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Student learning in microeconomics: An experiment in teaching scientific philosophy and economic methodology

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STUDENT LEARNING IN MICROECONOMICS: AN EXPERIMENT IN TEACHING SCIENTIFIC PHILOSOPHY AND ECONOMIC METHODOLOGY

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STUDENT LEARNING IN MICROECONOMICS:
AN EXPERIMENT IN TEACHING SCIENTIFIC
PHILOSOPHY AND ECONOMIC METHODOLOGY

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ABSTRACT

STUDENT LEARNING IN MICROECONOMICS:
AN EXPERIMENT IN TEACHING SCIENTIFIC
PHILOSOPHY AND ECONOMIC METHODOLOGY

by Randall B. Bartley

This study endeavored to determine if exposure to the philosophy of science and the methodology of economics would assist students in understanding the principles of microeconomics. The study was conducted at Motlow State Community College, Tullahoma, Tennessee, during the 1990 spring semester, using four principles of microeconomics classes. Two of the classes served as a control group and two served as an experimental group. A three-week instructional module on the philosophy of science and the methodology of economics was prepared by the author and presented to the experimental group as a preliminary to the principles of microeconomics course. During the time the experimental group received the module, the control group completed a non-microeconomic-related writing assignment. Upon completion of the writing assignment and instructional module, both groups received the identical principles of microeconomics course taught by the author.

Differences in the student's cognitive understanding of microeconomics was measured by administering a pre- and

posttest utilizing the standard College-Level Examination Program (CLEP) Subject Examination in Introductory Microeconomics. An alternative method of evaluation was also used employing the results of four regularly scheduled course content examinations prepared by the author. In addition to the test data used to measure increased student cognitive learning, other variables were also analysed such as gender, age, grade point average, number of college semester hours completed, and employment status to determine their possible effect upon student learning performance.

The results of the study indicate that the completion of an instructional module on the philosophy of science and the methodology of economics as a prelude to an introductory microeconomics course does not assist students in achieving higher examination scores. There was an indication that female students scored higher than male students and that older students scored higher than younger students; but, overall those students who received the instructional module did not achieve a higher level of cognitive understanding of elemental microeconomics than those students who did not.

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CHAPTER I

INTRODUCTION

The world in which we live is a highly complex, dynamic infrastructure of sensitively balanced economic social systems. Economics touches virtually every fiber of our social existence. No one can evade the influence and pressure that economics exerts upon his or her day-to-day life. It dictates and guides our "coming into the world" and our "going out of the world," and all of our successes and failures in between. Unfortunately, as James B. Ramsey has so succinctly pointed out, "Economics is the academic discipline most discussed by the general public. It is also one of the least understood."[1] Perhaps one of the reasons this is true, is because economics has the reputation of being hard to apprehend and interpret, and consequently, is oftentimes omitted from one's educational process.

College students often view the study of economics as a "necessary evil," an affliction they must endure to acquire an undergraduate degree. Discounting the usual antagonistic references to the "dismal science," the subject is seldom broached without there being questions as to the validity of economic inference. Many students find the association of

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[1]James B. Ramsey, Economic Forecasting--Models or Markets? (London: The Institute of Economic Affairs, 1977), 11, quoted in James F. Ragan, Jr. and Lloyd B. Thomas, Jr., Principles of Economics (San Diego, CA: Harcourt Brace Jovanovich, Publishers, 1990), 2.

economic theory to real world phenomena extremely ambiguous. There appears to exist a perception that economic theory is great for discussing abstract, make-believe concepts, but because it is not a "true science," it contains very little veracity upon which actual social activity can be founded. Couple this with the ever-present rumor that economics is one of the hardest courses on campus to understand, regardless of how much or arduous your study, and you create a particularly unpleasant scenario. The ultimate effect of such a scenario is that students undertake the study of economics with a prejudicial lack of attentiveness that generally results in an unrewarding educational experience.

Statement of Problem

The purpose of this study is to determine if exposure to the philosophy of science and the methodology of economics will assist students in understanding the principles of microeconomics. The primary intent behind such exposure is to promote interest in the subject of microeconomics through the acquisition and appreciation of the scientific goals of economics, the processes and manner of establishing economic concepts and theory, and the nature and value of scientific economic explanation.

Hypothesis

College students enrolled in a principles of microeconomics class who receive special instruction on the

philosophy of science and the methodology of economics will score higher on the College-level Examination Program (CLEP) Subject Examination in Introductory Microeconomics than those students who have not received the special instruction.

Significance of the Study

Virtually every university and college in the United States offers principles of economics. From the major four-year schools to the smaller two-year junior and community colleges, to the most prestigious private schools, almost every post-secondary institution requires students to take at least one, and generally two or more courses in the principles of economics.[2] The subject of economics has become so important to the everyday lives of our citizenry, that it is now required by a variety of academic disciplines and fields of study. Even though students are not clamoring to take economics, enrollment in the principles of economics courses at many institutions constitutes the highest for any single discipline.[3] Such courses may also prove to be the first and only exposure to the subject of economics that many students receive during their college careers. Consequently, it becomes imperative that students are provided

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[2]Phillip Saunders and William B. Walstad, "Teaching The Principles Of Economics: An Introduction And Summary," in The Principles of Economics Course: A Handbook For Instructors, eds. Phillip Saunders and William B. Walstad (New York, NY: McGraw-Hill Publishing Company, 1990), 1-2.

[3]Ibid.

with the best possible chance to acquire the knowledge and insight necessary to either further their studies in economics or function intelligently in an economically-oriented society.

Economic educators have for many years attempted to determine the most expeditious and appropriate manner to teach the principles of economics. Some well known economists and educators, such as Robert Eisner, Campbell R. McConnell, G. L. Bach, William E. Becker, William B. Walstad, Lester C. Thurow, and Rendigs Fels, to name just a few, have completed numerous studies on the subject and have provided a wealth of innovative instructional material. A myriad of articles and summaries found in The Journal of Economic Issues, The Journal of Economic Education, The Southern Economic Journal, The American Economic Review, and The Journal of Economic Literature, attest to their noteworthy contributions, as well as the contributions of many others. They have provided much needed information regarding the challenges and requirements of teaching college economics.

The information contained in the aforementioned literature covers a varied range of topics and deals with research data concerning everything from general measurement concepts and methods to specific aids and unique teaching techniques. Some of the most interesting and innovative techniques of recent times have been the development of economic games and computer-assisted instruction. John J.

Siegfried and Rendigs Fels, both of Vanderbilt University, conducted an extensive study in this area and found that students can learn economics through a variety of delivery modes. In addition to economic games and computer-assisted instructional packages, they reviewed computerized study-management systems, general programmed instruction, video presentations, and the use of graduate student instructors. What they learned was that students preferred self-paced instruction and that for the money spent, the computerized study-management system proved to be the best method of instruction. This was found to be particularly true for the "low-achiever" student. Siegfried and Fels also discovered that a one-year course in elementary economics had a more lasting effect in the forming of greater economic competency than did shorter termed courses.[4]

Another area that continues to draw a great deal of attention is that dealing with the attitudes and interests of the students who take economics courses. The conclusion of one particular study conducted by G. L. Bach and Phillip Saunders suggests that there exists a positive correlation between the "consumption of economic ideas" and a student's interest in economics.[5] Investigating the same type of

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[4]John J. Siegfried and Rendigs Fels, "Research on Teaching College Economics: A Survey," The Journal of Economic Literature 17 (September 1979): 923-969.

[5]G. L. Bach and Phillip Saunders, "Economic Education: Aspirations and Achievements," The American Economic Review 55 (June 1965): 329-356.

relationship, Lewis Karstensson and Richard K. Vedder completed a more systematic empirical effort which suggested that "introductory course grades and the incidence of taking additional [economic] courses were positively and significantly associated with the various measures of student attitude toward the subject." They also found that "greater gains in economic understanding are likely to be made by those students who, relative to others, are interested in the subject."[6] The implications of these and more recent studies on the same subject suggest that what is most important in teaching the principles of economics is finding new ways to make the information interesting and meaningful. As John J. Siegfried and William B. Walstad put it:

> Don't worry about what they think of the subject initially or even during the course. If the instructor can teach them, the students will develop a greater appreciation (liking) for economics. In other words, attitudes towards economics may be a product of what students learn rather than a determinant of what they learn.[7]

This particular study anticipates building on the above concepts and ideals by examining the effectiveness and benefaction of providing a special instructional module on the philosophy of science and economic methodology in an attempt

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[6]Lewis Karstensson and Richard K. Vedder, "A Note on Attitude as a Factor in Learning Economics," The Journal of Economic Education 5 (Spring 1974): 109-111.

[7]John J. Siegfried and William B. Walstad, "Research On Teaching College Economics," in The Principles of Economics Course: A Handbook For Instructors, eds. Phillip Saunders and William B. Walstad (New York, NY: McGraw-Hill Publishing Company, 1990) 276.

to generate student interest and understanding of basic microeconomics. It is hoped that by showing the link between the philosophy of science and the methodology of economics, students will come to understand that economics is a true science. The acquisition of such knowledge should go a long way to dissolve the veil of "vagueness" and "abstractness" that has caused so much student consternation and suspicion in relationship to the validity and real-world application of economic theory. If students can connect the methods and procedures of developing economic theories with real-world economic activities, and can came to realize that those developmental methods and procedures constitute real scientific achievement, a lot of the "dismal" may be removed from the "dismal science." If this can be accomplished by the use of a special instructional module, one requiring no special equipment or material, an additional advantage of being cost effective could also be realized. It would be considerably less expensive than many of the equipment-generated-assisted systems, and could even be modified to accommodate any number of different self-paced instructional techniques. Perhaps the most advantageous feature of such an instructional technique, is that it could be utilized by virtually any size institution and for any number of students.

It is the aspiration of this study, that the results will prove convenient in teaching students the principles of

microeconomics. It is also hoped that the results will reveal the usefulness and practicality of an instructional module as an integral, or at least complementary, element of a general economics course or program of study. As implied by A. B. Wolfe, a past professor of economics at Oberlin College, when addressing a 1909 Conference on the Teaching of Elementary Economics, educators must carefully consider course structure, as well as subject-matter content, when developing an economics course:

> We are confronted with three questions: What should be the aim or aims of a college course in elementary economics? What is the proper content or subject-matter through which to attain these aims? How should this subject-matter be handled? . . . This question of content is not so simple as it looks . . . The field of economic phenomena and of economic knowledge is so vast that we must pick and choose. And in our picking and choosing we must constantly have regard for the actual conditions and difficulties which confront both teacher and student.[8]

Definition of Terms

Methodology. The concepts, theories, and basic principles of reasoning as pertains to a particular subject. Refers to the methods, techniques, processes, or procedures involved in developing scientific assumptions, theorems, and principles.

Methodology of Economics. The scientific methods, techniques, processes, and procedures employed in economic

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[8]A. B. Wolfe, "The Aim and Content of a College Course in Elementary Economics," The Journal of Political Economy 17 (December 1909): 673-684, quoted in Royall Brandis, "The Principles of Economic Course: A Historical Perspective," The Journal of Economic Education 16 (Fall 1985): 277.

analysis and development of economic theory.

Ontology. The nature of reality; "the systematic study of being."[9]

Epistemology. The "study or theory of the origin, nature, methods, and limits of knowledge."[10] "The theory of 'objective' scientific knowledge."[11]

Formal Logic [Pure Logic, Deductive Logic, Analytical Logic]. The "act or process of reasoning . . . a logical method in which a conclusion necessarily follows from the proposition stated."[12] Deals with a priori reasoning.[13]

Inductive Logic [Applied Logic, Logical Positivism, Empirical Logic]. "Reasoning in which general principles are derived from particular facts or instances."[14] Statements based on sensory perceptions. The process of making valid generalizations based on the study and weight of evidence gathered in testing propositions, opinions, and surmises; deals directly with truth and probability.[15]

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[9]The American Heritage Dictionary, 2d ed., s.v.

[10]Webster's New World Dictionary of the American Language, rev. ed., s.v.

[11]Fritz Machlup, Methodology of Economics and Other Social Sciences (New York, NY: Academic Press, 1978), 59.

[12]The American Heritage Dictionary, 2d ed., s.v.

[13]Machlup, Methodology of Economics and Other Social Sciences, 58.

[14]The American Heritage Dictionary, 2d ed., s.v.

[15]Machlup, Methodology of Economics and Other Social Sciences, 59.

Instructional Module. A short or condensed part of an overall instructional program/course developed to cover subject matter that is directly related and beneficial to program/course content. A stand-alone complement, complete with teaching objectives, strategies, materials, references, and evaluation techniques.

Microeconomics. The part of economics that is concerned with the individual units of an economy--the households, businesses or firms, and industries--and with individual markets, particular prices, and specific goods and services.[16]

Other terms will be utilized and defined in the body and conclusion of the study that are best explained by their place and usage within the context of the provided material.

Procedures of the Study

Conduct

The study is conducted at Motlow State Community College, Tullahoma, Tennessee, utilizing four principles of economics classes. The classes used include three daytime classes and an evening class. All classes consist of a mix of traditional and non-traditional college students, and include the initial participation of 93 students.

The actual course that was used for the study is listed

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[16]Campbell R. McConnell, Economics: Principles, Problems, and Policies (New York, NY: McGraw-Hill Book Company, 1987), G-20.

in the Motlow State Community College Catalog/Student Handbook as Principles of Economics II. The Catalog/Student Handbook describes the course as "a study of basic economic concepts and microeconomics."[17] Topics covered as part of the course "include consumer and firm behavior, economic growth, market structures, price output determination, labor and unions, international trade and finance."[18] To accommodate the inclusion of the instructional module without sacrificing course content, actual classroom instruction is accomplished by more efficient utilization of classroom time and structuring of course material.

Evaluation Techniques

Two methods of evaluating student achievement is employed as part of the study. Participants completed a predesignated number of subject matter content examinations, as well as a special pre- and posttest examination. The subject matter examinations are employed to evaluate the students' cognitive understanding of the presented material and to assign course grades. The pre- and posttests are employed to establish the necessary statistical bench marks to be used in evaluating the research data. Results of all the examinations are incorporated as part of the study's

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[17]Motlow State Community College, 1990 Catalog/Student Handbook (Springfield, IL: Phillips Brothers Printers, 1990), 110.

[18]Ibid.

statistical analysis.

Assumptions

Based on classroom experience, it is assumed that student demographics such as age, sex, work experience, length of time since graduating from high school, academic major, whether the student had economics in high school, etc., will not have any significant impact on how well a student does in a college level principles of economics course. Likewise, it is further assumed that class sizes, the classroom mix of traditional and non-traditional students, and class meeting times will not significantly influence the results of the study. Lastly, it is assumed that the CLEP Subject Examination in Introductory Microeconomics is a satisfactory measure of a college student's microeconomic knowledge.

Limitations of the Study

The study is conducted at a community college whose student body is historically a combination of traditional and non-traditional students. If the study were completed at a four-year college or university, it is expected that the participants would be predominately traditional students. Consequently, the sample classes used may or may not be representative of microeconomic classes nationwide.

Because the classes used in the study are randomly selected and coded as either control or experimental, they

do not have an equal number of students. Likewise, there are only four classes used; two as control classes and two as experimental classes. If more students and additional classes were used, and if class enrollment were equally distributed, it is possible that the results could be affected.

Students attending Motlow State Community College whose programs of study include the principles of economics, are required to complete six semester hours of study--three hours of macroeconomics and three hours of microeconomics. The students are not required to complete these courses in any particular sequence; therefore, many of the students participating in the study will have previously completed the macroeconomic course and will have been exposed to certain basic economic concepts. This occurrence will likely produce different statistical results than a study comprised of participants who have never been exposed to any college level introductory economics.

The CLEP Subject Examination in Introductory Microeconomics, produced and provided exclusively by the Educational Testing Service, is used to establish pre- and posttest scores for evaluation and comparison purposes. It is most probable that a test other than the CLEP Subject Examination in Microeconomics would produce different evaluation and comparison results.

Organization of the Study

Chapter I describes the purpose and significance of the

study, the hypothesis, assumptions and limitations, and the conduct and organization of the study.

Chapter II reviews the relevant and available literature pertaining to the teaching of the philosophy of science and the methodology of economics as a prelude to a prefatory economics course, the use of an instructional module, and the review of that material relative to developing and teaching a module on the philosophy of science.

Chapter III reviews the relevant and available literature relative to developing and teaching a module on the methodology of economics.

Chapter IV presents the methodology of the study and the statistical analysis of the test and evaluation data.

Chapter V presents the summary, conclusions, and implications of the study.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

A review of current literature provided no research information pertinent to the teaching of the philosophy of science and the methodology of economics as a preface to the principles of microeconomics. In fact, there was no evidence of any such introductory-type instruction ever being provided for any standard principles of economics course. The literature did reveal a myriad of diverse research and study that has been completed, essentially since the end of World War II, that has dealt with everything from "what," "for whom," and "how" to teach undergraduate economics.[19] The Federal Reserve Bank of Minneapolis, for example, began distributing a publication in the 1970's that provides colleges and universities with the goals and objectives for college level economics courses.[20] There have been special ongoing efforts like the one sponsored by the Joint Council on Economic Education to develop a Teaching Education Program

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[19]Phillip Saunders and William B. Walstad, "Teaching The Principles of Economics: An Introduction and Summary," in The Principles of Economics Course: A Handbook For Instructors, eds. Phillip Saunders and William B. Walstad (New York, NY: McGraw-Hill Publishing Company, 1990), 1-8.

[20]Allen F. Larsen and Andrew T. Nappi, eds., Goals and Objectives of the Introductory College-level Course in Economics (Minneapolis, MN: Federal Reserve Bank of Minneapolis, 1976).

to be used by post-secondary schools.[21] More recently, there have been numerous studies and publications that have dealt with supplemental and alternative methods of teaching principles of economics courses, such as computer-assisted, self-paced models;[22] televised lectures, live lectures, and programmed learning materials;[23] and case study approaches;[24] but, virtually nothing was found in the available literature that is even remotely associated with the purview of this study.

Principles of Economics Textbooks

One important source of available knowledge that at least afforded salutary, if not truly applicable information, was certain college level principles of economics textbooks. Many principle's textbooks include sections, usually as part of the introductory chapters, that are devoted to the subject of science and/or economic methodology.

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[21]W. Lee Hansen, Phillip Saunders, and Arthur L. Welsh, "Teaching Training Programs in College Economics: Their Development, Current Status, and Future Prospects," The Journal of Economic Education 11 (Spring 1980): 1-9.

[22]James W. Marlin, Jr. and James F. Niss, "The Advanced Learning System, A Computer-managed, Self-paced System of Instruction: An Application in Principles of Economics," The Journal of Economic Education 13 (Summer 1982): 26.

[23]Donald W. Paden and M. Eugene Moyer, "The Relative Effectiveness of Three Methods of Teaching Principles of Economics," The Journal of Economic Education 1 (Fall 1969): 33.

[24]Ronald A. Banaszak and Dennis C. Brennan, Teaching Economics: Content and Strategies (Menlo Park, CA: Addison-Wesley Publishing Company, 1983), 193-230.

