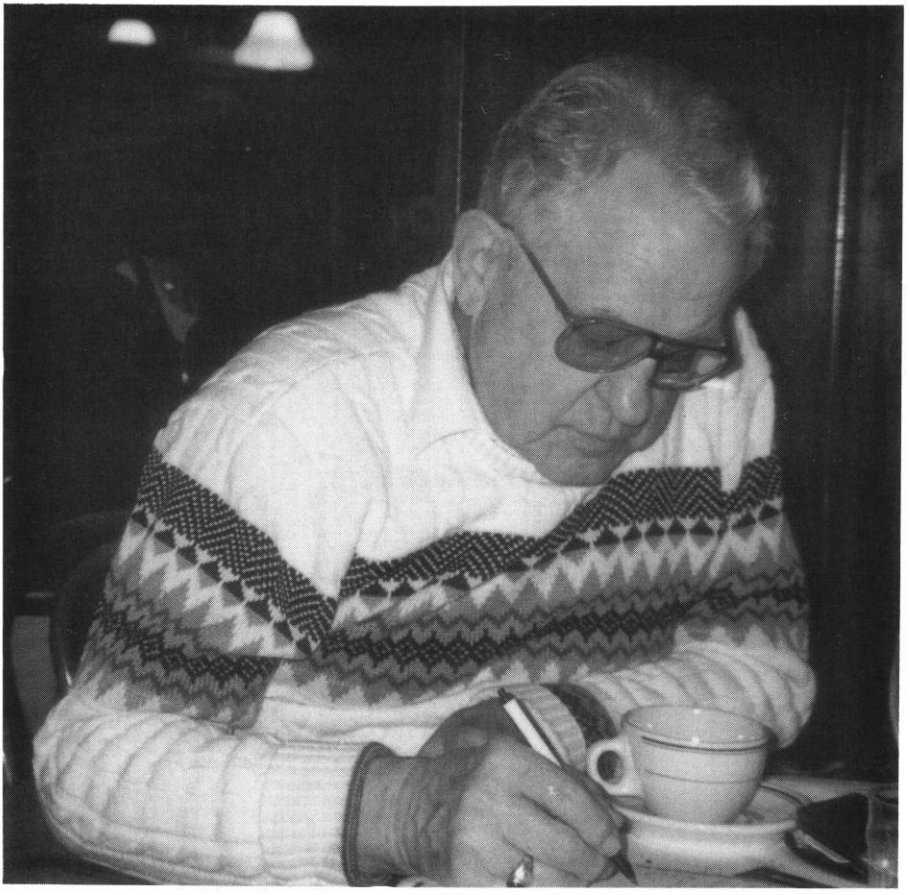
Beyond Agriculture and Economics



Glenn L. Johnson

To Lynn + Mary
with my compliments
Lynn, I believe this
book makes the excellent
practical work you do equal
to anything in a university!
Glenn Johnson

Beyond Agriculture and Economics

Management, Investment, Policy, and Methodology

A. Allan Schmid, editor

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Contents

[1]Items between vertical bars are reprinted material. Only reprinted material with subheadings is indicated in this table of contents.

PART II

PART III

Preface/Introduction

A volume that can capture the essence of extraordinary and pioneering scholarship must itself be unique. Many festschrifts have extolled the accomplishments of the honoree, but few are the basis for a kind of dialogue in which the scholar further evolves his thinking and creates still new possibilities for further scholars to explore. This volume contains papers by four authors selected for their work in the fields tilled by Professor Johnson. These include: (1) Managerial decision making; (2) Investment-Disinvestment Theory; (3) Agricultural policy (domestic and international); and (4) Methodology and valuational processes. While the topics were given by Johnson's interests, the authors were asked to present their own best thinking on the topic, thus providing a perspective on Johnson's work and others in the field, rather than simply a summary extolling his virtues.

In addition, Johnson was requested to select some representative excerpts from his published work in order to make them easily accessible to scholars. The fact that Johnson could not leave well enough alone is a tribute to his willingness to continue to explore and create. He was not content to merely place some of his published work along side the four survey papers. So he proceeded to add new text and perspective to his work, to explore how his thinking evolved, answer some of his critics, add some self-criticism, and probe his favorite topics once again.

The papers by Robert P. King, Alan E. Baquet, Michel J. Petit, and Warren J. Samuels were presented June 3 and 4, 1988, at a symposium at Michigan State University. While this marked Johnson's formal retirement, he was heavily involved at the time in directing the Social Science Agricultural Agendas and Strategies project, which was a reflection of his commitment to making research relevant and problem solving. A volume with this title was published in 1991 by the Michigan State University Press. This national project kept him from immediately working on his input into this volume. The intervening years allowed Johnson to reflect on and extend his work. We probably should have allowed the four authors to further comment on Johnson's latest ruminations, but this book has to stop somewhere. But, if I know Glenn, he will figure out some other way to make addenda and continue the dialog with his former students, colleagues, and scholars around the world.

The publication of this book was made possible in part by a generous grant from the Seevers Family Foundation. Many thanks to all who made it possible.

A. Allan Schmid
East Lansing
January 1996

Chapter 1

About This Book

Glenn L. Johnson

This book is organized around four papers presented at a symposium sponsored by Michigan State University's Department of Agricultural Economics on the occasion of my retirement.

Of the four papers, two deal with the practical areas in which I did most of my life's practical work: (1) private decision making (with heavy emphasis on farm management) and (2) public policy and choices. The first paper by Robert P. King is entitled "Managerial Decision Making." The second, by Michel J. Petit, is entitled "Agricultural Policies in an International Context—Implication for Agricultural Research."

Because both my M.A. and Ph.D degrees are in general economics, it should not surprise anyone that I have had deep interests in the more disciplinary and methodological aspects of the work I have done. This was recognized by the organizers of my retirement symposium with two papers: one entitled "A Review of Investment/Disinvestment Theory" by Alan E. Baquet and the other "Determinate Solutions and Valuational Processes: Overcoming the Foreclosure of Process" by Warren J. Samuels. Both of these papers deal with disciplinary concerns of long standing importance in my life's research and teaching. Both papers also note many of the disciplinary and methodological issues I have found to be important in doing practical work pertaining to both private and public decisions and choices.

Reflecting back on the work I have done, I desire to stress here the synergism I have experienced between my disciplinary interests and my practical work on such multidisciplinary subject matters (SMs) as farm and agribusiness management; the development and growth of societies; such policy concerns as those involving technology, resources, and the environment; and human and institutional development. A similar synergism has existed between my basic discipline of economics (including its ancillaries: mathematics, statistics, and philosophy) and my multidisciplinary work on specific practical problems faced by the decision makers I have served. These specific problems were typically part of a *set of multidisciplinary problems* that define a *subject matter* (SM) area such as farm management, marketing, science policy, development policy, or resource and environmental policy. Further, the decision or policy making person or group facing the specific multidisciplinary practical problem was typically from the *set of decision makers* (including choosers) that define a broader multidisciplinary SM area. The two major differences between problem-solving (PS) and SM work are

the specificity of PS work with respect to which (a) problem is of concern in the SM's set of problems and (b) the specific choice or decision making unit in a SM area's set of choosers or deciders is involved. A third difference that is largely a consequence of the first two is that PS work must be complete in the sense that it covers all different relevant disciplinary dimensions of the specific problem faced by the specific decision-making unit being served. The importance of the problem and the costs of researching it help determine how much and what kinds of detail from the different disciplines are relevant, i.e., worth pursuing in view of the specific problem being addressed.

Typically, my PS and SM work has required me and my associates to extend, improve, and even "jerry-rig" the theories, techniques, and basic measurements of economics and its ancillaries to improve the capacity of economics to support PS and SM work. At times, this has involved simplification and diminution of economics to address only a minor proportion of the specific multidisciplinary problem or subject of concern; in other instances, elaboration and further development of the details of "accepted" economics has been required. As the picture of the multidisciplinary domain of a problem or subject matter clarifies in the process of working on it, it often proves necessary to add disciplinarians and other specialists to multidisciplinary problem solving teams such as political scientists, microbiologists, anthropologists, chemists, and sociologists, including broader subject matter experts such as agronomists, human ecologists, medical doctors, veterinarians, food scientists, environmentalists, and agricultural economists. These disciplinary and SM specialists, like economists and agricultural economists, become uncomfortable when realistic examination of the multidisciplinary domain of a problem or subject reveals either a need to (1) simplify and diminish their discipline or subject or (2) remedy revealed deficiencies in their discipline or subject. Among disciplinarians, economists are the most troublesome perhaps because their interests in optimization makes them unduly and somewhat arrogantly convinced they should play a dominating coordination role despite the importance in many practical problems of the technical, institutional, human and resource changes commonly assumed away in economic theory.

In my experience, multidisciplinary PS and SM work has been enhanced by contributions from the basic disciplines (social, biological, and physical, and humanistic) while the basic disciplines have benefited from the consequences of being tested in PS and SM work. I have been repeatedly humiliated as an economist by revelation of the shortcomings of economics and have been exalted as those shortcomings have been remedied in cooperative teamwork that has investigated the multidisciplinary domains of relevant practical problems and subjects or issues.

In organizing this book, A. Allan Schmid and I discussed needs to:

1. Display the synergism discussed above with specific illustrations of practical PS and SM work.

2. Credit students and colleagues who have helped me both in spotting disciplinary deficiencies and in overcoming them.
3. Display the sequences that have taken place in synergistic improvement of economics for purposes of improving the PS and SM work I have done and how those improvements have been used in the work done by me and my associates and can be used by others.

Early on, in organizing this book, A. Allan Schmid suggested that I include selections from my own work that are related to each of the four papers commissioned for my retirement symposium. As the needs listed above became apparent, it became clear that excerpts from chapters, articles, and books would fill these needs better than entire chapters or articles particularly if accompanied by transitional statements to explain the sequential relevance and the contributions of the excerpts.

Some of these excerpts are so long that it is easy to confuse past with what has been written specifically for this book. Yet, the dated nature of many of the earlier excerpts make it important for readers to be able to distinguish easily between the two. Consequently, my quotations from my past publications are indented from both margins and marked with two vertical gray lines on those indentations for the entire length of each quotation in chapters 3, 5, 7, and 9.

This book is organized into four parts. Each part starts with and features one of the four papers commissioned for my retirement. In each part, the lead-off commissioned paper is followed by a chapter consisting of excerpts from papers, chapters, and articles written by me along with transitional or explanatory statements and notes designed to help meet the three needs enumerated above. In Part III, Michel J. Petit's paper has prompted me to reprint papers and excerpts relevent for Warren J. Samuels's paper. Consequently, chapter 7 that responds to Petit's paper is particularly long and chapter 9 that responds to Samuels's paper consists primarily of commentary.

To help the reader, it is noted that this book substitutes three features for an index: (1) a detailed table of contents, (2) extensive chapter by chapter lists of references, and (3) for some chapters, endnotes.

Part I

Chapter 2

Managerial Decision Making[1]

Robert P. King[2]

Throughout the history of our discipline, managerial problems have been a central focus for research, teaching, and extension activities. In overviews of pre-World War II management research and teaching activities, Johnson (1955) and Jensen (1977, 1–89) note that farm management specialists whose primary training was often in the agricultural sciences were instrumental in the development of farm accounting procedures and in the establishment of farm record associations. Through these efforts they collected descriptive data that were the basis for efficiency standards and comparative analyses of farm firm performance. They also developed many of the budgeting procedures that are still used in much of our research and teaching on farm management. During that same period, researchers whose primary training was in economics began to explore ways to apply principles from economic theory to farm management problems. Under the leadership of W. J. Spillman and J. D. Black, production function estimation techniques and procedures for deriving profit maximizing levels of input use were developed (Johnson 1955, 206).

In the years after World War II, significant advances in econometrics, operations research, decision theory, and computing technology created exciting new opportunities for applying economic concepts and methods in the analysis of managerial problems in agriculture. Heady's *Economics of Agricultural Production and Resource Use*, published in 1952, consolidated and extended the conceptual and methodological foundations for applying the theory of production economics to farm management problems. It added momentum and new direction to already active production economics research programs at a number of Land Grant universities. These research programs focused first on production function estimation and later on applications of linear programming.

