steps—drafting, researching, revising, outlining, etc.—are repeated and revisited. In junior high school and even in high school, writing was probably taught as a linear process: first you pick a topic, then you read about your topic, then you write an outline of your paper, then you write a first draft of your paper, then you revise your paper, and finally you proofread your paper, in that order. But research shows that that's not the way the majority of adults write. Adults write using a recursive process. You may begin writing before you even know for sure what you want to write about. You may research your topic and begin writing, only to stop and research your topic some more. You may write certain parts of your paper out of order (for example, you may write the introduction last). You may write a draft, *then* outline it, and see that you need more material or more evidence. You may begin drafting a paper, decide you need to take an entirely different tack, and start drafting again. The combinations are too numerous to count.

Give it time, and relish the recursiveness. If you do those two, you are off to a good start. Here are a few other pieces of advice to help you along.

Adopt learning as a goal. In our concern about grades, we often forget about one very important thing: learning. Approach the writing assignment as a chance to learn: to learn about a subject, to learn about research methods and sources of information, to learn about your writing and research habits (and whether you may need to change them).

Think of yourself as a writer. Too often students think of themselves as, well, students, and they view their assignments as required tasks in which they have no real investment. The problem with that is it puts you in the wrong position in relation to what you want to accomplish. If you were taking an exam, you would do well to regard yourself as a student. But writing a paper is not about taking an exam or even studying per se. It is about writing and all that writing entails—planning, researching, drafting, revising, thinking. Therefore, do not think of yourself as a student but as a writer, an economist, a scholar. For models and inspiration, read the series of interviews with writers in the *Paris Review* and the testimonials of economists in *Passion and Craft: Economists at Work*; both are available in the library.

Surrender to the process. Researching and writing a paper is not, alas, a strict matter of completing a series of tasks that take a finite amount of time and that yield a predictable result. Researching and writing a paper is instead a recursive and sometimes uncertain and unpredictable process that refuses to fall completely under our control. The more you surrender to the process, the happier you will be.

Start early. That means today. Not after this weekend's parties, or after spring break, or after the UNC game, but today. How? Make a list of possible topics. Compile a bibliography of books and articles on your topic. Read about your topic, and take notes as you read. Formulate a tentative thesis. Write what you know, and what you would like to know, about your topic.

Set a schedule. Do not trust that you will work efficiently and in a timely manner. Set a schedule for your writing project, and stick to it. Show up at the same time every day so the muse will know when to find you. Tip: Set Monday mornings as deadlines; that way, you won't be tempted to spend the entire weekend away from your project.

Understand the need for information. Information comes primarily from two sources: thinking and research. If you don't know what to write, you have not thought enough about your topic or researched it enough—or both.

Write before you are ready to write. Students often see writing as the final activity of a linear process, as the thing you do after you have conducted your research and formulated your ideas. But in reality, researching and thinking and writing are all of a piece. Start writing something—anything—before you have finished your research. Write even before you know what you want to say. Indeed, it is often only by writing that we work out and discover what we truly want to say. Important: Please keep track of your sources as you work out your ideas on paper. Do not rely on your memory! When you come across a passage or a statistics you might use in your paper, write down precisely where it comes from. Accurate and scrupulous note-keeping in the pre-writing stage will save you lots of extra work and headaches later when you draft your paper.

2. The Paper as a Whole

In your economics courses at Duke, you might be asked to write all manner of papers. You may be asked to review a book or review the literature on a particular topic; you may be asked to take a policy position and defend it, or to describe someone else's position and assess its

strengths and weaknesses. You may be asked to pose an interesting economic question and answer it, or to explain a real-world situation, using economic theories and concepts. You may be asked to write other kinds of papers as well.

Regardless of the kind of paper you are asked to write, it may be helpful to think of the paper as having three major parts: a beginning, a middle, and an end. In the beginning, you will want to introduce your topic and indicate the purpose of the essay. If your essay states and defends a point of view—that is, if it has a thesis, a main point—you will want to state it, usually at the end of the introduction (or near the end: in many economics papers, the introduction ends with a brief paragraph previewing the sections or content to come). Depending on the length and genre of the paper, not to mention the complexity of the argument, the introduction can be as short as a single paragraph or as long as four or five (or more). As a rough guide, figure to have one paragraph of introductory material for a five-page essay; two paragraphs for a ten-page essay; and three or four for essays fifteen pages or longer.

The middle of your paper should be the longest part; it is where you fulfill the expectations raised or keep the promises made in the introduction. The middle is where you actually do what your introduction said it would do. If your paper states a thesis, the middle should be used to support the thesis, by presenting pieces of supporting evidence, usually in ascending order of importance.

The end, or conclusion, is usually short, often just a paragraph, maybe two. Whereas introductions often end with the thesis statement, conclusions often *begin* with the thesis statement. The conclusion is where you want to restate your main point or main purpose. Depending on the assignment, your conclusion can be used to suggest lines of further research, to call readers to action, to direct attention to larger issues. Conclusions often refer back to the introduction as a way of stressing the main point of the essay.

3. Making Arguments: Claim, Reasons, Evidence—or, How to Ace that Essay Exam

Much of the writing you will do in your economics classes is meant to persuade. Whether you are writing a short-essay answer to an exam or a term paper, you are usually being asked to state a position or an answer—and then defend or evaluate it. In other words, you are asked to make an argument. But just how does one do that?

An excellent guide to the task is *The Craft of Research* (2d ed.), by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams (Chicago, 2003). Booth, Colomb, and Williams define a research argument as follows: A *claim* based on one or more *reasons*, reasons that are supported by *evidence*. Let's look at each of those in turn.

A *claim* is another word for thesis. It is an argument or interpretation, not a statement of fact, and thus needs support. A claim, for its part, is made because of a *reason*. Reasons explain *why* we believe a claim to be sound. But merely providing reasons is not enough. Reasons must be supported by *evidence*—information regarded as fact. Statistics, mathematical models, and the conclusions of other research reports are among the items that can serve as evidence.

Suppose you are asked to write a paper explaining the pros and cons of a flat income tax. You are to support your points with evidence and, in the end, take a position for or against, explaining your reasons. How might the core of your argument look? Here is one hypothetical

example:

A flat tax should replace our current progressive one because it would better stimulate economic growth. Two recent theoretical papers, Marshall 2000 and Walker 2002, show that a flat tax would encourage investment in the software industry. Another recent theoretical paper (Abrams 2003) suggests that the American automobile industry would have benefited from a flat tax in the late 1970s. And congressional testimony by CFOs of prominent companies alludes to the likely stimulative effects of a flat tax.

Let's examine the argument in light of claims, reasons, and evidence. The claim is that a flat tax should replace the current one. Great. That is a useful claim, not because it is "true" or a fact, but because it is open to reasonable debate and needs to be supported.

But why make such a claim? On what basis is it made? Reason: because it would stimulate economic growth.

Fine. We have a claim, and we have the reason for the claim. But the reason needs to be supported. We need evidence suggesting that growth would be stimulated as the result of a flat tax. What evidence does the argument provide? It refers to three scholarly papers and testimony by CFOs.

Let's revisit our argument, this time by labeling each component: claim, reason, evidence.

A flat tax should replace our current progressive one_{claim} because it would better stimulate economic growth._{reason} Two recent theoretical papers, Marshall 2000 and Walker 2002, show that a flat tax would encourage investment in the software industry._{evidence 1} Another recent theoretical paper (Abrams 2003) suggests that the American automobile industry would have benefited from a flat tax in the late 1970s._{evidence 2} And congressional testimony by CFOs of prominent companies alludes to the likely stimulative effects of a flat tax._{evidence 3}

Now: is the evidence appropriate or trustworthy or valid? Well, that's for you, the writer-researcher, and your reader, to decide. Part of making an effective argument is selecting evidence that your reader will find persuasive. We will return to the notion of evidence in part II of this manual.

The formula just described can differ depending on the situation. In the typical empirical economics paper, for instance, the reasons for a claim are usually not explicitly stated. (The reason behind the claim would be that a model, which has been tested with data, bears the claim out.) The evidence would be the particulars of the data, model, and methodology themselves.

Recall that one makes a claim because of a reason. But are the two logically connected, or mutually relevant? Why should one accept your claim, even if it is based on reason supported by evidence? The answer is a reader may not. If that is potentially the case, you will need to state how your reason is relevant to your claim. The principle that connects your claim to your reason is what Booth, Colomb, and Williams call a *warrant*. A warrant explains how your reason is relevant to your claim. Your reader can accept the truth of your reason, but not necessarily its relevance. In the argument about the flat tax, for example, a reader could react as follows: "Why is economic growth a desirable objective of tax reform? Why should a tax that stimulates economic growth be favored over another kind of tax? Why, for example, should it be favored over a tax that further redistributes income, or a tax that discourages certain behaviors?" Your

answer, if you choose to provide it, would be your warrant. Your warrant may be that economic growth is simply good or desirable—a warrant, in this case, based on a cultural or discipline-specific norm. Ultimately, a reader may have to take your warrant on faith.

Finally, a full research argument acknowledges counterarguments or contrary evidence—and then responds to (not necessarily refutes!) them. To return to our flat-tax argument, we see that the studies that are cited are all theoretical and pertain only to certain sectors of the economy. It would be nice to have some empirical studies to cite as evidence, or studies that pertain to the macroeconomy! But we do not. So how can we acknowledge, and respond, to that? Here is one way:

Although no studies of a flat tax focus on the economy as a whole and although empirical data are lacking, the available studies and accounts suggest that, in general, a flat tax is good for business.

Let's add this, and a warrant, to our full argument:

A flat tax should replace our current progressive one_{claim} because it would better stimulate economic growth._{reason} Few would question that a growing economy is desirable, especially those who remember all too well the dreary days of “stagflation” in the late 1970s and the recession of the early 1980s._{warrant} Two recent theoretical papers, Marshall 2000 and Walker 2002, show that a flat tax would encourage investment in the software industry._{evidence 1} Another recent theoretical paper (Abrams 2003) suggests that the American automobile industry would have benefited from a flat tax in the late 1970s._{evidence 2} And congressional testimony by CFOs of prominent companies alludes to the likely stimulative effects of a flat tax._{evidence 3} Although no studies of a flat tax focus on the economy as a whole and although empirical data are lacking,_{acknowledgment} the available studies and accounts suggest that, in general, a flat tax is good for the economy._{response}

To sum up, a basic argument is a claim, based on one or more reasons that are then supported with evidence. The argument is made more sophisticated and scholarly by acknowledging, and then responding to, counterevidence.

A final word on claims. In *The Craft of Research*, Booth, Colomb, and Williams rank three kinds of claims according to their significance. The least significant is a claim that further confirms what others have consistently argued. Next in significance is the claim that helps clear up a puzzling, uncertain, or otherwise vexing issue. Those two are by far the kinds of claims advanced by the vast majority of economics papers (indeed, by the vast majority of research papers in general). Far less common—far, far less common—but greatest in significance, is the claim that causes scholars to completely reconsider an issue long thought settled.

4. Making *Economic* Arguments

The last section identified and discussed some general components to a research argument. Here we will discuss a particular kind of argument: an economic argument. The reflections made about arguments in general still apply; here we add to them a consideration of what

makes for an *economic* argument. As we'll see, as a discipline, economics has its own way of making an argument—of “proving” or supporting a hypothesis—that distinguishes it from other disciplines.

First of all, economic arguments address an economic topic. But wait: this is not entirely accurate, for, as economists like Gary Becker have shown, almost any behavior can be subjected to economic analysis. So let's amend this to say the following: Economic arguments subject a phenomenon to economic analysis. This leads us to the next two criteria.

Second, economics arguments use economic assumptions, concepts, and theories to explain or understand the phenomenon in question. The assumptions, concepts, theories are, as you might imagine, the ones found in your college textbooks: the assumption that people respond to incentives, the law of supply and demand, opportunity cost, the marginal principle, the notion of spillovers or externalities—the list can go on.

Third, economics arguments use certain kinds of evidence to support hypotheses. There are at least four kinds of evidence that are most common and most accepted in economics. The first you just heard about: the assumptions, theories, and concepts found in economics textbooks. Better yet is to back up those assumptions and theories and concepts with the second kind of evidence: quantitative data. By quantitative data, I mean data on things that can be measured, that one can put a number on: income, or years of schooling, or hours spent working, or number of papers published. And the more observations in the data set, the better. The next step in economic analysis is to use data to test a model, and that brings us to the third kind of evidence: econometrics. Econometrics is evidence in that it constitutes a method of hypothesis testing that is accepted by the discipline. Econometrics often and most familiarly takes the form of regression analysis, in which the change in one variable (the “dependent” variable) is explained as a function of other variables. Finally, there is a fourth kind of evidence: economic modeling. Economic models are mathematical equations that represent a simplified version of the economy or the decision-making process of an economic agent. The models are based in part on economic assumptions, theories, and concepts—the first kind of evidence discussed above.

The building blocks of an economic argument may be seen more clearly if we consider a counterexample. Suppose someone wanted to find out how fast-food employers would respond to an increase in the minimum wage. Will they hire less labor, as economic theory predicts? Someone unfamiliar with economics and its methods might respond by saying, “If I want to know how fast-food employers will react to an increase in the minimum wage, why don't I simply go ask a dozen or so of them and find out?” However valuable such an effort might be, it is not the economic way. Economists prefer evidence on what people actually do, rather than on what they say. They would be much more impressed by statistics that show how hiring actually changed in the wake of a wage increase.

Part II

The Writing of Economics: A Discipline-Specific Examination

5. Writing about Evidence

5a. Writing about Models

5b. Writing about Data

5c. Reporting Data and Results in Tables

5d. Tables and Text: Writing about Your Results

6. Writing Literature Reviews

7. Writing History-of-Thought Papers

8. Writing Book Reviews

9. Writing Abstracts

Part II: The Writing of Economics: A Discipline-Specific Examination

The first part of this manual looked at writing from a distance. This part will get down to the nitty gritty and take up writing about certain kinds of things. In section 5, we will discuss writing about evidence—the data and information one uses to support a hypothesis or claim. Much of the writing we do in economics and in our economics courses is meant to persuade. As we read in section 4, to persuade, economists use certain kinds of evidence: economic assumptions, concepts, and theories; data; econometrics; and economic modeling. In this section of the manual we will discuss how to write about models, data, and tables.

In section 5, the discussion of evidence applies mainly to empirical economics papers. The subsequent sections of part II will examine other genres of economics writing: abstracts, literature reviews, book reviews, and history-of-thought papers.

5. Writing about Evidence

George Tauchen, William Henry Glasson Professor of Economics at Duke, often talks of writing a paper from the inside out. When economists write papers, Professor Tauchen explains, “we start from the innermost spot, the model and equations. We do the empirical work, and then write a narrative around selected tables and figures. We gradually expand the paper outwards in both directions towards the introduction and conclusion. Those two sections are written last: it’s impossible to write them until the author knows what is inside the paper.” With that in mind, in this section we will discuss writing those “innermost” parts. Section 6 of the manual will discuss introductions and conclusions.