A few of the more contributory textbooks that were reviewed include Elbert V. Bowden's, Economics: The Science of Common Sense; Edwin Mansfield's, Economics: Principles/ Problems/Decisions; Roger N. Waud's, Economics; Richard T. Froyen and Douglas F. Greer's, Principles of Economics; David N. Hyman's, Economics; Campbell R. McConnell's, Economics: Principles, Problems, and Policies; William J. Baumol and Alan S. Blinder's, Economics: Principles and Policy; and William D. Nordhaus and Paul A. Samuelson's, Economics. At best, however, the information gleaned from this source of available literature was extremely minuscule. Generally, the textbooks do not contain actual scientific procedures or processes associated with economic theory and practices, as much as they contain a definition of economic terms relating to methodology. Of the textbooks reviewed, Campbell R. McConnell's proved to be one of the more prolific. It provided one of the largest sections on the subject and was entitled, "Methodology." Unfortunately, the eight pages or so that McConnell included in this section served more as a statement of methodology than an explanation or description of scientific economic development. He does an excellent job of defining descriptive economics; economic principles, laws, and theories; a hypothesis; an abstraction; economic models (graphs), and the difference between inductive and deductive reasoning. Additionally, he provides a very good illustration of the

relationship between facts, principles and economic policy, and even does an admirable job covering the individual goals of an economic system; but, in the final analysis McConnell provides very little real insight to economic methodology.[25]

Elbert V. Bowden is another author that provides a section in his textbook on economic methodology. He titled the section, "Scientific Methods In Economics." In the introductory paragraph, he states his views on methodology:

> Economics has been the leader among the social sciences in developing scientific techniques and analysis. This has been recognized by the Nobel Prize committee which, ever since 1969, has rewarded prizes to distinguished economists for their scientific work in economics.[26]

Bowden also established the premise for economic analysis:

> Science is concerned with cause-and-effect relationships: What causes what? What would happen if . . . ? So scientific methods in economics are concerned with what influences the choices--the decisions about what to do with our scarce resources.[27]

These two statements constitute the sum total of Bowden's contribution to ensconce economic methodology. The balance of the section deals with what most of the other textbook writers provide, which is a basic definition of terms explaining the differences between laws, principles, theory, and positive verses normative economics. To Bowden's credit,

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[25]Campbell R. McConnell, Economics: Principles, Problems, and Policies (New York, NY: McGraw-Hill Book Company, 1987), 3-11.

[26]Elbert V. Bowden, Economics: The Science of Common Sense (Cincinnati, OH: South-Western Publishing Company, 1986), 37.

[27]Ibid.

he does provide one bit of information that may suggest why the principles of economics textbooks do not truly indulge economic methodology. In a section entitled, "The Role Of Math In Economics," he makes the statement "You don't need much math to learn basic economic principles."[28] He goes on to assert how advantageous the understanding of mathematics is to understanding the process of economic analysis; but, only if you are planning on being a Ph.D. economist. It is only at the Ph.D. level that students must acquire the necessary mathematical tools to understand economic development. The methodological detailed procedures or practices you will eventually have to understand to be a "Ph.D.," he suggests, are tools to be acquired later in the educational process, not in the principles courses.[29]

The one textbook that possibly comes the closest to authenticating the existence of economic methodological information is the one written by William D. Nordhaus and Paul A. Samuelson. They provide a small three-page section as part of the introductory chapter, that is titled, "The Scientific Approach." In this section they address the fact that economists have "developed techniques--sometimes called the 'scientific approach'--that provides them a head start in understanding the forces that underlie issues like unemployment, prices and wages, income distribution, or

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[28]Ibid., 44.

[29]Ibid., 44-45.

foreign trade."[30] They also address the major sources of economic knowledge--observation, analysis, statistics, and experiments--as the means by which scientific economics advances. Without detailed explanation, they minimally suggest that the development of economics follows some set of established procedures, and therefore, is considered to be a "science."[31] Substantiality, however, Nordhaus and Samuelson apparently reach the same conclusion as other authors, in that they do not supply very much actual methodological data or information in their principles textbook--at least not as much as this study supposes is necessary and sufficient to adequately prepare the introductory college-level student for a principles course in microeconomics.

Instructional Modules

With regard to utilizing an instructional module as an integral part of an overall principles of economics course, a review of the available literature again proved to be ineffectual. There are numerous studies and other published works in such disciplines as mathematics, elementary and secondary education, and engineering that pertain to the use of modular-type classroom instruction; but, very little can be found connected with economics. Of the little that was found on the subject, however, a 1979 study undertaken by

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[30]William D. Nordhaus and Paul A. Samuelson, Economics (New York, NY: McGraw-Hill Book Company, 1989), 5.

[31]Ibid., 5-7.

the Department of Economics at Washington State University (WSU), proved the most informative.

The WSU study was a three-year program funded by the National Science Foundation for the expressed purpose of implementing an "Integrated Modular Approach" in teaching its introductory economics courses. Unlike the module approach used in this study, the WSU approach was to design, implement, and evaluate a complete introductory economics sequence (course). The idea was to cover a common set of economic concepts, yet allow the students to pick and choose different modules covering topics in which they had a particular interest.[32] In completing the sequence, all students initially received a nine-week core module, and then were free to select two three-week topical modules consisting of eight lectures each. WSU expected that this modular-technique of instruction, would provide them four principal advantages over their traditional mode of instruction: (1) improved student learning and attitude, because of enhanced student choice and involvement; (2) a more attractive role for the faculty, because module specialization would reduce the number of preparations, and provide more faculty choice in the allocation of actual teaching time; 3) better use of departmental resources due to a more centralized administrative structure and division

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[32]William Hallagan and John Donnelly, "An Integrated Modular Approach to Teaching Introductory Economics," The Journal of Economic Education 16 (Spring 1985): 129-134.

of labor; and 4) closer coordination between the principles courses and upper-division courses, because of enhanced control over the core curriculum.[33] In providing these advantages, the approach was expected to effectually differ from the traditional approach in five areas: "(1) student cognition, (2) student satisfaction, (3) cost effectiveness, (4) faculty satisfaction, and (5) standardization of core curriculum."[34]

The results of the WSU study provided no evidence that there was any substantial difference in student cognition or student satisfaction between the module and traditional approach. With regards to being cost effective, the module approach did prove to be superior to the traditional approach. The WSU economics department found that they were able to accommodate higher student enrollments without having to increase the number of graduate level teaching assistants or their classroom instruction time. Additionally, the department experienced an overall 45 percent drop in faculty time devoted to the principles courses. Lastly, and for many the most significant advantage, the module approach did provide for a greater standardization of the core principles curriculum. On the negative side, there were only two major encumbrances to the module approach, and both had to do with faculty and student satisfaction.

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[33]Ibid., 129.

[34]Ibid., 133.

First, the approach did not succeed in attracting faculty to the process, and secondly, there was a noticeable decline in faculty-student interaction.[35]

With the exception of the WSU study, and a few other marginally relevant works, current literature is essentially void concerning the use of an instructional module. This is especially true in dealing with subject areas relative to the study of the philosophy of science and the methodology of economics as they pertain to an introductory principles of economics course. That very little research has apparently been completed in this specific area, especially in relationship with a principles of microeconomics course, justifies this study.

Philosophy of Science

A review of the relevant and available literature would not be complete without including that material deemed indispensable and necessary to the development of an instructional module on the philosophy of science and the methodology of economics. The review will begin in this chapter with that research pertaining to the philosophy of science and conclude in the next chapter with that pertaining to the methodology of economics.

To fully appreciate current economic methodological thought, and admire the consummate value of economics as a

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[35]Ibid.

science, requires a terse consideration of its evolution. Like other natural and social sciences, economics evolved from a general "philosophy of science," that has itself undergone evolutionary upheaval.

Defining "Philosophy of Science"

In researching the "philosophy of science," it quickly becomes evident that there exists no succinct, conclusive definition. Virtually every writer who addresses the subject presents a differing perspective or insight until ambiguity is the only consonant theme. Consequently, it would appear prudent to establish a "definitional" benchmark or starting place; the most obvious place to begin such a task would be the dictionary:

> **Philosophy:** "theory or logical analysis of the principles underlying conduct, thought, knowledge, and the nature of the universe: included in philosophy are ethics, aesthetics, logic, epistemology, metaphysics, etc....the general principles or laws of a field of knowledge, activity, etc. [the philosophy of economics]..." (Webster's New World Dictionary 1988, 1015).

> **Science:** "the state or fact of knowledge...systematized knowledge derived from observation, study, and experimentation carried on in order to determine the nature or principle of what is being studied." (Webster's New World Dictionary 1988, 1202).

In essence, it is not the subject itself, but the approach or procedure employed in the analysis of a subject that denotes it as a "philosophy." Accordingly, the "philosophy of science," in its rudimentary form, can be defined as the practice and/or method of scientific inquiry. In

turn, this inquiry can be further defined based on the operational context of marginal methodology: (1) that there is a definite ordering of events, (2) that knowledge is always superior to ignorance, (3) that a communication link, based solely on sensory perception, exists between the individual scientist and external reality, (4) that there are cause-and-effect relationships that exist within the physical and social orders, and (5) that there are certain commonalties among all observers: (a) that the observer seeks knowledge based on a desire to improve human conditions, (b) that the observer has the mental capacity to relate observations to actual events or possible events, and (c) that society will support the observer in his pursuit of knowledge.[36] With these basic premises, or "raison d'ete," the philosopher or scientist undertakes the study of a particular subject.[37]

Scientific Methods/Goals

Philosophers of science have embraced many differing views concerning the exact intentions of scientific inquiry. Like trying to define "philosophy," there exists numerous and varying views as to which scientific methods or goals are the "right" ones to follow. To help with the problem, there has surfaced certain time-tested fundamental criteria

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[36]Gideon Sjoberg and Roger Nutt, A Methodology for Social Research (New York, NY: Harper and Row, Publishers, 1968), 23-24.

[37]Ibid.

that serve to satisfy certain basic philosophical and scientific methodology. Essentially, these basic criteria have evolved into two generalized philosophic camps: (1) a pure mathematical-type of science, where everything is formal, inherent or innate, i.e., "natural;" or (2) a social-cultural-conceptual-type of science, where everything is based on empirical observations or sensory-type experiences, but from which certain a priori propositions can be made. Adding to these two positions, and contributing to the overall base of criteria, the modern-day scientist has attempted to mollify the situation by including "description," "explanation," and "prediction" as necessary to the scientific process. As to which of the two basic designations or philosophic camps represent the most significant methodology, the present scientific community appears equally split.[38] Consequently, in order to fully appreciate present-day scientific methodology, the evolution of scientific or philosophical thought must be addressed.

Early Scientific Methodology

The philosophy of science, or more exact, that science which deals with the pursuit of knowledge (epistemology), could probably be traced to the beginning of time, or at least to man's first encounter with physical phenomena.

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[38]Daniel M. Hausman, ed., The Philosophy of Economics: An Anthology (New York, NY: Cambridge University Press, 1984), 1-42.

But, in terms of recorded endeavors, most studies of science begin with the "great thinkers," Socrates, Plato and Aristotle. History reveals that each spent a considerable amount of time writing and presenting their respective thoughts and beliefs pertaining to scientific methods and goals. History also shows us that other great philosophers such as Bacon, Galileo, Descartes, and Newton, made significant contributions to an ever-broadening array of scientific inquiry and method.[39] However, it was not until the eighteenth-century that any real strides were made in the characterization of the philosophy of science, or scientific methodology.

Eighteenth and Nineteenth Centuries

Eighteenth-century philosophers were basically termed "logical positivists." They believed that scientific assessment required sensory experiences. The significant leaders of this philosophical thought included Ernst Mach, Bertrand Russell, Alfred North Whitehead and Ludwig Wittgenstein. Their methodology was one of pure logic based upon and supported by sensory experiences. To a logical positivist, theoretical statements had no scientific meaning if they could not be verified through observed experience. Logical positivism maintained that the only "meaningful"

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[39]Baruch A. Brody, Readings In The Philosophy of Science (Englewood Cliffs, NJ: Prentice Hall, Inc., 1970), ix-5.

statements were worthy of scientific analysis. To be "meaningful," statements had to be either analytic (tautologies) or synthetic (verifiable or falsifiable factual statements). This meant that speculative or abstrusive (metaphysical) statements were not considered to be worthy of scientific analysis because they were not "meaningful," at least in the sense of being either analytic or synthetic. According to this strict belief, philosophers should concentrate only on the "nature, goals and methods of empirical meanings," or in short, only on the "physical evidence" of a statement.[40]

While the positivist view was the dominant methodology of eighteenth-century philosophers, not all were in complete agreement with its rigid application. Two such men were Immanuel Kant and David Hume. Even through they were positivists, they did not entirely embrace the whole spectrum of positivism. In his work, Critique of Pure Reason, Kant presented his dissension with the logical positivists on the grounds that there are certain "a priori propositions," or truths, that can be known without actual sensory confirmation. Using such topics as the existence of God and the axioms and rules of Euclidean geometry, Kant attempted to show that some propositions are true without directly having to observe or experience them, and that no observation or experience could ever result in falsifying such propositions.

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[40]Bruce Caldwell, Beyond Positivism: Economic Methodology In The Twentieth Century (Winchester, MA: George Allen & Unwin, 1982), 1-67.

Through his philosophy of als ob ("that the things of the world must be viewed as if they received their existence from a highest intelligence"), Kant presented two very important corollaries: "speculative reason has a place in scientific inquiry and teleology [study of final causes] is also important to scientific advancement."[41] Without ever spelling out the methodological procedure he employed, Kant contrasted and compared the methodology of pure practical reason with that of theoretical philosophy:

> A process, according to principles of reason, by which alone the manifold of any branch of knowledge can become a system [and hence a science]. In contrast, by the methodology of pure practical reason...is understood the mode in which we can give the laws of pure practical reason access to the human mind, and influence on the maxims, that is, by which we can make the objectively practical reason subjectively practical also.[42]

The basic postulate presented by Kant's work is that all qualitative experiences must be converted into metaphysical and/or mathematical-type universal laws in order to add to scientific knowledge.

It would seem intuitively obvious, that the positivist persistence that assertions be analyzed solely on the basis of observable evidence lacks a certain degree of realized accuracy. For example, the fact that all squares have four

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[41]L. Pearce Williams, "Kant, Naturphilosophie and Scientific Method," in Foundations of Scientific Method: The Nineteenth Century, eds., Ronald N. Giere and Richard S. Westfall (Bloomington, IN: Indiana University Press, 1973), 6-8.

[42]Fritz Machlup, Methodology of Economics and Other Social Sciences (New York, NY: Academic Press, 1978), 13.

equal sides should not necessitate repeated mathematical verification anymore than the fact that a circle does not. Consequently, to accommodate the intuitiveness of such "synthetic" truths, the logical positivist attempted to differentiate between "a priori" world truths, and analytic truths or truths dependent upon logic and the terms selected to define that logic. The end results were that actual sensory evidence would only be required to substantiate synthetic propositions and not necessarily analytic truths. But, there remained a basic problem. In either case, the truth of a statement still depended upon actual observation or the fact that it is so obviously true it does not require observation. Furthermore, is was found that the truth of any statement is established only for individual situations. Ultimately, many philosophers felt that sensory confirmation only set forth the truth of singular events, and that those events should be viewed in terms of a specific time, place, and set of related circumstances. The idea was that once established how could such a "static" confirmation of facts be made to reveal not yet observed or known truths. One of the major philosophers concerned with this line of thought was David Hume. In completing his work on the Theory of Causation, Hume expressed a very strong a priori view:

> If a body of like color and consistency with that bread we have formerly eaten be presented to us, we make no scruple of repeating the experiment and foresee with certainty like nourishment and support. Now this is a process of mind or thought of which I would willingly

know the foundation.[43]

This illustration, as well as much of Hume's initial writings, closely paralleled deductive logic. But, this is not to suggest that he was a "once-and-for-all" believer in the deductive process, because Hume also presented data contrary to the deductive belief. For instance, using the bread example, Hume went on to suggest that deductive reasoning may prove to be untrustworthy in that the next slice of bread could possibly turn out to be fatal to the one consuming it. Actually, it is difficult to tell where Hume stood philosophically since he appears to concurrently agree and disagree with many of the basic scientific concepts of his day. However, he was at least consistent, because what he did with deductive logic, he also did with the concept of inductive logic. His problem with induction revolved around the issue of reliability. Hume concluded that inductive propositions generally made reference to some previously established truths or past reliability and consequently, were only avoiding or "begging off" the real question by assuming the past events to be valid, when in actuality they may be invalid. But, if induction is fallible, and assuming that Hume is also right about deductive reasoning being fallible, what is correct and proper scientific methodology? To Hume, the answer was "cause" and "effect." Every proposition must

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[43]Hausman, The Philosophy of Economics: An Anthology, 17.

exhibit that a "cause" and "effect" relationship exists between a statement and its results, for it to be a scientific truth. Proper scientific methodology was the process of connecting two events that were contiguous in terms of time and space, to a specific physical occurrence. To be deemed true "scientific methodology," a process had to show a connection between two definable phenomenon--the occurrence of event number one, defined as the "cause," and the resulting occurrence of event number two, defined as the "effect." If no such connection could be shown to exist, Hume considered the proposition to be unworthy of scientific consideration. Unfortunately for Hume and his arguments, this is precisely what many of his fellow philosophers felt about his theory--many considered it unworthy of inclusion into the mainstream of scientific exploration. In the final analysis, Hume's work, as well as that of Kant, did very little to sway the scientific community away from its views on logical positivism. The positivist movement continued to hold firm to its strict inductive methodology and endured as the mainstay of scientific thought well into the twentieth century.

Twentieth Century

In 1925, Moritz Schlick, a physicist and philosophy professor at the University of Vienna, organized a weekly discussion group that consisted of a number of his scientific and mathematical colleagues. This group became known as the Vienna Circle. Over the years, it gained recognition by its

promotion of the logical positivist's cause. While the members of the group fluctuated over time, many considered the group to be comprised of the most significant scholars of twentieth-century philosophical thought. A few of the more prominent of the group included the likes of Friedrich Waismann, Rudolf Carnap, Otto Neurath, Hans Hahn, Herbert Feigl, Phillip Frank, Kurt Godel, and Karl Menger. The circle only existed for seven years, but its views proved to solidify positivist ideals against any possible encroachment of "speculative philosophers" and/or "post-Kantian idealists." The circle felt that the only true goal of philosophy was the logical analysis of positive sciences:

> We have characterized the **scientific world-conception** essentially by **two features. First** it is **empiricist and positivist:** there is knowledge only from experience, which rests on what is immediately given. This sets the limits for the context of legitimate science. **Second,** the scientific world-conception is marked by the application of a certain method, namely **logical analysis.** The aim of scientific effort is to reach the goal, unified science, by applying logical analysis to the empirical material.[44]

The overall aim of the circle was to promote true positivism by stripping away all metaphysical speculation from scientific theorizing, and replacing it with pure empiricist doctrine. They were not attempting to say that metaphysical statements were not worthy of scientific study, only that those statements not founded on empiricism were not worthy. In fact, the circle really felt that they had "bridged" the

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[44]Caldwell, Beyond Positivism: Economic Methodology In The Twentieth Century, 13.

gap between metaphysical phenomena that could be verified or falsified, and those immaterial, or supernatural phenomena that were considered true, but could not be verified or falsified. In Schlick's view, the logical positivist theory "is that activity through which the meaning of statements is revealed or determined," and that metaphysical statements in and of themselves are not necessarily false:

> The denial of the existence of a transcendent external world would be just as much a metaphysical statement as its affirmation. Hence the consistent empiricist does not deny the transcendent world, but shows that both its denial and affirmation are meaningless.
>
> This last distinction is of the greatest importance. I am convinced that the chief opposition to our view derives from the fact that the distinction between the falsity and the meaninglessness of a proposition is not observed. The proposition 'Discourse concerning a metaphysical external world is meaningless' does **not** say: 'There is no external world,' but something altogether different. The empiricist does not say to the metaphysician 'what you say is false,' but 'what you say asserts nothing at all!' He does not contradict him, but says 'I don't understand you.'[45]

Beyond the establishment of physical evidence as the only significant approach to scientific advancement, the Vienna Circle also established the belief that all sciences were unified in their methodology. This concept finally established that the social sciences were united with the physical, at least in the context of their methodology:

> Thus, with the aid of the new logic, logical analysis leads to a **unified science.** There are not different sciences with fundamentally different methods or different sources of knowledge, but only **one** science. All knowledge finds its place in this science and, indeed, is knowledge of basically the same kind; the appearance of

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[45]Ibid., 13-14.