As the possibilities for applying production economics to the analysis of farm management problems expanded, the question of how well these new tools would fit into existing managerial processes grew in importance. In the early 1950s, the conceptual foundations for a general model of managerial behavior were developed by Johnson (1954) and by Johnson and Haver (1953). They focused on issues such as: (1) managerial learning and the conditions under which managers expend resources to acquire additional information, (2) sources and uses of information, (3) the use of insurance, and (4) decision strategies under risk. This research served as the foundation for

the Interstate Managerial Study (IMS), a comprehensive study of managerial processes that included a seven-state survey of 1,065 farmers designed to collect quantitative and qualitative data on a wide range of managerial activities. The IMS researchers found strong evidence for the applicability of economic theory in the analysis of farm management problems. They also found that economic models alone are not adequate for fully understanding managerial processes or for solving managerial problems.

During the [33] years since the final results of the IMS were published (Johnson et al. 1961), advances in economic theory, quantitative methods, and information technology have continued to expand our ability to apply economic concepts to managerial problems. Agricultural economists have made important contributions to many of those advances. As a profession, we have made much less progress in understanding the managerial processes our concepts and tools are designed to support. As Johnson (Johnson 1987, 709) observed in a retrospective review of Heady's *Economics of Agricultural Production and Resource Use*:

> Current theoretical work on managerial processes is highly specialized on the expected utility hypothesis to the neglect of optimization vis-à-vis problem definition; the acquisition of value and value-free knowledge (learning); analysis; decision-making rules beyond the expected utility hypothesis; performance of the administrative and executive function by managers; and, finally, the bearing of responsibility for actions taken. This broader, more complete view of management needs to be researched theoretically and empirically not only for the sake of farm management but for the sakes of agribusiness and public management as well.

I agree with this assessment.

In this paper my objective is to explore ways we can extend and redirect management research in agricultural economics to include this "broader, more complete view of management." I will organize my discussion around three basic managerial processes: (1) problem definition, (2) decision making, and (3) learning. For each, I will identify some of the specific issues that can and need to be researched. Because my own research focuses on management information systems in farm and small agribusiness firms, I will pay particular attention to the problems and opportunities recent advances in information technology have created for these firms.

Throughout this paper, I will refer extensively to literature from psychology, organization theory, and general business management. It is noteworthy that much of the research in these areas has its historical roots in the work of a general economist, Herbert Simon. During the 1950s, his work contributed both to economic theory and methods and to the understanding of managerial processes in organizations in a manner that parallels contributions made by agricultural economists during that period (Simon 1976). Simon's influence has been greatest outside of economics, but it has been the basis for a long-standing, active body of research focusing on the managerial problems to which we now turn our attention.

In his 1978 presidential address to the American Economics Association, Simon (Simon 1978, 14) made the following observation:

> "Reasonable men" reach "reasonable" conclusions in circumstances where they have no prospect of applying classical models of substantive rationality. We know only imperfectly how they do it. We know even less whether the procedures they use in place of the inapplicable models have any merit—although most of us would choose them in preference to drawing lots. The study of procedural rationality in circumstances where attention is scarce, where problems are immensely complex, and where crucial information is absent presents a host of challenging and fundamental research problems to anyone who is interested in the rational allocation of scarce resources.

The questions Simon poses in this passage are among the questions researched by the participants in the IMS, and they are questions that demand our attention in future management research.

PROBLEM DEFINITION

A problem exists when what is or is expected to be differs from what ought to be (Johnson 1961, 142–49). Problem definition—the process of recognizing and structuring problems for analysis—depends, then, on both positive and normative beliefs. Problems rarely come to us neatly packaged, and problem definition is, itself, a difficult problem.

In this section I first discuss problem recognition. Statements of practical problems are the product of this process. We can observe such statements in managers' "to-do" lists, reports prepared by crop and livestock production consultants after periodic visits, and case summaries prepared by financial management specialists working with financially stressed farmers. Statements of practical problems tend to be rooted in the concrete facts of a particular situation.

In the second part of this section, I discuss problem formulation. Structured restatements of practical problems as instances of general problem types are the product of this process. As economists, we develop skills in casting practical problems into a general optimizing framework. Given information on input-output relationships, prices, and preferences, we have powerful tools for solving such problems. As managers of our own affairs, though we place a high value on the insights gained from this point of view, we realize that few practical problems can be satisfactorily solved within it. We need a broader view of general problem types, then, if we are to successfully understand and assist managers.

Problem Recognition

Recognizing a difference between what is and what ought to be requires attention both to the internal status of the activity being managed and to its environment. It also requires knowledge of goals and objectives. If we want to understand the process of problem recognition, we need to collect data on both perceived facts and values.

When one person manages an activity, there is often little incentive to formalize and communicate beliefs about facts and values. When several people manage an activity or interrelated set of activities, formalization and communication become more important. Large organizations respond to this need by developing formal control systems that alert managers to deviations from planned performance (what ought to be) and suggest or initiate actions to avoid or correct a problem situation. In effect, these control systems are tools for problem recognition. Through the study of existing control systems and efforts to design new ones, we can learn much about this important managerial process.

Control systems help managers recognize problems by monitoring internal and environmental conditions and comparing them to pre-established standards or targets (Boehlje and Eidman 1984, 663–64; Davis and Olson 1985, 315–22; Fuller 1982). As the examples presented in Boehlje and Eidman (1984, 684–769) illustrate, control systems can be developed from a short, intermediate, or long run perspective for a single enterprise or function or for overall organizational performance.

Processes for identifying differences between what is and what ought to be were the focus of an empirical study by Pounds (1969) on problem recognition in a large corporation. Pounds paid particular attention to the formal and informal sources of information managers used to define performance standards. He identified four major categories: (1) historical performance levels, (2) planned performance levels, (3) performance levels dictated by others, and (4) extra-organizational standards reflecting average performance in the industry or the performance of a competitor. Clearly, these categories, with the possible exception of the third, are also appropriate in a small firm setting.

One of the interesting findings from Pounds' study is that planned performance levels were, perhaps, the least frequently used information source for performance standards, despite the fact that the organization studied placed considerable emphasis on planning. Even in a large, well-managed organization, then, the comparative analysis methods so sharply criticized by production economists in the years immediately following World War II are widely used.

Historical and extra-organizational information sources have also been important in recent efforts to formalize problem recognition processes in farm firms. They are central, for example, to the procedures for comparative analysis and trend analysis proposed by Harsh, Connor, and Schwab (1981, 134–49) and to the expert system for financial statement analysis developed

by Phillips and Harsh (1987). Historical and extra-organizational information are also the primary basis for standards in livestock production record systems that generate action lists for swine and dairy herd managers (e.g., Williamson 1982, 593–600).

Future research on problem recognition is likely to be most productive if it focuses on cross sectional studies of managers in a particular firm type and on the design of control systems for particular management activities. Characterizing the formal and informal processes managers use to identify problems is certainly a logical starting point for this research. As in the study by Pounds (and in the IMS), this research will require open-ended interviews and, where possible, direct observation of managerial behavior. A more specific issue that can be explored both through interviews with managers and through control system design efforts involving managers is the role of formal plans in control systems. In particular, we need to know more about how managers perceive the content and structure of formal plans and about the value of plans in control systems for operational, tactical, and strategic management activities. Finally, an issue that will be important in control system design is that of the impact of information technology on the frequency and level of detail in monitoring. The central question here is that of the level of resources that should be devoted to problem recognition.

Problem Formulation

Problem formulation is the process by which practical problems are structured for analysis and solution. A basic tenant of research in the tradition of the information processing theory of human problem solving developed by Newell and Simon (1972) is that problem formulation, as represented by a "problem space," has a profound influence on problem solving strategies. If this aspect of the information processing theory is correct, understanding problem formulation is critical to understanding and improving managerial processes.

A fundamental question in any effort to understand problem formulation is that of whether there are meaningful general problem categories into which specific practical problem can be mapped. A number of problem typologies have been proposed. Based on findings from laboratory studies involving highly structured problems, Greeno (1978, 239–70) identifies three broad categories of problems: (1) inducing an underlying structure from a set of facts, (2) finding an allowable sequence of operations for transforming an initial situation to a goal situation, and (3) arranging a set of elements or components in a way that satisfies some criterion. Drawing on research on medical decision making, Chandrasekaran (1983) identifies (1) diagnosis, (2) data retrieval and inference, and (3) What-Will-Happen-If or consequence finding as three fundamental problem types. Of, perhaps, greater interest in the study of managerial processes is the typology of problems Reitman (1964, 284–89) proposes in his essay on ill-defined problems. He

identifies six general problem types, which I have characterized with short descriptive phrases and illustrated with farm management examples in Table 2.1.

I believe these typologies, especially Reitman's, do help us classify managerial problems, even though they almost certainly do not accurately reflect categories managers actually use. They are also of interest as we consider the applicability of problem formulations rooted in economic theory. Clearly, economics has much to contribute to the solution of each problem type, but without a high degree of problem structure it does not, on its own, provide useful solutions to any.

This leads to a second fundamental question regarding problem formulation: that of how managers structure ill-structured problems. Reitman suggests that ill-structured problems are given structure through the addition of constraints. In effect, ambiguity is a function of the nature and number of "open constraints," and strategies for solving ill-structured problems are actually strategies for imposing new constraints that limit the choice set. This process for structuring ill-structured problems can be likened to what Johnson (1977, 34) has termed efforts to establish premaximization calculations. Reitman argues that few ill-structured problems ever become fully structured. By analogy, it can be argued that the preconditions for maximization are rarely fully met for management problems.

Writing after Reitman, Simon (1973) notes that another strategy for solving ill-structured problems is to decompose them into simpler, more fully structured subproblems that can be solved independently. This is the strategy large organizations adopt, through their choice of an organizational design, as they deal with the problem of managing large, complex operations. An organizational structure is a concrete manifestation of a strategy for decomposing problems (March and Simon 1958). Decomposition is also an important, but less easily observed, aspect of problem formulation for individual decision makers.

As in the case of research on problem recognition, research on problem formulation will be most productive if studies focus attention on cross sections of managers from similar firms. Research on problem typologies should focus initially on identifying the problem categories managers actually use and on assessing relationships between manager characteristics, such as educational background and years of experience, and strategies for problem classification. Findings from such studies can be particularly useful in designing information system components that can adapt to different problem formulations and in understanding how information system components can help managers structure problems. Problem decomposition is an important issue to be explored in research on strategies for structuring ill-structured problems. Problem decomposition has received some attention from economists, most notably in the literature on the separability of farm production and marketing decisions (e.g., Anderson and Danthine 1983; Holthausen 1979). Managers' strategies for structuring production and

TABLE 2.1. Reitman's Problem Typology

PROBLEM TYPE	DESCRIPTION	EXAMPLE
TYPE ONE	Move from one well-defined state to another well-defined state.	Knowing the fall tillage operations performed on each field and current soil conditions, schedule and perform the field operations necessary to plant 300 acres of corn and 300 acres of soybeans by May 15.
TYPE TWO	Use any materials or methods you choose to invent or design something that will satisfy a general set of criteria.	As someone considering a career in farming, design an "ideal farm that can be profitably managed by your family.
TYPE THREE	Use the materials and methods available to you to design or invent something that will satisfy a general set of criteria.	Knowing the land, labor, and capital resources available to you, formulate a profitable farm plan for this year.
TYPE FOUR	Use specific components (perhaps in a specified fashion) to invent or design something that will satisfy a general set of criteria.	Design a division of labor and decision-making responsibilities between two partners that will facilitate coordination and make effective use of the talents of each.
TYPE FIVE	Redesign a particular thing or process to meet specifications defined by a set of similarities and/or differences.	Redesign a dairy herd milking system to allow the same number of cows to be milked with 25 percent less labor.
TYPE SIX	Explain how a particular event occurred or how you reached a particular, well-defined state.	Explain how your debt-asset ratio reached its current level of 90 percent.

marketing problems need to be compared to these theoretical results. Also, as family farms grow in size and complexity, study of their evolving organizational structures may also provide useful insights on problem decomposition.

DECISION MAKING

How do managers make decisions? This was a fundamental question motivating the IMS, and it continues to be a question that deserves the attention of agricultural economists.