5a. Writing about Models

Often, one of the innermost parts of an economics paper is the model section. It is customary in empirical economics papers to have a section devoted to describing your model. Although the length of the description varies from paper to paper, a typical model section will be from three to five pages long. If the paper presents a simple regression, the model might simply be the regression equation and the Gauss-Markov assumptions (e.g., that $\text{Cov}(\varepsilon_i, \varepsilon_j) = 0$ for $i \neq j$). It is not a bad idea, in writing down this notation, to use superscripts on the various β ’s to indicate its variable. More complicated papers might present notation, develop a basic model of economic behavior, report the first-order conditions necessary for agents’ to optimally set prices or choose investment or whatever, and then interpret those conditions.

In the model section, the writer takes the reader through the series of equations that constitute the model. The model may have been briefly described in the introduction; but in this section, it is described in detail. As you describe your model, its corresponding mathematical form is presented. It is customary to state the statistical technique the analysis will use—reduced-form regression, two-stage least squares, etc.—and why it was chosen. You should lay out all the assumptions you make in your model, as well as explain the intuition behind those

assumptions. In your models, the notation should either (a) follow the standard notation in the literature or (b) be very self-explanatory. You should liberally use subscripts, superscripts, and Greek letters, and you will find it very helpful to use specialized equation editors (like the Equation Editor or MathType in Word).

You should also indicate the source of the model. Did you construct it yourself, or, as is much more common, is it borrowed or adapted from someone else?

In writing about your model, you present your assumptions about the economic agents you will consider and lay out the decisions and information they have available to them. On what basis do they make decisions? When are those decisions made—all at once, or in a series of steps or moments? What is the optimal way of acting based on the circumstances you have constructed?

For a sample model section, see appendix 2.

5b. Writing about Data

Another of the innermost parts of an (empirical) economics paper is the data section. In empirical economics papers, it is customary to describe the data one uses. The best way to learn about writing a data section is to read several data sections in the literature on your topic and pay attention to the kinds of information they contain.

What you tell your readers about your data will depend in large part on the kind of analysis you are conducting. Generally speaking, however, your data section should do at least the following:

- *Identify the data source* (e.g., “This study uses data from the 1999 wave of the Panel Study of Income Dynamics.”).
- *Provide a general description of the data source* (number of observations, population groups sampled, time period during which the data were collected, method of data collection, etc.).
- *State the strengths and weaknesses of the data source*, especially how they relate to other data sources used in the literature (does the data source provide more observations, and/or more recent observations, than other sources? was the data collected in a more reliable manner? etc.).
- *Note any features of the data that may affect your results* (were certain populations overrepresented or underrepresented? is there attrition bias or selection bias?)
- *Explain how you may have computed certain kinds of data* that the source did not give directly (did you have to add/subtract/multiply/divide two given pieces of data to get a third?) Describe how you selected your sample (did you have to eliminate certain kinds of observations?)

You should pay attention to what aspects of your data will be most relevant to your project; you might spend more energy discussing your dependent variable than a control variable.

Data sections often contain a table of descriptive statistics, statistics of relevance about the sample. These statistics usually include the mean (e.g., mean income, mean age, mean years of schooling, etc.) and standard deviation. For categorical data (like race), however, you do not report a mean; instead, you report the percentage of the observations in each group. Again, the nature of your project will determine how best to describe your data.

And it bears repeating that the best way to learn how to write a data section is to read several data sections in the literature and pay attention to the kinds of information they contain.

In the appendix to this manual you will find two sample data sections of varying lengths. Study them with respect to the discussion presented here.

5c. Reporting Data and Results in Tables

[Note: This section and the next are drawn almost wholesale from *Writing Economics: A Guide for Harvard's Sophomore Economics Concentrators*, which Harvard has kindly allowed us to use.]

Once you have located your data or have run regression analyses and have gotten your results, you now need to present them. Commonly, in economics papers, results and statistical information are presented in tables. But how much of that data or how many results should you report in your tables? The short answer: Less is usually more. This is particularly the case when it comes to reporting the results from regression analyses. A common mistake made by virtually all novice researchers (including graduate students) is to include every parameter estimate from every regression specification that you ran. Such a “kitchen sink” approach is usually done to demonstrate to the professor that you have done all this wonderful econometric work. But that approach is usually counterproductive, as it often obscures what your important findings really are. So what to do?

Better would be to present only those parameter estimates that speak directly to your topic. To illustrate this point, let's consider a hypothetical rhetorical situation for which you might construct a table in which to present your findings. Suppose that you are writing about the effect of education on wages. Suppose your main regression places an individual's wage on the left-hand side and regressors such as education, race, and gender on the right-hand side. You believe that the regressor of interest—education—is correlated with the error term of the wage equation: that is, more “able” people earn more at their jobs and also obtain more education. Because of this correlation between the error term and education, the measured effect of education in the regression will reflect not only the true causal effect of education on wages but also some of the effect of ability on wages. To circumvent this “ability bias” you use a separate measure as a proxy for ability. Though such a proxy is not available, assume for the sake of exposition that a special data set contains an individual's evaluation by his or her second-grade teacher. When presenting your results, you want to focus only on the estimates of the education effect and the ability effect. Your table might look something like this:

Table 1 OLS Estimates of the Effect of Education on Wages. Dependent Variable: Log of Yearly Earnings, 1985–1995

	1	2	3	4
Years of Education	.091 (.001)	.031 (.003)	.086 (.002)	.027 (.005)
Ability Dummy		.251 (.010)		.301 (.010)
State Dummies Included?	No	No	Yes	Yes
No. of Observations	35,001	35,001	19,505	18,505
No. of Persons	5,505	5,505	4,590	4,590
Adjusted R ²	.50	.55	.76	.79

Note: Standard errors are in parentheses. Data are from the Tennessee Second Grade Ability Survey and Wage Follow-up, and include individuals evaluated between 1962 and 1971. The “ability dummy” equals 1 if the individual’s second-grade teacher classified the individual as “able,” and 0 otherwise. Each regression also includes yearly dummies, ten one-digit industry and twenty Census-defined occupation dummies, labor market experience (defined as one’s age minus 6), experience squared, seniority on the current job, seniority squared, Census region of current residence, marital status, race, gender, and a dummy variable denoting whether the individual lives in a city of more than 100,000 persons. Columns 3 and 4 have fewer observations because the state of residence is not available for some individuals.

A few words of explanation are in order. The columns are numbered 1, 2, 3, and 4; each refers to a different regression. Using only numbers as column heads is fairly common in tables that present the results of a series of regressions. In most other cases, however, you will need to use actual words as column heads.

Also, the table has a fairly detailed note explaining the details of the table, such as the data source and the numbers in parentheses. It is customary to include such notes at the bottom of tables. The goal is to enable the reader to make sense of the table on its own.

Now, to the results. Note that the table is selective in its presentation of data: the table does not present the parameter estimates of your control variables (regressors such as race and gender), but it does present any detail that helps interpret the parameters of interest (including the dependent variable). Your estimates should be identified using as much language as possible, rather than by simply using letters in the equation that stands for the estimates; that is, in your table, say “Years of Education” rather than just giving, say, the letter β (or whatever letter stands for that estimate).

Don’t worry about repeating yourself in the text and in the notes—that will often be necessary so the reader can understand your table without looking back at the text. You should present enough information in total so that a researcher could replicate your results. For very detailed projects, this may require a data appendix.

Tables may be placed directly in the text, or they may be all put together at the end of the paper. Which you should do is largely a matter of your own preferences (or your professor’s!).

5d. Tables and Text: Writing about Your Results

In section 5c we reviewed a few details about presenting results in a table. Let's now look at how you might actually write about those results. For as informative as a table might be, it cannot stand alone: it must be correspondingly discussed in the running text.

When you present information in a table, there are at least two expectations that you need to fulfill. The first is that you explicitly introduce the table. You are expected to point out to your readers that the table exists and indicate, briefly, its general content. Usually, those two things can be accomplished in a single sentence: "Table 1 shows the incomes earned by full-time workers in the United States," or "Table 1 provides demographic statistics on the sample population," or "In table 1, I present the results of the three regressions." Once you introduce the table and briefly describe its general contents, you can discuss the table more particularly. That brings us to our second expectation.

The second expectation is that you identify the main points made by the data in the table. The table cannot, and should not be expected to, "speak for itself." Rather, you should explicitly tell your readers the important realities that the data show: "As we see in table 1, 45% of the sample earned less than \$25,000 in 2003," or "Table 1 reveals several significant characteristics of our sample that could affect our results: one-third of women in the sample had less than a high-school education; nearly two-thirds were unmarried; and exactly one-half had at least one child under 3," or "As expected, the coefficient on education is, in every regression, significant and positive." Please note that you are not expected to comment on or restate every piece of information that a table contains; but you are expected to point out to your readers the "meaning" or your interpretation of the data in it. What do you most want your reader to take away from the table?

All of this is to say that you have to describe the contents of the table in the text. You cannot simply refer to a table (or worse, not refer to it at all!) and leave it at that.

Let's return to the hypothetical rhetorical situation described in section 5c. As you'll recall, suppose that you are writing about the effect of education on wages. Suppose your main regression places an individual's wage on the left-hand side and regressors such as education, race, and gender on the right-hand side. You believe that the regressor of interest—education—is correlated with the error term of the wage equation: that is, more "able" people earn more at their jobs and also obtain more education. Because of this correlation between the error term and education, the measured effect of education in the regression will reflect not only the true causal effect of education on wages but also some of the effect of ability on wages. To circumvent this "ability bias" you use a separate measure as a proxy for ability. Though such a proxy is not available, assume for the sake of exposition that a special data set contains an individual's evaluation by his or her second-grade teacher. When presenting your results, you want to focus only on the estimates of the education effect and the ability effect. Your table—and it is the same as in section 5c, by the way—might look something like this:

Table 1 OLS Estimates of the Effect of Education on Wages. Dependent Variable: Log of Yearly Earnings, 1985–1995

	1	2	3	4
Years of Education	.091 (.001)	.031 (.003)	.086 (.002)	.027 (.005)
Ability Dummy		.251 (.010)		.301 (.010)
State Dummies Included?	No	No	Yes	Yes
No. of Observations	35,001	35,001	19,505	18,505
No. of Persons	5,505	5,505	4,590	4,590
Adjusted R ²	.50	.55	.76	.79

Note: Standard errors are in parentheses. Data are from the Tennessee Second Grade Ability Survey and Wage Follow-up, and include individuals evaluated between 1962 and 1971. The “ability dummy” equals 1 if the individual’s second-grade teacher classified the individual as “able,” and 0 otherwise. Each regression also includes yearly dummies, ten one-digit industry and twenty Census-defined occupation dummies, labor market experience (defined as one’s age minus 6), experience squared, seniority on the current job, seniority squared, Census region of current residence, marital status, race, gender, and a dummy variable denoting whether the individual lives in a city of more than 100,000 persons. Columns 3 and 4 have fewer observations because the state of residence is not available for some individuals.

How would a discussion of the results presented in this table likely go? Here is one possibility:

Table 1 presents the OLS estimates of the effect of education on wages. It shows that including a measure of ability in the wage equation dramatically lowers the predicted effect of education on earnings. Column 1 does not include an ability measure and indicates that a year of education raises wages by 9.1 percent. Column 2 adds the ability measure; the education effect now drops to 3.1 percent. Columns 3 and 4 show that this general pattern is repeated even when state-level dummy variables are included. The estimates in table 1 are therefore consistent with the hypothesis that the OLS estimates suffer from an upward ability bias.

A few points are instructive here. First, the discussion begins by introducing the table and indicating its content (“Table 1 presents the OLS estimates . . .”). Second, the meaning or conclusion to be drawn from the table is explicitly stated (“It shows that including a measure . . .”). Indeed, the conclusion is even restated in a different way at the end of the discussion (“The estimates in table 1 are therefore . . .”). And third, the discussion does not mention every single piece of data in the table. Instead, it selects for discussion only those data that are important for the task at hand.

Too often, authors do not pay close attention to the paragraphs that describe their results. After all, the results are in the table; what difference does it make how they are described in the text? But it is necessary to craft carefully paragraphs that describe your results. Any well-designed empirical project is complex; a lot of factors must be considered in order for any single factor to be precisely estimated. You want to guide the reader and focus his or her attention on the important parts of the table, and in the right order. Moreover, no empirical paper turns

out perfectly. Usually, the data do not resoundingly support each and every idea. In those cases, it is crucial to discuss your results as honestly and carefully as possible.

6. Writing Literature Reviews

Remember the four-move pattern discussed in the section on introductions (section 6)? You might recall that move 2 of the pattern reviews the literature. Literature reviews are staples of scholarly economics articles. A review should do at least four things. First, it should analyze critically, and organize, a body of research. Second, it should put your own study in the context of other studies. Third, your review should highlight your study's contribution. And fourth, it establishes your scholarly "bona fides" by showing you have done your homework.

Here are some guidelines to consider when writing your literature review.

- *Begin with comments about the body of research as a whole.* This should be your assessment of the literature as a whole. Have there been many studies, or few studies? Do the studies focus on methodological issues, or data issues, or some other issue? Have the studies been mostly empirical, or theoretical, or both? Have they focused on a similar set of questions? Is there a general consensus on the major issues in the literature?
- *Organize your review according to themes (data, methodology, results, etc).* Your principle of organization should make sense for your particular review. Here, for example, is a review organized according to rural vs. urban development: "All four studies took a position on **whether rural or urban development should be favored**. Epstein and Joseph (2000) favor rural development. In contrast, Bhattacharya (2001) and Van Neer (2000) believe urban development is more important. Marshall (2003) concludes that it does not matter: either kind of development is equally beneficial."
- *Begin paragraphs with a sentence that puts in explicit context what follows.* Don't leave it to your reader to infer the point you are making. "**The sources of data used in the studies vary greatly.** Smith (1999) uses data from the Survey of Income and Program Participation. As he explains, the SIPP is well-suited to explore the relationship between hourly wages and participation in the Food Stamp Program. Jones (2000) uses data from the High School and Beyond Survey. . . ."
- *Explain the merits, and the shortcomings, of the existing studies.* Be explicit about this. Do not leave it to your readers to infer this information. "Although Rodriguez (2001) and Dudley (2000) ask the right questions, their studies are hampered by data sets with an insufficient number of observations."
- *Explain how your study will make a contribution.* You may have already done this in your introduction, but it never hurts to remind readers. "Although Rodriguez (2001) and Dudley (2000) ask the right questions, their studies are hampered by data sets with an insufficient number of observations. The present study hopes to avoid the flaw in Rodriguez's and Dudley's analyses by using a new data set with over 1,600 observations."

You will find it helpful to read the literature reviews in published economics papers. Sometimes those reviews will be in the introduction; other times the review will appear in a section of its own. A good source for literature reviews is the *Journal of Economic Literature*. Pay attention to the kinds of information given in reviews and to any principles of organization the author uses. How does the author construct the review to bear on his or her subject? For a sample literature review, see appendix 5.