> fundamental differences between the sciences are the deceptive result of our using different sublanguages to express them.[46]

A. J. Ayer provided a very good summary of the positivist position as regards the social sciences, when he stated, "the scale and diversity of the phenomena with which the social sciences dealt made them less successful in establishing scientific laws, but this was a difficulty of practice, not of principle: they too were concerned in the end with physical events."[47]

The work of the Vienna Circle has been recognized as the highlight of twentieth-century positivism. Its many contributions have certainly seemed to usurp those of other philosophers. But, it would be unfair to imply that it was the only significant twentieth-century group active in developing and furthering the positivist paragons. In the United States, for example, the positivist doctrine was being amplified by two opposing philosophical followings known as the "operationalists" and the "pragmatists." The operationalists believed that if a scientific term is meaningful then it is necessarily capable of being individually measured and verified in terms of its actual operation. The pragmatist, on the other hand, believed that the truth of a statement can only be found by testing the practical aspects of the statement. In any case, both philosophical doctrines

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[46]Ibid., 16.

[47]Ibid.

followed very closely the positivist requirements for sensory confirmation or denial.

In addition to the American contributions, the cause of positivism was also furthered by other groups around the world. There were numerous groups like the Gesellschaft fur Wissenschaftliche Philosophie in Germany, the Levow-Warsaw in Poland, and the Uppsala School in Sweden that donated much to the positivist influence.[48] The cumulative effect of these and many other groups assisted in magnifying the prominence and strength of the positivist movement. Nevertheless, it, like its predecessors, slowly began to lose its dominance over scientific thought.

Beginning in the early 1930's, logical positivism underwent a kind of metamorphosis. What emerged was a new, more sophisticated and omniscient brand of logical positivism--a positivism which demonstrated to be less dogmatic in its absolute need for observable experiences. This new, more up-to-date movement was called "logical empiricism," and included the works of such notable long-time positivists as A.J. Ayer, Richard Braithwaite, Rudolf Carnap, Carl Hempel, and Ernest Nagel. They developed a slightly different view of the homogeneity that existed between scientific theory and observational or sensory experiences. While the logical positivists felt that <u>only</u> analytical or synthetic statements contained any sensible or cognitive

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[48]Ibid., 17.

significance, the logical empiricist alleged that portions of a proposition need not require direct observation to contribute to the truth of the whole. By taking such a position, they attempted to attack a basic problem that had plagued the scientific community for a long time--proper selection of scientific criteria.

During the period between 1930 and 1950, more and more philosophers began to find the positivists' pure inductive view of science too restrictively rigid. They considered it too narrow to handle certain universal types of laws. Inferably, the scientific community began to broaden its methodological base in quest of criteria that were of cognitive importance in helping to clarify the relationship existing between theories, theoretical terms, and scientific explanations. Substantially, how does one know if a proposition is true solely because it is, such as a tautological truth, or because of a veritable, genuine experience? What or how are exact, undeniable test criteria determined? Responding to this dilemma, the logical empiricists proposed that there existed certain generally accepted propositions that were based on observed experiences, but that were not totally verifiable. For example, how would someone prove that all horses have four legs? The process to physically verify that statement would be virtually impossible; better yet, why would you have to? Why couldn't a proposition be developed and a conclusion drawn about the whole, based on

the observation of an appropriate number of the parts? Furthermore, of all the horses available in the world for observation, if one was found with only three legs, does that mean that the remainder of the horses in the world are all three-legged? Does one exception serve to falsify the proposition or can assumptions be based on the truth of the whole? To satisfy this possibility and answer the questions concerning proper criteria, the logical empiricist claimed that all that was required was to find a "connector" between the observed parts of the whole that would allow for future deduced explanations. This thesis was to be termed the "symmetry thesis." It provided the leap (link) between the explanation of phenomena and the ability for future scientific prediction. Since this concept was not an entirely new idea, it proved to be an agreeable one to the scientific community. In actuality, the thesis was very similar to the ideas already established by David Hume in his Theory of Causation. As Hume had pointed out in his writings, "there may be certain relationships and phenomena, which may contain particular empirical parts and about which a general statement or theory can be developed."[49] Even though Hume's ideas can be used to support either an inductive or deductive approach to scientific inquiry, his contributions greatly aided the logical empiricist movement. Basically,

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[49]Mark Blaug, The Methodology of Economics (Binghamton, NY: Cambridge University Press, 1984), 5.

what Hume's "connective" thesis proposed was that there was no requirement or sustained need to use repeated sensory experiences as scientific premises. This freed scientists from having to check and positively verify every possible proposition, thereby allowing the freedom to theorize based on the existence of certain previously determined truths. This overall concept provided the heart of what was to become the covering-law model of scientific explanation or the "hypothetico-deductive" model.

Hypothetico-Deductive Model

The search for criteria to distinguish true synthetic statements from those considered nonsensical, culminated with logical empiricists concluding that there existed certain "theoretical" statements that need not be defined in observable terms. This was not a new revelation, since the existence of such statements had been recognized and used by both the natural and social sciences for some time. The declaration was unique however, in that philosophers had previously employed "theoretical" statements only to help organize sensory data, and once organized, were then eliminated from the science. For the first time, philosophers were saying that such statements may have a legitimate place in true scientific inquiry. In fact, during the decades of the 1940's and 1950's, so many philosophers began to subscribe to this ideal that a new model was developed, one that was amply termed the "hypothetico-deductive" model.

The model, which was initially introduced by Rudolf Carnap and Carl Hempel, and then later purified by Hempel and Peter Oppenheim, described the general structure and functions of theories.[50] The model, as suggested by Hempel and Oppenheim, stated that all true scientific explanations possess a structural commonalty. Every scientific explanation is based upon at least one universal law around which revolves the initial and boundary conditions that make up its premises or "explanans," and by which the explanation, or "explanandum," is determined by the logic of deductive reasoning. The definition or rationale of the inherent universal law would be such statements as "in all cases where events A occur, events B also occur." Then by deductive logic or hypothetical syllogism, "if A is true, then B is true; A is true; therefore B is true." The outcome of of this mode of reasoning was to expand the significance of explanations to incorporate predictions, since all explanations involve the same set of operations that a prediction requires. Hempel and Oppenheim argued that the only real difference between the two was "that explanations come after events and predictions before events."[51]

The hypothetico-deductive model became the main focus of philosophical thought, providing the motivational push

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[50]Caldwell, Beyond Positivism: Economic Methodology In The Twentieth Century, 21-32.

[51]Blaug, The Methodology of Economics, 3.

needed by some philosophers to branch out and explore new and innovative methods of scientific inquest. One such philosopher was Richard Braithwaite. In his 1953 work, Scientific Explanation, he suggested that the deductive process of analysis may even be so complex as to consist of a hierarchy of theoretical structure:

> The proposition in a deductive system may be considered as being arranged in an order of levels, the hypotheses at the highest levels being those which occur only as premises in the system, those at the lowest level being those which occur only as conclusions in the system, and those intermediate levels being those which occur as conclusions from deductions from higher-level hypotheses and which serve as premises for deductions of lower-level hypotheses.[52]

Ernest Nagel, another noted philosopher, contributed to Braithwaite's basic thesis by demonstrating in his 1961, The Structure of Science: Problems in the Logic of Scientific Explanation, "that scientific theories have three components: an 'abstract calculus', 'a set of rules that in effect assign an empirical content to the abstract calculus' and a model for explicating the abstract calculus."[53] In essence, the hypothetico-deductive model provided the means by which theoretical or non-observable statements could be embodied in scientific inquiry. Theoretical conditions no longer needed to be addressed only in terms of observable verification, but could be afforded cognitive significance

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[52]Caldwell, Beyond Positivism: Economic Methodology In The Twentieth Century, 25.

[53]Ibid.

given that the overall theory in which they are expressed is verified. But, no matter how accepted the model, it did have its critics.

The major fault of the hypothetico-deductive model most expressed by its critics dealt with the symmetry thesis (connection between explanation and prediction), especially since many considered it based on Hume's Causation Theory. Hume's "cause and effect" did not necessarily require a connection between any two events, therefore there may not exist any real "connecting mechanism." If this is true, the critics suggested that the model was invalid in providing scientific explanation. But, for all the discord over the symmetry thesis and Hume's theory, a lot of the criticism simply boiled down to the question of normative versus positive scientific explanation. Most critics of the model felt that the model was too normative in that it "told it like it should be" and not "like it is." Nonetheless, the model continued to be widely accepted and even served to settle a long-running debate between the ideologies of "realism" and "instrumentalism." The realist believed that theories containing theoretical propositions were only true if those propositions referred to <u>real</u> substance. The instrumentalists believed theories were instruments, not to be judged in terms of being true or false, but rather on the basis of their adequacy. In either situation, the hypothetico-deductive model's inclusion of theoretical terms tended to

negate the issue by making both the realist's and the instrumentalist's arguments incredulous.

Popperian Methodology

While the hypothetico-deductive model of scientific reasoning served as a significant catalyst for the logical empiricist movement, the writings of Sir Karl Popper helped to give the movement real emphasis. In a book entitled, The Logic of Scientific Discovery, Popper denies the logical positivist's basic assertions that all statements are either analytic or synthetic. He essentially supports the concept of deductive reasoning by noting the difference between:

> the psychology of knowledge, which deals with empirical facts, and the logic of knowledge, which is concerned only with logical relations. [He points to] four different lines along which the [deductive] testing of a theory could be carried out. First there is the logical comparison of the conclusions among themselves, by which the internal consistency of the system is tested. Secondly, there is the investigation of the logical form of the theory, with the object of determining whether it has the character of an empirical or scientific theory, or whether it is, for example, tautological [as a completely axiomatic system would be]. Thirdly, there is the comparison with other theories, chiefly with the aim of determining whether the theory would constitute a scientific advance should it survive our various tests. And finally, there is the testing of the theory by way of empirical applications of the conclusions which can be derived from it.[54]

To Popper, the purpose or philosophy of science should not be the evaluation of past theories in order to make them over into true scientific explanations of the future, but

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[54]Machlup, Methodology of Economics and Other Social Sciences, 41.

rather the method of evaluating theories in the sense of their actual presentation. Popper considered the evaluation of empirical listing an unrewarding scientific pursuit because he felt that it was highly probable that almost all theories contained at least one "truth" that was non-verifiable. Effectually, any attempt to "demarcate," or segregate meaningful statements from meaningless statements --separate the empirical sciences from the metaphysical-- cannot be accomplished through inductive logic. Popper's position is that it is illogical to think that one can pull together a collection of particular experiences and then to project those experiences into the future with any degree of exactness. There does not exist any premise for future verification in past situations; consequently, Popper elects to reject the concept of induction, and replace it with a type of deductive falsificationism.

The concept of falsificationism is based on the premise that a universal statement can never be logically, or conclusively, established; but, that it could be logically refuted based on the deductive use of a single proposition or statement. To use an example of falsificationism that originated with John Stuart Mill, "no amount of observations of white swans can allow the inference that all swans are white, but the observation of a single black swan is enough to refute that conclusion."[55] Playing on this analysis,

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[55]Blaug, The Methodology of Economics, 12.

Popper's view of scientific inquiry asserts that a statement may or may not be capable of plenary verification (no direct proof of truth), but that a statement can be shown to be completely and totally false. It is this basic belief that becomes Popper's overall scientific criterion:

> science is that body of synthetic propositions about the real world that can, at least in principle, be falsified by empirical observations because, in effect, they rule out certain events from occurring. Thus, science is characterized by its method of formulating and testing propositions, not by its subject matter or by its claim to certainty of knowledge; whatever certainty science provides is instead certainty of ignorance.[56]

Popper maintains that the most intriguing statements in science have high empirical confirmation and consequently a very low inductive probability. The whole question of falsification is therefore one of distinguishing a "science" from a "nonscience." It is the establishment of certain methodological procedures that can be well corroborated as providing a specific statement that is critical. The theory itself may eventually be discarded based on the evaluation of available evidence, but the actual act of establishing a theory is at least one in which certain data has been corroborated as containing valid assumptions. It is the process of establishing theory that was considered to be most important to Popper. Fundamentally, it was the act of delineating the methods required to place a theory under close scientific scrutiny, and not the final results, that

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[56]Ibid.

marked it as a true science.

Contemporary Scientific Methodology

Ultimately the traditional positivist and empiricist views that dominated scientific methodology for decades began to lose their auspiciousness. The positivist thrust for stern objective dispassionate procedural analysis, and dogmatic refusal to allow any form of subjective interpretation, created immense gaps in their scientific methodology. Beginning with Popper and his normative methodology of falsificationism, the scientific community began directing its attention away from the exact path of logical empiricism to follow varying methodological alternative approaches to scientific inquiry. While no single approach has arisen to replace the positivist movement, there has developed a unifying theme, or at least an acknowledgment of a fundamental direction, for modern-day scientists. Whereas positivism and empiricism localized on the embellishment of universal models and rules in affiliation with specific statements or theories, contemporary philosophers have focused their efforts on the analysis of alternative theories. Rather than condensing assessment to the analysis process of a single theory, they broadened the scope to include the problem of theory choice. What became important was not the single-minded evaluation of a particular theory to determine its validity, but rather the determination of alternatives to the theory. The ever-present questions of proper and

adequate testing, assessment, and demarcation criteria continued to be important, but they were now incorporated only as provisions relative to the choices among existing and available alternative theories.

The new heterodoxy, or the movement away from accepted scientific beliefs and doctrines, involved the organization and analyses of universal statements from the context of constantly changing methodologies and historical prognosis. Because of its diversity, the new heterodoxy has produced a number of new and different philosophical approaches, such as that of the Bayesians, the related achievements of Henry Kyburg and Isaac Levi, and the developmental concepts of Larry Laudan, Dudley Shapere and Stephen Toulmin.[57] But, to really appreciate the new heterodoxy is to examine the works of Thomas Kuhn, Imre Lakatos, and Paul Feyerabend.

Scientific Revolutions

Thomas Kuhn published The Structure of Scientific Revolutions in 1962, and in so doing, gave notice to the empiricists that a new era of scientific methodology was dawning. In his work, Kuhn aggressively challenged the empirical approach concerning the "how" (through observed regularity) a science develops, by presenting his concept of historical evolution. Like Popper, Kuhn proclaimed to understand the importance history plays in scientific

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[57]Hausman, ed., The Philosophy of Economics: An Anthology, 20-22.

advancement, and acknowledged the significance that time lends to the overall methodological process. But, where Popper's view of scientific methodology was bound within a normative framework of continuous revolutionary-like advancement, Kuhn's views of scientific advancement were bound within a positive framework of erratic and capricious discontinuous jumps in scientific thought. To understand this position, is to first understand Kuhn's concepts of "normal science" and "scientific paradigms:"

> 'normal science' means research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice . . . [a] paradigm is some accepted examples of actual scientific practice-examples which include law, theory, application and instrumentation together--[which] provide models from which spring particular coherent traditions of scientific research.[58]

For Kuhn, normal science is the following of precise, terse and well annotated procedures and rules to solve scientific problems. The process is considered to be the approved or legitimate method of problem-solving as accepted by the existing scientific community. To this process, the paradigms provide the commonalty of values, beliefs, and techniques needed by the community to validate the science. The purpose or nature of science, or normal science, is not innovation per se, but rather the day-to-day work of clarifying and substantiating current scientific positions.

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[58]Caldwell, Beyond Positivism: Economic Methodology In The Twentieth Century, 71.

Consequently, scientific advancement will experience extended periods of time when no new paradigms are emerging. In fact, Kuhn believed that it might take a considerable time of evaluation and study of current problem-solving activity to gain sufficient insight and evidence to modify or change one or more of the existing paradigms. But, from time to time as the scientific community goes through this normal employment of existing procedures, new and different techniques will arise to replace the old, therein constituting a jump form one paradigm to another. In accordance with Kuhn's views, this process is extremely slow, and except for historical hindsight, oftentimes occurs without the scientific community even being aware that it is happening. Most often the event that initiates such a process of change is some existing anomaly or crisis within the current body of scientific knowledge. As the anomaly or crisis in present thought continues, the need then arises for extended extraordinary research, i.e., "the scientific revolution," from which a new paradigm emerges and upon which the entire scientific community focuses its debate as to its acceptance or rejection. If the new paradigm is eventually rejected, it simply vanishes from the accumulated body of scientific knowledge. But, if the new paradigm withstands the scrutiny of the unalloyed scientific community and is accepted as new scientific thought, it will either replace the old paradigm or simply be added to the present body of knowledge. In

either case, an existing paradigm is never abandoned until a new paradigm has undergone the revolutionary process and been accepted as a suitable and proper alternative.

While Kuhn's work has experienced considerable acceptance, especially by the general lay public, there has been criticism. For the most part, the criticism has centered around the definition of his paradigms and the "normal science-revolution-normal science" sequence of scientific expansion. The issue was best summarized by a fellow philosopher, John Watkins, when he wrote:

> Thus we have the following clash: the condition which Kuhn regards as the normal and proper condition of science is a condition which, if it actually obtained, Popper would regard as unscientific, a state of affairs in which critical science had contracted into defensive metaphysics.[59]

Other Kuhnian critics went so far as to resurrect the age-old argument of normative versus positive science, pointing out that Kuhn was not really describing a methodology as much as he was stating a history of science, and as such, was his revolutionary process "telling it as it is" or "as it should be?" But, regardless of the criticism leveled against Kuhn's scientific revolution theory, he has been applauded, even by many of his scientific adversaries, for his clean characterizations and description of what constitutes a normal and revolutionary-type of science.[60]

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[59]Ibid., 77.

[60]Blaug, The Methodology of Economics, 32-34.

Scientific Research Programs

The contemporary scientific community has been plagued with a recurring problem that has thus far evaded solution. It focuses upon the belief that there cannot be a simultaneously "methodology-free, totally descriptive historiography of science and an ahistorical pure prescriptive methodology of science."[61] This issue is perceptibly the chief difference between Popper's offensive methodology (he denounces a great deal of what is termed "science" because it cannot be justified on the grounds of the methodology employed), and Kuhn's defensive methodology (he attempts to exonerate or free scientific endeavor in lieu of constant methodological faultfinding).[62] In an undertaking to philosophically bridge the gap between Popperism and Kuhnism methodology, and to promote historical primacy, Imre Lakatos published a number of works in the late 1960's and early 1970's wherein he perfected and presented his methodology of "Scientific Research Programs."

Through his writings, Lakatos expanded Popper's view pertaining to the importance of methodology by including the importance of historical research. His chief theme was that "philosophy of science without history of science is empty [and that the] history of science without philosophy of

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[61]Ibid.

[62]Ibid.

science is blind."[63] In his mind, the philosopher should concentrate more on the methodology and rules for the modification and comparisons of theories, rather than the direct act of assessing theories. Philosophers should be less concerned with how well or poorly a theory is supported by presented data, and more concerned with how a particular version of a theory improves that theory over the last. Additionally, Lakatos felt that more importance should be placed on analyzing the progress being made by the proponents of one particular theory as compared to that being made by the proponents of a competing or alternative theory.[64] In his work, Falsification and the Methodology of Scientific Research Programs completed in 1971, Lakatos shared his views and insight on the process of theory resolution. Lakatos explained that theories should be analyzed based on their "progressiveness" or "regressiveness," which is determined on whether or not they are considered to be theoretical or empirical "problemshifts:"

> Let us say . . . a series of theories is theoretically progressive (or 'constitutes a theoretically progressive problemshift') if each new theory has some excess empirical content over its predecessor, that is, if it predicts some novel, hitherto unexpected fact. Let us say that a theoretically progressive series of theories is also empirically progressive (or 'constitutes an empirically progressive problemshift') if some of this excess empirical content is also corroborated, that is, if each new theory leads us to the actual discovery of

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[63]Ibid.

[64]Hausman, ed., The Philosophy of Economics: An Anthology, 23.