Production economics is based on a rational model of decision making. It focuses on how decisions should be made. In its most extreme form, the rational decision model is based on the behavioral assumptions of static economic theory. Alternatives and their associated outcomes are assumed to be known completely, and decision makers are assumed to maximize known utility functions. Under these conditions, optimization methods are the logical and appropriate basis for decision making. The rational decision model becomes more complex as these assumptions about knowledge of alternatives, outcomes, and preferences are relaxed. The economics literature on decision making under uncertainty provides ample evidence of that complexity. Unchanged, however, is the emphasis on how decisions should be made.

Behavioral models of decision making are characterized by an emphasis on how decisions actually are made. Here, initial assumptions have a much different focus. At the basis of Newell and Simon's information processing theory of problem solving, for example, is the assumption that humans share four essential characteristics that are relevant for describing decision making behavior. First, people process information in serial rather than parallel fashion—i.e., they think about things one-at-a-time rather than simultaneously. Second, short-term memory is quite limited. As Miller's (1956) classic results demonstrate, most people can only keep seven, plus or minus two, bits of information in short-term memory. Third, humans have essentially unlimited long-term memory. Retrieval from long-term memory is rapid, but the time required to "write" information to it is long. Finally, people can and do make use of external memory devices, such as scratch pads, books, and databases. Given these information processing capabilities, people are assumed to solve problems by sequentially acquiring and processing information. Through this learning process, the problem solver's "knowledge state" is transformed until it coincides with a problem solution.

In this section, I approach decision making from a behavioral perspective. I use the term "decision making" in a limited sense to refer to three processes in Johnson's (1976) general model of problem solving: observation, analysis, and decision. These are processes by which managers collect and analyze positive and normative information and identify "right" actions for solving practical problems. They are closely linked to problem definition and to execution and responsibility bearing, the other three processes in Johnson's model. My decision to consider observation, analysis, and decision together and in isolation from other these other processes leads to some rather artificial distinctions. It is motivated by the fact that both rational and behavioral decision theory have focused on these three activities and by

the belief that these are the most concurrent of the managerial processes Johnson has identified.

Though researchers on decision making have identified general patterns of problem solving activities that are associated with broad problem types, practical problem solving is, by its very nature, situation specific. Therefore, I will not attempt to characterize decision processes for particular problem types. Rather, I will first discuss methods for studying decision making as a problem solving process, giving particular attention to verbal protocol analysis. In the concluding part of this section, I will turn to the issue of how we can use knowledge of problem solving processes to guide the design of computer based tools to support decision making.

Methods for Investigating Decision Processes

The IMS was, in many respects, a behaviorally oriented study of decision making. IMS researchers used both structured and open-ended questions to collect data on managerial processes. Structured questions (Johnson *et al.* 1961, 199), such as:

> 33. Was there any time in the last year when you refused to use your money for an apparently profitable purpose in order to "play it safe?"
> _____ Yes _____ No

were commonly used in statistical analyses of relationships between managerial behavior and managerial characteristics. Such analyses were the focus of studies on sources and uses of information (Mawby and Haver 1961, 24–40), knowledge situations (Johnson and Lard 1961), analytical processes (Thomas and Knight 1961, 55–84), expectation formulation (Partenheimer and Bell 1961, 85–104), decision making (Jensen and Halter 1961, 105–27), and utility functions (Halter 1961, 128–39). Open-ended questions (Johnson et al. 1961, 192), such as:

> 17. Could you please tell me how you made up your mind about what or how much of each product to produce this year?

played a less central role in the analysis of the IMS. They were important, however, in helping identify issues such as problem definition that were not considered in the initial design of the study.

Contemporary behavioral decision theorists continue to use these two approaches to the study of decision processes, but they place greater emphasis on less structured methods for gathering data on decision processes (Todd and Benbasat 1987). These include direct observation of managerial behavior, as in Mintzberg's classic study of general managers; capture of keystrokes as subjects use decision models; monitoring subjects' eye movements as they scan information displays during problem solving tasks; and recording (either concurrently or retrospectively) subjects' verbal accounts of their problem solving activities. Protocols are the products of each of these

methods. A protocol is "a description of the activities, ordered in time, in which a subject engages while performing a task." (Hayes 1981, 51)

Concurrent verbal protocols have played an especially important role in recent behavioral research on problem solving. Essentially records of subjects thinking aloud while solving case problems, concurrent verbal protocols provide detailed data on cognitive processes. Particularly important is the fact that the data in a concurrent protocol reflect the subject's own view of the problem solving process rather than the researcher's.

Objections to the use of verbal protocols in research on decision making have focused on concerns about the accuracy and completeness of protocols and about the ability of researchers to objectively analyze the unstructured data contained in protocols. Regarding the accuracy and completeness of protocol data, retrospective protocols have been criticized because they require subjects to retrieve details on the sequence of cognitive activities from long-term memory. Often those details are not fully retained or they are, by association, confused with memories of another decision task (Ericsson and Simon 1984, 19). Concurrent protocols are not subject to this criticism, but questions about the thinking-aloud process interfering with decision making have been raised. Ericsson and Simon (1984, 16–19) identify conditions under which this should not occur. Citing several recent studies, Todd and Benbasat (1987, 500) note that there is no conclusive evidence for significant interference, even in protocol analyses of complex decision tasks.

Regarding researchers' ability to objectively analyze verbal protocol data, Ericsson and Simon (1984, 5–6) distinguish between analyses involving identification and counts of directly observable events (e.g., occurrence counts for particular words and phrases) and analyses that infer structure and meaning from protocol data. Objectivity is more likely to be questioned in the second case. In response to this problem, researchers have developed formal frameworks that facilitate summarization and comparison of two or more coders' analyses of the structure and meaning of protocol data. The methodology described by Johnson, Zualkerman, and Garber (1987) is one example of such a framework. They divide the analyses of protocol data into two parts: syntactic analysis and semantic analysis. Syntactic analysis focuses on the identification of instances of behaviors grouped into three fundamental behavioral categories: operations, which are primitive problem solving activities; episodes, which are patterns of operations; and data cues, which are the data items processed in the problem solving process. Semantic analysis focuses on the description of the problem context in which these basic behaviors occur. That problem context (on problem space) is described in terms of actions, goals, abilities, conditions, additions, and strategies. Johnson, Zualkerman, and Garber go on to describe graphical and statistical tools that can be used to summarize data within the framework.

The end product of a study of decision making based on protocol analysis can simply be a description of decision processes. It can also be an explicit computer simulation model of the decision process: an expert system. Expert systems differ fundamentally from other simulation models in that

they focus on the representation and prediction of cognitive rather than physical, biological, and economic processes.

Expert systems have received increasing attention from agricultural researchers in recent years. They are of interest to agricultural economists for at least two important reasons. First, if at least some significant part of an expert's behavior can be automated by an expert system, constraints on scarce expert time and energy can be relaxed. In the immediate future, I believe the potential for expert systems to contribute significantly in this way are limited. The second reason for interest in expert systems is more immediate and, perhaps, more important. By systematically investigating the strategies and knowledge people use to solve problems, we may be able to improve our ability to analyze, evaluate, support, and teach problem solving. Building cognitive models can help us formalize, validate, and verify behavioral theories of decision making.

Decision research based on protocol analysis is expensive for both researchers and subjects, and the results from this kind of research are difficult to generalize. These same criticisms can be made, however, about much of the research conducted in colleges of agriculture. With careful planning, adequate funding, and appropriate involvement of researchers from other disciplines, I believe we can make significant progress in behavioral research on decision making. Without such progress, we will continue to have difficulties in successfully applying useful insights from economic theory to practical managerial problems.

Computer-Based Support for Problem Solving

That resources used in decision making should be allocated according to economizing principles is an important, yet all too often forgotten, insight from Johnson's concept of knowledge states (Johnson and Lard 1961, 41–54) and from Simon's concept of bounded rationality (Simon 1986). Advances in information technology have altered both factor price and factor substitution relationships in this resource allocation problem, yet computer based information systems often support managerial work, at best, indirectly (Mintzberg 1975; Keen and Scott Morton 1978, 1–2).

The concept of a decision support system (DSS) is, in part, a response to this problem. Sprague and Carlson (1982, 4) define DSS as "interactive computer-based systems that help decision makers use data and models to solve unstructured problems." This definition succinctly identifies four key characteristics of DSS. First, and most important, it emphasizes help or support for decision makers. A DSS is a tool to be used by decision makers rather than a substitute for them. This feature is the overriding consideration in the design of DSS. Second, DSS are interactive—they are meant to be used directly by decision makers and need to provide both quick and flexible response. Third, they contain and integrate both data and models. This means they give users easy access to data and to tools for combining and analyzing data from several sources. Finally, DSS are designed for use in unstructured

decision situations. Often these are situations where computer based support can improve both the efficiency and effectiveness of decision making, but the need for human judgment makes automation of decisions undesirable or impossible.

The central question in DSS design is that of how decisions can be supported most effectively. The challenge in DSS design is to draw on insights from both rational and behavioral decision theories in order to build tools that take advantage of the power of optimizing models and are well adapted to both the strengths and weaknesses of humans as problem solvers. An attempt to achieve such a synthesis is reflected in the following four basic DSS components identified by Carlson (1983, 21) in his framework for DSS design:

1. Specific representations (e.g., graphs, tables, and pictures) to assist in conceptualization and to provide a frame of reference for using the DSS.
2. Operations on the representations to support intelligence, design, and choice activities in decision making.
3. Memory aids to support the use of representations and operations.
4. Control aids to help the decision maker control the representations, operations, and memory aids.

Representations, control aids, and memory aids such as computerized scratch pads and data files for storing the content of previous screens displayed in an analysis are all designed with insights drawn from behavioral theories of decision making in mind. On the other hand, operations such as stochastic budgeting models and statistical procedures, as well as memory aids such as internal and external databases, tend to be based on rational theories of decision making.

DSS design efforts by agricultural economists will almost always focus on classes of problems associated with particular enterprises or activities (Harsh 1987; King 1985). Protocol analysis and insights from behavioral research on decision making should play an important role in these design efforts. From a general design perspective, the need for database and model structures that give users more flexible support for problem solving poses a number of difficult technical challenges. While such issues deserve our attention, it is also important to remember that the DSS design process, itself, can be a valuable mechanism for learning about decision processes. Because user needs are often poorly understood, DSS design efforts often rely on prototyping, the joint exploration of design problem solutions by users and developers. We need to use this interaction not only as a way to find better solutions to design problems but also as a mechanism for extending our knowledge of decision making behavior.

LEARNING

Management is a learning process. Through observation and analysis, managers work to overcome inadequacies in their knowledge until decisions can or must be made. This is the view of decision making that is the basis for Johnson's (1977, 25–46) general model of problem solving and for Newell and Simon's information processing theory of human problem solving.

In the early 1950s, Johnson's work on knowledge situations (Johnson and Haver 1953; Johnson 1954) helped lay the foundations for an understanding of the economics of managerial learning and was the motivation for a systematic study of farmers' sources and uses of information (Johnson and Lard 1961, 41–54). In this section, I revisit these two issues, considering sources and uses of information first and then the economics of learning.

Sources and Uses of Information

Advances in information technology have had a dramatic impact on the cost of organizing and retrieving data about production, marketing, and financial activities within a firm and on the cost of accessing data about its physical, economic, and institutional environment. In recent years, a number of studies have focused on the question of how these changes are affecting sources and uses of information in farm and agribusiness firms (e.g., Brown and Collins 1978; Arthur Anderson & Co. 1982; Alderfer and Dobbins 1984; Batte, Schnitkey, and Jones 1988; Schnitkey, Batte, and Jones 1988).

Comparing the results from these studies to those reported by Mawby and Haver, one is struck initially by how little has changed with regard to both the types of information farmers consider most important and the range of major information sources. In Brown and Collins' 1978 survey, for example, farmers identified marketing and production technology as the most important information types. Price and production information were also identified as most important by the farmers surveyed in the IMS (Mawby and Haver 1961, 28). Regarding sources of information, local market reports (presumably broadcast by radio or published in local newspapers), radio broadcasts, and general farm magazines were identified as the three most important sources of marketing information by the Ohio farmers in Batte, Schnitkey and Jones' survey. Radio, newspapers, and farm magazines were also among the most frequently identified sources of price information in the IMS (Mawby and Haver 1961, 31).