7. Writing History-of-Thought Papers

The history of economic thought (sometimes called the history of economics) is concerned with the history of the discipline of economics—the history of economic ideas, of economic methodology, of economic practice. How, and why, has economics become so mathematical? What accounts for the rise and influence of the Chicago school (Friedman, Becker, et al.)? What are the origins of rational choice theory? How did the labor theory of value change over the nineteenth century? What circumstances attended the composition of Keynes's *General Theory*? To what degree did the French economists of the eighteenth century influence John Stuart Mill? Just what was the *methodenstreit* all about? What role has funding agencies played in the evolution of the discipline? How did the demand theory we know and love come to be? Practitioners of history of thought (HET) need to be skilled on two fronts: they need to understand the economic concepts they encounter; and they need to know the tools and techniques of the historian. (Note that HET is *not* economic history. That is, it is not the history of economic institutions or economic activity, such as a history of the Federal Reserve would be, or a history of the changes in tobacco manufacturing. Economic history is a separate subject altogether.)

The format of HET papers has not become as standardized as we see in empirical and theoretical economics papers. Still, HET papers are usually written in sections, with section heads.

As mentioned earlier, introductions to HET papers are expected to present certain pieces of information: what the paper is about, what is new or valuable about the paper, what the thesis of the paper is. See the example from Flavio Comim's paper, below, in the discussion of introductions.

HET papers rely on two sources of evidence: primary and secondary. Primary evidence refers to the writings of an economist himself, or the writings in which a particular idea was set forth. Primary evidence may be divided into published sources (Keynes's *General Theory*, for instance) and unpublished sources (e.g., Keynes's papers in King's College Library). Secondary evidence refers to other HET papers—articles and (sometimes) books *about* a particular economist or idea. Suppose you wanted to research the rise of the Chicago school. Primary sources would be such things as the minutes of department meetings, department memos, and the writings (published and unpublished) of the people involved (say, Milton Friedman's autobiographical writings). Your paper, once finished, would constitute a secondary source.

HET papers usually state and support a thesis. A thesis is simply an interpretation or argument that may or may not be true and hence needs to be supported with evidence. The evidence, as indicated above, comes from primary and secondary sources.

Thesis-driven inquiries may begin explicitly with a research question. To what degree did the French economists of the eighteenth century influence John Stuart Mill? The answer would constitute a thesis. Or with only the vaguest notion of a question in the foreground, a the-

sis may emerge inductively as one reads and rereads—and reads again!—the primary sources. That is, the substance of a thesis may emerge by reading *between the lines* of a text. The substance of the interpretation is then usually implicit, rather than explicit, in the text; it is not plainly evident to the casual or superficial reader. Whatever the thesis is, and however it was determined, it is usually stated in the introduction of the paper.

As mentioned before, in *The Craft of Research*, Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams rank thesis statements according to their significance. The least significant is a thesis that further confirms what others have consistently argued. Next in significance is the thesis that helps clear up a puzzling, uncertain, or otherwise vexing issue. Those two are by far the kinds of theses that the vast majority of HET projects (indeed, that the vast majority of research projects in general) advance.

The body of the paper is by far the longest part. It is where you present your evidence that supports your thesis. In many HET papers, the body begins by setting the historical context for the topic you are about to discuss. It then usually moves on to consider the evidence you have gathered in support of your thesis. It is usually helpful to readers to point out the way in which the evidence you present supports the thesis, rather than letting readers figure it out for themselves.

As with empirical and theoretical economics papers, conclusions to HET papers are often brief—one, two, perhaps three paragraphs. And whereas in introductions you usually build up to your thesis statement, in conclusions you usually *begin* with it. The conclusion is your chance to sum up your argument in a clear and concise manner, and in a way that does not simply repeat, word for word, what has been already said. It is also the place to suggest other lines of inquiry or broader implications of the topic and findings that you didn't have to space to explore. The conclusion helps answer the question, "So what?" In any event, it should not essentially repeat the opening paragraph or simply restate the theme and findings.

8. Writing Book Reviews

Book reviews play a vital role in the discipline: They allow economists, with a minimum of effort, to keep up with what is current in the literature.

I like the book review because of all the genres of economics writing, the book review is one of the few places where an economist's personality and style are permitted to be flagrantly displayed. Scholarly articles proper (HET articles and empirical and theoretical papers) are usually sober and tied down to a particular format. Not so with book reviews. In a book review, you have license to begin with a catchy opening, as Robert Solow, a Nobel Prize winner, once did:

Like all good things for body and soul, this book is going to hurt. —Review of *Activity Analysis of Production and Allocation*, from the *American Economic Review*, June 1952

Or, to take a more recent example, this time by another Nobel winner, Amartya Sen:

This is a great book. But it begins terribly. —Review of *Poverty, Inequality, and Development*, from the *Economic Journal*, March 1983

But it's not just the beginning that can be catchy. The ending can be clever, too:

Were there a Surgeon General of neoclassical economics, this book would carry a warning label.
—Bruce J. Caldwell, final sentence, review of *Against Machines: Protecting Economics from Science*, from the *Journal of Economic Literature*, June 1990

So cut loose and have fun with this genre. But (there's always a *but*, isn't there?): Remember that the book review has a serious, utilitarian purpose. All fun with no content makes for a failed review. With that in mind, here are a few things to consider when writing a review.

- *Come to the point quickly.* Is this a book your audience is likely to find worthwhile?
- *Give readers an overview of the main contents of the book.* What is the book about? What is its thesis or emphasis?
- *State the strengths and weaknesses of the book.* Is the book well written? Does it support its arguments? Does it fulfill the expectations it raises? Is it unsatisfactory in some way?
- *Explain how the book fits in with the existing literature.* Has the author written other books of its kind? How does the book respond to or continue other studies?
- *State the author's credentials.* Is the author a professor of economics, or is he or she of another discipline? Is the author a known ideologue or does he or she come from a particular milieu that might color their attitudes and positions?
- *Note any miscellaneous, interesting, or useful features of the book.*

Above all, keep this in mind: A book review is not just a summary or recap of a book's content—it is not a book report!—but an appraisal of the book: its contribution, its importance, its usefulness.

For a particularly engaging review that is fun and useful, see Paul Krugman's review of *Against the Tide: An Intellectual History of Free Trade*, which appeared in the June 1997 issue of the *Journal of Economic Literature* and which is reproduced here as appendix 6.

9. Writing Abstracts

Most economics articles contain abstracts, a paragraph-long condensation of the main elements and features of a given paper. The content of an abstract can vary, but they often state what the paper does, the data and methodology used, and the principal findings. What you choose to put in your abstract should depend on the contribution of your paper. If you had only 150 words to say something about it, what would you say?

Abstracts are by definition brief—usually 150 words or less. Here, for instance, is an abstract of only 58 words. It confines itself to stating what the paper does.

We selectively survey, unify and extend the literature on realized volatility of financial asset returns. Rather than focusing exclusively on characterizing the properties of realized volatility, we progress by examining economically interesting functions of realized volatility, namely realized betas for equity portfolios, relating them both to their underlying realized variance and covariance parts and to underlying macroeconomic fundamentals. —Torben G. Andersen, Tim Bollerslev, and Francis X. Diebold, "A Framework for Exploring the Macroeconomic Determinants of Systematic Risk," NBER Working Paper no. 11134, 2005

Of course, an abstract can contain additional details. Here is one by the same trio of authors that states not only what the paper does, but what the findings, and the implications of those findings, are.

A rapidly growing literature has documented important improvements in financial return volatility measurement and forecasting via use of realized variation measures constructed from high-frequency returns coupled with simple modeling procedures. Building on recent theoretical results in Barndorff-Nielsen and Shephard (2004a, 2005) for related bi-power variation measures, the present paper provides a practical and robust framework for non-parametrically measuring the jump component in asset return volatility. In an application to the DM/\$ exchange rate, the S&P500 market index, and the 30-year U.S. Treasury bond yield, we find that jumps are both highly prevalent and distinctly less persistent than the continuous sample path variation process. Moreover, many jumps appear directly associated with specific macroeconomic news announcements. Separating jump from non-jump movements in a simple but sophisticated volatility forecasting model, we find that almost all of the predictability in daily, weekly, and monthly return volatilities comes from the non-jump component. Our results thus set the stage for a number of interesting future econometric developments and important financial applications by separately modeling, forecasting, and pricing the continuous and jump components of the total return variation process. —Torben G. Andersen, Tim Bollerslev, and Francis X. Diebold, “Roughing It Up: Including Jump Components in the Measurement, Modeling, and Forecasting of Return Volatility” NBER Working Paper no. 11775, 2005

What you choose to include in an abstract depends on your interpretation of the paper’s important or interesting features and its contribution or what distinguishes it from other papers.

Part III

Bookends: Introductions and Conclusions

10. Introductions

10a. General Content of Introductions

10b. Yes, But How to Actually Begin a Paper?

10c. Introductions: Summing Up

11. Conclusions

Part III: Bookends: Introductions and Conclusions

This part of the manual will discuss writing the two major sections of a paper that really function in tandem with one another: introductions and conclusions. It is no accident that the discussion of introductions and conclusions comes *after* the discussion of the “innermost” parts of an economics paper (section 5): after all, introductions and conclusions are usually written last (or at least their final form is written last, although drafts of the introduction and conclusion may be written earlier in the writing process).

10. Introductions

In this section we will consider the general content of introductions, focusing on a series of “moves” that many introductions progress through. We will also review ways to begin a paper.

The discussion that follows is the most sprawling of the manual, so please bear with me. If you’re like me, figuring out how to simply begin a paper is as much a challenge as writing the paper as a whole. Also, if you’re like me, you want to sound smart; you want to sound profound. You want to speak the Truth. So we tend toward—what else?—the grandiose opening. (Hey, it works for the Book of Genesis and the Gospel of John, so why not us?) We begin with, say, “Since the beginning of time, humankind has sought ways to elevate their happiness” or “Through the ages, economists have been vexed by the problem of poverty.” The problem with such a beginning is that we lay claim to more authority than we can possibly have. (Have *you* been around since the dawn of time?) It’s akin to beginning a personal essay or, God forbid, a poem (shriek!), with “God is . . .” or “Love is . . .” When we commit ourselves to so grand a subject, we are bound to fall flat on our face.

Let’s do something different: Let’s begin smaller, or at least more humbly. As you’ll see, to do so puts us in acceptable company.

10a. General Content of Introductions

So, what kinds of things should be in the introduction? The answer depends in part on the audience for the paper, which, as most of you have learned the hard way, professors often fail to identify. The moral: Always ask your professor to identify the intended audience of a paper. Depending on your audience, you may need to provide a lot of background information or none at all; you may need to define or avoid certain terms, or you may be able to use them without a second thought. Is your audience likely to be receptive or skeptical or downright hostile to your point of view?

The answer also depends on the kind of document you are writing. Many of you who write honors papers will write an empirical or theoretical economics paper (the kind of paper in which you test or develop a model). With those papers, it may be helpful to think of an introduction as consisting, roughly, of four “moves.” In Move 1, you announce your topic. In Move 2, you review previous research on your topic. Move 3 finds you indicating a gap or problem with the previous research. And in Move 4 you state what your paper does, how it fills the gap

or responds to the problem. Sometimes the moves can be made in a rather spare manner:

The importance of the equilibrium real exchange rate, the relative price of non-traded to traded goods consistent with balance-of-payments equilibrium, has long been recognized. However, no simple, compact derivation of the determinants of the real exchange rate in a multicommodity framework appears to be available. Section I below attempts to fill this gap, and Section II notes the implications of the main result for a number of applied questions. —Peter Neary, “Determinants of the Equilibrium Real Exchange Rate,” *American Economic Review*, March 1988

Here is another short introduction, but with a bit more detail. It also follows the four-move pattern:

More immigrants entered the United States during the past decade than in any comparable period since the 1920s. Among the issues raised by this influx, none is as controversial as its effect on the labor market opportunities of native-born workers. Evidence on the labor market consequences of immigration is limited (see Greenwood and McDowell 1986 and Borjas 1990). This paper presents new evidence on the effects of immigration, based on changes in the distributions of wages in 24 major cities during the 1980s. Although immigrant inflows are small relative to the populations of most cities, recent immigrants are a significant fraction of less-educated workers in many cities. We therefore concentrate on measuring the effects of immigration at the lower tail of the wage distribution. In particular, we ask whether recent declines in the real earnings of the least-skilled workers in the U.S. economy are related to immigration. Our empirical analysis reveals large differences across cities in the relative growth rates of wages for low- and high-paid workers. Nevertheless, these differences bear little or no relation to the size of immigrant inflows. Our results therefore confirm the findings of earlier studies, based on 1970 and 1980 Census data, that suggest that the labor market consequences of higher immigration are relatively small. —Kristin F. Butcher and David Card, “Immigration and Wages: Evidence from the 1980s,” *American Economic Review*, May 1991

The introduction begins with move 1, in which the topic is introduced and its significance suggested:

More immigrants entered the United States during the past decade than in any comparable period since the 1920s. Among the issues raised by this influx, none is as controversial as its effect on the labor market opportunities of native-born workers.

The next sentence combines moves 2 and 3: the literature review (the citations to Greenwood and McDowell 1986 and to Borjas 1990) and the problem in the literature (“evidence . . . is limited”):

Evidence on the labor market consequences of immigration is limited (see Greenwood and McDowell 1986 and Borjas 1990).

Move 4 takes place in the next sentence:

This paper presents new evidence on the effects of immigration, based on changes in the distributions of wages in 24 major cities during the 1980s.

The rest of the introduction elaborates on move 4 and presents the results of the study.

For a good example of the four-move pattern in a longer introduction, see appendix 7 at the end of this manual. (This idea of introductions consisting of moves, by the way, is not my own. It comes from John M. Swales, a professor of linguistics at the University of Michigan who has made it a point to examine the written discourse of the academic disciplines.)

If you are writing a history-of-thought paper, your choices may be a bit less formalized, although you are still expected to present certain pieces of information: what the paper is about, what is new or valuable about the paper, what the thesis of the paper is. Here is an example of an entire introduction that is also concise (a mere 146 words):

Philip Wicksteed (1844–1927) holds a curious place in economics. For those familiar with his work, it is certainly a conundrum that he has not received more attention from the academic community. Although some economists recognize the innovation and merits of his work, the general consensus among historians is that Wicksteed was simply a disciple of William Stanley Jevons, one of the founders of marginalist economics. This essay takes issue with that consensus and argues that Wicksteed made his own contribution to economics. As I will show, at the heart of Wicksteed's original contribution is a conception of economics as a moral activity and practical science—a conception that Wicksteed derived from Aristotle. His economic methodology rested on his own notion of “common sense,” which provided a contemporary argument for economics as a moral science based on individuals' daily experiences in all their complexities and psychological nuances. —Flavio Comim, “*The Common Sense of Political Economy of Philip Wicksteed*, *History of Political Economy*, Fall 2004

In a general sense, an introduction raises certain expectations in the reader, and it is your job as the writer to realize that and to fulfill those expectations. Take the introduction just quoted from Comim. Based on that introduction, the reader would expect a demonstration of Wicksteed's conception of economics and how it is derived from Aristotle. If Comim does not do those things, the reader will be frustrated and the paper will not be a success. If Wicksteed does those things and many, many more, the reader will also become bewildered, not having been prepared for the multidimensional content of the paper.