> some new fact. Finally, let us call a problemshift progressive if it is both theoretically and empirically progressive, and degenerating if it is not. We 'accept' problemshifts as 'scientific' only if they are at least theoretically progressive; if they are not, we 'reject' them as 'pseudo-scientific' . . . We regard a theory in the series falsified when it is superseded by a theory with higher corroborated content.[65]

Lakatos contended that science is really governed by what he termed "Scientific Research Programs" (SRP). The history of science is not the development of scientific theories, but of individual SRP's made up of a "hard core" of scientific knowledge that constitutes a series of related theories that were developed contingent upon certain fair methodological rules and procedures. The "hard core" is considered to be the currently agreed upon methodological knowledge as accepted by its scientific proponents. It embodies the existing metaphysical beliefs, as well as those beliefs Lakatos labeled "positive heuristic" (suitable methods of scientific research), and "negative heuristic" (unsuitable methods of scientific research). Surrounding the "hard core" of scientific knowledge is a "protective belt" of auxiliary hypotheses which support the "hard core," and which together represent the "testable" theories. It is within the "protective belt" that the continual testing and appraisal of theories is completed. The merit or competence of the SRP is found in its continued ability to account for all of the facts as represented in competing SRP, while at

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[65]Caldwell, Beyond Positivism: Economic Methodology In The Twentieth Century, 87.

the same time being capable of a certain degree of empirical prediction not found in rival SRP. According to Lakatos, if particular SRP provide more empirical content than their contemporaries or predecessors, then they are deemed "theoretically progressive;" if that particular SRPs' predictive ability provides new and uniquely corroborated insight, then it is deemed to be "empirically progressive." Finally, if the SRP does nothing but modify or adapt to new information, as opposed to generating or predicting new information, then the scientific community deems it to be "degenerating." It should be noted however, that because SRP are deemed to be in a degenerative mode, is not to assume it is absolutely abandoned. Lakatos' theory does not profess to represent a conclusive, ever enduring concept of scientific development (there is no set, once-and-for-all SRP). Over time a science can become a nonscience and vis-a-versa. In essence, it is this possibility that represents the heart of Lakatos' demarcation criterion of historical confirmation or denial. It also serves as the foundation of his belief in historical falsificationism, and the basis for his conclusion that the ability to test competing or rival theories is contingent upon their predictive capabilities. With this position, Lakatos has somewhat filled the division between Popper and Kuhn, by asserting a methodology that can be accepted as either a prescriptive and/or descriptive philosophy.

As far any criticism of Lakatos' SRP is concerned, the

"scientific jury" is still deliberating. Some philosophers have expressed their concern that his SRP are too rigid in their methodology, while others feel they are too middle-of-the-road. Like his concept of theory analysis, perhaps only time and historical perspective will provide the answer.[66]

Theoretical Anarchism

Contemporary philosophy has come a long way since the pure positivist position of the Vienna Circle. But for all the new and innovative approaches to the philosophy or methodology of science, the scientific community continues to be haunted by some of the same problems and concerns of its predecessors. Even the assumed free and open style of the current-day "choice/alternative" philosophy will probably be confronted with answering certain age-old scientific questions associated with proper selection and assessment of suitable methodological criteria. Naturally, the digression to old issues also brings with it the return of some of the same old arguments and differences of opinion. This is especially true in the area of assessment, or more specifically, in the "how" assessments are to be accomplished.[67]

Many present-day philosophers have come to agree with the pro-historical attitudes of Kuhn and Lakatos over those of Popper's ahistorical concept, and have acquiesced that

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[66]Blaug, The Methodology of Economics, 34-40.

[67]Hausman, ed., The Philosophy of Economics: An Anthology, 20.

scientific inquiry is a collaborative effort of the entire scientific community, past and present. They have also come to agree that scientific inquiry must be based on some commonly accepted rules or procedures-oriented techniques or methods, to be a candidate for scientific adoption. But, there continues to be considerable debate in regards to normative versus positive science. Nonetheless, a great many contemporary philosophers apparently agree that a personal-type of evaluational influence does creep into the appraisal process of most scientific analysis, causing the methodologies to be "normative," or what has been described as "theory-laden." The idea is that while empirical observation--seeing, hearing, touching, etc.--is the best way of verifying or falsifying a single theory, the facts of that theory are actually based upon the observations of a particular observer. Based on the assumption that most observers are normal or rational individuals, they will naturally analyze data supported by their individual frame of reference. This means that all observers observe based on some sort of preconception or prior conditioning to the world around them. If this is true, and if this truth is combined with the idea that as theory (paradigms, SRP, etc.) evolves historically it loses some of its empirical content, then what can be gained by testing one theory and its predictability with that of another? Does such a proposition make the comparisons of theories on the basis of choice and

alternatives a mute point? One particular philosopher, Paul Feyerabend, thinks so. In fact, he uses this proposition to build a contemporary argument against using any type of prescribed scientific methodology.

In his book, Against Method, Feyerabend argues that the only way to scientific progress is methodological anarchism. He suggests that the only methodology to follow is no methodology at all:

> given any rule, however 'fundamental' or 'necessary' for science, there are always circumstances when it is advisable not only to ignore the rule, but to adopt its opposite. . . .There are even circumstances--and they occur rather frequently--when argument loses its forward-looking aspect and becomes a hindrance to progress. . . .And where arguments do seem to have an effect, this is more often due to their physical repetition than to their semantic content.[68]

It has been suggested by some, that this extreme view of Feyerabend's is actually related to his love of scientific freedom rather than his love of scientific methodology.[69] But, whatever the case, Feyerabend's position is that by having to follow the "rules of scientific inquiry," science is arbitrarily limiting its creative and exploratory ability and responsibilities:

> To sum up: wherever we look, whatever examples we consider, we see that the principles of critical rationalism (take falsification seriously; increase content; avoid ad hoc hypotheses; be 'honest'--whatever that means; and so on) and, a fortiori, the principles of logical empiricism (be precise; base your theories on

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[68]Caldwell, Beyond Positivism: Economic Methodology In The Twentieth Century, 87.

[69]Blaug, The Methodology of Economics, 43.

> measurements; avoid vague and unstable ideas; and so on) give an inadequate account of the past development of science and are liable to hinder science in the future. They give an inadequate account of science because science is much more 'sloppy' and 'irrational' than its methodological image. And, they are liable to hinder it, because the attempt to make science more 'rational' and more precise is bound to wipe it out. . . What appears as 'sloppiness,' 'chaos' or 'opportunism' when compared with such laws has an important function in the development of those very theories which we today regard as essential parts of our knowledge of nature. These 'deviations,' these 'errors,' are preconditions of progress.[70]

Whether Feyerabend's anarchism will prove its value to the philosophy of science can only be left to the ensuing scientific community. But, for the present his views do not appear to be shared by many of his contemporaries. Most critiques of his work indicate that his writings are enjoyable to read because he attacks scientists specifically, and the ambiguity and objectiveness of science, generally.[71] But, for the time being he is on the outside looking in as regards his fellow philosophers. There is however, one area in which Feyerabend's leads his contemporaries, and that is as an example of how wide and diverse the philosophy of science has progressed.

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[70]Caldwell, Beyond Positivism: Economic Methodology In The Twentieth Century, 84.

[71]Ibid.

CHAPTER III

METHODOLOGY

Introduction

The methodology of the study involves two distinctly different, but closely aligned activities. The first is to research and scrutinize the information available on the methodology of economics, and the second is to collate and present the information in an appropriate manner and format. The successful accomplishment of the second activity is predicated on the satisfactory completion of the first, and the first was successively predicated on research of the available literature relative to the philosophy of science. The previous chapter provided the results correlative to researching the philosophy of science. This chapter focuses on the research connected with the methodology of economics. The ensuing chapter presents the methodology and statistical results of the study.

Methodology of Economics

Introduction

As one of the first social sciences to parallel accepted methods of scientific philosophical development, economic methodology has evolved from eons of indepth philosophical and analytical appraisal of social conditions and interactions. To adequately comprehend economics as a science, and

supposedly better understand economic theory, is to acquire an appreciation of the evolution of economic methodology.

Early Economic Methodology

Initial philosophical and scientific inquiry inherently began within the realm of natural occurrences. But, as the necessity for social transpose grew, so did the need for understanding and explaining that activity. Although economics was one of the first social sciences to adhere to the methodological appraisal of existing philosophical inquiry, the scientific transition from the "natural" to the "social" context was not all that arduous. This is especially true given that all initial scientific inquiry shared certain intrinsic ethical, moral, political, and ritualistic social underpinnings. In fact, it seems the only proper and/or realistic way to approach the study of social behavior, since pre-capitalist market structures and exchange transactions were really only extensions of existing social relationships.

Ancient Greece

In the philosophical environment of ancient Greece, the great thinkers of that era wrestled not with specific matters of economic socialization, as much as they did with socialization in general. While economic subjects--market action, wealth, foreign trade, competition, etc.--were considered, they were usually embodied in the "higher plane"

of orderly socialized needs and requirements. It was expected that all economic activity would transpire within the "natural order" or the "natural reality of being." Economics was simply a part of a much broader social and philosophical agenda, that stressed the more applicable matters of ethics and politics.[72] Even some of the great philosophers of the time--Socrates, Plato, Xenophon, and Aristotle--had very little to say about the philosophy of economics, and virtually nothing at all to say about the methodology of economics. This is not to suggest that they made no contributions to economic thought or method, but what they provided was always presented as part of a more complex political and/or "state" structure. Each philosopher recognized and strived to better understand the economic happenings around him or her, but it was primarily so that those conditions could be controlled. It was the collective view that economic interaction met certain social needs, but it was also their view that that activity, specifically market interactions, had to be tightly controlled so as not to lead to social excess and/or corruption.[73]

Recognized by some as one of the earliest economists, Xenophon presented his views on management and economics in a work entitled, Oeconomicus. To Xenophon, a good and

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[72]John M. Ferguson, Landmarks Of Economic Thought (New York, NY: Longmans, Green and Company, Inc., 1950), 1-6.

[73]Eric Roll, A History Of Economic Thought (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1959), 25-35.

proper manager should always work to increase the size of his economic surplus by understanding and applying the concept of value:

> The same things are wealth and not wealth, according as one understands or does not understand how to use them. A flute for example, is wealth to one who is competent to play it, but to an incompetent person it is no better than useless stones . . . unless he sells it . . . in which case it becomes wealth. Thus, in the end, wealth is that from which a man can derive profit, but if it causes him harm, it is not wealth. Even land is not wealth if it makes us starve instead of supporting us.[74]

Another noted philosopher writing at about the same time as Xenophon was Plato. He attempted to provide an economic foundation upon which to build the perfect state. In his work, the Republic, Plato established a basic economic concept relating to exchange activities among individuals:

> A city--or a state--is a response to human needs. No human being is self-sufficient, and all of us have many wants . . . Since each person has many wants, many partners and purveyors will be required to furnish them. One person will turn to another to supply a particular want and for a different need he will seek out still another. Owing to this interchange of services, a multitude of persons will gather and dwell together in what we have come to call the city or the state . . . And so one man trades with another, each assuming he benefits therefrom.[75]

As market interactions slowly intensified in scope and degree, the Greek's pure ontology--nature [relations] of

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[74]Ben B. Seligman, "Philosophic Perspective in Economic Thought," in The Methodology of Economic Thought: Critical Papers from the Journal of Economic Thought, ed. Warren J. Samuels (New Brunswick, NJ: Transaction, Inc., 1980), 250-252.

[75]Robert B. Ekelund and Robert F. Hebert, A History Of Economic Theory And Method (New York, NY: McGraw-Hill Publishing Company, 1990), 17.

being--as exemplified in the Republic became laced with the realities of human wants. Eventually, the "ethics of natural law" were expanded to incorporate the "ethics of economics." Economics gradually became a significant force in the social and natural order; but, even so, a great many philosophers endlessly refused to consider economics within the realm of philosophical inquiry because of the "undignified" behavior of the market place. To the Greeks, it was not the individual and his/her institution that mattered, but how they fit into the overall system--the "natural system." As Aristotle pointed out in his writings on the exchange process and the use of money, man's needs and the acquisition of commodities to satisfy those needs was right and natural; however, the production of commodities in an attempt to satisfy man's unlimited desires was unnatural. What Aristotle objected to was the pursuit of monetary gain in fulfilling man's needs. He felt that man was meant to act "virtuously," satisfying only his "natural" needs, and should not be allowed to act "undignified" by satisfying human desires above and beyond his basic requirements.[76]

Middle Ages

During the Middle Ages, the "law of nature" continued to serve as the central philosophical theme to mold economic

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[76]Harry Landreth, History of Economic Theory: Scope, Method and Content (Atlanta, GA: Houghton Mifflin Company, 1976), 14.

behavior. Ethical standards of conduct, based on the old natural law paradigm, were promoted and advanced by the Canonist and Scholastic philosophers of the times. These sufficed as the basic tenets of economic activity and were implanted in marketplace interactions, e.g., competition would insure a market price that just covered implicit and explicit costs--pure economic profit was not ethical. As Thomas Aquinas pointed out in his work, Summa Theologica, "competitive markets would generate prices of goods just equal to the socially necessary costs of production."[77]

Societies from the Roman Empire to the fifteenth century, continued to view and experience economic ideals as part of their "natural" and "theological" existence. Eventually however, theological philosophers, lead by such men as the Scotsman Duns Scotus, and the English monk Thomas Middleton, attempted to separate theology from philosophy, by asserting the economic ideals of "individual welfare." Others like Roger Bacon and William of Accam, extended this new paradigm to suggest the need for studying scientific phenomena directly, and separately, from theology. The culmination of their efforts set the groundwork for what would become the philosophical concept known as logical positivism.[78] Their work also began to indicate that the

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[77]Daniel R. Fusfeld, The Age of the Economist (Glenview, IL: Scott, Foresman and Company, 1990), 4.

[78]Ben B. Seligman, "Philosophic Perspectives in Economic Thought," 250-252.

existing ideals of ethical conduct might not be appropriate for a capitalist system. But, until the sixteen century the basic economic theme remained fixed in the "natural" laws. Overall economic thought and activity of the middle ages can best be summarized by an old German illustration--the "parable of the monk." A German monk on a pilgrimage to Rome bought a silver chalice for his church. After returning home, the monk showed the chalice to several merchants and told them how much he paid for it. The merchants all congratulated him on his purchase and praised him for making such a shrewd deal, proclaiming that he had paid far less than the true value of the chalice. They all laughed at the fact that an unworldly monk was a better barterer than any of them, for he got such a good deal. The monk was so upset upon hearing the comments of the merchants, that he immediately returned to Rome, located the seller of the chalice, and paid him more money. To the monk, it was the only moral thing to do.[79]

Sixteenth Through The Eighteenth Centuries

Beginning in about the sixteenth century and continuing through the eighteenth century, individual kingdoms and municipalities began to evolve as nations. Emerging from feudal systems into medieval economic and social orders, the lords and peasants, millers and priests, and other such

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[79]Fusfeld, The Age of the Economist, 4-5.

models of "society first," began to be replaced with a new consideration for individualism. Philosophers struggled to maintain a lucid and unclouded definition and understanding between a spreading market economy and the old pattern of social economic ethics. As the feudal system finally gave way to a concept of political unification, a new philosophy of national policy emphasizing commerce and international trade began to appear. The significance of political and national doctrine was beginning to be shaped. At the core of that process was a revitalized attempt to accommodate social and individual economic needs. The initial economic methodology to emerge to handle the new ideology was called mercantilism. It was to serve as the catalyst to modify and gradually supersede the theme of natural law.

Prompted by the fusion of the natural law concept with that of economic necessity, philosophers began to foster and promote an ideal political economy--society and the nation governed by comprehensive business practices translated into specific governmental regulations. It proved to be a very popular and lucrative concept, as mercantilism grew to be the primary source of all national wealth. Commerce became the watch-word of the times. But, as with all things good or bad, there are consequences. The consequence of complete governmental control over economic activity, is the loss of individualism; and so it was with mercantilism.

As the mercantilist system grew, it began to strip away

individual economic purgatives until finally certain liberal groups and individual philosophers were successful in initiating a movement to modify the system. The group primarily responsible for spearheading the movement was called the physiocrats. They were strong advocates for less governmental regulation and more free market operations. The leaders of the physiocrats, principally Francois Quesnay and Jacques Turgot, were instrumental in combining the moral concepts of natural law with those of mercantilism to promote individualistic trends in philosophy and economics.[80] It was through their efforts in this area that the stage was set for the classical capitalist ideology of Adam Smith.

Classical Methodology

The contributions of eighteenth-century philosophy resulted in the birth of economics as a separate discipline of scientific inquiry. Strongly influenced by Aristotle's teleology, or belief that all of nature is directed toward a certain end, Newton's systematic research form, Descartes' methodological precepts, and finally, Montesquieu's ideas on the historical and evolutionary development of legal and political forms, the methodology of what is now termed classical economics was shaped. The central figure behind that effort was a noted philosopher of the time named Adam Smith. Smith published two books which were to serve as the basic

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[80]Ibid., 14-15.

counterstones of the classical movement, The Theory of Moral Sentiments (1759) and Inquiry into the Nature and Causes of the Wealth of Nations (1776). Smith, a Scotsman by birth, believed in a strong system of natural theology. Through his writings, he combined the Greek-Scholastic doctrine of natural law with everyday common sense to show the relationship between the state and the individual.[81] Described as a "system builder," Smith showed how the natural order could coexist in harmony with that of the social economic order.[82]

Either from benevolence or from self-contemplation the individual suddenly became the focus of economic attention. Predicated on the natural order of existence, social order was, as Adam Smith explained, based on "the uniform, constant, and uninterrupted effort of every man . . . to better his condition. Every individual is continually exerting himself to find out the most advantageous employment for whatever capital he can command. It is his own advantage, indeed, and not that of society, which he has in view."[83] The essential classic economic axiom was grounded on this fundamental concept of human nature as derived from the

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[81]Ekelund and Hebert, A History Of Economic Theory And Method, 99-102.

[82]R.C. Linstromberg, "The Philosophy of Science and Alternative Approaches to Economic Thought," in The Methodology of Economic Thought: Critical Papers from the Journal of Economic Thought, ed. Warren J. Samuels (New Brunswick, NJ: Transaction, Inc., 1980), 274-275.

[83]John M. Ferguson, Landmarks Of Economic Thought, 69.

Physiocratic belief in natural liberty and the importance of economic growth as a means of meliorating the conditions of man's existence. Utilizing a combination of human nature theory and historical reflection,[84] Smith devised the three major principles of economic liberalism--personal liberty, private property, and individual initiative and control of enterprise.[85] The now famous "invisible hand" ideal that individuals operating through self-interested behavior will promote an orderly market place, and thereof, create order for the whole society, suggests that Smith employed a kind of abstract-deductive historical evaluative methodological style to develop his theories. Generally working from the "natural" order of everyday events, he would apply a type of a priori deduction followed up by an historical inductive method of verification. For example, deductively he would present a basic doctrine such as the tendency of wages relative to equality, and then would inductively evaluate such a tendency by investigating and verifying in the "real world" those forces that might impact on the relationship.[86]

In consideration of other prominent early classical economists, there did not appear to be a methodological

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[84]Robert B. Ekelund and Robert F. Hebert, A History Of Economic Theory And Method, 100.

[85]John M. Ferguson, Landmarks Of Economic Thought, 71.

[86]John Neville Keynes, "The Scope and Method of Political Economy," in The Philosophy of Economics: An Anthology, ed. Daniel M Hausman (New York, NY: Cambridge University Press, 1985), 70-75.

consensus. On one extreme was the mathematician, Thomas R. Malthus, who employed a concrete inductive method of evaluation, and on the other was David Recardo, who was almost totally deductive in his approach. Somewhere between these two extremes was Smith. But, regardless of which methodological path the classical economists followed, they clearly established economics as a discipline capable of scientific method. They formed a specific scientific community, whose efforts resulted in the development of a dominant paradigm: (1) laws of production, capitalism, wages, rents, etc.; (2) wages and population growth; (3) law of diminishing returns; (4) product/service prices based on the cost of production; etc. Furthermore, they showed that not only was economics a science because of its scientific methods of investigation, but also because of its predictive ability.[87] Applying the basic considerations of Thomas Kuhn's concept of a normal science, the development of classical economic theory warrants inclusion as a definite philosophical and scientific effort.

Verificationism

While Adam Smith and the early classical theorists established many of the procedures and policies to be followed in economic inquiry, very little of what was developed was ever written down and documented as true methodology.