Perhaps more than any of the other studies, results from the Arthur Anderson & Co. survey point to some of the dramatic changes in farmers' sources and uses of information since the IMS. One notable change is the increased importance contemporary farmers place on financial and production records for their own operations. This may be due as much to differences in survey design and researcher objectives as to differences in behavior, but the lack of responses about financial records and accounting

systems is particularly striking in the IMS results. It is consistent with the hypothesis that farming has evolved from a period when relative stability of prices and institutions and the introduction of new, clearly dominant production technologies made general recommendations generally applicable and durable to a period when greater environmental instability and a wider range of technical opportunities make it necessary to give more consideration to the firm's internal status when decisions are made (Sonka 1985; King and Sonka 1988, 270–99). This trend points to the increased importance of decisions about investments in formal, often computer based, record systems and services.

A second notable change is the increased importance of paid consultants as an information source for contemporary farmers. This may reflect an increase in demand for specialized interpretive and advisory services, or it may be the result of increased private sector activity in providing information products and services that were once considered to be public goods (Bonnen 1988, 452–83; King 1986, 197–213; Streeter 1988). Regardless of its cause, this trend suggests farmers are giving increased attention to decisions regarding resource allocations for learning because they lead to direct monetary expenditures.

The Economics of Learning

In the IMS, Johnson and Lard (1961) found strong evidence that farmers could understand and identify examples of five knowledge situations: (1) subjective certainty, (2) risk action, (3) learning, (4) inaction, and (5) forced action. This typology of knowledge situations provides general insights that are useful for evaluating decisions about the allocation of resources to learning, but the problem of applying those general insights in a practical setting poses a number of difficult challenges.

From the perspective of how learning should be incorporated into managerial processes, the literature on dual control, which focuses on the problem of simultaneously managing a process and learning about it, is the source of one framework for making insights from the typology of knowledge situation operational. In effect, dual control models extend the set of variables in a dynamic optimization problem to include descriptors of information states and control variables for resource allocations to learning (e.g., Chow 1976; MacRae 1973; Rausser 1978). Results from statistical sampling theory are the basis for describing the dynamics of information states. These models are, at least in concept, flexible enough to differentiate between learning activities that lead to increases in "information stocks"—human capital or knowledge—and those that increase inflows and processing of less durable information. Solutions to dual control models provide explicit recommendations regarding resource allocation to learning. The usefulness of these models is limited, however, by the fact that they are, at best, difficult to solve and usually focus on a single type of decision with a

limited range of learning activities. Marschak's (1971) theory of the economics of information systems provides insights on how these models might be extended to a wider range of decisions and learning activities, but the informational requirements for making such an extension are enormous.

Results from behavioral research on managerial learning can provide useful information on factors that limit managerial learning. Research on subjective probability assessment has repeatedly demonstrated that people faced with the task of using data from experience or simple experiments to resolve uncertainty are poor intuitive statisticians (e.g., Hogarth 1975; Kahneman, Slovic, and Tversky 1982). By identifying heuristics that lead to systematic biases in probability assessment, this research can be instrumental in designing more effective methods of supporting learning activities of this kind. Research on organizational learning—the processes by which goals, rules for problem recognition, and problem solving search strategies are adapted to reflect experience—suggests that learning tends to be fragmentary and problem driven and that firms often appear to overinvest in data collection and analysis (Cyert and March 1963, 123–25; March and Shapira 1982, 92–115). This research can provide useful insights on the design of mechanisms that can, where necessary, help manage managers' attention and make learning more systematic. Often these mechanisms can be incorporated into control systems and formal management information system reports. Finally, protocols of managers working on carefully designed tasks that require explicit decisions about the allocation of resources to learning may be a source of valuable information on how managers actually do make these decisions. As in the case of dual control models, however, this approach is likely to yield insights that are, at best, situation specific.

In the near term, a potential alternative to both these approaches to understanding the economics of managerial learning outside the context of a particular decision may be suggested by Johnson's (1988) observation that management is best understood and studied as a separate process within a firm. The output from this process is not only decisions but also services related to implementation and responsibility bearing. If, as suggested by King and Shuker (1987), those services and the managerial inputs used to produce them can be measured for a cross section of firms engaged in similar production activities, it may be possible to analyze substitute and complement relationships among managerial inputs in the production of management services, including learning. Analysis of the impact of managerial services on the efficiency of resource use in the product producing activities of those firms may, in turn, make it possible to infer the value of those services. Through what is, in effect, a static production function analysis of managerial processes, we may gain useful insights about the economics of resource allocation to learning and other managerial activities.

CONCLUDING REMARKS

Like all other human activities, management is complex and multifaceted. This makes management research at once difficult and engaging. As a profession, I believe we are committed to improving our understanding of managerial processes and to developing concepts and analytical tools to support those processes. I believe we are also concerned that management research from a broad perspective will weaken valued disciplinary ties to economics.

The challenge facing us is to synthesize insights from economics with insights from other disciplines. I believe this process is already evident in some of the most exciting recent developments in general economics. As Lindbloom and Cohen (1979) emphasize in their essay on the usefulness of social science research in social problem solving, we also face the challenge of strengthening contacts with the managers who are the subjects of our academic inquiry. We must design managers and their "ordinary knowledge" into rather than out of our theories and models.

Glenn Johnson's contributions to our understanding of managerial processes and to our appreciation of the need to study them from a multidisciplinary perspective are unparalleled in our profession. The following six points, paraphrased from a recent paper (Johnson 1988, 19–22), outline steps we can take to achieve the synthesis of disciplinary and practical knowledge needed for management research:

1. Maintain empirical contact with farms and farm managers.
2. Maintain conceptual contact with other disciplines and areas of study.
3. Use case studies to screen available theories and concepts for relevance.
4. Also use generally available knowledge to screen available theories and concepts.
5. Continue efforts on theoretical and conceptual research.
6. Conduct systematic empirical studies of managerial processes.

As we look to the future, I believe these should be key features of a research strategy that can improve both our understanding of managerial behavior and our ability to develop tools to improve managerial performance.

NOTES

1. This is Minnesota Agricultural Experiment Station Publication No. 16,132.

2. Robert P. King is a professor in the Department of Agricultural and Applied Economics at the University of Minnesota. He holds the E. Fred Koller Chair in Agricultural Management Information Systems.

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Chapter 3

Private Decision Making
(Farm and Home Management)

Glenn L. Johnson

Robert P. King's presentation treated me kindly and related the work my colleagues, students, and I have done to both current and promising future work on decision making as part of farm management. He has done this so well that it almost seems ungracious to add to it with excerpts from publications, background explanations, and sources of insights as A. Allan Schmid has requested. On the other hand, an important reason for doing so involves the numerous difficulties that existed for farm management in the early post war period (and still exist in part) that extend beyond inadequate attention to decision making.

In the early post war period, farm management was dominated by the positivism of Cornell, which preceded what is now known as logical positivism (Salter 1948, Johnson 1992). Cornellian farm management was highly empirical and uninfluenced by the attempts of W. J. Spillman (1933), John D. Black (1926), and John D. Black *et al.* (1947) to introduce static neoclassical economic theory into farm management. Further, Cornellian farm management was not influenced by the 1939 attempt of T. W. Schultz to introduce the dynamics of Frank Knight's work ([1921] 1946) on risk, uncertainty, and profit into farm management. King's paper pertains to the post World War II attempt to incorporate managerial theory as part of dynamic production economics into farm management so as to improve the treatment of problem definition, observation, analysis, and decision making as four of six steps in managerial processes, the two omitted steps being execution and the bearing of responsibility for actions taken.

Cornell's farm management, being positivistic, gave little attention to research on the values so important in understanding farm (and home) decisions. The effect of this was not as adverse as would be expected because the extensive practical empirical work of Cornellian farm managers kept them in close touch with farmers and their families, problems, and values despite the positivism of the Cornellian farm management of the time.

From the above, it was concluded that it would be fruitful to present here some of what I have written about (1) efforts (including some adverse consequences) to introduce static production economics into farm management, (2) the effort in farm management to go beyond both strict and logical positivism to deal explicitly with nonmonetary as well as monetary values, and

(3) certain aspects of farm managerial theory and practices not covered in King's well-defined, well-organized, and well-executed paper. Prior to the three sections on these three topics in this chapter is an autobiographical section that may help some readers understand my views of farm management and farming. The three sections on production economics, values, and selected topics in managerial theory that follow the autobiographical section are made up largely of quotations from earlier published or "phantom" literature, while the autobiographical material in this chapter is written especially for this book. An additional biographical section is to be found in Chapter 5 relates to work I have done on public policy problems and issues, both international and domestic.

SOME RELEVANT AUTOBIOGRAPHY

My farm management study started in a high school vocational agricultural education (VAE) class. It consisted of a school year of farm planning, budgeting, and marketing study, followed by a year on technical crop production and another year on livestock production. My successive VAE teachers taught farm management well. Their training in budgeting and planning was realistic. It took cash flow, debt repayment, and living costs into account, although in the 1932–36 period cash flow would have been better called "cash trickle." Ten years earlier, my father had gone broke on a large commercial farm in Minnesota during the farm depression of the 1920s only to borrow money to start farming again as an Illinois renter in 1928. As someone else has observed, the great depression of 1929 came in the middle of hard times for farmers in general and our family in particular. Our creditors had nothing to gain by closing us out in the great depression except unrecoverable legal costs. Cash flow, debt service, and family living costs were essential components of farm planning and budgeting for our farm business. My father wanted to buy my mother's family farm. We planned and budgeted how to do this but could not resolve the cash flow, debt service, and other costs despite repeated conferences when our cultivating teams met midfield and we let the horses "blow" while we schemed, budgeted, and planned to no avail. My VAE teacher wanted me to take a regional competitive examination for a University of Illinois fellowship during my senior year. I took it and won the fellowship much to the surprise of my other high school teachers who did not know me nearly as well as my VAE teacher. The drought of 1936 convinced me to go to the University of Illinois, although I was already farming on my own account as a renter.

An outstanding farm appraisal course at the University of Illinois involving Professors H. C. M. Case and Larry Norton taught me more about budgeting, cash flow, debt service and the multidisciplinarity of farm management, appraisal, and finance, particularly with respect to the technical agricultural sciences. Professor Charles Stewart and the rural sociologists in the department (1) stimulated me and made me aware of the

importance of the human and social dimensions of farm management, appraisal, and finance, and indeed of agricultural and rural societies and (2) taught me a considerable amount about Wisconsin's pragmatic institutionalism and something about German historicism. While workable farm plans and appraisals were sought, optimization techniques were not formally applied. Nonetheless, a particularly satisfying well-taught course in the general economics department taught me much about neoclassical economic theory—enough to add an interest in the basic discipline of economics to my practical interests in farming and rural sociology. I later earned an M.A. at Michigan State College and a Ph.D. at the University of Chicago, both in departments of general economics. At Michigan State, I took a split M.A. minor in the separate departments of farm management and sociology.

Perhaps the three most important additional experiences providing me with further orientation to managerial processes before starting to teach farm management at the University of Kentucky in 1948 were (1) projections work done for Dr. O. C. Stine of the Bureau of Agricultural Economics (BAE) in close iterative interaction with members of Congress and of the administrations of Roosevelt and Truman, (2) U.S. Navy Supply Corps case study training at the Harvard School of Business Administration and subsequent service, first as head of a destroyer supply and disbursing department and then as the Staff Supply Officer for Admiral Beatty, Commander, Destroyers, U.S. Atlantic Fleet, and, finally, (3) courses under Professor Frank Knight at the University of Chicago that acquainted me with his much earlier work on risk, uncertainty, and profit while stressing the inadequacies of static economics for understanding managerial activity and, in turn, stimulating me to read M. A. Girshick (1946), C. O. Hardy (1923), A. G. Hart (1946), J. von Neuman and O. Morgenstern (1947), Abram Wald (1947), and Milton Friedman and L. J. Savage (1948) on sequential analysis, game theory, and the expected utility analysis hypothesis to gain a better understanding of managerial processes.

ADDING MORE PRODUCTION ECONOMICS TO FARM MANAGEMENT

As indicated in chapter 1, this chapter (and chapters 5, 7, and 9, as well) is a mixture of reprinted material from my past and that written specifically for this book. Some of the former is dated and now acknowledged to have developmental shortcomings. To help the reader distinguish between my past and current writings, all quotations from my earlier publications are indented from both margins. Further, the reader will find two vertical gray lines, one in each margin running the entire length of each quotation regardless of whether only a few lines or several pages are quoted.