Developing a sense of what to include, and not include, in your introduction comes from practice and reading, from paying attention to what others do and to what has worked, or not worked, for you in the past. Depending on the complexity of your topic and your paper, your introduction can be as long as a thousand words, or more—or, as we've seen, as short as a single paragraph. An introduction can be quite concise and to the point. I think a lot of times we feel the need to “pad” our introductions with all manner of interesting but, let's face it, extraneous statements. We don't. In fact, our introductions will usually be better without such extra cushion.

At the same time, don't neglect to include specific details about the organization of your paper and what it will end up saying. Economics professors tend not to like surprises; they're grading a paper, not reading a mystery novel. They want to know up front where you're going to go.

10b. Yes, But How to Actually Begin a Paper?

What follows is a survey of the many ways in which economics papers may begin. We will begin with some

An effective introduction may begin by expressing something meaningful and *to the point* and that raises the reader's interest. Here is how Kenneth G. Elzinga begins his appraisal of Paul Samuelson's famous economics textbook (then in its eleventh edition, now in its eighteenth):

In 1948, Americans in great numbers were reading Dwight D. Eisenhower's *Crusade in Europe* and Dale Carnegie's *How to Stop Worrying and Start Living*. Atop the best-seller list in fiction were two totally different reading experiences: *The Big Fisherman* by Lloyd Douglas and Norman Mailer's *The Naked and the Dead*. That year as well Kinsey's *Sexual Behavior of the Human Male* approached the top of the best-seller list.

Also in 1948, unmentioned by *Publishers Weekly*, a textbook authored by a young economist at MIT was published at a suggested retail price of \$4.50. The book, entitled *Economics*, came to out-sell Eisenhower and Mailer on war, Carnegie on worrying, Douglas on the Apostle Peter, and even Kinsey on sex. —“The Eleven Principles of Economics,” *Southern Economic Journal*, April 1992

The detail about the suggested list price and the books it outsold I find particularly charming. Paul Samuelson himself began a tribute to his colleague Robert Solow as follows:

The great Cambridge mathematician G. H. Hardy summed up his scholarly worth with the assertion: “I collaborated with Littlewood.” When I meet up with Saint Peter in Heaven it will be my boast, “I collaborated with Bob Solow.” —“Robert Solow: An Affectionate Portrait,” *Journal of Economic Perspectives*, Summer 1989

Anecdotes often make for good beginnings. Here are the first two paragraphs of an article by Gary Becker on restaurant pricing:

A popular seafood restaurant in Palo Alto, California, does not take reservations, and every day it has long queues for tables during prime hours. Almost directly across the street is another seafood restaurant with comparable food, slightly higher prices, and similar service and other amenities. Yet this restaurant has many empty seats most of the time.

Why doesn't the popular restaurant raise prices, which would reduce the queue for seats but expand profits? Several decades ago I asked my class at Columbia to write a report on why successful Broadway theaters do not raise prices much; instead they ration scarce seats, especially through delays in seeing a play. I did not get any satisfactory answers, and along with many others, I have continued to be puzzled by such pricing behavior. —“A Note on Restaurant Pricing and Other Examples of Social Influences on Price,” *Journal of Political Economy*, October 1991

The quotation can make for an effective beginning. Kenneth Arrow began a short contribution to a panel discussion on the relationship between economic history and economic analysis with a quotation:

Henry David Thoreau said about the newly invented telegraph: “They tell us that Maine can now communicate with Texas. But does Maine have anything to say to Texas?” —“Maine and Texas,” *American Economic Review*, May 1985

Sometimes, the quotation is combined with an anecdote. This paper leads with a quotation from a *New York Times* article:

“Deep in a citrus grove, law officers crept up on Dionatan Rocha and caught him red-handed. Dionatan, a 12-year-old wearing a baseball cap and T-shirt, was picking oranges, in plain violation of Brazil’s child-labor code. . . . Says Mr. Grajew: ‘Brazil’s chronically unequal wealth distribution has one root cause: Millions of children are working instead of studying.’” —Kevin Sylwester, “A Model of Public Education and Income Inequality with a Subsistence Constraint,” *Southern Economic Journal*, July 2002

An intriguing or pithy statement or question can make for a good opening. Kevin Hoover begins a 2002 essay with a simple yet provocative question: “Is econometrics possible?” Hoover’s entire first paragraph is worth quoting:

Is econometrics possible? The question reminds me of an argument between two divines at an ecumenical conference. BAPTIST MINISTER: “I don’t believe in infant baptism.” ROMAN CATHOLIC ARCHBISHOP: “Not only do I believe in infant baptism, I have seen it done.” Every applied economist has seen it done; yet Tony Lawson in his book, *Economics and Reality* (1997), assures us that, splash the econometric holy water as you may, economic heaven will not be a whit closer. The metaphor is perfectly apt: for Lawson’s reason for dismissing econometrics is metaphysical: transcendental realism provides an accurate ontology of the economic world; econometrics is necessarily incompatible with transcendental realism. Nancy Cartwright, who is also a realist, appears more favorably disposed to econometrics. After all, in her *Nature’s Capacities and Their Measurement* (1989), she stokes the self-esteem of economists by suggesting that quantum physicists might learn a thing or two about handling probabilities from econometricians. Beneath a cheery exterior, her views are in fact stunningly pessimistic: the conditions in which econometric methods can succeed are strict; they may be in the land of quantum physics, but never in their country of origin. Against both Lawson and Cartwright, I maintain that econometrics and realism are compatible and, indeed, that realism helps us better to understand the role and successes of econometrics. —Kevin D. Hoover, “Econometrics and Reality,” in *Fact and Fiction in Economics: Models, Realism, and Social Construction* (2002)

This paragraph, by the way, constitutes the entire introduction of the paper. It is yet another example of a concise yet perfectly acceptable introduction: it announces the topic, engages the literature, and states a thesis.

Note how with a little bending of grammatical rules, the ordinary can take on a surprising verve:

Karl Marx a minor post-Ricardian? Bah humbug. —Margaret Schabas, “Comment,” *History of Political Economy*, Spring 1995

Here the writer begins with two incomplete sentences to good effect. This beginning would have been much less arresting had it read, say, “Was Karl Marx a minor post-Ricardian? The evidence suggests he was not.”

Much to my surprise, even the occasional postmodern touch may be found in the economics literature, as in this opening paragraph:

The Long Run: b. 1890? d. 1989 (circa). A recent obituary (Helfgott 1989) reports an old

friend's passing, calling economists to acknowledge the demise and accept our loss. Cause of death, it is alleged, was technical change. Forensics suggests that the deed was done with that infamous blunt instrument, the computer. The motive was profit. —James R. Seldon, "A Death Much Exaggerated: On the Demise of the Long Run," *Journal of Economic Education*, Spring 1994

Now, not all papers begin with outright flair or in some unusual way. Most papers begin rather prosaically—and there's nothing at all wrong with that. There's a lot to be said for being straightforward.

Many economics papers begin by simply stating what the paper does, or by announcing the topic, or by stating the main argument, as in the following example:

This paper develops a consumption-based model of asset pricing which integrates the real financial and monetary sectors of the economy. Unlike most earlier consumption-based models which treated the probability distributions of asset payoffs and future commodity prices as exogenous, we derive these distributions endogenously within a general equilibrium model by assuming rational expectations. This yields new insights into the implications of inflation and real sector activity for asset pricing. —Glenn W. Boyle and Leslie Young, "Asset Prices, Commodity Prices, and Money: A General Equilibrium, Rational Expectations Model," *American Economic Review*, March 1988

Often, papers begin by describing an economic problem, reality, or phenomenon, as in this example:

How do increases in competition affect equilibrium bidding at auctions? According to the Walrasian analogy of markets as auctions, an increase in the number of bidders should encourage more aggressive bidding so that, in the limit, as the number of bidders becomes arbitrarily large, the imperfectly competitive auction setting approaches the efficient perfectly competitive outcome. —Han Hong and Matthew Shum, "Increasing Competition and the Winner's Curse: Evidence from Procurement," *Review of Economic Studies*, October 2002

Relevant statistical or historical background is always acceptable material for openers:

For 20 years following 1949, average total fertility per woman in China hovered just above six children. The year 1970 marked the beginning of persistent fertility declines. By 1980, the rate had dropped to 2.75, and since 1992 it has remained under 2. —Marjorie McElroy and Dennis Tao Yang, "Carrots and Sticks: Fertility Effects of China's Population Policies," *American Economic Review*, May 2000

Requiring that schools be "accountable" for their efforts to educate students is among the latest popular education reforms. Although many states had already implemented their own accountability systems, the national trend toward increased accountability has escalated following the passage of the federal No Child Left Behind Act of 2001. Most of these accountability systems share the feature that they require some form of standardized testing of students and that the results be made public. —David N. Figlio and Cecilia Elena Rouse, "Do Accountability and Voucher Threats Improve Low-Performing Schools?" *Journal of Public Economics*, vol. 90, 2006

Finally, a discussion of previous studies of your topic is also a common way to begin. If fact, it may be the most common. Here is the first paragraph of an introduction from a paper on random-walk behavior:

Several recent papers have studied the univariate time-series process for U.S. GNP, including Campbell and Mankiw (1986), Clark (1986), Cochrane (1986), Nelson and Plosser (1982), Quah (1986), Stock and Watson (1986), and Watson (1986). A major focus of these papers has been the extent to which GNP movements are well approximated by a process with a unit root with drift, as opposed to stationary movements around a time trend. The empirical evidence on this is mixed. Campbell and Mankiw, Nelson and Plosser, and Stock and Watson conclude that the random-walk (unit-root) approximation is quite good. Clark, Cochrane, and, perhaps, Quah and Watson say that it is not. —Kenneth D. West, “On the Interpretation of Near Random-Walk Behavior in GNP,” *American Economic Review*, March 1988

10c. Introductions: Summing Up

So what is the bottom line of this discourse on introductions? I would suggest you begin by mastering the four-move pattern described above: announce your topic; review previous research; indicate a gap or problem with the previous research; state how your paper will fill the gap or respond to the problem; state your main point, your thesis; and preview the content of the paper. It would be hard to go wrong with that. Once you have mastered that, look for ways to introduce style into your introductions. But remember: a little style goes a long way. Less is decidedly more.

11. Conclusions

Just as introductions are often written after the body of the paper has been developed, so are conclusions. Your conclusion should function in tandem with your introduction. Indeed, conclusions are, in a way, upside-down versions of introductions: whereas in introductions you usually build up to your thesis statement, in conclusions you usually *begin* with it. Let’s take a closer look at this often neglected part of a paper.

Conclusions to economics papers are usually brief. At their most pedestrian, they recap what has already been said in the paper. You may use your conclusion to restate your research question or purpose and to restate your principal findings. You may discuss the policy implications of your results. You may identify ways in which your present project can be extended or improved.

But think of conclusions as much more than that. The conclusion is your chance to sum up your argument in a clear and concise manner, and in a way that does not simply repeat, word for word, what has been already said. It is also the place to suggest other lines of inquiry or broader implications of the topic and findings that you didn’t have the space to explore. The conclusion helps answer the question, “So what?” That is, why should readers care? Why should they find your subject important?

I would suggest reading your introduction and your conclusion side by side. They should be consistent with one another: the thesis or question or conclusion you state in your introduction should be the one you state in your conclusion. But the conclusion should be more than just a mirror of the introduction. Consider that whereas the introduction speaks to the contents of the paper that are actually to come, the conclusion should speak more to issues slightly beyond the

paper. In other words, while looking back at the paper just presented, the conclusion should also look ahead.

Let's look at some conclusions from published economics papers. The first one is to a paper that investigated the role of congestion in models of travel costs. It begins by restating the methodological problem encountered in the literature then concludes by stating the main finding of the paper and indicating the policy implications.

Congestion is an important site attribute in many travel cost models of recreation demand, but it is typically ignored, particularly in the revealed preference context. This is because properly controlling for congestion costs requires the solution of a difficult endogeneity problem. While stated preference models offer a potential solution based on answers to hypothetical questions, revealed preference approaches require an instrumental variables solution unless identification is to be based on distributional assumptions and functional form restrictions.

Implementing such an instrumental variables approach, we find evidence of significant congestion effects. Failing to properly account for their endogeneity leads one to incorrectly recover agglomeration benefits, and to mis-measure the value of other site attributes. The practical lesson for policy-makers is that we will tend to understate the value of large sites (by more than half in the case of Lake Winnebago) if we ignore the role of congestion costs. —Christopher Timmins and Jennifer Murdock, "A Revealed Preference Approach to the Measurement of Congestion in Travel Cost Models," *Journal of Environmental Economics and Management*, forthcoming

This next one is from a paper that compared models of forward-looking behavior with those of "myopic" (irrational) behavior; the comparison was with respect to which the models were consistent with the data (that is, "fit" the data) on drinking and smoking rates among middle-aged men. It is similar to the preceding one in that it starts by reviewing what the paper did and stating the main conclusion ("Our analysis suggests that . . ."); it ends not with policy implications but with suggestions for future research.

This study has analyzed smoking and heavy drinking in a sample of elderly individuals drawn from the HRS. The main objective of the analysis has been to explore differences between myopic and forward looking models. We have investigated whether models of forward looking behavior explain the main regularities found in the data better than myopic models. Earlier studies have typically assumed that individuals are either myopic or forward looking. In contrast, we provide an empirical framework which allows us to control for varying degrees of forward looking behavior of individuals and, therefore, nest the competing theories. Estimating the discount factor is desirable and helps us to distinguish between the competing hypotheses which have been put forward to explain the consumption of harmful and addictive goods. Our analysis suggests that forward looking models which control for observed habit formation, unobserved heterogeneity and differences in initial conditions fit the data the best. They also have the best predictive power for a sample of mean above age 70. Our analysis thus provides strong evidence for the hypothesis that older individuals are forward looking and take future risks associated with smoking and heavy drinking into consideration when determining their choices.

Our analysis relies on a number of simplifying assumptions. Models based on hyperbolic discounting present an alternative to the two types of models considered here. Our framework could be extended to estimate a behavioral model with hyperbolic discount factors. Future research, with longer panels, should investigate whether these hybrid models provide better fits of the data than models we analyzed. Although estimating hyperbolic-discounting models are feasible, in principle, additional problems arise because of the need to estimate two separate discount factors. Given the availability of only short panels, it may prove to be quite challenging to

precisely estimate these types of models. Nevertheless, our results are quite promising for further work which combines formal decision-theoretic analysis and estimation to address questions regarding the degree of forward looking behavior imposed in modelling the consumption of potentially harmful and addictive goods. —Peter Arcidiacono, Holger Sieg, and Frank Sloan, “Living Rationally Under the Volcano? An Empirical Analysis of Heavy Drinking and Smoking,” *International Economic Review*, forthcoming

Let me conclude this discussion of introductions and conclusions by emphasizing the importance of reading—and rereading. The more introductions and conclusions to economics papers you read, the more familiar you will become with their conventions and style, and the better prepared you will be to write them.

Part IV

Economists Do It

With . . . *Style?*

Part IV: Economists Do It With . . . *Style?*

In this part of the manual we deal with an aspect of writing that is fraught with danger: style. In earlier versions of the manual, this part actually came at the beginning. I have since moved it to appear much later in the manual. I did that for two reasons. First, I didn't want readers to get the impression that style was the most important element in writing, that it was the first thing a writer should worry about. Second, and conversely, I wanted to stress the fact that sound argumentation—claims, reasons, evidence—are fundamental to sound economics. No amount of style will disguise the fact that a paper has nothing to say or contribute.