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[87]Mark Blaug, The Methodology of Economics (New York, NY: Cambridge University Press, 1984), 58.

It was not until the nineteenth century that most economists really began to define the methodology associated with the new science of economics. It also represented a period of major theoretical change and scientific revolution, as the classical paradigms of production and consumption gave way to neoclassical paradigms of utilitarianism and individual welfare. As for the economists of the period, they fell into a doctrine of defensive methodology and were primarily considered verificationists.

The Positions of Senior-Mills-Cairnes

The earliest economists to explicitly deal with the subject of economic methodology were Nassau Senior, J. S. Mill, and John Elliot Cairnes. Collectively, their ideas on the subject of economic methodology can be perceived as representative of the times. Fundamentally, they regarded political economy as a science whose scope was very positive and methods deductive.[88] Being the first to distinguish economics as a positive science, Senior provided four propositions upon which the designation rested:

> (1) the principle of rationality, i.e., that people are rational and calculating and will attempt to acquire wealth with a minimum of sacrifice; (2) the Malthusian population doctrine; (3) the principle of diminishing returns in agriculture; and (4) the principle of historically increasing returns for industry.[89]

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[88]Ibid., 59-85.

[89]Harry Landreth, History of Economic Theory: Scope, Method, and Content, 124.

Strongly espousing that economics is, and will always be, a "purely deductive discipline," Senior's views can best be summarized by a statement he made, when he said, "political economy depends more on reasoning than on observation.[90]

Like Senior, Mills also regarded political economy as a hypothetical science employing a priori methodology. But, he was not as dogmatic as Senior in selecting deductive over inductive logic. He felt that observation and experience must be taken into consideration before the hypothetical laws of economics could be employed for interpretation and explanation of facts. Mills viewed the effect of comparing the deductively drawn conclusion with observable facts as the means for ascertaining the limits of their application. Not believing in the symmetry thesis, if a theory did not predict accurately, Mills would suggest that insufficient evidence had been provided to verify the facts; i.e., there is nothing wrong with the conclusion, you simply have not gathered sufficient or correct data yet to prove it. The ultimate assertion would be that there is nothing wrong with the theory, given that the assumptions are true, simply because you cannot verify it. The obvious problem is that you did not collect the appropriate data. Generally, Senior, Mills, and Cairnes basically agreed on the context of economic methodology, except in this one area, and here it is

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[90]John Neville Keynes, The Scope and Method of Political Economy, 77.

simply a matter of degrees. Cairnes agreed with the basic doctrines of both Senior and Mills, except he was even more emphatically deductive. He felt that theories could never be disproved by comparing their implications with facts. To Cairnes:

> Economic laws can be refuted only by showing either that the principles and conditions assumed do not exist, or that the tendency which the law affirms does not follow as a necessary consequence from this assumption. In short, either prove that the assumptions are unrealistic, or else demonstrate a logical inconsistency, but never take a refuted prediction as a reason for abandoning an economic theory, particularly because only qualitative predictions are possible in economics.[91]

In summary, Senior-Mills-Cairnes' methodological positions were very similar to those of Smith, Ricardo, and the other early classical economists. The only real differences being that theirs was recorded and the earlier economist's positions were only implied through their writings.

The German Historical School of Economic Thought

In the latter part of the 1800's (1880-1890), economic thought and methodology was dominated by what was termed Methodenstreit. Essentially, it was the position of a group of German economists, whose economic methods and concepts became known as the the German Historical School. The school's methodology disagreed with the existing post-classical abstract-deductive reasoning, in that the school felt that science should not only theorize on economic activity, but

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[91]Mark Blaug, The Methodology of Economics, 80.

should also analyze its moral merit. The school saw economics as having the high ethical task of including morality into the science. It considered it the job of economists to establish the methods by which standards of justice and morality could be applied to situations concerning economic decision making. Economics was to be judged in terms of the "rightness" of production and distribution of wealth. The method that the historical school believed would make such an "ethical realistic" approach to economics possible was pure inductive logic--economic generalizations of specific historical observations of actual economic activity. The school emphasized that economic life varies over time and that only by the analysis of past events can the present be understood. It is only through the comparisons of economic conditions from one period to another, and from one society to another, that true economic doctrine can be developed.[92] With the addition of this view, the economic methodological world was expanded to encompass two distinct schools of methodological thought, the Classical (British) and the Historical (German).

John Neville Keynes

In 1891, John Neville Keynes published his book, The Scope and Method of Political Economy. In it, Keynes attempted to bridge the differences between Senior-Mill-

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[92]Harry Landreth, History of Economic Theory: Scope, Method, and Content, 273-299.

Cairnes' abstract-deductive methods of reasoning, and the historical-inductive reasoning of the German Historical School. In essence, he agrees in part with both methods of reasoning. In his remarks concerning the theories of economic growth and progress, he states that, "the part played by abstract reasoning is reduced to a minimum, and the economists' dependence upon historical generalization is at a maximum."[93] On the other side of the argument, when discussing the theories of relative prices and incomes, he demotes the significance of empirical inquiry by stating, "deduction from elementary principles . . . occupies a position of central, though not exclusive, importance."[94] He goes on to say, "This is in accordance with the ordinary logical cannon, that the greater the number of causes in interaction, the less possible it becomes to fulfill the operation, and the more complicated the mode of their condition required for valid inductive reasoning."[95] Keynes is also quick to acknowledge the importance that certain quantitative methods might have in helping to deduce unknown quantities from some known quantities, and consequently, be useful in the testing and verification of theories.

On the subject of prediction, Keynes simply reasserts

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[93]Fritz Machlup, Methodology of Economics and Other Social Sciences (New York, NY: Academic Press, 1978), 491.

[94]Ibid.

[95]Ibid.

the Senior-Mill-Cairnes position that any theory can be considered predictive predicated on the assumption that the theory is generally true. However, economic theory should not be considered only for its predictive ability, because that ability should really only be used as a springboard for studying the relevant facts. The fact that a theory does not predict accurately should not be justification for abandonment of the theory, but rather the catalyst for further inquiry. The theory remains true, it is just that certain data have yet to be retrieved to prove the theory's power of prediction.

The result of Keynes' endeavors--amply aided by the supporting works and inference of Alfred Marshall--was the determination that no single method of political economy was necessarily superior over any other. Depending upon the "special department" or "key aspects of the science" being studied, any number of different methods might be employed, e.g., "abstract or realistic," "deductive or inductive," "mathematical or statistical," "hypothetical or historical," etc.[96]

Verificationism's Last Stand

As the nineteenth century drew to a close, so did post-classical economic thought and essentially, verificationism. The century had witnessed the first real attempt at defining

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[96]John Neville Keynes, The Scope and Method of Political Economy, 83.

economic methodology and the origination of a new economic paradigm of utilitarianism and individual welfare. As the neoclassical thought gained acceptance, so did a short-lived school of heterodox economic methodology known as American Institutionalism. It was a methodology that followed the inductive process of logical reasoning. To ward off this movement, Lionel Robbins, a prominent economist teaching both at the London School of Economics, and the University of London, along with another prominent economist, Frank Knight, not to mention a number of modern-day Austrian economists such as Ludwig von Mises, made a final pitch for the old deductive-verificationist method of economic inquiry. Robbins, Knight, and von Mises where all devout neoclassical economists, who emphasized the individualism and subjectivity of economics and who believed that human action played a particularly important function as an object of scientific inquiry. All three individuals supported the basic premises of Senior, Mill, and Cairnes.[97]

In An Essay on the Nature and Significance of Economic Science (1932), Robbins recounts the old Senior-Mill-Cairnes proposition, and concludes that the old orthodox methodology remains the most valid:

> It should not be necessary to spend much time showing that it [validity] cannot rest upon a mere appeal to 'History.' . . . there would be no sufficient reason for

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[97]Daniel M. Housman, ed. The Philosophy of Economics: An Anthology (New York, NY: Cambridge University Press, 1985), 38-40.

> supposing that history 'would repeat itself' . . . For if there is one thing which is shown by history, not less than by elementary logic, it is that historical judgment is the worst possible basis of prophecy.[98]

Robbins continues in his essay to show the logical process of deduction:

> the proposition of economic theory, like all scientific theory, are obviously deductions from a series of postulates . . . The main postulate of the theory of value is the fact that individuals can arrange their preferences . . . the main postulate of the theory of production is the fact that there is more than one factor of production . . . we do not need controlled experiments to establish their validity: they are so much the staff of our everyday experience that they have only to be stated to be recognized as obvious.[99]

Robbins even goes so far as to deny that such concepts as the elasticity of demand can ever be quantified because of its instability, or that utility can be objectively analyzed and compared because it is impossible to verify by actual observation or introspection. The overall gist of Robbins' works, as supported by the methodological underdressing of Knight and the Austrian school, revolves around basic a priori heuristic postulates. Robbins' position is founded in the doctrine that economic truths only require a single verification to prove overall validity:

> economic truths--based as they are on such innocent and plausible postulates as a maximizing consumer who is able to consistently rank order his/her preferences, and a maximizing entrepreneur who consistently

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[98]Lionel Robbins, "The Nature of Economic Generalizations," in Philosophy and Economic Theory, eds. Frank Hahn and Martin Hollis (New York, NY: Oxford University Press, 1979), 36-37.

[99]Ibid., 39-46.

> faces a well-behaved production function and factor markets--require verification only to check that they do apply in any particular case.[100]

Falsificationism

Prior to the 1930's, methodological individualism and a priorism were the controlling methodological viewpoints. Economic theory was deduced from unmistakably obvious basic postulates, the premises of which were based upon observation and introspection. The implications of the theory, as derived from the premises, required validation only for the purpose of verifying their applicability and not for the purpose of validation per se. If a particular implication or theory was ever refuted by comparing future results with the a priori truth of the theory, then there must have been some facts yet to be discovered to explain the difference. It was the test of a science to be capable of finding such facts. Consequently, no theory could be rejected on purely empirical grounds, because an incorrect prediction could only be the work of certain "disturbing causes" yet to be identified. However, by the late 1930's some economists began to question such a hypothetico-deductive methodology, the most prominent being Terence Hutchison, Paul Samuelson, Fritz Machlup and Milton Friedman. These individuals have contributed significantly to twentieth-century economic methodology, a methodology that has been based preeminently

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[100]Mark Blaug, The Methodology of Economics, 91.

on the ideals of Karl Popper's positivism and methodological falsificationism.

Twentieth-Century Logical Positivism

Terence Hutchison was a major critic of the hypothetico-deductive model of conventionalist economic explanation.[101] In 1938, Hutchison published, The Significance and Basic Postulates of Economic Theory, with the specific intend of establishing a new foundation for modern economic theory. His basic theme was that economics is a science, and as such must deal with facts in an empirical testable manner.[102] Hutchison separates all statements as being either "logically necessary, analytic propositions" or "logically indeterminate, synthetic propositions." Economic propositions ultimately become either tautological or empirical, with tautological propositions being those that do not prohibit any imaginable occurrences, while empirical propositions would prohibit at least one possible occurrence from happening. If a proposition is intrinsically falsifiable, then it prohibits at least one occurrence from happening; therefore, it is empirical.[103]

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[101]Lawrence A. Boland, The Foundation of Economic Method (Hempstead, MA: George Allen & Unwin, 1982), 23.

[102]Bruce Caldwell, Beyond Positivisim: Economic Methodology In The Twentieth Century (Winchester, MA: George Allen & Unwin Inc., 1982), 106-112.

[103]Mark Blaug, The Methodology of Economics, 94-97.

Operationalism

The physicist, Percy W. Bridgman, writing in his 1927 book, The Logic of Modern Physics, expressed a concept he entitled "operationalism" (nothing but physical, observed operations should be used in physics or any other scientific endeavor) and in so doing, helped to endorse the ideals of logical empiricism.[104] Nine years later, Bridgman released still another book on the same subject entitled The Nature of Physical Theory in which he confirmed his basic belief in operational methodism. At about the same time that Bridgman was introducing his concept on operationalism, another noted scientist, A. J. Ayer, published a separate piece of work on logical positivism entitled, Language, Truth, and Logic. With the publication of Bridgman's and Ayer's works, operationalism was tied to the general views of positivism and specifically to the tenets: "If a specific question has meaning, it must be possible to find operations by which an answer may be given it."[105]

Concentrating on the basic theme of operationalism, the award winning economist, Paul A. Samuelson, combined the ideals of operationalism with that of empiricism in his 1947 book, The Foundations of Economic Analysis. In his book, Samuelson argued that comparative statics is useless until

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[104]Fritz Machlup, Methodology of Economics and Other Social Sciences, 20-21.

[105]Ibid., 161.

corresponding principles are specified. For example, most assumptions about constrained maximization are useless for economic prediction because they lack operationally meaningful theorems. "The direct verifiability of a proposition depends on the operationality of the concepts which comprise it."[106] In his book, The Methodology of Economics, Mark Blaug stated that Samuelson's definition of operationally meaningful theorems is nothing more than Popperian falsificationism as explained in the language of the old Vienna Circle.[107] Speaking at an American Economic Association meeting in May, 1963, on the "Problems of Methodology," Samuelson's remarks seemed to support Blaug's allegations and serves as a kind of summary for the operationalists concept. At the conclusion of his speech, Samuelson finished with the following statement, "If the abstract models contain empirical falsities, we must jettison the models, not gleam over their inadequacies."[108]

Conventionalism

Fritz Machlup, a noted contemporary economist, has been described by some as the most productive twentieth-century publisher of economic methodology. Based on a paper, "The Problem of Verification in Economics," which he presented at

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[106]Ibid., 559.

[107]Mark Blaug, The Methodology of Economics, 100.

[108]Fritz Machlup, Methodology of Economics and Other Social Sciences, 481.

the Annual Conference of the Southern Economic Association on November 19, 1954, and what he indicates in his book, Methodology of Economics and Other Social Science, Machlup's methodological position appears to lie somewhere between a priorism and ultra-empiricism. While he understands the importance of empirical research, he also notes that no test is a once-and-for-all proof of validity. He touched on this in his book when he observed, "absence of contradictory evidence, a finding of non-contradiction, is really a negation of a negation: indeed, one calls a hypothesis 'confirmed' when it is merely not disconfirmed."[109] It is this tenet or methodological position, that prompted Spiro Latsis to label Machlup a "conventionalist." In a book for which Latsis served as editor, Method and Appraisal in Economics, Latsis was discussing certain alternative methodologies of economics and the methodology of Imre Lakatos' Scientific Research Programs, when he distinguished the three primary economic methodologies of a priorism, falsificationism, and conventionalism. Latsis observed that Machlup's methodism was most closely related to that of conventionalism. Machlup responded by accepting the label, at least in the sense that it represents "someone who accepts as meaningful and useful basic propositions that make no assertions but are conventions (postulates) with regard to analytic procedure."[110]

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[109]Ibid., 140.

[110]Ibid., 460.

Leaning more toward positivism than a priorism, Machlup prefers to speak of refutations or disconfirmation rather than falsification; but, he does declare that "the dictum is surely right: testing of an empirical hypothesis results either in its disconfirmation or its non-disconfirmation, never in its definitive confirmation."[111] Demonstrating a similarity with Kuhn's and Lakatos' paradigms of science, Machlup contends that even if a theory is disconfirmed it should never be rejected until a better theory has been suggested to replace it. The test of such a theory would be its predictability. While Machlup retains his need for empirical justification and his concept of disconfirmation, he ultimately agrees with Milton Friedman. While empirical studies can not be employed to verify or falsify a theory, they can be used to determine applicability, because the best test of a theory is measured by its predictive powers and not in the verification of its propositions.[112]

Instrumentalism

"Economics as a positive science is a body of tentatively accepted generalizations about economic phenomena that can be used to predict the consequences of changes in circumstances."[113] To Milton Friedman, theory in positive

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[111]Ibid., 140.

[112]Bruce Caldwell, Beyond Positivism: Economic Methodology In The Twentieth Century, 164-165.

[113]Milton Friedman, "The Methodology of Positive

economics is to "be judged by the precision, scope, and conformity with experience of the predictions it yields." In essence, positive economics is, or can be, an "objective science in precisely the same sense as any of the physical sciences."[114] It is this view that has labeled Friedman an instrumentalist: theories and hypothesis are nothing more than instruments with which to make predictions. In his essay on the "Methodology of Positive Economics," Friedman points out that empirical study is not for the judging of the propositions or postulates of a theory, but rather for judging the implication of the entire theory:

> Viewed as a body of substantive hypotheses, theory is to be judged by its predictive power for the class of phenomena which it is intended to "explain". Only factual evidence can show whether it is "right" or "wrong" or, better, tentatively "accepted" as valid or "rejected". As I shall argue at greater length below, the only relevant test of the validity of a hypothesis [notice that "only"] is comparison of its predictions with experience. The hypothesis is rejected if its predictions are contradicted ("frequently" or more often than predictions from an alternative hypothesis); it is accepted if its predictions are not contradicted; great confidence is attached to it if it has survived many opportunities for contradictions. Factual evidence can never "prove" a hypothesis; it can only fail to disprove it, which is what we generally mean when we say, somewhat inexactly, that the hypothesis has been "confirmed" by experience.[115]

Friedman also makes the point that for assumptions to be

Economics," in Philosophy and Economic Theory, eds. Frank Hahn and Martin Hollis (New York, NY: Oxford University Press, 1979), 33.

[114]Ibid., 19.

[115]Mark Blaug, The Methodology of Economics, 104.

right, they must be wrong, "Not only is it unnecessary for assumptions to be realistic, it is a positive advantage if they are not: to be important . . . a hypothesis must be descriptively false in its assumptions."[116] Friedman assuredly recognized that empirical evidence is vital to the development of the hypothesis, but he felt that it was more vital in testing the hypothesis.

In summary of Friedman's work on positive economics, Mark Blaug did an excellent job in his book on economic methodology when he reiterated Friedman's three central arguments:

> (1) assumptions are "largely" irrelevant to the validation of theories, which ought to be judged "almost" solely in terms of their instrumental value in generating accurate predictions; (2) standard theory has an excellent predictive record as judged by "countless application . . . to specific problems"; and (3) the dynamics of competition over time accounts for this splendid track record, whatever are the facts of either overt behavior or the motivation for behavior on the part of individuals.[117]

Contemporary Economic Methodology

It is difficult to determine or single out a distinct methodological approach that accurately and/or completely represents present-day economic thought. If we are to take our cue from current economic literature it would appear that the economic "playing field" is wide open. Modern-day economists present us with a process of economic analysis

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[116]Ibid.

[117]Ibid., 119.

that ranges between extreme inductive reasoning (logical positivism and ecometrics) and extreme deductive reasoning (a priorism and Hypothetico-deductive logic). The age-old argument concerning positive and normative economics also continues to play a central role in contemporary methodology. All in all, contemporary economic methodology can best be summed up by Joseph Schumpeter's economic methodological development. The first article Schumpeter ever published was in 1906. That article was an appeal for economists to employ the mathematical method in analyzing economic theory. Just two months before he died in November, 1949, Schumpeter presented a paper at the Universities-National Bureau Conference on Business Cycle Research, in which he made a plea for the use of the historical method in analyzing economic theorems. It has been noted that throughout his 44 years of extensive economic research and writing, Schumpeter utilized a combination of statistical, historical, and theoretical analysis. It has been suggested by economists such as Fritz Machlup that this trend from pure positivism to a type of hypothetico-deductive reasoning is prototypic of the great economic minds of our times.[118] If this is true, then the methodology of current economic analysis is not dependent upon a single philosophy, but a combination of scientific philosophies. In the final analysis, perhaps Kuhn's concept

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[118]Fritz Machlup, Methodology of Economics and Other Social Sciences, 461.

of a normal science is the most valid philosophy of all. Maybe the only thing that really matters is that economic research requires some sort of prescribed, detailed set of rules and procedures for the act of analyzing economic data; and so long as those rules and procedures are not violated and are monitored and approved by the current scientific economic community, that particular methodology should be considered appropriate.