Among published appraisals of the introduction of production economics into farm management is an article in volume 39 of the *Journal of Farm*

Economics in 1957. It was entitled "Agricultural Economics, Production Economics, and the Field of Farm Management." An abridged version of the article follows:

> Since the interwar period, the relationship between the fields of agricultural economics, production economics, and farm management [had] been under discussion. Early giants of agricultural economics such as Taylor, Black, and Spillman saw rather clearly that economics had a considerable contribution to make to farm management and explained the need for this contribution with vigor (Wilcox et al. 1941, 5-11). Agricultural economists were easily convinced. Actually, it might even be said that agricultural economists, deans, and directors were overconvinced—at least agricultural economics attained such an administrative triumph over farm management in the land grant system that there is, at the present time, no separate department in the land grant system whose function is that of doing teaching, research, and extension solely in the field of farm management.
>
> Typically, the consolidation of farm management departments into agricultural economics departments preceded the development of a "production economics group" within a department of agricultural economics. These production economics groups, however, have developed rapidly and farm management is now tending to be defined as a subfield of production economics. Lest the reader think the author is "setting up a straw man," it is important to note that this definition of farm management is becoming institutionalized. In the USDA, for instance, there is an Agricultural Research Service. Within that service is PERB, the *Production Economics Research Branch*, and *within* that branch, one finds farm management.[1] Another example of the institutionalization of the definition is found in the awards contests of the American Farm Economics Association where there is a subcommittee on farm management and production economics. On the surface, it appears that farm management as a discipline is now well on the way to being dominated by production economics a subfield of economics and agricultural economists. This, it appears, would be unfortunate for both farm management and production economics. Management (including farm management) cannot be defined, abstractly or in practice, as only a subfield of economics. Still further, production economics has important contributions to make in other areas.
>
> ### THE FIVE RESISTANCE GROUPS
>
> One way of seeing some of the fundamental relationships among agricultural economics, farm management, and production economics is to examine the strengths of groups who have been resisting, first, the domination of farm management by agricultural economists and, more recently, by production economists in particular. There are five such resistance groups.
>
> The first group is made up of certain farm management extension personnel. Farm management extension men both in the United States and in the rather recently developed National Advisory Service in England have never swallowed the agricultural and production economics lines completely. They continue to place heavy reliance on information and systems of thinking from fields other than economics at the expense of not being able to employ fully all agricultural and production economic data and systems of analyses.

The second resistance group is the Society of Farm Managers and Rural Appraisers. One can search the publications of that society without finding much evidence of the triumph of production economics or, for that matter, of agricultural economics over farm management. The publications and meetings of that society cover subjects much broader than that of economics. In fact, the subject matter ranges from technical material of an engineering, animal husbandry, and agronomic nature, on one hand, to information on credit, taxation, and social security on the other.

A third resistance group is made up of farm management professors of the earlier variety teaching mainly at the undergraduate level, though, in some cases, also at the graduate level. By and large, these professors are mature academic people who are not altogether convinced that they should "go over to agricultural and production economics" as far as the positions occupied by many agricultural economists, particularly those occupied by some of the younger men who are more highly trained in production economics and who are doing their applied work in the field of farm management. Many of the traditional professors have been successful. Their products have stood up well despite criticism from agricultural economists. Many are productive teachers who have earned reputations, over the years, of having a great deal to offer to students interested in the "management of farms." Many such professors now have in their classrooms some sons of former students who have been advised by their fathers to take some courses from "Professor So an So," because somehow or another, "Professor So and So" contributed a great deal to their father's general education and ability to handle the problems of managing and operating farms.

A fourth resistance group is made up of a few agricultural economics departments which now, and prior to the general consolidation of farm management departments into agricultural economics departments, were primarily concerned with farm management. In some of these departments, the earlier forms of farm management have had enough political power to prevent them from being completely overwhelmed by general agricultural economics and, more recently, by production economics.

In recent years, a new and fifth resistance group has grown up in connection with the so-called farm and home development program or whole-farm-unit approach of the extension services. Serious thinking about the idea of farm and home development indicates that it is really a very broad management program involving the integration and attainment of the family and business goals of a farm family with the resources and technology at the disposal of that family. Where departments of agricultural economics have dominated farm management, or where the farm management groups have adhered to a rather strictly "economic" or business point of view, extension administrators have been almost universally reluctant to let either dominate a farm and home development program. Instead, extension administrators have insisted that farm and home development programs be broad, encompassing (as appropriate in solving the problems faced) agricultural engineering, agronomy, animal husbandry, human nutrition, homemaking, psychology, sociology, and agricultural economics. Although, in the administrative practice of the extension service, the roles allotted to these disciplines often appear to be haphazard and somewhat inappropriate when the different state organizations are compared, noneconomic disciplines have probably played more important roles than general agricultural economists

and production economists or farm management men would have suggested originally.

The common strength possessed by the resistance groups furnishes a concrete indication of the inadequacy of economics as a conceptual and empirical framework for farm management. Each resistance group tends to derive its strength from facts, concepts, theories, and principles furnished by the noneconomic disciplines.

AGREEMENT BETWEEN CURRENT MANAGERIAL THOUGHT AND THE RESISTANCE GROUPS

There is a basic similarity between the actions of the resistance groups discussed above and current thought concerning the managerial process. This similarity indicates that theory and practice are in close agreement in many respects. Such consensus commands the attention of all who are concerned with the welfare of farm management . . . In both instances, economics turns out to be a necessary but insufficient basis for management. In practice, the resistance groups require noneconomic facts, theories, and principles to operate successfully while, very similarly, those trying to conceptualize the managerial process find themselves drawing on logic (both deductive and inductive), the physical sciences, psychology, ethics, and sociology—to mention only a portion of the list. Neither static nor dynamic economics (whatever the last may be) are an adequate framework for management.

Academic thought on the managerial process has been a developing everchanging thing. Among a host of others, the very production economists who correctly argued hard a few years ago for a place in farm management for static production economics have continued their study of the managerial process. In the field of political science and public administration, workers are developing what is known as organization theory. In the fields of mathematics and statistics many are working on the theory of decision making, while in sociology and psychology many are working on a field called human behavior. At Stanford University, there is a Center for the Advanced Study of the Behavioral Sciences. In economics, managerial theory is evolving from risk and uncertainty theory, on one hand, and the theory of games, on the other. Home management specialists, too, are making their contributions as well, of course, as business administration specialists.

As the production economists doing applied work in farm management began to think about the management process, they drew heavily on Frank Knight's contributions in *Risk, Uncertainty, and Profits*. To a lesser extent, they drew on statistical theory and the theory of games. With this intellectual ancestry, a natural first tendency was to look at the different forms of imperfect knowledge. The question was: "What kinds of imperfect knowledge bother farm managers in a dynamic, everchanging world?" Introspection and examination of the managerial process as practiced by farmers revealed that managers are concerned with many types of information not commonly regarded as economic in nature. It was clear that institutional arrangements change repeatedly and that a successful manager keeps up with a flow of information on such things as income tax, social security, local taxation, production control programs, and price supports. It was also clear that technological change plays a more important role than

economists ordinarily assign to it. Also, as the changing behavior of people has impacts on the farm business, such changes make it necessary for the manager to gather and analyze information on people.

Once the range of information that managers use was thought out, a natural subsequent step for students of the managerial process was to examine the assumptions of the static production economic theory. Such examinations reveal the inadequacies of both static and dynamic economics as frameworks for the managerial disciplines. Many forms of static theory, it was found, assumed for a number of reasons[2] that technology is unchanging, that institutional arrangements are essentially static, that human behavior is predictable from constant, unchanging utility functions, and that managers have perfect knowledge of the present and future. A consequence of these assumptions is that prices are unchanging. Thus, it is clear that static production economics assumes away much of both the process and problems of management. It is no wonder that resistance groups were able to find a very real and important common ground on which to stand; namely, the inadequacies of static economics as a structural framework for management.

. . . When the economic scientist looks at the thought processes that farm managers employ, he is humbled about the contribution that he, as an economic scientist (either static or dynamic) can make to an understanding of the thought processes actually employed by managers in solving problems. Production economics, specialized as it is in answering questions about resource and enterprise combinations and levels of output, has only a modest contribution to make. Logic including statistics appears to have far more to offer than economics. Induction and deduction are thought processes employed day by day and hour by hour by managers.

Some may argue "Yes it is true that static economics is limited but how about dynamic economics? It appears to have enough breadth potentially, at least to handle all of the problems faced by managers." As dynamic economics is poorly developed at this point in time, it is hard to see clearly its eventual value in understanding managerial processes. When the question is asked, what does economic theory (either dynamic or static) have to offer to a farmer thinking out the economics of a dynamic problem in animal breeding or in building construction, we find that the theories of genetics or of physics are at least as important as the theories or principles of economics. About all that economic theory has to offer, it appears, in the process of solving engineering problems, is the basic economizing principle of matching added costs against added returns, under certain second-order conditions, as a basis for defining an optimum. This principle is of use both (1) in solving [a] breeding or engineering problems, which may be either static or dynamic, and (2) in ascertaining, with the dynamic decision-making process, the optimum amount of information to acquire and the optimum amount of analyzing worth doing. Strangely enough, the same optimizing principle so basic in statics complements theoretical physics and genetics in solving dynamic engineering and breeding problems. Attempts to substitute economic theories and principles for the principles of physics and genetics in solving such problems would be foolhardy. Dynamic *economics* appears to be little better than static economics as an intellectual framework for management . . .

IMPLICATIONS OF THE ABOVE ARGUMENT

The implications of the argument presented in this paper are broad indeed. The following conclusions are presented:

1. The land grant system has made a mistake in permitting agricultural economics to dominate farm management.
2. Production economics, as a subfield of agricultural economics, is not in position to give complete intellectual guidance to the field of farm management.

This paper does not imply that:

1. The traditional forms of farm management were capable of bringing out the full potential of the discipline.
2. The land grant system would be better off with its former farm management organization than it is at the present time. This is to say that the earlier farm management organization also had its shortcomings, one but not all of which could be remedied by using more economics.

The resistance groups[3] and earlier farm management departments did not have the organized interdisciplinary breadth required to support the increasingly broad concept of management. Typically, the earlier farm management departments emphasized technical agricultural sciences without giving adequate attention to the social sciences (including economics) and the humanities. Still more important, they were sometimes highly inductive and empirical. For this reason, they did not always use enough theory and principles from any science, including the physical sciences, economics, other social sciences, and the humanities. The survival ability of the pockets of resistance to the onslaught of an unduly specialized approach to farm management does not indicate that the earlier approach was ideal or that it had sufficient breadth.

. . . When one looks to the future of farm management, he sees a subject almost unmasterfully broad. Several other disciplines from both the sciences and the humanities also have much needed, important contributions to make to farm management which cannot be made by anything one could reasonably call dynamic economics. These other disciplines include statistics, logic, sociology, home economics, psychology, philosophic value theory as well as the physical and biological sciences. In this connection, managerial thinking still has rough days ahead—it still has to absorb the contributions of the other social sciences and the humanities *without* becoming dominated by any of them. Perhaps farm management, involving as it does both the sciences and the humanities, is an impossible academic discipline. Is it possible for professional farm managers to secure enough training in the range of disciplines running from soil chemistry and physics, on one hand, through economics and the social sciences to ethics, on the other, to operate in a multiplicity of farm situations? Although thousands of actual farm managers succeed in doing this, each of them is dealing with a specific, individual situation. The academic farm management men face a much more difficult task. They must be prepared to operate in many different farm situations. At the present time, the author knows of no academic, research, or extension service farm manager who meets the test of being able to operate across the

board from the details of science to ethics in any farm situation. The same is true of personnel in farm management firms. These people, too, display a tendency to be specialized by geographic areas and by type of farm as well as by academic disciplines.

This present unsatisfactory situation is not without promise, however. Much work is being done on many phases of management in many disciplines. In the extension service, the farm and home development program makes slow painful progress. The roles of the various disciplines in management are certainly clearer than they were fifteen years ago. Yes, even clearer than they were five years, two years, or even a year ago. Progress is occurring in the form of a willingness to let all disciplines contribute to our understanding of the managerial process without dominating it.