Stephen Weinberg, a Harvard PhD who teaches the economics writing course in the Writing 20 program, likes to divide style, humor, etc., into three categories. The first is flourishes that help draw the reader's attention to the point being made; this is great. The second is flourishes that help keep the reader's attention without really getting in the way; these are ok, but usually aren't as great as the writer thinks. And the third is flourishes that substitute for substance; these are completely unacceptable. It bears repeating: Style works best when it helps to draw the reader to your main point.

Economists like to think of their writing as unadorned and straightforward. It may therefore surprise you that economists often write with a surprising amount of style. Here, for example, is how one of our Nobel Prize winners, George J. Stigler, once began an economics paper:

The future is obscure, even to men of strong vision, and one would perhaps be wiser not to shoot arrows into it. For the arrows will surely hit targets that were never intended. Witness the arrow of consumerism. —“A Sketch of the History of Truth in Teaching,” *Journal of Political Economy*, March 1973

So much for economic inquiry having no place for metaphor, not to mention style. (Actually, economics uses a ton of metaphors. To name a few of the more obvious ones, sticky wages, cobweb theorem, liquidity, tournament, game theory, consumer sovereignty, elastic, ratchet effect, zombies, free rider, spillover effects, price ceiling, sunk costs—I could go on.)

George Stigler won the Nobel Prize in 1982, almost ten years after the article just referenced appeared. So it was not the case that winning the prize “earned” him the right to indulge in style. Indeed, many of our Nobel Prize winners displayed an engaging style decades before they could have entertained any notions of winning the distinguished honor. Take Robert Solow, who won the prize in 1987. Here are the opening sentences of an article he published in 1955–56:

In her paper with the above title Mrs. Robinson was annoyed at many of the practices of academic economists. We have reason to be grateful for her annoyance, for she seems to have written her article the way an oyster makes pearls—out of sheer irritation. —“The Production Function and the Theory of Capital,” *Review of Economic Studies*, vol. 23, no. 2

Mrs. Robinson, by the way, was Joan Robinson, an economist of high stature. Solow was not picking an easy target. Perhaps she was in some ways his muse, for twenty years later (still 12 years before the Swedish Academy came knocking), we find Solow exercising more angst over Mrs. Robinson—and still with style:

I know I should resist the impulse to reply mainly to the back of Professor Robinson's hand. She

does say some things that could be described as a mite misleading. But it must be wrong to yield to that temptation, on the general principle that anything that tastes good must be bad for you. — “Brief Comments,” *Quarterly Journal of Economics*, February 1975

At least now she has graduated from Mrs. to Professor.

Sometimes, style is right under our noses. Here is how one of our very own professors, Ed Burmeister, began an article for the *Journal of Money, Credit, and Banking*. His opening statement, of course, cleverly plays on the adage to beware of Greeks bearing gifts:

Since I have been a theorist bearing free parameters, and since my hostilities are aimed at dogmatic propositions—be they Marxian, Keynesian, or Austrian—it might seem that [Robert] Lucas and I are natural candidates for a duel over his proposed Principle. Indeed, for all I know he is ready to draw his sword; I am not. —“On Some Conceptual Issues in Rational Expectations Modeling,” *Journal of Money, Credit, and Banking*, November 1980

Style, which is what we have been considering here, is a device meant to persuade—or at least to gather the reader’s attention. Think of style as a method of delivery, of increasing the demand for a product (yours!) by presenting it in a particularly appealing or thought-provoking way.

OK, perhaps I’m being unfair. Perhaps not everyone can write with the style of a Stigler or the buoyancy of a Burmeister. But I suspect that more people can than we otherwise think. And the examples above prove that there is room for style in published economics writing. Even in one of the most sober of journals, the *American Economic Review*, one can find, with all due apologies to Strunk and White, elements of style. Would it surprise you to learn that a paper published in the December 2005 issue of the *AER* contains a reference to Sherlock Holmes and an epigraph from Wittgenstein? Or that an article in the March 2003 issue commences with a simile involving the parents and children in Garrison Keillor’s Lake Wobegone?

I hope you can see that economists have found a place for style in their writing. But let me repeat Stephen Weinberg’s point about style: style works best when it helps draw the reader to your point; it is acceptable when it provides a small smile to keep the reader awake; and it is terrible when it gets in the way of making a point or substitutes for it.

Part V

Eight Principles of Clear, Cohesive, and Coherent Writing

Part V: Eight Principles of Clear, Cohesive, and Coherent Writing

For anybody who is really interested in writing clearly and with flow and coherence, I recommend buying and working through Joseph Williams's short book *Style: Ten Lessons in Clarity and Grace*. The book is now in its seventh edition. Short of that, I offer the following eight principles. Most come from Williams (as do many of the examples) and can be found in similar or exact form in any number of good composition books. They apply to all kinds of genres, especially the kinds of documents you are likely to write on the job: memos, reports, letters, and the like.

Before we discuss the principles, let's consider perhaps *when* and *when not* you should put them into practice. I certainly would not worry about them while you are drafting a paper. When you are drafting, the idea is to get words and ideas down period, without worrying about being correct or elegant or even accurate. Thus, I would not worry about the principles when you are writing your first drafts. And then even after you have a finished draft, I would not necessarily begin subjecting every sentence to the principles. No, I'd let your own sense of your text, and especially your readers' sense, be your guide. I would treat these principles as tools to use when you or your readers think a sentence or passage could be improved. If there is a passage that you or your readers have trouble with, then just maybe one or more of the following principles can help you out.

PRINCIPLE 1: Keep your complete grammatical subjects short.

Readers like to get past the subject to the verb as quickly as possible. Therefore, as much as possible, structure your sentences so that they have complete grammatical subjects that are short. Here are two versions of the same sentence, the first with a long complete subject (italicized), the second, with a short one:

Long subject: *A full explanation of why the model cannot accommodate this particular case of omitted variable bias* is given in the appendix.

Short subject: *The appendix* explains in full why the model cannot accommodate this particular case of omitted variable bias.

Needless to say, the occasional sentence with a long grammatical subject is fine and may even be desirable. But generally speaking, keep your complete subjects short.

Here is an example from the literature. Note how in each passage, the complete subjects are short and thus you come quickly to the verb.

No one has the right, and *few* the ability, to lure economists into reading another article on oligopoly theory without some advance indication of its alleged contribution. *The present paper* accepts the hypothesis that *oligopolists* wish to collude to maximize joint profits. *It* seeks to reconcile this wish with facts, such as that *collusion* is impossible for many firms and *collusion* is much more effective in some circumstances than others. *The reconciliation* is found in the problem of policing a collusive agreement, which proves to be a problem in the theory of information. —George J. Stigler, *Journal of Political Economy*, 1964

PRINCIPLE 2: Express key actions as verbs.

Express key actions as verbs. That may sound obvious. But we often do not express key actions as verbs. Rather, we often “hide” key actions in abstract nouns or, as they may also be called, nominalizations—noun forms of words that can also be verbs. Examples of nominalizations are *analysis* (the nominalization of *to analyze*), *assumption* (*to assume*), and *resistance* (*to resist*). Many nominalizations end in *-tion*, *-ment*, *-ence*, and so on. Here are some examples of sentences with nominalizations, along with those same sentences revised to eliminate the nominalizations. Note that for some words, the verb form and the noun form are the same.

There is *opposition* among many voters to nuclear power plants.
Many voters *oppose* nuclear power plants.

Economists made *attempts* to define full employment.
Economists *attempted* to define full employment.

We conducted a *review* of the matter.
We *reviewed* the matter.

The model makes the *assumption* that people engage in utility *maximization*.
The model *assumes* that people *maximize* their utility.

There is a *need* for further *study* of the problem.
We *need* to *study* the problem further.

PRINCIPLE 3: Begin sentences with “old” information.

Here are two passages that say the same thing. Which flows better?

1a. Some astonishing questions about the nature of the universe have been raised by scientists studying black holes. The collapse of a dead star into a point perhaps no larger than a marble creates a black hole.

1b. Some astonishing questions about the nature of the universe have been raised by scientists studying black holes. A black hole is created by the collapse of a dead star into a point perhaps no larger than a marble.

Most readers consider 1b to flow better. Why? Because in 1b, the second sentence begins with a term that the reader has already encountered: *black holes*. In other words, in 1b, the second sentence begins with *old information*.

Clear writing is writing that *flows*. In order to create flow, begin sentences with old information. Old information is information—names, words, phrases, and their equivalents—that your reader has already encountered or can reasonably anticipate; it is information that refers back to something already stated. Here is an example. The old information is in boldface; the information it refers back to is italicized.

The Methods of Ethics is the key to understanding *Sidgwick's* work. **It** was his first and most important book and is fundamental to his thought in that his ethics underlie his writings on economics and politics. **Sidgwick** oversaw the publication of five editions between 1874 and 1893, and was in the midst of producing a sixth when he died in 1900. **It** occupies a central place in the history of moral philosophy. —Roger E. Backhouse, *History of Political Economy*, Spring 2006

Old information is not just words or phrases that have been stated before. Often, old information appears as a sentence connector or transitional word or phrase that indicates the relationship between a sentence and the one that preceded it: *for example, thus, however, in contrast, moreover*. The point is to begin your sentences with a piece of information that tells the reader how it relates to the sentences that just preceded it.

PRINCIPLE 4: End sentences with new information.

Just as it is wise to begin sentences with old information, it is wise to end them with new information. New information is just that: information that your reader has not encountered yet or could not anticipate. Generally speaking, new information is the most important in a sentence; it thus should receive the most emphasis by being placed at the end of the sentence.

PRINCIPLE 5: Make the subjects of your sentences the person, place, or thing that the sentence is about.

In his excellent writing guide *Expectations: Teaching Writing from the Reader's Perspective*, George D. Gopen says that the subject of a sentence should answer the question, *Whose story?* In other words, the subject should tell the reader who or what the sentence is about.

To see this principle at work, read the following two passages. They each have the same content; but each has a different “character” as the subjects of its sentences, and each thus is about different things:

Omitted variable bias has plagued studies of student achievement. *It* has prevented researchers from reaching confident conclusions about the best way to reform the education system. (This “story” is about omitted variable bias.)

Educational researchers have long been stymied by the problem of omitted variable bias. *They* therefore cannot be confident that their studies yield reliable conclusions about the best way to reform the education system. (This “story” is about educational researchers.)

Got it? Let's see. Here are three sentences. Which sentence is best?

1. Gary Becker was awarded the Nobel Prize for economics in 1992.
2. The 1992 Nobel Prize for economics was awarded to Gary Becker.
3. The year 1992 saw Gary Becker win the Nobel Prize for economics.

Answer: It depends. If I were writing a biographical note on Gary Becker, sentence 1 would be best. If I were writing a story about the Nobel Prizes awarded in 1992, sentence 2 would be best. And if I were reviewing the events of the year 1992, I'd pick sentence 3.

PRINCIPLE 6: Make the first few words of your sentences constitute a limited set of concepts.

If you begin your sentences with old information, you will create a passage that flows, a passage that is cohesive. But is it *coherent*? Maybe not. Consider the following passage. Every sentence begins with old information. But what's the point?

Sayner, Wisconsin, is the snowmobile capital of the world. The buzzing of snowmobile engines fills the air, and their tanklike tracks crisscross the snow. The snow reminds me of Mom's mashed potatoes, covered with furrows that I would draw with my fork. Her mashed potatoes usually make me sick, which is why I play with them. I like to make a hole in the middle of the potatoes and fill it with melted butter. Butter is good on rolls, too.

Most readers will judge the passage to be rambling, incoherent. Why? Because the subjects of the sentences do not demonstrate a consistent pattern:

Sayner, Wisconsin, is the . . .
 The buzzing of snowmobile engines . . .
 The snow reminds me of . . .
 Her mashed potatoes . . .
 I like to make a hole . . .
 Butter is good on rolls . . .

Each beginning presents readers with new information. For that reason, the passage is incoherent. Here is another passage, written in a more sophisticated style, but suffering from the same vice:

The particular ideas toward the beginning of sentences define what a passage is "about" for a reader. Moving through a paragraph from a cumulatively coherent point of view is made possible by a sequence of topics that seem to constitute a limited set of related ideas. A seeming absence of context for each sentence is one consequence of making random shifts in topics. Feelings of dislocation, disorientation, and lack of focus in a passage occur when that happens.

As with the first passage, most readers consider this one incoherent as well. Why? Again, look at the first few words of each sentence:

The particular ideas toward the beginning . . .
 Moving through a paragraph from a . . .
 A seeming absence of context . . .

Feelings of dislocation, disorientation, and . . .

The string of words that begin each sentence is inconsistent and diffuse; thus, our attention is not focused on a limited set of ideas. Now compare that version with this one:

Readers look for the topics of sentences to tell them what a whole passage is “about.” If **they** feel that its sequence of topics focuses on a limited set of related topics, **they** will feel **they** are moving through that passage from a cumulatively coherent point of view. But if **topics** seem to shift randomly from sentence to sentence, then **readers** have to begin each sentence from no consistent point of view, and when that happens, **readers** feel dislocated, disoriented, and the **passage** seems out of focus.

Most readers judge the revised passage to be much more coherent. Why? Because the words that begin each sentence focus on a limited set of concepts: *readers, topics, passage*.

PRINCIPLE 7: Be concise.

Clear writing is generally concise. Joseph Williams offers five principles of concision:

- Delete words that mean little or nothing.
- Delete words that repeat the meaning of other words.
- Delete words implied by other words.
- Replace a phrase with a word.
- Change negatives to affirmatives.

Consider the following sentence: “In my personal opinion, it is necessary that we should not ignore the opportunity to think over each and every suggestion offered.” Williams revises that sentence for concision using the five principles. Here is his revision: “We should consider each suggestion.”

Learning to be concise, and learning to recognize sentences that are needlessly wordy, takes practice. So let’s practice! Here is a sentence that can benefit from a good pruning. Try your hand at revising it for concision. The sentence comes from one of Williams’s exercises.

Critics cannot avoid employing complex and abstract technical terms if they are to successfully analyze literary texts and discuss them in a meaningful way.

That 24-word sentence can be shortened to as few as 12 words. Email your revision to me at writing@econ.duke.edu.

PRINCIPLE 8: Write in paragraphs.

This principle comes not from Williams but from Strunk and White, in their famous guide to writing, *The Elements of Style*. Paragraphs may perform any number of functions. Many (most?) develop an idea; in those cases, the paragraph should have a topic sentence, a sentence

that states the main or controlling idea. Others may describe something, such as an economic model or a dataset. Once you have drafted a paper, examine each paragraph as a whole and list briefly what it does (or what it is supposed to do). You can use that list to get a good sense of the content and organization of your paper. You should be able to describe the function of each paragraph in a phrase or, at most, in a single short sentence. If you need two or more sentences to describe what a paragraph is doing, that may be a sign that you need to revise it. Duke's Writing Studio has an excellent online handout on reverse outlining.

An excellent discussion of paragraphs may be found in *Expectations: Teaching Writing from the Reader's Perspective*, by George D. Gopen.