As stated at the beginning of this chapter, the methodology involved in this study is presented in the following chapter. The next chapter also includes the results of the statistical inference to determine if exposure to the philosophy of science and the methodology of economics assists students in understanding the principles of microeconomics. As noted, the primary intent behind such exposure is to promote interest in microeconomics through the acquisition and appreciation of the scientific goals of economics, the processes and manner of establishing economic concepts and theory, and the nature and value of scientific economic explanation.

CHAPTER IV

STUDY METHODOLOGY AND STATISTICAL ANALYSIS OF DATA

Methodology of the Study

Introduction

The procedures and methods employed in this study focalizes on four basic functions: (1) research and analysis of the available literature pertaining to the employment of instructional modules, the philosophy of science, and the methodology of economics; (2) development and presentation of an instructional module on the philosophy of science and the methodology of economics; (3) composition and selection of the research population; and (4) collection and analysis of the generated data. Chapters II and III of this study have dealt with the first of these functions; the present chapter deals with the remaining three. The structure and process associated with the completion of each of these functions was accomplished as scrupulously as possible given the obvious constraints and administrative requirements of an educational environment. Predicated on the research and analysis of the available literature, the most significant and precise aspect of this study was the development and presentation of the instructional module.

The Instructional Module

Based on the investigation and study of the available

literature, a special three-week instructional module on the philosophy of science and the methodology of economics was prepared. Because of the absolute number and immensity of available material, this study necessarily represents only that material considered germane to the development and presentation of the instructional module. The analysis and subsequent inclusion or omission of a particular scientific concept, theory, or individual piece of work is not based on any specific level of personal expertise, and should not be considered a personal appraisal or indictment. The decision of which material to include or not to include as part of this study is founded entirely on the author's perceived importance and prominence within the existing literature, as represented by the estimated attention of the current scientific economic community.

To facilitate and assist actual classroom presentation, a syllabus for the instructional module was developed and is included as Appendix 1. Incorporated as part of the overall course, the module was administered during the first three weeks of the course following a traditional basic lecture/ discussion instructional format. Devised from separate and distinct teaching objectives, a short examination of the material contained in the module was completed by the participants to enhance and guarantee their complicity. The results of the examination were included as part of the student's final course grade.

Control and Experimental Groups

Selection of Groups

The participants of the study were all Motlow State Community College freshman and sophomore students. Their selection for the research project was based entirely on the fact that they chanced to enroll in one of four Principles of Economics II--Microeconomics--courses being taught by the author during the the spring semester, January through May, 1990.

At the time of spring semester 1990 registration, the four classes were indiscriminately designated as either control classes or experimental classes. In an attempt to ensure two groups of comparable proportions, the only criterion employed in separating the four classes between control and experimental, was class size. At the beginning of the study, the two classes designated as the control group had a total enrollment of 43 students, and the two designated as the experimental group had a total enrollment of 50.

Classroom Instruction

The four classes used in the study were individually advised of the research project, but were not provided any information as to the reason or nature of the undertaking. None of the classes was informed as to its designation, i.e., experimental or control, and was only provided information concerning the importance of the study and its

participation therein. In any discussion concerning actual course content and/or course requirements, all classes were repeatedly apprised and confirmed as being equally significant to the research project. Endeavoring to circumvent the possibility of distorted results, a concentrated effort was made to promote and foster a non-competitive attitude among the different classes.

Classroom presentations and course work were scheduled to coincide as closely as possible. The experimental group received the special instructional module on the philosophy of science and the methodology of economics during the first three weeks of class. During the time that the experimental group was receiving the instructional module, the control group completed a non-microeconomic-relevant writing assignment in the library. At the conclusion of the three-week instructional module and writing assignment, both groups received the identical course on the principles of microeconomics. To guarantee veridical results, all classroom work and presentations relating to course content were prepared and completed with the same degree of exactness. A detailed copy of the course syllabus for the experimental and control groups is provided as Appendix 2 and 3, respectively.

Collection of Research Data

Measurement of Student Performance

A critical component of the research project was the

selection and utilization of an applicable and reliable instrument for measuring the data collected. The instrument selected had to be wholly capable of validating recognizable cognitive learning achievement in the area of microeconomics. In an attempt to secure a neutral and impartial measurement tool, it was considered necessarily proper to locate an appropriate standardized, commercial meting instrument. The instrument found to satisfy the criteria was the Educational Testing Service's College-Level Examination Program (CLEP) Subject Examination in Introductory Microeconomics. The examination qualified as a nationally recognized and accepted college-level measurement of a student's proven performance in introductory microeconomics. Because it is a nationally recognized and employed CLEP subject examination, the actual examination material is maintained in strictest confidence and therefore could not be provided as a part of the study documentation. The examinations used during the study were requested and controlled at all times by the Motlow State Community College's Coordinator of Guidance and Testing.

The primary purpose of the CLEP subject examination was to measure the extent of a student's prior basic knowledge of microeconomics (pretest), and then to compare that with the student's extent or level of knowledge after receiving the instructional module and completing the course (posttest). All study participants were administered both the pre- and posttests as part of overall course requirements.

At the conclusion of the posttest, a comparison of test scores was completed between the control and experimental groups. The purpose of the comparison was to determine if there were any significant differences in scores between those students who received the instructional module and those who did not.

In addition to the CLEP Subject Examination in Introductory Microeconomics, both groups (all four classes) were required to complete four "routinely or regularly" scheduled course content examinations prepared by the author. These examinations covered material from the required textbook for the course, Economics: Principles, Principles, and Policies, by Campbell R. McConnell, and that material presented by the author during actual classroom lecture/discussion. Each examination consisted of approximately 80-90% multiple choice questions, and 10-20% short essay questions. The results of the four regularly scheduled course content examinations were also used as student performance evaluation tools and were made part of the research findings.

Student Demographic Information

Conceivably, there may exist numerous exogenous factors that can affect a student's performance on an examination as relates to measuring cognitive learning. This is probably true in any given test situation, but may be especially true when measuring performance relative to special modular type instruction. In an attempt to mitigate and/or account for

the possible inclusion of external factors that could affect a student's test score, certain demographic information as age, gender, major program of study, grade classification, and cumulative grade point average were also collected and reviewed as part of the study. Review of this information was most helpful in determining statistical similarities or dissimilarities between the experimental and control groups.

Statistical Analysis of Data

Introduction

The primary technique employed to examine the research hypothesis was to evaluate and compare the difference in the mean test scores on the CLEP subject examination between the experimental and control groups. By calculating the average differences between the pre- and posttests, and then determining the mean improvement, or lack of improvement of each group, the research hypothesis was tested. If the average mean improvement of the experimental group proved to be numerically superior, then it would suggest confirmation of the research hypothesis. But, if the average mean improvement of the experimental group proved statistically insignificant, or if the control group's average mean improvement score was numerically higher than the experimental group's, then it suggests that the research hypothesis lacks confirmation and that the null hypothesis is accepted. The final, resolute determination as to confirmation or denial of the research

hypothesis was the definitive or absolute comparison of the two average mean improvement scores.

The mathematical difference between the pre- and post-test scores of the two groups was utilized to calculate an arithmetic (sample) mean for each group. The degree of cognitive learning achieved by the control and experimental groups was based on the significant difference existing between the sample means and the statistical inference. All statistical inference was completed utilizing the standard $\underline{t}$-distribution test.[119]

Employing the $\underline{t}$-distribution test, the research (alternative) hypothesis was statistically accepted or rejected based on a comparison of the $\underline{t}$-distribution test value to that of a critical value of $\underline{t}_{\underline{a}}$, where $\underline{a}$ represents a certain statistical confidence level. For purposes of this study, all tests were computed at the .05 level of confidence, i.e., $\underline{a} = .05$. The critical value of $\underline{t}_{\underline{a}}$ at the .05 level of confidence was determined by utilizing standardized data from "Data of Percentage Points of the $\underline{t}$-Distribution," computed by Maxine Merrington, Biometrika.[120] To insure statistical accuracy, in all $\underline{t}$-distribution tests involving degrees of freedom (df) of more than 30, the standard infinite $\underline{t}_{\underline{a}}$ value of 1.645 was utilized. In all $\underline{t}$-distribution tests involving

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[119]Lyman Ott and William Mendenhall, Understanding Statistics (Boston, MA: PWS-KENT Publishing Company, 1990), 256-313.

[120]Ibid., 679.

degrees of freedom of less than 30, the appropriate critical $\underline{t}_a$ value from the aforementioned table was utilized.[121] All the distinct $\underline{t}$-distribution test values employed were based on the different required degrees of freedom:

> The concept of degrees of freedom refers to the number of independent deviations used in the determination of the estimated value of the standard deviation . . . . there are n - 1 [n = number of participants in the sample population] independent deviations because x [the sample mean] has been calculated from the sample and therefore, n - 1 degrees of freedom are associated with its use.[122]

In determining degrees of freedom, the total sample population for this study consisted of 80 students. The control group sample population included 31 students participating in the CLEP subject examinations and 36 students participating in the regularly scheduled course content examinations. For the experimental group sample population, 42 students participated in the CLEP subject examinations, and 44 students participated in the regularly scheduled course content examinations. The differences in the sample populations between the CLEP subject examinations and the regularly scheduled course content examinations, were that

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[121]Curtis K. Church, Ph.D., Associate Professor, Mathematics, Middle Tennessee State University, interview by author, telephone interview, Murfreesboro, Tennessee, October, 1990; Janice Harder, Ed.D., Associate Professor, Office Systems Technology, Motlow State Community College, interview by author, personal conversation, October, 1990; and Sandra A. Arman, B.S., Lab Instructor/Technician, Mathematics, Motlow State Community College, interview by author, personal conversation, September-October, 1990.

[122]Donald R. Plane and Edward B. Oppermann, Business and Economic Statistics (Plano, TX: Business Publications, Inc., 1986), 212.

some students were unable to participate in either the pre- or posttest because of personal problems such as individual or family illness, etc.

Statistical inferences involving the comparison of the difference between the sample means of the two populations--control group and experimental group--were conducted as follows: (1) the null hypothesis was rejected if $\underline{t}$ proved to be greater than $\underline{t}_a$ or if $\underline{t}$ proved to be less than $-\underline{t}_a$, (2) the research (alternative) hypothesis was rejected if $\underline{t}$ proved to be less than $\underline{t}_a$, (3) the null hypothesis was accepted if $\underline{t}$ proved to be less than $\underline{t}_a$ or if $\underline{t}$ proved to be greater than $-\underline{t}_a$, or (4) the research (alternative) was accepted if $\underline{t}$ proved to be greater than $\underline{t}_a$.[123] In agreement with these procedures and in compliance with previously indicated methods and techniques, Tables 1 - 19 provide the statistical inferences and demographic analysis associated with the accumulated research data.

Analysis of Primary Data

The primary and essential data to be analyzed consists of that information collected and assimilated as the result of the CLEP subject examinations and completion of the four regularly scheduled course content examinations. The results of the $\underline{t}$-distribution tests for these data is presented in Tables 1 and 2.

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[123]Ott and Mendenhall, Understanding Statistics, 247-318.

TABLE 1

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN CLEP SUBJECT EXAMINATION IN INTRODUCTORY MICROECONOMICS: PRETEST AND POSTTEST SCORES

Group	n	x	S^2	S_p	df	t
Control	31	2.871	14.920	4.2328	71	-.346
Experimental	42	2.524	20.109			
Difference		.347				

The evaluation of the mean difference between the pre- and posttest scores revealed very little variance between the two groups. With a sample mean difference of only .347, it was concluded that the cognitive learning achieved by the two groups was relatively the same. This contention was supported by the t-distribution test. The test statistic (t) was calculated to be -.346. The critical value of t_a at an .05 level of confidence is 1.645. Since the value of t was less than the critical value of t_a, the research (alternative) hypothesis was rejected and the null hypothesis was accepted. Predicated on these results, the completion of a unique instructional module on the philosophy of science and methodology of economics as a prologue to an introductory microeconomics course did not insure a higher score on the CLEP Subject Examination in Introductory Microeconomics. It was concluded that the experimental group, upon receipt of

the instructional module, did not achieve a higher level of cognitive understanding of elementary microeconomics.

A secondary or alternative approach to examining the research hypothesis, was to evaluate and compare the results of the four regularly scheduled course content examinations. This was accomplished using the same elemental statistical analysis and comparison techniques that were employed in analyzing the results of the CLEP subject examinations, the results of which are presented in Table 2.

TABLE 2

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN REGULARLY SCHEDULED COURSE CONTENT EXAMINATIONS

Group	n	x	S^2	S_p	df	t
Control	36	73.3868	124.7726	11.5631	77	1.4850
Experimental	44	77.2466	140.9740			
Difference		3.8598				

Unlike the results from the pre- and posttest analysis, the results from the four regularly scheduled course content examinations showed that the sample mean of the experimental group was 3.8598 points greater than the control group's. This difference, meager as it may be, was suggestive of a slightly increased level of cognitive learning on the part of the experimental group. However, the t-distribution test

was not very supportive of such a proposition in that the test statistic of 1.4850 was less than the critical $\underline{t}_a$ value of 1.645 at the .05 level of confidence. Like the pre- and posttest statistical inference, the data for the regularly scheduled course content examinations indicated no significant difference between the two groups. The cumulative results of the two statistical evaluations did not support the research hypothesis that completing the instructional module would contribute significantly to an increased level of cognitive learning as represented by higher scores on the prescribed examinations.

Even though there was no significant difference between the control and experimental group's performance on the pre- and posttest, or on the regularly scheduled course content examinations, it is interesting to note the difference in the sample mean scores between the two categories of tests. On the pre- and posttest there was only a .347 difference between the two groups. But, for the regularly scheduled course content examinations there was a 3.8598 difference in favor of the experimental group. In an attempt to determine the significance of such a difference and what factors might contribute to such a distinction in mean scores between the two measurements, three additional factors were evaluated.

The first factor considered in explaining the difference in the sample means scores of the two groups was prior microeconomic knowledge. Did one group of students, in this

case the experimental group, possess a higher "entry-level" knowledge of microeconomics than the other? To examine this factor, a t-distribution test was completed utilizing only the CLEP subject examination pretest data. The resultant information is provided in Table 3.

TABLE 3

t-DISTRIBUTION TEST ON THE CLEP SUBJECT EXAMINATION IN INTRODUCTORY MICROECONOMICS PRETEST SCORES

Group	n	x	s^2	s_p	df	t
Control	31	35.2903	11.9742	5.2752	71	2.7412
Experimental	42	38.7143	39.4285			
Difference		3.4240				

The sample mean score difference between the experimental group and the control group, when analyzing only the CLEP subject examination pretest results, was 3.424 in favor of the experimental group. This suggests that the experimental group may have possessed a higher level of prior cognitive microeconomic knowledge than did the control group. This possibility was minimally substantiated by the results of the t-distribution test. The t-distribution test value was 2.7412 and the critical t_a value was 1.645. Since the t value was greater than the t_a value at the .05 confidence level, it supported the contention that the experimental

group possessed higher entry-level cognitive knowledge of basic microeconomics. Since the initial comparison of the sample mean scores for the pre- and posttest results did not indicate any significant difference between the two groups, the next factor of interest would be a comparison of the CLEP subject examination posttest results. The data generated from this analysis is presented in Table 4.

TABLE 4

$\underline{t}$-DISTRIBUTION TEST ON THE CLEP SUBJECT EXAMINATION IN INTRODUCTORY MICROECONOMICS POSTTEST SCORES

Group	n	x	S^2	S_p	df	$\underline{t}$
Control	31	38.1613	24.5731	6.6150	71	1.9644
Experimental	42	41.2381	57.7955			
Difference		3.0768				

Analogous to the pretest results of the CLEP subject examination, the posttest results reflect a $\underline{t}$ value (1.9644) greater than the critical $\underline{t}_a$ value (1.645) at a .05 level of confidence. This denotes a significant difference between the two groups in terms of the posttest data, implying that the experimental group may have realized a more meaningful gain in cognitive understanding of introductory microeconomics than did the control group. Similarly, the analysis of the sample mean scores appears to suggest such a hypothesis.

The experimental group achieved a 3.0768 higher sample mean score than did the control group, again suggesting that the experimental group may have achieved a higher level of cognitive understanding of the material.

If the pretest and posttest data were exclusively reviewed, it would appear that the research (alternative) hypothesis should be accepted. The statistical results of the t-distribution tests and the comparison of the two groups' sample mean scores both visibly support such an action. In both instances, it would seem that the special instructional module on the philosophy of science and the methodology of economics aided the experimental group in understanding the presented course material. But, as evidenced by the data presented in Table 1, and supported by that presented in Table 2, when all the collected data are compared and the statistical mean differences analyzed there was no significant difference between the two groups. In fact, when a more detailed comparison was made between the pretest sample mean scores and the posttest sample mean scores, it becomes obvious that the control group actually achieved a more genuine improvement in test scores. On the pretest, the control group's sample mean was 35.2903 as compared to 38.7143 for the experimental group. On the posttest, the control group's sample mean increased to 38.1613 producing a 2.8710 increase, while the experimental group's sample mean increased by only 2.5238 to 41.2381. The .3472

mean difference increase for the control group implies that completion of the instructional module was not advantageous to enhancing a student's cognitive ability to understand elementary microeconomics.

The last factor analyzed as an explanation of why the two measurement instruments would produce such a difference in sample mean scores was work experience. The supposition being that one particular group of students might possess a significantly larger number of currently employed members, and consequently, influence the test results. However, in polling the members of both the control and experimental groups, it was determined that both groups had roughly the same number of employed members. Based on the information gathered, approximately 42% of the control group and 52% of the experimental group were currently employed in either a part-time or a full-time job, and that almost 83% of the control group and nearly 84% of the experimental group had some prior work experience within the past three years. Consequently, work experience was ignored as a significant influencing factor.

Analysis of Student Demographic Data

Finally, in an attempt to ascertain the possible impact of any extenuating external factors on the testing process, statistical comparisons were also transacted using certain collected student demographic information. The results achieved on the different tests were analyzed and compared

along the lines of the different demographic classifications of age, cumulative grade point average, gender, academic program of study, type of degree, total number of semester hours completed, and student classification (freshman or sophomore), to determine if any distinguished or significant differences existed between the two research groups.

Analysis Based on Age

To analyze student performance predicated on age, the control and experimental groups were individually divided into two age categories: "below 25" and "25 and over." The determination to use the age of 25 as the breaking-point was based on the calculated average age of the two groups. The average age of the control group was calculated to be 25.4 years and the average age of the experimental group was calculated to be 25.9 years. The overall cumulative average for the two groups was then calculated to be 25.66 years.

Based on the two age categories, the two groups were compared using the standard t-distribution test to evaluate the CLEP subject examination pre- and posttest scores, and the regularly scheduled course content examinations. The results of these evaluations are provided in Tables 5 - 8.

The results of the CLEP subject examination pre- and posttest evaluation of the two age groups did not reveal a significant statistical difference between the control and experimental groups at the .05 level of confidence. As displayed in Tables 5 and 6, the t value for both the "below 25

years of age" and the "25 years of age and older" categories was less than the critical t_a value, -.0795 < 1.645 and -.5687 < 1.711, respectively. Noteworthy however, was the

TABLE 5

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN CLEP SUBJECT EXAMINATION IN INTRODUCTORY MICROECONOMICS PRETEST AND POSTTEST FOR STUDENTS BELOW 25 YEARS OF AGE

Group	n	x	S^2	S_p	df	t
Control	20	2.4000	14.7701	3.9027	44	-.0795
Experimental	26	2.3077	15.5815			
Difference		.0923				

TABLE 6

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN CLEP SUBJECT EXAMINATION IN INTRODUCTORY MICROECONOMICS PRETEST AND POSTTEST SCORES FOR STUDENTS 25 YEARS OF AGE AND OLDER

Group	n	x	S^2	S_p	df	t
Control	10	4	16.2206	4.9073	24	-.5687
Experimental	16	2.8750	28.7977			
Difference		1.1250				

difference in the sample mean scores between the two age categories for both research groups. In both tests, those students over 25 years of age scored a little higher than

did the younger students. This was especially conspicuous for the control group, which posted a positive 1.6 difference (4 minus 2.4) between the two age categories. A like difference was also reflected in the sample mean scores of the two age categories relative to the statistical analysis of the four regularly scheduled course content examinations, as evidenced by the information contained in Tables 7 and 8.