Among other "nasty questions" about the future of farm management are these two: Would it be possible to administer departments of farm management that must master such a wide subject matter? It is possible, if such departments could be administered internally, for them to exist side by side with the other departments of agronomy, animal husbandry, economics, crops, philosophy, sociology, home management, and human nutrition, which would necessarily have to nurture such a department? The problem is indeed a grave one. Perhaps farm management is a subject for the dean's office or the experiment station administrator's office instead of a basis for a department or a section of a department. Perhaps, instead, it is only a "point of view," which, while properly held by all agricultural educators, is unduly restricted by being consigned to *any* portion of an administrative structure. Although the answer is far from clear today, two facts are worth remembering: (1) The survival rate among independent farm management departments has not been very encouraging. (2) The tendency to narrow farm management to a subpart of agricultural and production economics, when it is a subsection of a department of agricultural economics, is not entirely beneficial to either farm management or production economics.

TAKING FARM MANAGEMENT BEYOND BOTH STRICT AND LOGICAL POSITIVISM TO DEAL WITH VALUES

In 1960, I published a paper entitled "Value Problems in Farm Management" in the *Agricultural Economics Journal* (English). This paper was concerned with the necessity of dealing objectively with values in a manner going beyond both the empiricism of Cornellian farm management and what I have dubbed the "conditional normativism" of the production economists (including me) who were busy in the fifties and sixties putting more static production economics into farm management and in developing dynamic production economics for use in farm management. It should be stressed to persons reading this article that because it was written in 1959, before I came to know better, I unwisely refer to (1) farm management as a "discipline" rather than a "multidisciplinary subject or area of study" and (2) "value-free information" as knowledge about "what is or will be" and value information as knowledge about what "ought to be." I had not yet realized that monetary (and other) exchange or extrinsic values are concepts

about readily observable values that exist and that I was ignoring the reality of such more intrinsic nonmonetary values as those experienced when enjoying the goodness of freedom, a well-nourished body, or suffering the badness of a lingering death from cancer. Further, I had not yet grasped C. I. Lewis's (1955) distinction between right and wrong, on one hand, and "goodness and badness," on the other hand—a distinction closely related to the difference between a *prescription* to solve a problem and the *value knowledge* used along with value-free knowledge to reach the prescription. This paper was written while on sabbatic leave, studying philosophic value theory. The paper on values in farm management follows in, essentially, its original form:

> I would judge that some people look at my title and remark "Anything worthwhile that can be said on that subject has been said,"[4] Others, I am afraid remark, "Nothing worthwhile can be said on that subject." Obviously, I do not agree, as I suggested this topic when asked to speak on a topic of my own choice.
>
> What I have to say on this subject at this point amounts to a partial progress report on my sabbatic leave program in which I am investigating philosophic value theory or moral philosophy with the hope of acquiring more ability to handle values in both policy (public management) and farm management (private policy) work. So far, I have spent about two months of absorbing new difficult ideas and of questioning old accepted ones.[5] This has had a tendency, I am afraid, to leave me somewhat confused and unconfident about just what I do know about values. However, the experience is proving to be a salutary one; I would strongly advise it for anyone who is convinced that his own position on the problem of handling values is "the last word" on the subject.
>
> In the pages to follow, I will demonstrate the importance of value problems in farm management teaching, research, and extension. Following this, I will attempt to demonstrate that while most existing statements and positions on the subject possess worthwhile characteristics, they commonly conflict with each other in such a way as to deny part of each others' useful characteristics while, at the same time, possessing something of use as individual positions. This situation gives me hope that something useful does, indeed, remain to be said on the subject of value problems in farm management. And, as I am but an amateur in philosophic value theory, it seems distinctly possible that much that is useful will still remain to be *done* as well as *said* on this subject after I have finished. In fact, I will conclude with suggestions for further work and discourse.
>
> Still by way of introduction, it also seems important for me to be clear that I am interested in the question of "how to deal with value problems in farm management as researchers, teachers, and extension or advisory service workers" but not in the question of "how to propagate or impose some set of values on others." While the answer to the latter question is probably important, it is not a relevant question until the former has been answered . . .

THE IMPORTANCE OF VALUE PROBLEMS IN FARM MANAGEMENT

Farm management is an applied discipline. This has been so historically and is largely so today in Britain, the United States, the Commonwealth, and in those continental countries in which farm management has developed to any significant degree. As an applied discipline, it often seeks "right" answers to problems of decision makers. Though the emphasis is on the problems of private decision makers, public problems are also important, particularly here in Britain with its annual price reviews which are based in substantial part on data produced by farm management workers. In any event, "right actions" often turn out to be some sort of a compromise between concepts of "what ought to be," on one hand, and concepts about "what is or will be" on the other.[6] Answering questions about right actions for farm managers involves the problem of handling values. This is a characteristic of a *practical* discipline.

On the more academic side, it does not appear that theoretical farm management workers can avoid the problem of handling values. As farm managers must and do handle values (Boyne and Johnson 1958), theorists studying what managers do must either deal with values or remain unrealistic. Even the attempt to avoid or to minimize attention devoted to value problems is an extreme "method" of handling value problems.

While the above indicates that value problems arise in the discipline of farm management, it does not indicate their importance. Some concept of their importance can be gained by examining the work of:

1. Extension and advisory service workers
2. Resident farm management teachers
3. Research workers
4. Agricultural policy makers who use farm management results.

In the original article, each of the four above points are elaborated in four subsections that are omitted here.

The omitted subsections were summarized in the following conclusions:

Our investigation of farmer education, research, and resident teaching work in farm management to agricultural policy has revealed that:

1. The practical orientation of much farm management work entails value problems.
2. Teaching people to manage involves teaching them how to handle values.
3. The theory of management involves at least a subtheory of how managers formulate values and handle value problems.
4. Value problems arise when farm management workers attempt to contribute to the formation of agricultural policy.

CONFLICTS AMONG POSITIONS

Having secured a general idea of the importance of value problems in farm management, it is now time to see how the discipline is served by different philosophic positions about values. Though there are many positions

and subpositions which might be taken by farm management workers with respect to value problems, only a few prominent positions will be considered in this paper. *Positivism* as expounded in general economics by Friedman (1953) and in farm management by Ciriacy-Wantrup (1956) is one position. A second position commonly taken by J. D. Black, T. W. Schultz, and their disciples (Heady 1956, 808) is what I call *conditional normativism*, which differs only slightly from a third complex position which is identifiable with the phrase "modern welfare economics" (Arrow 1951).

A *fourth* important [position is a *pragmatic* position] often identified with the agricultural economics phase of Wisconsin institutionalism and associated with the names of Commons, Parsons, Mead, Dewey, and Pierce (Parsons 1958). Finally, *outright normativism* should be considered.

According to Ciriacy-Wantrup, positive farm management "deals with how farmers *do* respond," not "with how farmers *should* respond." Positivists avoid the normative for many reasons. They argue that concepts of "what ought to be" are not capable of being [disproved] by empirical observation. They also avoid purpose, force, and cause as unobservable and, hence, neither verifiable nor unverifiable. They argue that nothing refutable or verifiable is contained in the statement that "water *wants* to run down hill," which is not in the statement that "water runs down hill." Quite to the contrary, they argue that animism, the projection of human or animal characteristics to physical objects, has retarded the acquisition of information in the physical sciences. They also reject use of value or purpose as explanation. It is circular to argue, they say, that a man does so and so because he wants to do so and so, for the only observable evidence that he wants to do so and so is that he does so and so.

It is interesting that Ciriacy-Wantrup (1956), in pleading for more positivistic work in farm management, does not reject nonpositivistic work. Neither does Robbins (1946) in his methodological essay. They evidently feel that other approaches are also useful. One of the difficulties for the positivists in this connection is that values are experienced. I, for instance, experience them introspectively and am capable of observing others experiencing them. The possibility of such experiences being something physical within our nervous system raises the question as to whether statements about values are nonverifiable and noncontradictable by observation of physical phenomena. Alternatively, failure to so establish a place for positivistic study of values, leaves the positivist with something less than a full interpretation of many events, particularly the actions of managers.

F. H. Knight, while tending to agree with the positivists in so far as scientific method is concerned, promptly expands the range of economic enquiry beyond positivism and concludes, "A serious analysis of social phenomena, . . . would have to be based on a quite complicated pluralism." He then outlines the main categories of this pluralism giving positivism a position, but *only* a position (Knight 1956, chap. 7, especially 172–77).

One of the important types of positivist work done by farm management men is the analysis of farm records and farm accounts. Here the primary emphasis is on describing what has happened within a farm business, not on solving problems. While it is true that the descriptive results obtained generally prove useful in solving problems, immediate problems to be solved do not generally provide the impetus.

Part of the criticism directed at so-called "traditional" farm management in the United States during the late 1930s, 1940s, and 1950s by Schultz (1939),

Black (1926), and, later, Heady (1952) and your speaker, was based on the distinction between the positivist and a more [conditionally] normative position. It was asserted that "facts do not speak for themselves. In order to be used in *solving problems*, facts must be *organized* by profit maximizing production economic theory." The important point was more than rationalism versus empiricism; it was also positivism versus what I now call "conditional normativism."[7] It was urged that questions of the following type be asked and answered. "If so and so is desired, what is the most efficient way of attaining it?" While answering such questions takes values into consideration, conditional normativism has a supposed advantage of leaving the investigator neutral with respect to questions about which values or ends are to be pursued. Conditional normativism contrasts with outright normativism which would answer questions about which values should be sought.

Conditional normativism in farm management has, in turn, been subjected to formal attack, a recent one being that of Kenneth Parsons (1958).[8] After quoting both J. D. Black and Heady, Parsons writes, "Two points are common to the positions of these economists: (1) ends and means are separated; ends are data, which stand alone so to speak, independent of the means of realization. (2) Whatever evaluation, whatever judgment which exists about the worth of an end is made antecedent to or independently of, any act of economizing or any analyzing by economists" (Parsons 1958, 296). And, later, we find, "The tragedy of the assumption that 'ends' are given is that it leads eventually to the idea that 'ends' . . . cannot really be studied or that they should be handed down authoritatively. In either case the implication is that creative intelligence cannot be brought to bear on such vital problems" (Parsons 1958, 299). Still later, "The problem is how 'to construct the good' from experience" (Parsons 1958, 299). This leads to the conclusion "that goals as principles of conduct can be investigated . . . In a family farm, family members are the actors. What they do is a means to their objectives. But the means and objectives form a continual flow, where the objectives give meaning and direction to what is done, and the doing is the means of realizing what is intended . . . The relation of means to ends is the problem to be investigated, not a hiatus" (Parsons 1958, 299)." Parsons clearly attempts to make a case against conditional normativism.

In making that case, Parsons also makes a case against positivism which avoids the study of values by refusing to use concepts involving values, purpose, goals, ends, etc. Parsons' position is that of a problem solver—that of a practical man. For Parsons, problems seem to involve differences between concepts of "what is, or will be" and "what ought to be." His argument against conditional normativism is that ends are dependent on means and, hence, cannot be given. His arguments against positivism and normativism in farm management would be that (1) either would prevent farm management workers from engaging in practical problems solving activity and (2) means cannot be studied independently of ends as the two are interdependent.

Parsons' cases against conditional normativism, normativism and positivism are not so conclusive as to destroy them. In connection with conditional normativism, the point was made earlier that results of positivistic work further other positivistic work and that this justified it (if positivistic work must be justified by being proved useful and, hence, justified normatively). Practical people have faith that estimates and predictions about reality are often useful even if not produced in response to a particular problem. Still

further, the fact that a researcher envisions that his descriptions will be useful in solving some problem does not mean that he must incorporate values, ends, goals, and purposes into his investigation and, hence, lose his respectability among positivists. Aside from these arguments, there appears to be little doubt but that some problems are nothing more than conflicts between conflicting concepts concerning the nature of present or future reality. Such problems can be solved by making choices in a very positivistic manner between appropriate hypotheses about the nature of present or future reality. While value judgments are involved in setting appropriate confidence limits for such choices (Rudner 1953), this does not necessarily involve interdependence of ends and means as Parsons argues.

Parsons' position against conditional normativism was stated earlier by John Dewey who used Lamb's essay on roast pig as a point of departure (Dewey 1950, 360 f.; Commons 1934).[9] The roast pig essay, according to Dewey, is amusing because burning down a house to get roast pig is sacrificing too many means to obtain roast pig. To Dewey, the value of houses determines the value of roast pig and, hence, means determine ends. This crude paraphrase of the Dewey argument has the advantage of making it clear that Dewey was dealing with a kind of "exchange value" for roast pig and that he was not seeing through the problem which Marshall clarified so admirably with his scissors analogy (Marshall [1890] 1946, 348).