Part VI

Final Words

Part VI: Final Words

Needless to say, I hope you find this manual helpful. I hope it at least addresses specific concerns you may currently face and provides at least some guidance on how to deal with any difficulties you may have. But despite the manual's pretensions to the contrary, no one can learn to write simply by reading a few tips or heeding a few guidelines. There is no one way to write. Writing is not a "problem" that can be "fixed" in a single semester or single course.

No, learning to write better takes commitment and practice. I think N. Gregory Mankiw, a well-known contemporary economist, said it best when he said, "I think of myself as a mediocre writer. I do not come by my mediocrity naturally. It is the result of hard work and determination."

Read economics papers to see how they are put together and what kind of information they contain. Read papers by Nobel Prize winners and John Bates Clark winners. Ask your classmates to read your drafts; do so by giving them specific instructions. Rather than just saying, "Tell me what you think," ask them to, say, see if they can identify your main argument and how you prove that argument, or what the discussion on pages 8 and 9 is trying to accomplish. It is only through practice and feedback that one can really improve.

This manual is a work in progress. It can be updated and modified as needed. Your suggestions and comments will be most welcome. Send them to writing@econ.duke.edu.

Appendix 1 Genres of Economics Writing

Economists write all kinds of documents. In other words, economics writing does not comprise a single genre but several genres. Let's look at the most common ones.

1. Scholarly papers. These are papers written expressly for other economists that report the results of new research. They are the papers that count for tenure. There are four categories of scholarly papers. The first two categories, empirical and theoretical, are considered today by the mainstream of the discipline to be "real" economics. The other two are largely holdovers from a time when economics was (for better or worse) less a social science and more of a humanities discipline.

Empirical papers. Test an existing model with data to see how well it represents reality. An example is Charles M. Becker et al., "The Migration Response to Economic Shock: Lessons from Kazakhstan," *Journal of Comparative Economics*, vol. 33, 2005. Empirical papers, being empirical, will have a data section or a discussion of data and will have tables (tabular presentations of data and results).

Theoretical papers. Develop a model that in theory represents reality. An example is Huseyin Yildirim, "Getting the Ball Rolling: Contributions to a Large-Scale Public Project," *Journal of Public Economic Theory*, vol. 8, 2006. Theoretical papers are easily identified by lots of "propositions," "proofs," and "lemmas" and tend to have a greater abundance of math than empirical papers.

Economic history papers. Examine changes over time in economic institutions, economic practices, and the like. For examples, see the articles in the *Journal of Economic History*. Not to be confused with the history of economic thought or the history of economics.

History-of-economic-thought papers. Examine the evolution of economics as a discipline and the origin and development of economic ideas. For examples, see the articles in *History of Political Economy* or the *Journal of the History of Economic Thought*. Also known as the history of economics (the discipline and its ideas). Not to be confused with economic history.

2. Survey articles/literature reviews. Take stock of what we know, and don't know, about an economic topic. These articles are usually found in the *Journal of Economic Literature* and the *Journal of Economic Perspectives*, both published by the AEA. Examples are "Stock Market Wealth and Consumption" by James M. Poterba (*Journal of Economic Perspectives*, Spring 2000) and "Industrial Organization and New Findings on the Turnover and Mobility of Firms," by Richard E. Caves (*Journal of Economic Literature*, December 1998). Another is "What Can Be (and What Has Been) Learned from General Equilibrium Simulation Models of School Finance?" by Thomas Nechyba (*National Tax Journal*, June 2003).

3. Handbook and encyclopedia entries. So-called handbooks are becoming popular these days. Handbooks are collections of essays or chapters written by specialists in the field, each essay providing a broad treatment of a topic; think an extended encyclopedia entry. The handbook essays may or may not be accessible to nonspecialists. The massive *Handbook of Econo-*

metrics is now at least five volumes and over 3,000 pages long. Encyclopedia entries, in theory, should be accessible to a nonspecialist. The most sophisticated economics encyclopedia is *The New Palgrave: A Dictionary of Economics*.

4. Book reviews and review essays. The primary source for these is the *Journal of Economic Literature*. But a few other journals (the *Economic Journal*, for instance) publish reviews as well. Reviews appear in a section of their own at or near the end of an issue; they are brief, typically 1,500 words or less. Not to be confused with the review essay, which is longer (5,000 words or so) and appears not in the book review section but in the main part of the journal.

5. Adult education. This refers to books written for an audience of non-economists. Thomas Sowell's *Basic Economics* and Stephen D. Levitt and Stephen J. Dubner's popular *Freakonomics* are recent examples. Milton Friedman, with his wife Rose, used to write books for the general public, *Free to Choose* being the most famous. Another celebrated example, from the 1950s, is John Kenneth Galbraith's *Affluent Society*.

6. Op-ed columns. Think Paul Krugman writing for the *New York Times* and Martin Feldstein and N. Gregory Mankiw for the *Wall Street Journal*, and Walter Williams's syndicated column. Gary Becker used to write a regular column for *Business Week*. The point of these columns is briefly to discuss topical economic points for a general audience.

Appendix 2: Sample Model Section

"Labor Hoarding and the Business Cycle," Craig Burnside et al., *Journal of Political Economy*, April 1993

LABOR HOARDING

247

which procedure we use to estimate the labor hoarding model, the fraction of output volatility accounted for by technology shocks drops between 30 and 60 percent relative to the standard model.¹

The remainder of this paper is organized as follows. In Section II we describe our basic model. Section III describes our econometric methodology. In Section IV we present our empirical results. Section V discusses some shortcomings of our analysis. Finally, Section VI contains some concluding remarks.

II. A Model of Time-varying Effort and the Business Cycle

Begins by indicating origin of model.

In this section we present a variation of Hansen's (1985) indivisible labor model modified to allow for labor hoarding. Our model economy is populated by a large number of infinitely lived individuals. To go to work each individual must incur a fixed cost, ξ , denominated in terms of hours of forgone leisure. Once at work, an individual stays for a fixed shift length of f hours. The momentary utility at time t of such a person is given by

$$\ln(C_t) + \theta \ln(T - \xi - W_t f). \quad (1)$$

Some assumptions of the model.

Here, T is a scalar denoting the individual's time endowment, θ is a positive scalar, C_t denotes time t privately purchased consumption, and W_t denotes the level of time t effort. According to this specification, what individuals care about is total *effective* work, $W_t f$. The time t utility of a person who does not go to work is given by

Note how the variables are clearly defined.

$$\ln(C_t) + \theta \ln(T). \quad (2)$$

Output, Y_t , is produced via the Cobb-Douglas production function

$$Y_t = A_t K_t^{1-\alpha} [f N_t W_t (\gamma^f)]^\alpha, \quad (3)$$

Key elements (here, output) continue to be modeled.

where $0 < \alpha < 1$, γ represents the growth rate of exogenous labor-augmenting technological progress, N_t denotes the total number of individuals going to work at time t , and K_t denotes the beginning of period t capital stock. The variable A_t represents the stochastic shock to technology, which evolves according to

$$\ln(A_t) = (1 - \rho_a) \ln(A) + \rho_a \ln(A_{t-1}) + \epsilon_{at}. \quad (4)$$

The unconditional mean of $\ln(A_t)$ equals $\ln(A)$, $|\rho_a| < 1$, and ϵ_{at} is the innovation to $\ln(A_t)$ with a standard deviation of σ_{ϵ_a} .

¹ The models in this paper allow for stochastic shocks in government consumption. While these shocks have a substantial impact on some properties of the model, we find that they have virtually no impact on the volatility of model output. This is consistent with results in Christiano and Eichenbaum (1992).

Another key
concept
modeled.

248

JOURNAL OF POLITICAL ECONOMY

The aggregate resource constraint is given by

$$C_t + K_{t+1} - (1 - \delta)K_t + G_t \leq Y_t. \quad (5)$$

The parameter δ represents the depreciation rate on capital ($0 < \delta < 1$). The random variable G_t denotes time t government consumption, which evolves according to

$$G_t = \gamma^t g_t, \quad (6)$$

where g_t has the law of motion

$$\ln(g_t) = (1 - \rho_g)\ln(g) + \rho_g \ln(g_{t-1}) + \epsilon_{gt}. \quad (7)$$

Here $\ln(g)$ is the mean of $\ln(g_t)$, $|\rho_g| < 1$, and ϵ_{gt} is the innovation to $\ln(g_t)$ with standard deviation σ_{ϵ_g} .

In the presence of complete markets the decentralized competitive equilibrium corresponds to the solution of a social planning problem. Proceeding as in Rogerson (1988), one can easily show that, since agents' criteria functions are separable across consumption and leisure, the social planner will equate the consumption of employed and unemployed individuals. Under these circumstances, the Pareto-optimal competitive equilibrium corresponds to the solution of the following planning problem: maximize

$$E_0 \sum_{t=0}^{\infty} \beta^t [\ln(C_t) + \theta N_t \ln(T - \xi - W_t f) + \theta(1 - N_t) \ln(T)], \quad (8)$$

subject to (3)–(7) and K_0 , by choice of contingency plans for $\{C_t, K_{t+1}, N_t, W_t; t \geq 0\}$. In (8), we have normalized the number of agents in the economy to one. Also, E_0 is the time 0 conditional expectations operator, and β is the subjective discount rate ($0 < \beta < 1$).

To complete the specification of the model we must specify the planner's time t information set, Ω_t^* . If A_t and G_t are seen *before* N_t and W_t are chosen, then the model is observationally equivalent to the standard indivisible labor model, modified to incorporate government consumption into the analysis (see Christiano and Eichenbaum 1992). Here we suppose that N_t must be chosen *before* A_t and G_t are known. Let Ω_t denote agents' common information set at the beginning of time t , which includes the lagged values of all variables in the model. Let Ω_t^* consist of Ω_t plus (A_t, G_t) . Then the planner's contingency plans for N_t will be a function of the elements of Ω_t , and the contingency plans for W_t , K_{t+1} , and C_t will be functions of the elements of Ω_t^* .²

² If $\xi = 0$, it is efficient for all individuals to go to work in every period ($N_t = 1$), given that they can adjust their labor effort, W_t , in response to shocks. For this reason we assume that $\xi > 0$.

The previous formalization of the planning problem incorporates the notion that firms must make employment decisions conditional on their views about the future state of demand and technology. Once employment decisions are made, firms adjust to observed shocks along other dimensions. In our model this adjustment occurs through variations in the labor effort that workers are asked to supply. Workers' compensation will depend on the effort supplied. However, to compute the laws of motion for the quantity variables, we do not have to be precise about the exact compensation scheme adopted by firms.

In the nonstochastic steady state of this economy, Y_t , K_t , C_t , and G_t all grow at rate γ ; W_t and N_t are constants. Throughout this paper we use lowercase letters to denote detrended variables (e.g., $y_t = Y_t/\gamma^t$). In general, it is not possible to solve this model analytically. Here we use King, Plosser, and Rebelo's (1988) log-linear modification of the procedure used by Kydland and Prescott (1982) to obtain an approximate solution to the planning problem. The resulting decision rules express $\{\ln(W_t), \ln(N_t), \ln(k_{t+1}), \ln(c_t)\}$ as linear functions of $\ln(k_t)$, $\ln(N_t)$, $\ln(A_t)$, and $\ln(g_t)$.

We conclude this section by considering the implications of our model for the standard RBC practice of interpreting Solow residuals as exogenous technology shocks. Most RBC studies (see, e.g., Prescott 1986) assume that output is produced via the Cobb-Douglas production function:

$$Y_t = S_t K_t^{1-\alpha} (H_t \gamma^t)^\alpha. \quad (9)$$

Here H_t denotes total hours worked. Under the maintained assumptions of the standard indivisible labor model, H_t equals total individuals at work times the fixed shift length, f :

$$H_t = N_t f. \quad (10)$$

Implicit in this formulation is the assumption that effort is constant over time.

According to our model, the logarithm of the conventionally measured Solow residual, S_t , is related to the logarithms of the true technology shock, A_t , and effort, W_t , via the relationship

$$\ln(S_t) = \ln(A_t) + \alpha \ln(W_t). \quad (11)$$

It follows that objects that are correlated with $\ln(W_t)$ will also be correlated with $\ln(S_t)$, even though they are not correlated with $\ln(A_t)$. Since our model predicts that $\ln(W_t)$ depends on $\ln(g_t)$, our model is consistent with the fact that the Solow residual is correlated with government consumption.

Given our estimates of the model's structural parameters, it is opti-

mal for agents to work harder in response to a positive innovation to government consumption. It follows from (11) that the Solow residual and average labor productivity will rise in response to such a shock. Naive Solow residual accounting falsely attributes the increase in average productivity to a shift in technology. It is also optimal for agents to work harder in response to a technology shock. Consequently, the Solow residual and average labor productivity will rise by more than a technology shock; that is, the innovation to $\ln(S_t)$ will be larger than the corresponding innovation to $\ln(A_t)$. We conclude that, according to our model, (i) effort is procyclical and (ii) naive Solow residual accounting systematically overestimates the level of technology in booms, systematically underestimates the level of technology in recessions, and systematically overestimates the variance of the true technology shock. In the next section we discuss our econometric method for studying the quantitative importance of this bias.

III. Econometric Method

The key problem in empirically implementing the model of Section II is that we do not have data on effort. In this paper, we adopt two strategies for dealing with this identification problem. Our first strategy, referred to as labor hoarding I, exploits functional form assumptions on the representative agent's utility function, as well as the assumption of perfect competition, to deduce a time series on effort that is a function of observable variables and a subset of the model parameters.

In the competitive equilibrium of our economy, effort is allocated so that the marginal product of an extra unit of effort times the marginal utility of an extra unit of consumption is equal to the marginal disutility of effort of those engaged in work, that is,

$$\theta(T - \xi - W_t f)^{-1} = \frac{\alpha Y_t}{C_t W_t H_t}, \quad (12)$$

where $H_t = N_t f$ denotes total hours worked at time t . Relation (12) allows us to deduce a time series for W_t , given observations on $\{Y_t, C_t, H_t\}$ and values for θ, T, ξ, f , and α . Given this information, we use (9) and (11) to deduce a time series on technology shocks.