TABLE 7

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN REGULARLY SCHEDULED COURSE CONTENT EXAMINATIONS FOR STUDENTS BELOW 25 YEARS OF AGE

Group	n	x	S^2	S_p	df	t
Control	20	72.2013	126.5088	10.9592	42	.1149
Experimental	26	72.5758	115.2356			
Difference		.3745				

TABLE 8

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN REGULARLY SCHEDULED COURSE CONTENT EXAMINATIONS FOR STUDENTS 25 YEARS OF AGE AND OLDER

Group	n	x	S^2	S_p	df	t
Control	10	77.6800	82.6607	9.8093	24	1.6741
Experimental	16	84.3000	104.3580			
Difference		6.6200				

Similar to the results of the CLEP subject examination evaluations, the "25 years of age and older" participants recorded higher scores; however, for the regularly scheduled course content examinations, it was the experimental group's "25 years of age and older" students that accounted for the most noteworthy difference. The experimental group's older student's sample mean score of 84.3 was 6.62 percentage points higher than the control group's older student's score of 77.68, and was a significant 11.7242 percentage points higher than the experimental group's "below 25 years of age" students. Since the majority of the study participants possessed prior work experience, perhaps longevity in the work place or just long-term exposure to real-world economic conditions might explain the existent difference. But, for whatever the reason(s) for the differences in sample mean scores, the t-distribution test results did not indicate that there was a significant statistical difference between the two age categories. When compared with the critical t_a values, neither the control group's nor the experimental group's computed t value ($.1149 < 1.645$ and $1.6741 < 1.711$, respectively) was significant at the .05 level of confidence.

Analysis Based on Cumulative Grade Point Average (GPA)

Arrayed in Table 9 is the t-distribution test data comparing the GPA of the two research groups. As the data demonstrates, there was no significant statistical difference between the control group's GPA and the experimental

group's GPA at the .05 confidence level. The results of the

TABLE 9

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN THE CUMULATIVE GRADE POINT AVERAGES FOR CONTROL GROUP VERSUS EXPERIMENTAL GROUP

Group	n	x	S^2	S_p	df	t
Control	36	2.6721	.4695	.7053	78	.9577
Experimental	44	2.8239	.5201			
Difference		.1518				

t-distribution test convincingly show that the test statistic value of .9577 was significantly less than the critical t_a value of 1.645 (a .6873 difference), and that the sample mean score difference between the two groups of .1518 did not indicate an important variance.

Analyses Based on Gender

Analyzing the two research groups based on gender did not produce any real meaningful statistical revelations, but the comparisons did recommend some interesting sidelights. The two groups were divided by gender, male and female, and then the control group males were compared with the experimental group males, and in turn, the control group females were compared with the experimental group females. All the groups were analyzed utilizing the same statistical tests as

the previous comparisons: (1) by utilizing the results of the CLEP subject examination pre- and posttest scores, and (2) by utilizing the mean results of the four regularly scheduled course content examinations. The results of these comparisons are contained in Tables 10 - 13.

Control group males verses experimental group males

TABLE 10

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN CLEP SUBJECT EXAMINATION IN MICROECONOMICS PRETEST AND POSTTEST SCORES FOR MALE PARTICIPANTS

Group	n	x	S^2	S_p	df	t
Control	17	1.3529	14.2427	4.4514	28	.1601
Experimental	13	1.6154	27.2455			
Difference		.2625				

TABLE 11

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN REGULARLY SCHEDULED COURSE CONTENT EXAMINATION SCORES FOR MALE PARTICIPANTS

Group	n	x	S^2	S_p	df	t
Control	20	73.3851	80.933	10.5097	31	.1426
Experimental	13	73.9192	157.1942			
Difference		.5341				

As shown in the preceding two tables, the male participant's t-distribution test value for the CLEP subject examination pre- and posttest scores was .1601 and the value for the regularly scheduled course content examination scores was .1426. The critical t_a values for the two examinations were 1.701 and 1.645, respectively. In neither instance was the t-distribution test value greater than the critical t_a value; consequently, there was no significant statistical difference existing between the two groups of male participants at the .05 confidence level. Likewise, there was insufficient numerical difference in the sample mean scores between the two groups to indicate that either group's cognitive understanding of microeconomics was significantly different than the other.

Control group females verses experimental group females

TABLE 12

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN CLEP SUBJECT EXAMINATION IN MICROECONOMICS PRETEST AND POSTTEST SCORES FOR FEMALE PARTICIPANTS

Group	n	x	S^2	S_p	df	t
Control	14	4.7143	10.2167	3.8720	41	-1.4153
Experimental	29	2.9310	17.2094			
Difference		1.7833				

TABLE 13

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN THE REGULARLY SCHEDULED COURSE CONTENT EXAMINATION SCORES FOR FEMALE PARTICIPANTS

Group	n	x	S^2	S_p	df	*t*
Control	16	73.3888	188.6541	12.2894	45	1.3883
Experimental	31	78.6419	132.2180			
Difference		5.2531				

As reflected in Tables 12 and 13 above, the statistical results of the female comparisons paralleled those of their male counterparts in that they were not found to be significant at the .05 confidence level. The *t*-distribution test values of -1.4153, for the CLEP subject examination pre- and posttest scores, and 1.3883, for the regularly scheduled course content examination scores, were both less than the critical t_a value of 1.645. Consonant with these two *t*-distribution tests, the corresponding comparisons of the sample mean scores also failed to reveal any significant differences between the two female groups; however, they did produce an interesting sidelight not experienced with the male students. In analyzing the sample mean scores for the CLEP subject examinations, the control group females showed an ever so slightly higher score (a 1.7833 difference) than the experimental group females. This mean improvement score

would tend to imply that the control group females achieved a small increase in true cognitive understanding over the experimental group. Unfortunately, whatever advantage the control group females may have achieved on the CLEP subject examinations they apparently lost on the regularly scheduled course content examinations. The control group females only posted a 73.3888 sample mean score for the regular course examinations, while the experimental group females posted a 78.6419. This would suggest that the experimental group females, and not the control group females as the CLEP subject examination results indicated, may have achieved a higher level of cognitive understanding of the presented course material. Whatever the case may be concerning the two female groups, the most interesting sidelight may not be the female comparisons at all, but rather the comparisons of female participants to male participants. In comparing Tables 10 and 11 (male participants' results) with Tables 12 and 13 (female participants' results), it is intriguing to see that the female participants' overall scores were higher, insinuating that the female students acquired a higher level of cognitive understanding of the subject than did the males.

Female participants verses male participants

To determine if female participants actually did score higher than their male counterparts, and if they did was it statistically significant at the .05 level of confidence, a number of additional tests were conducted. The data from

these tests are offered in Tables 14 - 17.

TABLE 14

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN CLEP SUBJECT EXAMINATION IN MICROECONOMICS PRETEST AND POSTTEST FOR FEMALE VERSUS MALE PARTICIPANTS

Group	n	x	s^2	s_p	df	t
Females	43	3.5116	15.3511	4.1115	71	3.8877
Males	30	1.4667	19.1540			
Difference		2.0449				

As shown by the data presented in the above table, the female students scored a 2.0449 higher sample mean than the male students. The importance of this higher mean score was upheld by the t-distribution test in that the test statistic was 2.2427 points greater than the t_a value of 1.645. As the ensuing two tables show, the significance of the sample

TABLE 15

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN CLEP SUBJECT EXAMINATION IN MICROECONOMICS PRETEST SCORES FOR FEMALE VERSUS MALE PARTICIPANTS

Group	n	x	s^2	s_p	df	t
Females	43	38.1628	38.5205	7.8443	71	1.7128
Males	30	34.9667	94.8609			
Difference		3.1961				

TABLE 16

$\underline{t}$-DISTRIBUTION TEST ON DIFFERENCES BETWEEN CLEP SUBJECT EXAMINATION IN MICROECONOMICS POSTTEST SCORES FOR FEMALE VERSUS MALE PARTICIPANTS

Group	n	x	S^2	S_p	df	$\underline{t}$
Females	43	41.6744	39.9384	6.4576	71	2.7608
Males	30	37.4333	44.2540			
Difference		4.2411				

mean score difference was further supported by the separate evaluations relative to the CLEP subject examination pre- and posttests. As Tables 15 and 16 reflect, the female participants recorded statistically significant pre- and posttest conclusions at the .05 level of confidence. The pretest $\underline{t}$-distribution test value of 1.7128 was .0678 points higher than the critical $\underline{t}_a$ value of 1.645, implying that the female participants may have entered the course with a slightly higher level of cognitive understanding of the subject material. Furthermore, the posttest scores advocate that the females improved upon their entry-level knowledge of microeconomics more significantly than did the males. The female participants' posttest $\underline{t}$-distribution test value (2.7608) was again greater than the critical $\underline{t}_a$ value (1.645), by 1.1158 points. This fact was further confirmed when the individual "entering" and "exiting" sample mean

scores were analyzed. The pretest sample mean score for the women was 38.1628, as compared to 34.9667 for the men. The posttest sample mean score for the women was 41.6744 and for the men it was 37.4333. While both groups experienced an improvement in scores, the women achieved higher scores, and more engrossing, a higher degree of improvement between scores. The difference between the female group's pre- and posttest scores was 3.5116 while the male group's scores only improved by 2.4666. Because both groups did show a positive improvement in scores, it was supposed that both groups experienced a positive improvement in cognitive understanding of microeconomics as a result of completing the course.

In addition to the female group scoring higher on the CLEP subject examinations, the group also scored higher on the regularly scheduled course content examinations, as the information reflected in the next table shows.

TABLE 17

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN THE REGULARLY SCHEDULED COURSE CONTENT EXAMINATION SCORES FOR FEMALE VERSUS MALE PARTICIPANTS

Group	n	x	s^2	s_p	df	t
Females	47	76.8536	154.1332	11.6124	78	1.2351
Males	33	73.5956	107.1244			
Difference		3.2580				

As indicated by the information in Table 17, the female group's sample mean score was 76.8536, which was 3.2580 points higher than the male group's mean of 73.5956. But, this difference was not sufficient evidence to indicate that a prominent difference existed between the two groups. The t-distribution test value calculation of 1.2351 was .4099 less than the critical t_a of 1.645, signifying that the indicated scores were not statistically significant at the .05 level of confidence.

Female participants' GPA versus male participants' GPA

Even though the female group's scores on the regularly scheduled course content examinations were not statistically significant in comparison with the male group's scores, the female group's sample mean scores and the results of the CLEP subject examinations revealed that the female group demonstrated the more significant improvement in cognitive understanding of the subject matter. To better understand why the female group showed more improvement than their male counterparts, a final analysis was completed involving the participants' GPA.

In reviewing the results of the GPA analysis furnished in Table 18, the difference between the two group's sample mean GPA's of .3308 would not appear to indicate much of a difference. However, when analyzed in more detail the statistical inference reflected in the table indicates that a significant difference did exist between the groups. The

TABLE 18

t-DISTRIBUTION TEST ON DIFFERENCES BETWEEN THE CUMULATIVE GRADE POINT AVERAGES FOR FEMALE VERSUS MALE PARTICIPANTS

Group	n	x	s^2	s_p	df	t
Female	47	2.8920	.5736	.6889	78	2.1137
Male	33	2.5612	.3337			
Difference		.3308				

t-distribution test value of 2.1137 was greater than the critical t_a value of 1.645 at the .05 confidence level. This would suggest that the female group's higher GPA, considering a high GPA as indicative of a student's academic ability, might help to explain the differences between the two groups' examination scores.

Other Student Demographic Data

Other related student demographic data collected during this study are presented in Table 19. It should be noted that along with the general information provided in the table, certain other previously introduced information is also provided in order to furnish a more exact depiction and to assist in the overall analysis. Additionally, it should be noted that the data in the table are not provided as a means to establish any new statistical inference.

TABLE 19

GENERAL STUDENT DEMOGRAPHIC DATA

Data Items	Control Group	Experimental Group	Total Sample
Student Classifications:			
Business Majors	29	27	56
Non-Business Majors	7	17	24
Freshmen	3	5	8
Sophomores	33	39	72
GPA	2.6721	2.8239	2.7556
Mean CLEP Subject Examination Scores:			
Pretest	35.2903	38.7143	37.2603
Posttest	38.1613	41.2381	39.9315
Difference	2.8710	2.5238	2.6712
Mean Regularly Scheduled Course Content Examination Scores	73.3868	77.2466	75.5097
Mean Ages	25.4167	25.8636	25.6625
Mean Number of Semester Hours Completed	54.5367	53.8023	54.1328

Based on the information provided, there appeared to be nothing outstanding that might add to the previous statistical inference. However, it was gratifying to notice the

overall average mean score for the regularly scheduled course content examinations of 75.5097, suggesting that the four internally prepared course examinations were fair and adequate measurement instruments. It was also gratifying to note the number of non-business majors who were enrolled in an introductory microeconomics course, and in this one particular case, ended up participating in an economics-related research project. But, overall there did not appear to be any additional information that would be useful in testing the research hypothesis.

Summary

The essential hypothesis set forth in this study was that college students enrolled in a basic principles of microeconomics class who receive special instruction in the philosophy of science and the methodology of economics will accomplish a higher level of cognitive understanding of microeconomics than those students who did not receive the special instruction. To test this hypothesis, the study participants were required to complete a pre- and posttest examination utilizing the College-Level Examination Program (CLEP) Subject Examination in Introductory Microeconomics and four regularly scheduled course content examinations.

The first approach to testing the hypothesis involved measuring the improvement in the students' actual level of cognitive learning. This was accomplished by analyzing the scores students received on a pretest versus the scores they

received on a posttest. Using the CLEP subject examination for both tests, individual student improvement was measured by subtracting the pretest score from the posttest score and using the difference to calculate a population or sample mean score. The statistical significance of the difference was determined by employing the standard $\underline{t}$-distribution test. The results of the tests did not indicate that a statistically significant difference existed between the two groups of students; consequently, the research hypothesis was rejected.

The second approach to testing the hypothesis involved the evaluation of the four regularly scheduled course content examinations. The two groups were again compared using the standard $\underline{t}$-distribution test. Again, the test results did not indicate that a statistically significant difference existed between the two groups and the research hypothesis was once again rejected.

Once testing of the primary data had been completed, two other $\underline{t}$-distribution tests were also performed utilizing only the pre- and posttest information from the CLEP subject examination. The individual pre- and posttest scores were used to establish students' "entry-level" and "exit-level" cognitive understanding of microeconomics. The statistical results of both tests indicated that a distinguishable difference existed between the groups, with the experimental group displaying a higher "entry-level" and "exit-level"

sample mean score than the control group. But, the control group achieved a more impressive sample mean improvement score (the difference between the pre- and posttest scores), which statistically negated the import of the experimental group's mean scores and further justified rejection of the research hypothesis.

The final part of the analysis involved the evaluation of selected student demographic information to ascertain the impact of exogenous factors relative to testing the research hypothesis. Such data as age, gender, work experience, cumulative grade point average, student classification, and total number of semester hours completed were analyzed as part of this evaluation. The most interesting sidelight to emerge from this analysis, was that the female participants seemed to demonstrate a slightly higher level of cognitive achievement than their male counterparts. But, as for the statistical significance of this finding, or the relevance of any of the analyses pertaining to the overall demographic information, no particular factor surfaced in support of the research hypothesis.

In conclusion, while the analysis of the demographic data and the results of certain tests are interesting, and in some cases possibly suggestive of further research, the results of this study are indisputable. The completion of an instructional module on the philosophy of science and the methodology of economics did not provide the experimental

group a statistically significant advantage over the control group.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

The purpose of this study was to determine if exposure to the philosophy of science and the methodology of economics would assist students in understanding the principles of microeconomics. The primary intent behind such exposure was to promote interest in the subject of microeconomics through the acquisition and appreciation of economics as a genuine science. A special three-week instructional module on the philosophy of science and methodology of economics was developed and presented as part of the study.

The study was accomplished at Motlow State Community College, Tullahoma, Tennessee, during the 1990 spring semester, utilizing four principles of microeconomics classes. Two of the classes served as a control group and two as an experimental group. The experimental group received the instructional module as a prelude to the principles of microeconomics course; the control group did not.

The fundamental hypothesis established for this study was that college students participating in a principles of microeconomics class who received special instruction on the philosophy of science and the methodology of economics would score higher on the College-Level Examination Program (CLEP) Subject Examination in Introductory Microeconomics than

those students who did not receive the special instruction. The CLEP subject examination, prepared and distributed by the Educational Testing Service, Princeton, New Jersey, was adopted as a valid test instrument to measure a student's cognitive learning achievement in introductory microeconomics. The examination was used as both a pre- and posttest to measure and compare the level of a student's prior basic knowledge of microeconomics with that achieved as a result of completing the course. A sample mean improvement score was obtained on each participant by subtracting the pretest score from that received on the posttest. The sample mean improvement score was then used to complete the necessary statistical tests.

An alternative method of evaluation was also employed utilizing the results of four regularly scheduled course content examinations prepared by the author. The sample mean, or average, scores for the two groups were determined and statistically analyzed. Additionally, certain student demographic information was collected and analyzed as a technique of reviewing similarities and/or dissimilarities between the two groups.

All statistical inference was completed by using the standard t-distribution test. The t-distribution test was considered to be the most appropriate technique to use in determining statistically significant differences between two small sample populations.

Conclusion

The results of the t-distribution tests comparing the control and experimental groups' CLEP subject examination mean improvement scores and sample mean scores from the four regularly scheduled course content examinations revealed no statistically significant differences in student response. The results of this study indicate that the completion of an instructional module on the philosophy of science and the methodology of economics as a prelude to an introductory microeconomics course does not assist students in achieving higher examination scores. Comparatively, students who did not receive any special instruction on the philosophy of science or the methodology of economics achieved the same level of cognitive understanding of elemental microeconomics as those who did.

Implications

During the course of this study, certain implications surfaced that might possibly serve as the foundation for further investigation or research in the teaching of economics. Toward that end, the following are submitted:

1. Additional research may be indicated concerning the differences between "entry-level" economic knowledge versus "exit-level" cognitive achievement among female and male students. An attempt should be made to determine if one group does, in fact, possess an ability over the other, and

if so, what factors might contribute to such an advantage.

2. Further research might be warranted in determining if prior work experience contributes to a student's basic understanding of economics. A study could be conducted to not only determine if prior work experience is a factor in cognitive learning of economics, but also which types of work and if work place longevity is a contributing factor.

3. The significance of age and the cognitive ability of an individual to understand economics might prove to be an enlightening research topic. Research to evaluate the maturity level of students in terms of degree and duration of day-to-day exposure to real-world economic activity, and if that activity was beneficial or not to the study of basic economic concepts and theory, might prove supportive to the classroom instruction of economics.

4. It might prove beneficial to conduct research on the proper usage of an instructional module on the philosophy of science and methodology of economics. A study could be undertaken to determine the most advantageous length and appropriate method of presenting such a module, e.g., as a one-time, separate portion of the overall course, integrated throughout the course, in three to four integral or separate steps, etc. The study could also examine the depth of the material presented relative to the method of presentation and educational preparedness of the students. Such a study might greatly aid in determining the palatability of the

module material and consequently, its contribution to the overall classroom instruction of introductory economics.

APPENDICES

APPENDIX 1

July 25, 1989

Dr. Barry Druesne
CLEP Program
Educational Testing Service
Rosedale Road
Princeton, NJ 08541

Dear Dr. Druesne:

I am writing in an attempt to acquire permission to use the CLEP Subject Examination in Introductory Microeconomics.