Dewey could just as well have said that a house is more valuable than three roast pigs, a statement which reveals the *independence* of the values of houses and pigs except at points of exchange or for right action. C. I. Lewis's (1955) distinctions between good and right and right and wrong also seem to have escaped Dewey. The "exchange value" of a good, service, or condition in any given "right action" or "equilibrium" situation—what it is worth—does depend on the value of the means required to obtain it. This, however, is not to say that the value of the good, service, or condition and of the means required to obtain it are interdependent. This difficulty in the Dewey argument combines with the obvious productivity of farm management workers who do not subscribe to the Parsons-Dewey position to suggest, again, that clear-cut, universal superiority does not exist for pragmatism over conditional normativism, normativism, and positivism.

"Modern welfare economics" represents a fourth complex and vaguely defined position. This position includes the modern day remnants of utilitarianism without necessarily confining itself to egoism or, for that matter, hedonism. Adjusted for the difficulties experienced in securing interpersonally valid utility measures, utilitarianism, as it appears in modern welfare economics, contains something of Kant's categorical imperative (Trant 1959, 75 f.). The modern welfare economists' unwillingness to impose non-Pareto better adjustments on others has a considerable practical similarity to Kant's (1950, 223) categorical imperative: "Act only according to that maxim by which you can at the same time will that it should become universal law."

Bentham's opposition to the principle of sympathy and antipathy also finds a place among some welfare economists. Bentham wrote: "the various systems that have been formed concerning the standard of right and wrong may all be reduced to the principle of sympathy and antipathy. One account may serve for all of them. They consist all of them in so many contrivances for avoiding the obligation of appealing to any external standard, and for prevailing upon the reader to accept the author's sentiment or opinion as a

reason in itself." Modern welfare economists get quite close to this position when they refuse to judge uncompensated changes, which make at least one person worse off while making others better off, as good or bad because they fear that any standard used to reach such judgments runs the danger of being purely personal and immoral in the sense that it would reflect only their own interests. This fear can combine with a strong attachment to *individualism*, as a value, to prevent the application of intelligence to value problems. Your speaker has encountered agricultural economists who attach so much value to individualism that they have tried to impose more of that value on him, thereby contradicting the value they were propagating.

Modern welfare economics also has an uncomfortable tendency to endorse or place a high value on things as they are. When a difference between "what is" and "what ought to be" constitutes the problem to be solved, an apparatus which cannot evaluate non-Pareto better changes often proves limiting.

The arguments which Parsons mobilized against conditional normativism also apply in substantial part to modern welfare economics. This is not surprising as the position of the modern welfare economists differs from that of the conditional normativist mainly in that conditional normativists do not always guard against the problems created by lack of interpersonally valid utility measurements.[10]

The position of Parsons-Dewey pragmatism is given considerable support by Knight's arguments concerning the interrelationships between means and ends in games and by Knight's (1956, 171 f.) classification for analyzing social phenomena mentioned earlier. These arguments are given still more significance by developments in the theory of games and economic behavior. Other support for Parsons-Dewey pragmatism comes from the productivity of Wisconsin agricultural economists and the widely observed tendency of experience, including problem solving experiences, to form our values.

The possibility that the Parsons-Dewey position is derived, in part, from a failure to recognize an identification problem raises questions about the universal interdependence of means and ends. That possibility requires us to consider the positions of outright normativism as well as positivism in farm management work. Though few farm management workers formally endorse normativism, there is no doubt that many practice normativism in the sense that they help formulate concepts of "good" and "bad" independently of means and then try to find and teach "right" actions as compromises between these concepts of good and bad, on one hand, and the existing conditions of reality, on the other. J. N. Keynes ([1890] 1930, 41) (Robbins 1946, preface) seems to feel, regardless of Dewey's difficulties, that there is a place for the study of the normative for he has argued that it is the *failure* "to recognize the fundamentally distinct character of inquiries into what is and inquiries into what ought to be, that is really responsible for attempts to solve practical economic questions without reference to their ethical aspects." The same can be said of Lionel Robbins. Others even make a place for normativism within science. Rudner (1953, 6) writes, for example, "that a science of ethics is a necessary requirement if science's progress toward objectivity is to be continuous."

The history of outright normativism is long and honorable, if confusing and contradictory. It goes back to the Greek classicists and the earliest biblical writers. Bentham's utilitarianism and Kant's categorical imperative are examples of normative positions which have had their impacts on modern

welfare economics (Trant 1959). More recently, we find G. E. Moore's ([1912] 1955, [1903] 1959) intuitionism having its impact on the position of utilitarianism in moral philosophy. On the U.S. side of the Atlantic, R. B. Perry (1926) makes the case for regarding "value as any object of desire" and argues against Moore's intuitionism. Perry argues that goodness is more than a mere matter of intuition—that the fact that the word "good" can be used as an adjective without being defined is no proof that it is undefinable. Ewing, one of Moore's students, counters that Perry's definition of value as an object of desire is psychological, which is, we suppose, a matter of what is rather than what ought to be. Ewing argues that ". . . if good = desired, better must = more desired, so that goodness is in proportion to the degree of desire and this is obviously not so," revenge being a counter case in point (Ewing 1953, 95). In the United States, C. I. Lewis (1955) has clarified the distinction between good and bad, on one hand, and right and wrong, on the other, that was used earlier in the paper . . . in discussing the practical nature of farm management teaching, research, and advisory or extension work. This distinction was also important in helping this writer see the possibility that Dewey was dealing with "exchange values for "right" actions rather than identifying goods and bads. Lewis also mobilizes a telling argument against the fears of welfare economists and others with respect to the measurement of utility and Bethamic fears of antipathy and sympathy. Lewis (1955, 67) wrote "We also make judgments concerning the value-qualities of experience we predict or regard as possible for others. And let us not be misled by the obvious dubieties affecting our apprehension of the experience of other persons into any belittlement of the possibility and practical importance of such judgements. It is only by some assurance in judgments of that sort that we can do anybody else any good—or any harm. For the social animal, considerable accuracy in judging the satisfaction or dissatisfaction which his actions may cause to others, is essential for keeping out of trouble, to say nothing of making friends and influencing people."

While neither the above nor my reading is exhaustive by any means, no position within normativism seems capable of being defended against proponents of opposing positions either within or outside of normativism. It appears, however, that normativists do a better job of defending themselves than would be expected from the unwillingness of farm management men to be normativists.

SUMMING UP AND A POSITIVE SUGGESTION

The Present Situation

At this point, it appears to me that Lord Keynes' famous statement on economists and political philosophers should be restated to read as follows (J. M. Keynes 1942, 383–84):

> The ideas of moral philosophers and of the philosophers of science, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world of farm management teachers, researchers and extension or advisory officers is ruled by little else. Practical farm management men, who believe themselves quite exempt from ivory tower influences, are usually the

accidental slaves of some defunct philosopher whose ideas they happen to have encountered. Similarly, research, teaching and extension or advisory administrators, who want value problems handled in certain ways, are often distilling their special positions from chance contact with the ideas of some philosophic scribbler of a few years back. There are not many who make contact with different philosophic ideas after twenty-five or thirty years of age. And, among those who do make such contacts, few explore the conflicts among such ideas in the hope of selecting the most useful or of developing superior positions. Consequently, the positions which farm management teachers, extension or advisory workers and, even, researchers, take on value problems are not likely to be the most clear, consistent and applicable. But sooner or later it is such positions which condition our ability to contribute to the advancement of farm management.

A Suggestion

My contacts with Professor Wisdom at Trinity College this past summer have produced a way of looking at philosophic scribbling which is not, I think, a position on values but is, instead, a position on how to go ahead in selecting and developing positions on values.

Statements about how to deal with values are sometimes simple and easily understood and sometimes complex, strange, and hard to understand. The simple statements are not hard to handle. Those which are meaningful to us as farm management men can be used; those which are not can be neglected.

The complex, strange, and difficult statements or positions about values, however, are apt to be more difficult to sort out. Complexity and difficulty may be confused with profundity. Meaningless statements and portions of statements may be confused with meaningful ones and needlessly followed at the expense of undue restrictions on our activity.

While disregard of all complex, strange, and difficult statements about values seems to be one way of avoiding the danger of undue restrictions, this procedure involves the risk of (a) disregarding important restrictions and (b) failing to benefit from important contributions which complex, strange, and difficult statements may contain. We seem to be constrained to study, compare, and extend the many positions held by members of our discipline in order to ascertain their meaning and importance for farm management and the tasks which are encountered within it. And until things are more settled, there appear to be some real advantages in looking carefully at the individual characteristics of situations in which each particular value problem arises.

Summing Up

In a very real sense, this suggestion has been followed in the above discussion of positivism, conditional normativism, pragmatism, modern welfare economics, and outright normativism. We found that:

1. All five of these positions have provided an important basis for useful work in farm management.

> 2. All five contain restrictions [on each other] which can be ignored advantageously in certain situations.
>
> In Knight's (1956) terms, farm management deals with social phenomena, a "serious analysis" of which has "... to be based on a quite complicated pluralism."

There was much confusion about how to study values in the "Interstate Managerial Study" (IMS) whose influence on present-day academic farm management was discussed in King's chapter of this book (chap. 2). This confusion grew out of the heavy influence of the "pure" positivism of Cornellian farm management thought and of the logical positivism and conditional normativism in the thinking of those bent on using more static and dynamic economics in farm management. These two philosophic orientations contributed to failures by academic farm management workers (including me) to distinguish between (1) problems and kinds of information used to solve them and (2) goals versus values, or "goodness and badness" versus "rightness and wrongness" (ala C. I. Lewis 1955). These two failures are addressed in the following subsections.

Problems Versus Kinds of Information

The problems addressed by real-world farm managers arise out of changes. Information about these changes is important to managers. IMS researchers tend to confuse kinds of changes and information about them with kinds of problems. In the IMS book entitled *A Study of Managerial Processes of Midwestern Farmers* (Johnson et al. 1961), the following appears on pages 9 and 10:

> ... the original model [of managerial processes] as elaborated in the basic references paid little attention to how normative beliefs are developed and used by managers in defining and solving problems. Attention was focused on the development and use of nonnormative concepts in the solution of previously defined problems. Still further, the model borrowed directly from statistical *procedures* for choosing between alternatives (hypotheses) and, hence, concentrated [like statistics] on simple problems involving only *one* kind of factual or nonnormative beliefs. Thus we find, "Five kinds of *problems* have been important ... (1) technical problems, (2) price problems, (3) problems created by changes in technology, (4) problems involving political, economic and social institutions, (5) personality problems" (Johnson 1954) and "almost all the *problems* which concern managers can be classified under one of the following subjects: 1. Changes in prices or lack of information concerning prices. 2. Lack of information concerning existing production methods. 3. Changes in production methods. 4. Changes in personalities, and lack of information concerning personalities. 5. Changes in economic, political and social institutions and lack of information concerning ... existing institutions" (Bradford and Johnson 1953, 11 and 15). At other times [in the IMS], essentially the same classification was regarded as a classification of the kinds of *information* used by farmers in solving problems. Thus we find

> "five broad subject matter areas which managers must study, as a basis for adjustment, can be distinguished . . . (1) price structures and changes; (2) production methods and responses (including weather effects); (3) prospective technological developments; (4) the behavior and capacities of people associated with farm business; and (5) the economic, political and social situations in which a farm business operates" (Johnson and Haver 1953, 8–9).