To assess the robustness of our results, we pursue a second identification strategy, referred to as labor hoarding II. This strategy exploits the full solution to the social planner's problem, rather than just one of the planner's Euler equations. The linearized equilibrium law of motion for effort can be expressed as

$$\ln(W_t) = \pi_0 + \pi_1 \ln(k_t) + \pi_2 \ln(H_t) + \pi_3 \ln(A_t) + \pi_4 \ln(g_t). \quad (13)$$

In our empirical application, we use readily available data from the Brazilian agricultural census describing the share of agricultural land in forest, pasture, temporary and permanent crops, along with the average value of land in farms (*cruzados* per hectare), in 2892 *municípios* (administrative divisions similar to U.S. counties) in 1985. The remaining variables in our analysis, which are obtained from other data sources, describe climatic, geological, geographical, and population attributes of each Brazilian *município*. Climate data, which report thirty-year norms for temperature (degrees celsius) and rainfall (cm) in December, March, June, and September, were obtained from Sanghi et al. (1997). We use the rainfall in the fall (March) and spring (September) seasons, but take a single average annual measure of temperature, owing to its lack of variation over the course of the year (particularly in the Northeast region). Altitude (100 m) and latitude were obtained from the IBGE (*Instituto Brasileiro de Geografia e Estatística*), which collects these data as part of its population censuses, and are used along with a vector of soil type indicators obtained from Sanghi et al. (1997) and a measure of the distance to the nearest major port calculated with the Haversine formula (Sinnot 1984). Research stock data (1000 constant value *cruzado*) were taken from Evenson and Alves (2000) to measure the aggregate expenditures on research in agricultural crops and livestock dating back to the mid-1960s in each *município*, with weights to account for the spatial proximity of research labs (reflecting the fact that labs target their research activities to the local environment), time-lags before the implementation of new technologies, and the depreciation and/or obsolescence of research output. Table 1 [not shown] describes the (unweighted) averages of each of the variables used in our analysis by region. —Christopher Timmins, “Endogenous Land Use and the Ricardian Valuation of Climate Change,” *Environmental & Resource Economics*, vol. 33, 2006

The National Health Information Survey (NHIS), a nationally representative annual health survey conducted by the National Center for Health Statistics, is our source of information on the health of the civilian, non-institutionalized, household population in the United States. The NHIS, which administers face-to-face interviews, began in 1957.

Our analysis requires information on the height and weight of individuals over a long period of time. The NHIS started collecting self-reported height and weight for adults in 1976. Our analyses use NHIS data starting in 1976, and every five years hence. The core questionnaire items are revised every ten to fifteen years, with the last significant revisions occurring in 1982 and 1997. Thus, we use data from three different questionnaire alterations (1976/1981, 1986/1991/1996, and 2001).

NHIS data is collected by the U.S. Census Bureau through a personal household interview. The NHIS sample, in which low-income and minority households are oversampled, is redesigned every ten years to concur with census results. In the 1970s and 1980s, African Americans were oversampled, and in more recent years, both African and Hispanic Americans have been oversampled. Weighting the data allows one to arrive at U.S. population characteristics. Unfortunately, starting in 1996, the number of adult interviews that included information on height and weight was reduced. Thus, our sample sizes for 1996 and 2001 are considerably smaller than in the earlier years.

Since our analyses focus on BMI, we remove all observations with missing height and/or weight values, and with outlier values of height and/or weight (height > 90 inches and weight > 500 pounds). The unknown/missing and removed groups represent 3 percent of the total sample.

With survey data spanning the course of 25 years, various concerns arise related to changes in the survey instrument and the validity and reliability of the data collected. One concern is whether the meanings of variables and their categories have changed over time. In particular, we are concerned about the definition of race, and how this definition changes throughout the 25 years of the survey. The actual composition of the group called Hispanic, which comprises five groups (Cuban, Mexican, Puerto Rican, South/Central American, or other Hispanic) has shifted over time. Between 1990 and 2000, the Hispanic population grew by 58 percent, and the proportion of Hispanics who are “other Hispanic” increased from 23 percent to 28 percent. During this time, the proportion of Hispanics who are of Mexican, Cuban, or Puerto Rican origin decreased somewhat. To some extent, Hispanics measured in 1976 are not the same demographic group as those measured in 2001.

Further, measurement error, always of concern when using survey data, is especially of concern when using self-reported height and weight data. Niedhammer et al. (2000) find that self-reported weight and height can be biased by five factors: overweight status and end-digit preference, which interact with age, educational level, and occupation.

Another measurement issue surrounds the use of the floors and ceilings on the height and weight collected by the NHIS. In the first four surveys used (1976, 1981, 1986, and 1991), the minimum height accepted was three feet, and the maximum height accepted was seven feet in 1976 and 1981, and eight feet, two inches in 1986 and 1991. In 1996, the minimum height allowed became four feet 10 inches, which increased to four feet 11 inches in 2001. Considering the floor and ceiling of weight, from 1976 to 1991, the minimum weight accepted was 50 pounds. In 1996, that minimum increased to 97 pounds, and in 2001 it increased to 99 pounds. The weight ceiling grew from 300 pounds in 1976 to 400 pounds in 1981, and then to 500

pounds in 1986, where it stayed in 1991. For some unknown reason, the NHIS then set the weight ceiling in 1996 at 290 pounds, and decreased it to 285 pounds in 2001. People who exceed the ceilings or are below the floors for height and weight are recorded at the ceiling or floor.

The changes in the ceilings and floor tend to downwardly bias the BMIs in 1996 and 2001, but affect mostly the tails of the BMI distribution. It is for this reason that we focus on the medians rather than the means, and examine the data in terms of shifts in weight categories.

Another reason for using the median BMI rather than the mean is that while height tends to be close to normally distributed, weight, and as a result, BMI, are skewed to the right. Thus, since the mean value of BMI would also be biased, we decided to use the median value, which will provide a more accurate middle value of the distribution.

All data in the NHIS, including height and weight, are self-reported. Bound, Brown, and Mathiowitz (1999) and Cawley (2000) have shown that self-reported height and weight are fraught with measurement error and bias. Essentially, they have found that people tend to report themselves as both taller and thinner than they actually measure. Thus, we utilize methodology developed by Bound et al. (1999), and later used explicitly by Cawley (2000), to correct for these errors. To adjust the height and weight, one needs a data set that contains both self-reported and measured height and weight. The National Health and Nutrition Examination Survey (NHANES) provides that link.

The NHANES aims to obtain nationally representative information on both the health and nutritional status in the United States through interviews and physical examinations. NHANES III is the seventh survey in this series, which began in 1960 as the National Health Examination Survey. NHANES III was conducted between 1988 and 1994, and similar to previous surveys in this series, it is based on a multi-stage, stratified, clustered sample of civilian non-institutionalized populations. It was conducted in two phases, 1988–1991 and 1991–1994. A total of 39,695 individuals were sampled, aged two months and older.

We use NHANES data only on adults with both self-reported and measured height and weight information, for whom both gender and race are known. Of those sampled, 20,050 had the opportunity to be both interviewed and examined and 91 percent complied with both. — Andrew Cook and Beth Osborne Daponte, “An Age-Period-Cohort Analysis of the Rise in the Prevalence of the U.S. Population Overweight and/or Obese,” IRP Discussion Paper no. 1296-05

Appendix 5: Sample Literature Review

"Mobility, Targeting, and Private-School Vouchers," Thomas J. Nechyba, *American Economic Review*, March 2000

VOL. 90 NO. 1

NECHYBA: PRIVATE-SCHOOL VOUCHERS

131

It is this research strategy that I employ here. Specifically, I explore the impact of vouchers on the distribution of educational opportunities by tracing their likely impact on household choices within a general-equilibrium multidistrict economy. The approach differs most dramatically from many previous studies on vouchers in that it considers the private-/public-school choice faced by parents as part of a larger choice problem and draws particular attention to the importance of considering mobility and migration when designing school-finance policies in general, and private-school voucher policies in particular. In retrospect, it seems surprising that, despite the widespread acknowledgment that variances in public-school quality play a large role in shaping the current location choices of households,¹ little attention has been given to the possibility that statewide voucher programs might cause significant changes in residential location patterns by severing the strong link between place of residence and school quality. The resulting forces are quite basic and emerge in Nechyba (1999a): Private schools tend to form in low-income districts in part to serve middle- to high-income immigrants who move to take advantage of lower house prices. Only if housing of sufficiently high quality is not available or if large negative neighborhood externalities exist in the low-income districts will private schools emerge elsewhere first.²

Given this insight, I focus here on the potential importance of residential mobility by employing a richer and more realistic model than that used in prior work and by embedding a state finance system that mirrors one that is in practice. I then study three voucher programs: (i) a general voucher applicable to any child in private school; (ii) a voucher targeted only to

low-income households; and (iii) a voucher targeted to poor districts. These voucher programs are demonstrated to have quite different impacts depending on the degree of mobility of households because proposals of types (i) and (ii) generate substantial migrations of moderate to high-income households to good neighborhoods within poor communities while proposals of type (iii) do not. The results also provide evidence that these mobility effects improve the equity implications of vouchers.

I. A Brief Look at the Prior Literature

The central debate over vouchers has typically revolved around the trade-off between an anticipated decline in public-school peer quality (as better students and parents are attracted to private schools) and a hypothesized increase in public-school efficiency from increased competition (Milton Friedman, 1962; John Chubb and Terry Moe, 1990; Henry Levin, 1992; Charles Manski, 1992; Robert McMillan, 1999a). However, we still lack conclusive empirical evidence on either of these effects. Caroline M. Hoxby (1994) and McMillan (1999b), for instance, report different empirical findings regarding the existence of a positive competitive effect in the absence of vouchers, while evidence from current voucher experiments is scarce (Cecilia Rouse, 1998). Similarly, while at least some current private schools seem to outperform public schools (William Evans and Robert Schwab, 1995; David Figlio and Joe Stone, 1997; Derek Neal, 1997), evidence on private-school markets resulting from large-scale voucher programs is available only in other contexts [as, for example, in Chile (Martin Carnoy and Patrick McEwan, 1998)]. More recent theoretical work has therefore investigated such markets more closely and particularly in the presence of peer effects. Elizabeth Caucutt (1997) and Dennis Eppe and Richard Romano (1998) suggest that private schools can internalize peer externalities through tuition policies, which implies that low-income/high-ability children might benefit as private schools purchase their peer quality with scholarships. Eppe et al. (1997) further demonstrate that public schools may use "tracking" to compete with private schools. Finally, William Hoyt and Kangoh Lee (1998) focus on issues surrounding

Review begins here.

Begins with assessment of the literature as a whole: A "big picture" statement

One problem with the literature (another "big picture" statement). . .

. . . and response to that problem.

¹ See Nechyba and Robert Strauss (1998) and Patrick Bayer (1999), as well as references therein, for empirical evidence of the impact of public schools on residential location choices. Hamilton Lankford and James Wyckoff (1997) provide further evidence on the importance of parental choices in changing segregation patterns.

² While the empirical evidence on private-school formation is sparse, the observation that private schools are likely to appear in low-quality districts conforms with the available empirical evidence from California which experienced a dramatic rise in the number of private schools in the late 1970's (Thomas Downes and Shane Greenstein, 1997).

Note again a
“big picture”
statement.

voting on vouchers, and Gerhard Glomm and B. Ravikumar (1995) concentrate on implications for future income distributions.

Few attempts, however, have been made to extend the analysis to multidistrict settings. Charles A. M. de Bartolomé (1990) uses a two-community model with peer effects to point out inefficiencies from voting when voters ignore the impact of migration, and Raquel Fernández and Richard Rogerson (1996) find in a two-community model (without peer effects) that policies which raise the fraction of wealthy residents in poor districts tend to be welfare enhancing. This conclusion is mirrored in Nechyba (1996). Epple and Romano (1995) introduce multiple districts into their framework but do not focus on vouchers. Finally, Gerald Goldstein and Timothy Gronberg (1986) develop a simple theoretic model in which they illustrate the nature of the mobility effect that arises when school choice and local public-finance models are merged, and Nechyba (1999a) demonstrates its potential importance in some stylized settings while putting forth the technical background for the methodology employed here.

Comments
on overall
weakness
of current
studies.

While these migration forces are thus easily illustrated, simple models help us little in determining whether such forces are likely to be of empirical relevance given the much richer environment into which vouchers would be introduced. In particular, existing housing varies substantially across districts, neighborhood amenities other than public schools are important in location choices, and neighborhood externalities may inhibit mobility. Therefore, I now turn to the exposition of a richer model than that of Nechyba (1999a), calibrate it more carefully with better data, and investigate the likely magnitude of migration and general-equilibrium effects of vouchers.

Uses review
to highlight
contribution
of present
paper.

II. The Model

The theoretical model I employ builds on Nechyba (1999a), where I introduced a private-school market into a well-defined local public-goods economy first explored in Nechyba (1997b). It takes as given the boundaries that divide a fixed set of houses into school districts and places no *a priori* restrictions on the mix of house and neighborhood qualities within and

across these boundaries. This allows the model to accommodate the empirically important possibility of the coexistence of rich and poor “neighborhoods” within a single school district (Epple and Holger Sieg, 1999), but households within a district are assumed to send their children to the same district public school regardless of the neighborhood within the district in which they reside. Each household is endowed with a house (which can be sold at the market price), a parental income level, and an ability level for its one child. The parental income level combined with the child’s ability determine the child’s peer externality within a school, and a school’s quality is determined by the interaction of the average peer quality of children within that school and per-pupil spending. Parents take endowments as given and choose (i) where to live, (ii) whether to send their child to the local public or a private school, and (iii) how to vote in local elections determining the level of public-school spending. A more formal exposition of these elements of the model follows and is provided in more extensive detail in Nechyba (1999a). The current model differs, however, in that (i) it contains five, rather than three, neighborhoods within each district; (ii) it does not assume perfect correlation between child ability and family income and incorporates a richer specification of peer quality; (iii) it builds a richer type space (750 rather than 81 types); (iv) it improves considerably on the calibration of the model to the data (such as incorporating a more realistic income distribution and a better match of house prices); and (v) it employs a hybrid local-/state-financing system that is less stylized.

A. District Structure

The set of houses is represented by the unit interval $\mathcal{N} = [0, 1]$ which is partitioned into three equally sized school districts, with each district further partitioned into five equally sized neighborhoods. C_{dh} denotes the set of houses in neighborhood h of district d , and C_d is the union of all neighborhoods in that district. Furthermore, $\mu(C_{dh})$ and $\mu(C_d)$ represent the measures of houses in each of these partitions. It should be noted at the outset, however, that each district is assumed to contain only a single public school, or alternatively that public schools

Appendix 6: Sample Book Review

770

Journal of Economic Literature, Vol. XXXV (June 1997)

research that preceded publication of his book. Here I offer for titillation a truncated selection from a draft version of Friedman's "Methodology of Positive Economics" (dropped from the published version), which states Friedman's outwardly paradoxical view that the "pure" theory of mathematical economics comes from the same methodological presumptions as "atheoretical" descriptive economics, in that both derive from the fallacious notion that

hypotheses can be tested by the "realism" of their assumptions independently of the accuracy of their predictions . . . this belief . . . indirectly fostered mathematical economics, with its emphasis on Walrasian general equilibrium analysis as an escape from the *ceteris paribus* of partial equilibrium analysis; it explicitly motivated monopolistic competition analysis, . . . it encouraged emphasis on arithmetic rather than economic considerations; . . . it has been manifested most recently in the belief that a theory can be tested by asking questions of consumers, producers, and the like. (p. 34, fn.8)

I believe Hammond's book might serve wonderfully as the "text" for a lengthy article on the present state and future prospects of economics; be that as it may, I forbear saying more here except to assert my personal conviction that readers will discover, as did I, that they are in line for a treat seldom encountered in contemporary economic literature.