I am a doctoral candidate at Middle Tennessee State University, Murfreesboro, Tennessee, working on a dissertation to concepts of microeconomic theory if they first acquire a basic appreciation of the "methodology of economics." The CLEP Examination will be used to determine the extent to prior basic economic knowledge (pre-test), and then to compare the extent of knowledge acquired after receiving a special methodology module and completing the course (post-test). The study will be conducted at Motlow State Community College, Tullahoma, Tennessee, where I am presently employed as an Assistant Professor of Economics. Four Principles of Economics classes presented at the College will be utilized to conduct the study. The study will be conducted during the Spring semester, 1990 (January - May, 1990), and will include approximately 130 students.

Because of the required level of security surrounding the utilization of a CLEP Examination, the Examination will actually be requested, administered and controlled by Ms. Jessie Campbell, the Motlow College Coordinator of Guidance and Testing. She is the individual that currently handles all CLEP Examinations, and has agreed to accept total responsibility for this project. Ms. Campbell's telephone number is (615) 455-8511, Ext. 206. Contingent on your approval, the Examinations should be mailed to:

Ms. Jessie Campbell
Coordinator of Guidance and Testing
Motlow State Community College
P.O. Box 88100
Tullahoma, TN 37388-8100

In addition to this initial request, I have also asked my doctoral committee chairperson from Middle Tennessee State University, Dr. Billy Balch, to provide you with a letter of verification. If you wish to contact me concerning this request, my telephone number at Motlow is (615) 455-8511, Ext. 325.

Thank you for your time and consideration in this matter.

Sincerely,

/s/ Randall B. Bartley

Assistant Professor, Economics
Career Education Division

APPENDIX 2

MIDDLE TENNESSEE STATE UNIVERSITY
Murfreesboro, Tennessee 37132

Department of Economics
and Finance

August 4, 1989

Dr. Barry Druesne
CLEP Program
Educational Testing Service
Rosedale Road
Princeton, NJ 08541

Dear Dr. Druesne:

Recently you received a request from Mr. Randall Bartley to use your Introductory Microeconomics CLEP Examination. As Mr. Bartley's doctoral committee chairperson, I wish to confirm that this examination will be used in his dissertation research. The research is required in his Doctor of Arts program and it will be conducted at his place of employment, Motlow State Community College in Tullahoma, Tennessee during a period extending from January until May, 1990.

We are grateful for your willingness to assist us in this project.

Sincerely,

/s/ B. W. Balch

B. W. Balch
Professor of Economics

APPENDIX 3

EDUCATIONAL TESTING SERVICE
Princeton, N.J. 08541

609-921-9000
Cable-Eductestsvc

August 2, 1989

College Board Programs
College-Level Examination Program

Randall B. Bartley
Assistant Professor, Economics
Career Education Division
Motlow State Community College
P.O. Box 88100
Tullahoma, TN 37388-8100

Dear Randall:

This is just a brief note to let you know that I received your letter of July 25 in which you outlined your request for use of the CLEP Subject Examination in Introductory Microeconomics in connection with your doctoral dissertation at Middle Tennessee State University.

I will, as I indicated on the phone, make the appropriate number of tests available to you for use in connection with your dissertation research. There will be no fee for the examinations.

The arrangement that we agreed to on the phone, and that you outlined in your letter of July 25, of having Ms. Jessie Campbell, Motlow College Coordinator of Testing and Guidance (who also serves as the CLEP test center administrator at Motlow College) order the tests for you, administer them, and return the results to us for scoring is satisfactory from our point of view.

I'll look forward to receiving the letter that you indicated would be coming from Dr. Balch, your dissertation chairman.

The next step would be for you to have Ms. Campbell call me sometime later this fall, at least three to four weeks in advance of the date on which you plan to administer

the test for the first time, to order the appropriate number of tests. I will coordinate the shipment of the tests and appropriate answer sheets to Ms. Campbell. After the testing, Ms. Campbell should return the tests (both used and unused) and answer sheets directly to me and I will arrange to have the answer sheets scored and scores reported to you.

I wish you good luck with your dissertation. If there is anything else that we can do to help, please let me know.

Sincerely,

/s/ Barry Druesne

Program Director
College-Level Examination
Program (CLEP)

APPENDIX 4

INSTRUCTIONAL SCHEDULE

FOR

THE PHILOSOPHY OF SCIENCE AND METHODOLOGY OF ECONOMICS

MODULE DESCRIPTION

This module is an introduction to the philosophy of science and methodology of economics. Students will be introduced to selected methodological concepts, with special emphasis on the general philosophy of science, philosophic terminology, and the evolution of economic methodology.

TEACHING OBJECTIVES

1. General Teaching Objectives:

a. To introduce students to basic scientific technique.

b. To provide students with a basic understanding of economic methodology.

c. To introduce students to selected methodological explanations of economic theory.

d. To enhance the students' comprehension of economics as a science.

e. To increase general receptivity of economic significancy in order to facilitate the students' continued studies in other economic-related disciplines.

f. To expand the students' basic academic competencies by employing a different learning activity that

extensively emphasizes reasoning and communicating skills.

2. Specific Teaching Objectives: Upon completion of this module of instruction, students will be able to:

a. Define "science" and "philosophy."

b. Define "methodology."

c. Discuss scientific methods.

d. Explain the basic ideas and relationships between logic, methodology, and epistemology.

e. Describe the early approaches to explaining scientific methodology.

f. Describe the new methodological heterodoxy in explaining scientific technique.

g. Discuss the economic methodology of the early verificationists.

h. Discuss the economic methodology of the falsificationists.

i. Explain the difference between positive and normative economics.

j. Discuss and compare operationalism, conventionalism, and instrumentalism.

3. Course Prerequisites: none.

TEACHING STRATEGIES

A. Individual Lecture: The primary teaching method will follow the traditional pattern of a single instructor lecturing for a specified time period in a normal college classroom setting. Students will be required to attend

class where they will be expected to participate in discussion and take notes of the material covered.

B. Required Textbook: To insure educational and informational continuity and integrity, the actual instructional material to be presented as part of the module will be taken primarily from The Methodology of Economics by Dr. Mark Blaug, Professor of the Economics of Education, University of London Institute of Education. Because of the short duration and special character of the instructional module, students will not be required to purchase a textbook; however, four copies of Dr. Blaug's book will be on reserve in the Motlow College library for student use.

MEDIA DELIVERY SYSTEMS

The media delivery systems to be employed in the actual classroom presentation will consist only of a wall-mounted blackboard, overhead projector, and portable screen.

DESIGNED AND PRODUCED MATERIALS

The only material to be produced for presentational use will be personally-prepared overhead projection transparencies.

METHOD OF EVALUATION

A short essay-type examination will be administered to evaluate the students' comprehension of the material covered in classroom lecture/discussion.

MODULE CONTENT

Definition of "Science" and "Philosophy"

Definition of "Methodology"

Scientific Methods

Cognate Philosophic Terminology

- General and Special Methodology
- Epistemology

Philosophy of Science

- Development Early Scientific Methodology
  - Verifiability Principle
    - Positivism
    - Operationalism
    - Pragmatism
    - Empiricism
  - Inductive and Deductive Inference
  - Hypothetico-Deductive Model
  - Falsificationism
    - Popperian Methodology
- New Scientific Methodological Heterodoxy
  - Kuhn's Paradigms
  - Scientific Research Programs
  - Theoretical Anarchism

Economic Methodology

- Early Economic Philosophy
  - Ontology
  - Ethics of Economics
  - Canonists and Scholastic Philosophy
  - Mercantilism

Physiocrats

Classical School

Nineteenth-century Verificationists

Senior-Mill-Cairnes

German Historical School

John Neville Keynes

Deductive-Verificationism

Twentieth-century Falsificationists

Positive and Normative Economics

Operationalism

Conventionalism

Instrumentalism

APPENDIX 5

COURSE SYLLABUS

PRINCIPLES OF ECONOMICS II

ECO 202

INSTRUCTOR: Randall B. Bartley

OFFICE: Eoff Hall, Room 210

OFFICE HOURS: 11:00 a.m. - 12:00 p.m. Daily

1:00 p.m. - 3:00 p.m. Daily

PHONE: 455-8511, EXT. 325

REQUIRED TEXT: Economics: Principles, Problems, and Policies, Campbell R. McConnell, 10th edition, 1987, McGraw-Hill Book Company.

COURSE DESCRIPTION: This course is a study of basic economic concepts and microeconomics. Topics covered include consumer and firm behavior, market structures, price and output determination, economic role of government: expenditures and taxation, and international trade.

TEACHING OBJECTIVES:

A. General Teaching Objectives:

1. To provide students with a basic understanding of microeconomic theory.

2. To enhance the students' comprehension of the role that "economics" play in everyday consumer and business activities and to magnify his/her versatility in the work force.

3. To expand the students' economic understanding and appreciation of the world and society in which we live.

4. To provide the necessary fundamentals of economics to facilitate the students' continued studies in economics and business-related

disciplines.

5. To expand the students; basic academic competencies by employing different learning activities emphasizing thinking, writing, computing, and communicating.

B. Specific Teaching Objectives: Upon completion of this course, students will be able to:

1. Describe and measure the different types of demand and supply "elasticity."

2. Explain how elasticity affects revenue.

3. Determine and explain the concept of "consumer equilibrium."

4. Explain the concept and applications of "utility."

5. Explain the concept and applications of "indifferences curve analysis."

6. Explain and determine economic costs.

7. Describe the production function.

8. Identify and discuss the factors of production.

9. Explain productivity.

10. Explain and determine total product, average product, and marginal product.

11. Explain and determine total cost, average costs, and marginal costs.

12. Explain the different market structures.

13. Discuss the market characteristics of a purely competitive firm.

14. Explain and determine total revenue, average revenue, and marginal revenue.

15. Explain and determine profit maximization, total revenue maximization, cost minimization, breakeven, and shutdown point.

16. Explain and determine short-run and long-run profits and losses for a purely competitive firm.

17. Discuss the market characteristics of a pure monopoly.

18. Explain and determine short-run and long-run profits and losses for a pure monopoly.

19. Discuss the market characteristics of a monopolistically competitive firm.

20. Explain and determine short-run and long-run profits and losses for a monopolistically competitive firm.

21. Discuss the market characteristics of an oligopoly.

22. Explain and determine short-run and long-run profits and losses for an oligopoly.

23. Discuss the considerations and factors influencing resource demand.

24. Explain and employ the "least-cost" and "profit-maximizing" rules of determining optimum combinations of resources.

25. Explain supply and wage determination of resources for perfectly competitive firms, monopsonies, and union situations.

26. Discuss the types of unions and their market power.

27. Explain how the "return" to each factor of production is determined.

28. Describe the basic principles of taxation.

29. Explain the different types of tax structures.

30. Identify the major sources and uses of tax revenue at the local, state and federal levels of government.

31. Illustrate the basic principle of comparative advantage.

32. Explain trade barriers and their effects on the economy.

CLASS ATTENDANCE: Class attendance and timeliness is expected. Any necessary absences and/or

tardiness to class must be cleared (excused) by the instructor. Any un-excused absences or tardiness to class WILL BE considered when determining final grades.

STUDENTS ARE RESPONSIBLE FOR ALL MATERIAL COVERED OR ASSIGNED DURING ANY ABSENCE FROM CLASS - THIS INCLUDES THE SCHEDULING OF EXAMS.

EXAMS: There will be five exams during the course. One exam will pertain to the material covered in the instructional module (reference course outline) and will be worth 4% of the final course grade. The remaining four exams will cover the remainder of the course and will be worth 96% of the final grade (each exam will be worth 24% of the final course grade).

If a student must miss an exam, the absence must be excused, either before or after the fact, with the instructor. Only those students who have been granted an excused absence for the day of the exam will be permitted to take a "make-up" exam.

IT IS THE RESPONSIBILITY OF THE STUDENT TO ARRANGE FOR A "MAKE-UP" EXAM. ANY "MAKE-UP" EXAMS' MUST BE COMPLETED WITHIN THREE DAYS OF THE STUDENT RETURNING TO CLASS.

Letter grade determination will be as follows:

A = 90 - 100%

B = 80 - 89%

C = 70 - 79%

D = 60 - 69%

F = Below 60%

ASSIGNMENTS: Chapters will be read from the required text as shown in the following outline.

COURSE OUTLINE

PRINCIPLES OF ECONOMICS II

WEEK	CONTENT TO BE COVERED	ASSIGNMENT
I	Pre-Test	
	Philosophy of Science	Provided in class
II	Philosophy of Science	Provided in class
	Methodology of Economics	
III	Methodology of Economics	Provided in class
	Examination #1	Philosophy of science and methodology of economics
IV	Demand, Supply and Elasticity	Chapter 24
	Consumer Behavior: Demand and Utility	Chapter 25
V	Consumer Behavior: Demand and Utility (Cont.)	Chapter 25
	Indifference Curve Analysis	
VI	Theory of Production and Costs	Chapter 26
	Examination #2	Chapters 24 - 26
VII	Market Structures	Chapter 27
	Competitive Markets	
VIII	Imperfect Markets: Monopoly and Monopolistic Competition	Chapter 28

WEEK	CONTENT TO BE COVERED	ASSIGNMENT
IX	Imperfect Markets: Monopolistic Competition	Chapter 29
	Imperfect Markets: Oligopoly	Chapter 30
	Examination #3	Chapters 27 - 30
X	Production and Demand for Economic Resources	Chapter 31
XI	Pricing and Employment of Resources: Wage Determination	Chapter 32
	Labor Unions	Chapter 39
XII	Labor Unions (Cont.)	Chapter 39
	Pricing and Employment of Resources: Rent, Interest, and Profits	Chapter 33
XIII	Pricing and Employment of Resources: Rent, Interest, and Profits (Cont.)	Chapter 33
	Examination #4	Chapters 31 - 33 and 39
	Public Sector: Expenditures and Taxation	Chapter 8
XIV	Public Sector: Expenditures and Taxation (Cont.)	Chapter 8
	International Trade	Chapter 41
XV	International Trade (Cont.)	Chapter 41
	Examination #5	Chapters 8 & 41
	Post-Test	

APPENDIX 6

COURSE SYLLABUS

PRINCIPLES OF ECONOMICS II

ECO 202

INSTRUCTOR: Randall B. Bartley

OFFICE: Eoff Hall, Room 210

OFFICE HOURS: 11:00 a.m. - 12:00 p.m. Daily

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PHONE: 455-8511, EXT. 325

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TEACHING OBJECTIVES:

A. General Teaching Objectives:

1. To provide students with a basic understanding of microeconomic theory.

2. To enhance the students' comprehension of the role that "economics" play in everyday consumer and business activities and to magnify his/her versatility in the work force.

3. To expand the students' economic understanding and appreciation of the world and society in which we live.

4. To provide the necessary fundamentals of economics to facilitate the students' continued studies in economics and business-related

disciplines.

5. To expand the students; basic academic competencies by employing different learning activities emphasizing thinking, writing, computing, and communicating.

B. Specific Teaching Objectives: Upon completion of this course, students will be able to:

1. Describe and measure the different types of demand and supply "elasticity."

2. Explain how elasticity affects revenue.

3. Determine and explain the concept of "consumer equilibrium."

4. Explain the concept and applications of "utility."

5. Explain the concept and applications of "indifferences curve analysis."

6. Explain and determine economic costs.

7. Describe the production function.

8. Identify and discuss the factors of production.

9. Explain productivity.

10. Explain and determine total product, average product, and marginal product.

11. Explain and determine total cost, average costs, and marginal costs.

12. Explain the different market structures.

13. Discuss the market characteristics of a purely competitive firm.

14. Explain and determine total revenue, average revenue, and marginal revenue.

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19. Discuss the market characteristics of a monopolistically competitive firm.

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21. Discuss the market characteristics of an oligopoly.

22. Explain and determine short-run and long-run profits and losses for an oligopoly.

23. Discuss the considerations and factors influencing resource demand.

24. Explain and employ the "least-cost" and "profit-maximizing" rules of determining optimum combinations of resources.

25. Explain supply and wage determination of resources for perfectly competitive firms, monopsonies, and union situations.

26. Discuss the types of unions and their market power.

27. Explain how the "return" to each factor of production is determined.

28. Describe the basic principles of taxation.

29. Explain the different types of tax structures.

30. Identify the major sources and uses of tax revenue at the local, state and federal levels of government.

31. Illustrate the basic principle of comparative advantage.

32. Explain trade barriers and their effects on the economy.

CLASS ATTENDANCE: Class attendance and timeliness is expected. Any necessary absences and/or

tardiness to class must be cleared (excused) by the instructor. Any un-excused absences or tardiness to class WILL BE considered when determining final grades.

STUDENTS ARE RESPONSIBLE FOR ALL MATERIAL COVERED OR ASSIGNED DURING ANY ABSENCE FROM CLASS - THIS INCLUDES THE SCHEDULING OF EXAMS.

RESEARCH PAPER: A research paper will be required for this course. Students will select and prepare a paper on one of the following topics:

The Federal Reserve System and Monetary Policy

The United State's Budget Deficit: Its History, Causes, and Implications

The Great Depression

Unemployment and Poverty in the United States

The Economics of Discrimination

The style and format of the paper will be in accordance with The Little, Brown Handbook, Third Edition, H. Ramsey Fowler, Little, Brown and Company, Toronto, 1986. The MLA style of parenthetical reference, and a list of works cited, will be used in citing sources.

The length of the paper will be at least the equivalency of 10 double-spaced typed pages, and will be turned-in in accordance with the course outline. The paper will count 4% of the final course grade.

The designated class time reflected in the course outline will be used for library research/writing time. Students are expected to be in the library during the specified class hours and will be required to sign-in at the circulation desk.

EXAMS: There will be four exams administered during the course. Each exam will be worth 24% of the final course grade, i.e., the four exams will be worth 96%

of the final grade and the research paper will be worth 4%.

If a student must miss an exam, the absence must be excused, either before or after the fact, with the instructor. Only those students who have been granted an excused absence for the day of the exam will be permitted to take a "make-up" exam.

IT IS THE RESPONSIBILITY OF THE STUDENT TO ARRANGE FOR A "MAKE-UP" EXAM. ANY "MAKE-UP" EXAMS' MUST BE COMPLETED WITHIN THREE DAYS OF THE STUDENT RETURNING TO CLASS.

Letter grade determination will be as follows:

A = 90 - 100%

B = 80 - 89%

C = 70 - 79%

D = 60 - 69%

F = Below 60%

ASSIGNMENTS: Chapters will be read from the required text as shown in the following outline.

COURSE OUTLINE

PRINCIPLES OF ECONOMICS II

WEEK	CONTENT TO BE COVERED	ASSIGNMENT
I	Pre-Test	
	Research Paper	Independent library study
II	Research Paper	Independent library study
III	Research Paper	Independent library study
		Paper due on Feb. 13 (turn-in at beginning of class)
IV	Demand, Supply and Elasticity	Chapter 24
	Consumer Behavior: Demand and Utility	Chapter 25
V	Consumer Behavior: Demand and Utility (Cont.)	Chapter 25
	Indifference Curve Analysis	
VI	Theory of Production and Costs	Chapter 26
	Examination #2	Chapters 24 - 26
VII	Market Structures	Chapter 27
	Competitive Markets	
VIII	Imperfect Markets: Monopoly and Monopolistic Competition	Chapter 28
IX	Imperfect Markets: Monopolistic Competition	Chapter 29

WEEK	CONTENT TO BE COVERED	ASSIGNMENT
IX (Cont.)	Imperfect Markets: Oligopoly	Chapter 30
	Examination #3	Chapters 27 - 30
X	Production and Demand for Economic Resources	Chapter 31
XI	Pricing and Employment of Resources: Wage Determination	Chapter 32
	Labor Unions	Chapter 39
XII	Labor Unions (Cont.)	Chapter 39
	Pricing and Employment of Resources: Rent, Interest, and Profits	Chapter 33
XIII	Pricing and Employment of Resources: Rent, Interest, and Profits (Cont.)	Chapter 33
	Examination #4	Chapters 31 - 33 and 39
	Public Sector: Expenditures and Taxation	Chapter 8
XIV	Public Sector: Expenditures and Taxation (Cont.)	Chapter 8
	International Trade	Chapter 41
XV	International Trade (Cont.)	Chapter 41
	Examination #5	Chapters 8 & 41
	Post-Test	

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