ROBERT W. CLOWER

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Against the tide: An intellectual history of free trade. By DOUGLAS A. IRWIN. Princeton: Princeton University Press, 1996. Pp. viii, 265. \$29.95. ISBN 0-691-01138-9. JEL 96-1245

As you read this review, somewhere in America someone is writing an article for *Harper's*, or *The Atlantic*, or *The Nation*; and he is chortling with glee at his own intellectual daring. You see, he intends to (gasp) attack free trade—which he imagines to be a simplistic dogma that economists repeat only because they learned it from their teachers, or because it serves the interests of their paymasters. It would never occur to him that there is more to it than that; that the case for

free trade has withstood many such assaults in the past, and that the response of experienced economists to his courageously radical critique will almost surely be "Oh no, not that old argument again." Douglas Irwin's *Against the Tide: An Intellectual History of Free Trade* is an entertaining, informative account of the emergence of the concept of free trade and of how that concept has weathered two centuries of attacks and criticism. I thought I knew the basics of that history; I was even a participant in some of it. Irwin's book, however, is full of new insights and unexpected delights.

One of the refreshing things about the book is the author's decision not to talk about personalities and events, but to write an intellectual history. Irwin chooses to take all arguments seriously on their own terms, regardless of the context in which they were offered or the motives of those who offered them.

What emerges from this approach, above all, is a sense of how deep and hard-won even the most basic insights of trade theory really are. For example, to someone accustomed to economic reasoning it seems utterly obvious that even if protection increases output in the protected industry it may reduce the value of output in the economy as a whole. But before Adam Smith, it turns out, nobody had stated clearly the idea that an economy must choose among competing uses of resources, and I am persuaded by Irwin's book that Smith's introduction of the concept of opportunity cost, rather than the later and more specific concept of comparative advantage, was the crucial breakthrough in trade theory.

Later in the book, Irwin recounts the debates over several qualifications to the argument for free trade; in each case what is striking is how long the debates went on, how hard it was to clarify concepts that one now covers in half an hour in the classroom. It was an agonizing intellectual long march from Ricardo's statement of the principle of comparative advantage to the explanation by John Stuart Mill of how reciprocal demand determines the terms of trade. From there to the proper appreciation of Torrens' argument that a tariff can improve a country's terms of trade had been an equally difficult journey

Briefly tells what the book is about.

Appraisal of book.

Begins discussing what he likes about the book.

Review begins here.

(and one in which Mill demonstrated his intellectual integrity by endorsing on logical grounds a doctrine that gave ammunition to his political enemies). Irwin's description of these intellectual odysseys evokes both admiration and nostalgia, at least among those of us who have (on a smaller scale) helped bring foggily expressed ideas about international trade gradually and painfully into the light of day.

It is also fascinating to read the long history of confused debate over Manolescu's wage differentials argument—a debate that was not fully clarified until the work of Bhagwati and Ramaswami in the 1960s—or the tortured history of Frank Graham's argument for protection under conditions of increasing returns, a debate that ran into the 1980s. I do have a few bones to pick with the author. Not surprisingly, these involve more recent debates, especially those involving increasing returns. For example, Irwin is skeptical about the relevance of external economies, and makes it sound as if Marshall was vague in describing them. But Marshall offered clear and compelling examples of external economies at work, not in international trade, but in the formation of industrial districts within countries. Nobody who studies interregional as opposed to international trade would share Irwin's diffidence about the crucial role of such external economies in generating specialization and trade. In this context it is surprising that the author does not mention the work of Michael Porter, whose insistence on the self-reinforcing processes of regional advantage has had a major impact on real-world policy makers. I would also argue that the debate over Graham's argument for protection has been much more satisfactorily resolved than Irwin suggests; Ethier's 1982 paper was a major step forward, although not the last word.

The book also suffers slightly from its single-minded focus on the normative theory of trade, ignoring any possible connection to developments in the positive theory. How could anyone write a chapter about modern developments in international trade theory without a single reference to Elhanan Helpman?

But these are minor criticisms of a work that is not only interesting and inspiring but

of great practical use. Why? Because when it comes to debates over free trade, ontogeny recapitulates phylogeny. Read the latest manifesto rejecting the dogma of free trade from the Economic Whatever Institute, or the just-published courageous 500-page attack on the myths of globalization by the political intellectual du jour, and you will see, over and over again, arguments that you recognize from Irwin's pages. The idea of free trade has been there and done that, and still it survives, because it is a far deeper idea than even most of its supporters will ever understand.

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The life of Adam Smith. By IAN SIMPSON ROSS. Oxford and New York: Oxford University Press, Clarendon Press, 1995. Pp. xxviii, 495. \$35.00 ISBN 0-19-828821-2. JEL 96-0452

This new life of Adam Smith extends beyond narrative history. It also has the objective of using Smith's life story in the broadest sense—including reactions by contemporary readers—to achieve a better understanding of Smith's texts: "examination of both the writing and reading of texts is necessary to clarify and particularize their range of meanings" (p. xvii). To these ends the author absorbs the materials in Dugald Stewart's memoir of 1793, John Rae's *Life* of 1895, and W. R. Scott's study of 1937; draws extensively on the correspondence edited by himself and Ernest Campbell Mossner and on some newly discovered letters; consults a remarkable range of archival materials, memoirs, newspapers, periodicals, and secondary literature; and makes extensive use of Mizuta's forthcoming catalogue of Smith's library. My concern is the weight of excess baggage carried through the narrative. Do we need to know, for example, that "Smith's physician, Dr. Cullen, occupied the upper floors over the old Scottish Mint in the Cowgate which ran parallel to the High Street on the South Side" (p. 308)? This sort of detail (and there is much of it) does not come free, but tends to crowd out the more substantive information contributing potentially toward both the narrative and the interpretive tasks. And indeed Smith does not even now, so it seems to me,

Now begins to say what he doesn't like about the book.

Undercuts his criticism and reaffirms book's merit.

Appendix 7: A Model of the 4-Move Pattern (Sample Introduction)

Econometrica, Vol. 51, No. 2 (March, 1983)

THE PRICE VARIABILITY-VOLUME RELATIONSHIP ON SPECULATIVE MARKETS

BY GEORGE E. TAUCHEN AND MARK PITTS¹

This paper concerns the relationship between the variability of the daily price change and the daily volume of trading on the speculative markets. Our work extends the theory of speculative markets in two ways. First, we derive from economic theory the joint probability distribution of the price change and the trading volume over any interval of time within the trading day. And second, we determine how this joint distribution changes as more traders enter (or exit from) the market. The model's parameters are estimated by FIML using daily data from the 90-day *T*-bills futures market. The results of the estimation can reconcile a conflict between the price variability-volume relationship for this market and the relationship obtained by previous investigators for other speculative markets.

1. INTRODUCTION

Move 1: Announces
the topic

THIS PAPER CONCERNS the relationship between the variability of the daily price change and the volume of trading on speculative markets. Previous empirical studies [2, 3, 6, 12, 14, 16] of both futures and equity markets always find a positive association between price variability (as measured by the squared price change ΔP^2) and the trading volume.² There are two explanations for the relationship. Clark's [2] explanation, which is secondary to his effort to explain why the probability distribution of the daily price change is leptokurtic, emphasizes randomness in the number of within-day transactions. In Clark's model the daily price change is the sum of a random number of within-day price changes. The variance of the daily price change is thus a random variable with a mean proportional to the mean number of daily transactions. Clark argues that the trading volume is related positively to the number of within-day transactions, and so the trading volume is related positively to the variability of the price change.

The second explanation is due to Epps and Epps [6]. Their model examines the mechanics of within-day trading. The change in the market price on each within-day transaction or market clearing is the average of the changes in all of the traders' reservation prices. Epps and Epps assume there is a positive relationship between the extent to which traders disagree when they revise their reservation prices and the absolute value of the change in the market price. That is, an increase in the extent to which traders disagree is associated with a larger absolute price change. The price variability-volume relationship arises, then, because the volume of trading is positively related to the extent to which traders disagree when they revise their reservation prices.

Move 2,
the literature
review.
Takes up
studies
by Clark
and by
Epps and
Epps.

¹We are grateful to Kal Cohen, Ronald Gallant, John Geweke, Dan Graham, Christopher Sims, T. Dudley Wallace, and the participants of the Triangle Area Econometrics Seminar for many helpful suggestions.

²Cornell [3] offers considerable empirical documentation on how pervasive the relationship is. His explanation is very similar to that of Epps and Epps [6].

Crucial word. This lets me know we're getting somewhere.

Specific identification of the problem.

486

G. E. TAUCHEN AND M. PITTS

The Clark and Epps and Epps models are complementary and they give considerable insight into the behavior of speculative markets. Yet, even when taken together, the two models provide a description of speculative markets that is incomplete and can be extended in two directions. First, both models work with the conditional distribution of the square of the price change over a short interval of time ΔP^2 , given the volume of trading, V , for the same interval of time. Application of either model requires the investigator to specify in advance or discover by nonlinear regression the functional form of the conditional expectation $E[\Delta P^2 | V]$. The model we derive below eliminates the need for this. The theory gives an explicit expression for the joint probability distribution of the price change and the trading volume over any interval of time. The joint distribution contains all relevant information about the price variability-volume relationship. Specifically, it determines the conditional distribution of the price change given the volume and the conditional absolute moments of all orders.

Presumably, the paper will do this. That's the expectation raised in this reader, at least.

Another indication of a problem with existing research. Presumably, the paper will test this conjecture.

Move 3: The problem with the existing studies. This I like to call the "turn." It is often signaled with words such as yet, however, nevertheless, although, and the like. Establishes a niche.

Second, neither model considers growth in the size of speculative markets such as that experienced by many of the new financial futures markets. Trading on a new market is initially very thin. If the market is viable, then the trading volume increases secularly as more traders become aware of the market's possibilities. Eventually a steady state is reached. The empirical results of other studies suggest that price variability should increase with the growth in the trading volume. This seems unlikely. In fact, one might conjecture that more traders would tend to stabilize prices.

A case in point is the 90-day T-bills futures market. This was one of the first and most popular of the new financial futures markets. During its growth phase the number of traders increased dramatically. (See the Appendix for more details.) One source of this growth was the gradual diffusion of information about the market;³ another was the relaxation of regulations restricting financial institutions' access to futures markets. The following display shows the average daily volume ($\bar{V}$) and the variance of the daily price change ($s_{\Delta P}^2$) for four nonoverlapping intervals, each comprised of 219 trading days:

Days	$\bar{V}$	$s_{\Delta P}^2$
1-219	.393	.057
220-438	1.094	.059
439-657	1.811	.018
658-876	5.490	.048

where the volume is measured in thousands of contracts, the price change variance is measured in (\$ thousands)², and the sample extends from the first day of trading, January 6, 1976, through June 30, 1979. The volume of trading appears to grow exponentially. A regression of the log of the daily volume of

³See Jacobs and Jones [8] for details about the opportunities that were available to traders taking positions in both the spot and futures T-bills markets.

trading on a trend term gives

$$\log(V(t)) = -1.462 + .0039t, \quad R^2 = .80, \\ (.033) \quad (.000065)$$

where $t = 1, 2, 3, \dots, 876$ denotes trading days and standard errors are in parentheses. According to the results of previous empirical studies, the variance of the daily price change should share in some of this .39 per cent per day growth in the volume of trading. But the data show that is not the case; if anything, the variance of the daily price change declines over the period. The corresponding regression of the log of the squared daily price change on a trend term gives

$$\log(\Delta P(t)^2) = -4.632 - .00047t, \quad R^2 = .002. \\ (.186) \quad (.00037)$$

More of Move 3,
establishing a niche.

Move 4: Occupies
the niche by extend-
ing model in two
ways suggested
above. Note the
"signposting."

More sign-
posting.
Here, to tell
what the
model does.

The theory of speculative trading as currently formulated cannot explain this gentle decline in the variance of the daily price change given the explosive growth of the trading volume.

The purpose of this paper is to derive and estimate a more general model of the price change and the trading volume on speculative markets. Like the Epps and Epps model, our model begins with an equilibrium theory of within-day price determination. A major difference between the two models is the way in which we connect the price change to the trading volume. Epps and Epps's key assumption gives them a nearly exact positive relationship between the absolute value of the change in the market price and the trading volume on each within-day market clearing. We do not invoke their assumption. Instead, we use a variance-components scheme to model the within-day revisions of traders' reservation prices. This allows us to derive the joint probability distribution of the price change and the trading volume for each within-day market clearing. Adding the random number of within-day price changes and volumes gives the daily values of each variable. The result is a bivariate normal mixture model with a likelihood function that depends only on a few easily interpreted parameters.

The model can explain both the results of previous studies and the anomalous data displayed above. If the number of traders is fixed, which is a reasonable assumption for the mature markets studied by others, then the model predicts that the distribution of the daily price change is leptokurtic and that the square of the daily price change is positively related to the daily trading volume. If the number of traders is growing, which is the case in the 90-day T-bills futures market, then the model predicts that the mean trading volume increases linearly with the number of traders. The reason is that the trading volume is one-half of the sum of the absolute changes in the traders' positions; another trader contributes another term to the sum. The model also predicts that the variance of the price change decreases with more traders. The reason for this is that the market price change during a single market clearing is the average of the changes in the traders' reservation prices. More terms in the average tend to wash out the effects of inter-trader differences.

Note the ex-
plicit
"signposting"
of how the
present pa-
per's model
is different.

Nice recap of model's achievements.

Though the model we derive and estimate can explain many of the stylized facts for new markets and for established markets, there is a natural direction in which further extensions of the model are possible. Specifically, we assume that each trader acts in the same fashion regardless of the total number of traders in the market; e.g., a typical trader acts in the same fashion whether there are 1,000 or 10,000 other active traders in the market. By doing so, we can prove that the average trading volume per trader is independent of the total number of traders and that it depends on only a few simple parameters. This result is particularly helpful in implementing and interpreting the empirical work. There is, however, another class of full-equilibrium rational expectations models [5, 7] which suggest that there is an interaction effect among the traders, and that at a fixed point in time the number of futures contracts per trader may decline as the market expands. This in turn suggests, but still requires formal proof, that the average trading volume per trader (the volume is the number of contracts that change hands per unit time) may decline as the market expands. In Section 5 we show that there is some evidence in favor of this effect, though the effect appears to be small relative to the direct expansion of the market. Indeed, it has to be small, for otherwise the market would implode and trading would cease as more traders enter the market, and this certainly did not happen to the 90-day T-bills futures market.

How research can be extended. Not a necessary component of introductions, but not an uncommon one either.

Standard "TOC" paragraph.

Section 2 describes the model in more detail. Section 3 applies the model to daily data for the 90-day T-bills futures market. Section 4 contains results about the price variability-volume relationship. Section 5 includes further discussion and suggestions for subsequent research. Section 6 contains the concluding remarks.

2. MODEL

2.1. Intra-day Trading

The market consists of J active traders who take long or short positions in a single futures contract. Within the day the market passes through a sequence of distinct Walrasian equilibria. The movement from the $(i - 1)$ st to the i th within-day equilibrium is initiated by the arrival of new information to the market. The time intervals between successive equilibria are not necessarily of equal length.⁴

At the time of the i th within-day equilibrium the desired position Q_{ij} of the j th trader is given by the linear relation

$$(1) \quad Q_{ij} = \alpha [P_{ij}^* - P_i] \quad (j = 1, 2, \dots, J)$$

⁴Since buy/sell orders are executed sequentially, many actual transactions at the exchange can comprise what we think of as a single market clearing or transaction.