Commitments to positivism (whether pure or logical) and conditional normativism (a variant of positivism) probably obscured for IMS researchers the normative nature of prices as monetary values. They also had to face the fact that the monetary and nonmonetary values of technologies, institutions, people, and resources were kinds of information as important as "value-free" information about these same "driving forces" in creating, describing, and solving the problems of change. What we know about types of information or knowledge important for farm managers deepened over the years with the study of philosophy, the empirical investigation of kinds and sources of knowledge used by managers (both private and public) and empirical studies of problem definition and solving (including learning) and decision making. In 1988, I summarized what studies of managerial inquiry (by farmers) had produced since World War II (Johnson 1988). In that paper, entitled "Farm Management Inquiry" and published in *Determinants of Farm Size and Structure*, which is unhampered by phrases (1) treating farm management as a discipline or (2) overtly or implicitly asserting the nonreality of values, I wrote the following:

> (on p. 21) Most farm management scholars and observers of farmers agree that the managerial activities of farmers include the definition and solution of problems encountered in running farms. Generally, farmers concentrate on the definition and solution of practical problems while overtly or implicitly expressing disdain for the disciplinary questions economists, statisticians, sociologists, and other disciplinarians sometimes refer to as "problems." Farmers are concerned with deciding what is the "right" course of action for them to take to solve a problem at hand—not with answering questions to improve academic disciplines.
>
> The practical problems of farmers ordinarily have many dimensions. One crucial dimension is that of values (Johnson 1960, 13–25). Until well-defined, a problem generally involves an awareness that "less good" is being attained than could be attained with resources being used, or that "more bad" is being experienced than would have to be, given the resources being used to avoid badness.
>
> Though knowledge of values is clearly important in defining (and solving) problems (Johnson 1960), value-free knowledge is also crucial. In many instances, the two kinds of knowledge appear to be pragmatically interdependent. The value-free knowledge required to solve a problem is typically multidisciplinary, often involving (among many other kinds of knowledge) knowledge about one or more agricultural technologies based upon knowledge generated by more than one of the basic biological and physical science disciplines. Similarly, the required knowledge of values is complex.

Some of the values are monetary, some nonmonetary. Some are extrinsic or exchange values while others are intrinsic.

Sometimes the knowledge available to a farmer when a problem is encountered is not sufficient to permit adequate definition of the problem; in such instances, learning, which is considered in more detail later, becomes an inherent crucial part of problem definition.

(on p. 3 and 4) It is repeatedly observed that successful managers are quicker and more efficient (in some sense) learners than less successful ones. They acquire accurate value-free and value knowledge quicker and at less cost to become better at defining and solving the problems they face. Past studies of managerial processes have indicated that the knowledge farm managers acquire is about technology, institutions, people and, perhaps, available resources (Johnson 1961). With respect to each of these three or four broad categories of knowledge, managers acquire both value-free and value information, the latter being nonmonetary as well as monetary, and extrinsic as well as intrinsic. When farm managers learn they, like others, focus on knowledge about the past and present in order to generate predictions about the future, i.e., knowledge comes in at least three tenses (see Table 3.1).

Learning in its broad sense includes the purchase of knowledge from consultants (lawyers, engineers, veterinarians, fertilizer experts, tax experts, and the like) and the use of subsidized sources of knowledge such as Soil Conservation Service and Cooperative Extension Service personnel. It also includes the generation of knowledge within the managerial unit itself. Whether self-generated or acquired, additional knowledge eventually has diminishing value to a manager. At the same time, it becomes increasingly expensive at the margin. There is an economics of determining the optimum amounts to acquire of each of the many kinds of knowledge relevant for solving a problem (Hardy 1923, Knight [1921] 1946, Hart 1946, Wald 1947). Knight's risk, uncertainty, and certainty taxonomy remains relevant but requires modification for sequential (Bayesian) processes, and the multidisciplinarity of problem definition and solution (Johnson and Lard 1961).

Table [3.1]. Knowledge Used by Farm Managers

SUBJECT	KNOWLEDGE OF VALUES						VALUE-FREE KNOWLEDGE		
	MONETARY			NONMONETARY[1]					
	Past	Present	Future	Past	Present	Future	Past	Present	Future
Technical									
Institutional									
Human									
Resources									

[1]Each of the three kinds of value knowledge under this heading could also be divided into intrinsic and extrinsic (exchange) value. Monetary values must be almost universally regarded as exchange values.

Note that the table above covers information on four subjects in three tenses. Further it covers knowledge about values and knowledge that is value free. For all four subjects, value knowledge is broken down into monetary and nonmonetary while the table footnote considers the differences between intrinsic and extrinsic values. As such, the table markedly improves the presentations cited above from my own 1953 textbook and a 1954 bulletin I wrote on managerial concepts:

> (also from the NC181 report cited above, on p. 4) There is an economics of learning that defines the optimum amount of knowledge to acquire by equating the marginal value of knowledge with its marginal costs (Johnson and Lard 1961). As soon as this is recognized, the static distinction is lost between the firm as a maximizer of net monetary values and the household as a maximizer of net nonmonetary values. The managerial or governance unit of a firm becomes a maximizer of the net monetary value of its own activities. Economizing is important in performing the six managerial activities of: (1) defining problems, (2) observing and (3) analyzing (which together constitute learning), (4) deciding, (5) executing, and (6) bearing responsibility (Bradford and Johnson 1953, 5; Johnson et al. 1961, chap. 9, 2–8; Johnson 1977, 1986). Each of these activities generates results of value at costs of which the nonmonetary costs are so important as to require conversion of the monetary to nonmonetary values rather than vice versa, expected utility analyses being cases in point.
>
> (and on p. 5 of the same report, we find) Managerial judgment appears to depend fundamentally on knowledge of what has value (goodness and badness) and about the truth of value-free perceptions. Judgments of normative truth, like judgments about value-free truth (if the two can be separated), are related to objectivity. Objectivity involves, in turn, a willingness and ability to abide by the results of the tests of (1) logic (coherence), (2) experience (correspondence), (3) clarity (lack of ambiguity), and (4) workability (Johnson 1986). Good managers can be observed to possess accurate value-free and value knowledge. Further, managers who can accurately judge the truth of value and value-free information are also better able to judge when additional knowledge is likely to be worth more than the costs of obtaining it. Perhaps nothing is more important in training farm managers than to instill in them "good judgment" along the lines just discussed, whether we teach as resident instructors, extension workers, advisors, or consultants.

GOALS VERSUS VALUES OR CONCEPTS OF GOODNESS AND BADNESS VERSUS THOSE OF RIGHTNESS AND WRONGNESS (ALA C. I. LEWIS) AND THE POSSIBLY FALSE FACT/VALUE DICHOTOMY

Failures to distinguish between concepts *concerning* "what ought to be done" (sometimes referred to as "goals" or "values") and concepts of "goodness" (sometimes also referred to as "goals" or "values") have confused academic farm managers and their work on managerial theory. See, for example, these ambiguities in my own article reproduced above and entitled "Value Problems in Farm Management." A closely related difficulty

is the one of distinguishing between the "rightness" and "wrongness" of acts (past, present, and future) and the goodness and badness of different aspects and consequences of acts. At least as damaging has been the highly questionable fact/value dichotomy that is the hallmark of logical positivism. These difficulties are far more than semantic because the conceptual differences involved have an importance that is independent of the words used in our confused discussions. Such confusions were present in the academic farm management work that preceded the Interstate Managerial Study (IMS) and, as indicated above, were present in that study itself; further, they persist today throughout academia and in much of academic farm management. The following excerpts illustrate my own efforts to use C. I. Lewis's (1955) distinctions to clarify these confusions in the literatures of farm management, public agricultural decision making, and research methodology.

In a book published by the Texas National Energy Modeling Project entitled *An Evaluation of the Normative and Prescriptive Content of the Department of Energy Mid-Term Energy Forecasting System (MEFS) and the Texas National Energy Modeling Project (TNEMP)*, and coauthored in 1980 with Judith Brown, I wrote:

> . . . At this point it seems worthwhile to make our vocabulary more precise. It is particularly useful to define the words *positive, normative,* and *prescriptive* . . . Such definitions are needed because of the wide variation in meanings assigned to these words by researchers in the biological, physical, and social sciences. A recent chapter by Fritz Machlup entitled "Positive and Normative Economics" (Machlup 1969, 99–124; Lewis 1955) indicates the need for such definitions by displaying numerous ways in which each of these three words are used in economics, just one of many disciplines . . .
>
> The word *positive* is used [in this book] as an adjective modifying knowledge or as a noun standing for a kind of knowledge. Positive [or value-free] knowledge deals with characteristics of the real world not having to do with the goodness or badness, per se, of a condition, situation, or thing [including acts].
>
> *Normative* is also used . . . as an adjective modifying knowledge or as a noun standing for a kind of knowledge. Normative knowledge deals with the goodness or badness, per se, of conditions, situations, and things . . . the [author] . . . and many respected philosophers treat empirical . . . knowledge [of values] as being attainable.

In *Research Methodology for Economists* (Johnson 1986, 18–20), I wrote:

> Prescriptive knowledge is knowledge about what ought or ought not to have been done, or ought or ought not be done. Prescriptions are sometimes expressed in the future tense as goals or targets. They are also expressed as actions in the present tense; at times they are stated imperatively as laws, regulations, social mores, and norms enforced with sanctions. On still other occasions they are recipes or standard solutions for standard problems. In evaluating past actions, prescriptions are also expressed in the past tense as statements about what ought or ought not to have been done. Prescriptive knowledge can be regarded as a function of value-free knowledge and

> knowledge about values and, as such, is a logical consequence of them. The functions (sometimes but not always strictly mathematical) relating value-free positive knowledge and knowledge about values to prescriptions are decision-making rules. While values and the value-free characteristics of conditions, situations, and things can both be viewed as observable and experienceable, the prescriptive cannot. The prescription is a decision to act, not the act prescribed or any condition, situation, thing, or event. Prescriptions are defined . . . by applying a decision rule to knowledge of values and value-free positivistic knowledge—its rightness and wrongness is definitional but not observable.
>
> Perfect knowledge is infinitely expensive for mortals. Indeed, some points of view about the reality of values hold that it is impossible to have any objective knowledge about values as characteristics of the real world. Thus, conflicts arise in reaching prescriptions to solve problems that are not always resolvable by acquiring more knowledge. In such instances, the decision rules used to convert knowledge about values and value-free knowledge into prescriptions are typically based on or include arbitrary distributions of power. This is nicely illustrated by the simple majority, two-thirds majority, or unanimous decision rules in political decision making. Conflict resolution involves decision rules that trade off increments of different values against each other in attaining a more ultimate value (or common denominator) within the constraints of unredistributable distributions of power.
>
> The exercise of power is often necessary in reaching decisions when we lack agreed-upon knowledge of a common denominator of value and/or agreement on value-free knowledge. Various social, political, market, and military covenants institutionalize distributions of power into decision rules. A few of the kinds of power distributed among individuals and groups by such covenants include those associated with ownership of income-producing resources, the possession of political and social rights, command of military and police resources and, indeed, the power of knowledge itself.

For farms and in farm families, power is distributed among and exercised by different family members, creditors, governments, shareholders if the farm is incorporated, and partners if organized as a partnership. Continuing now from *Research Methodology for Economists* (Johnson 1986) we find:

> To reiterate, prescriptive knowledge deals with what it is or will be right or wrong to do. When we evaluate past decisions, we try to determine whether or not it was right to prescribe the act someone tried to carry out. When we set our goals and targets we decide or prescribe what ought and ought not to be done in the future. When we act to solve a problem, we try to execute prescriptions (decisions).
>
> It is important, as C. I. Lewis (1955) points out, to distinguish between goodness and badness, on the one hand, and rightness and wrongness, on the other. For example, it is not always right to do what is good because often it is possible to do something still better at the same cost or sacrifice. Conversely, it is not always wrong to do what is bad. The situations we face often make it necessary to minimize losses. We find it right to do bad if it is

the least bad that can be done in the circumstances. For example, doctors typically write prescriptions that minimize badness for their patients. Particularly in the case of cancer patients, many of the treatments prescribed are bad in themselves, and healthy people would not subject themselves to their side effects. However, both patient and doctor often agree that it is right for a doctor to prescribe a treatment that will, hopefully, be more lethal for the cancer than the patient.

Prescriptive knowledge—about rightness and wrongness—is the logical consequence of a decision rule applied to a body of knowledge about values and a body of value-free knowledge. Hence, prescriptive knowledge is not primitive. By contrast, knowledge of values—of goodness and badness—can be viewed as experiential. Goodness and badness will be viewed in Chapters 5 and 8 as primitive terms (Moore [1903] 1959; 6-8, 17-21). Rightness is not experiential but definitional—it specifies "what ought to be."

. . . the word prescriptive [should] be used consistently to deal with what ought or ought not to be done—with what is right or wrong. The word value—about goodness and badness—[should] not be used to deal with what ought to be done despite the widespread tendency to define values as dealing with "what ought to be done."

. . . Problem-solving processes have been diagramed and outlined in many ways depending on the background and experiences of the authors. [The] figure [that follows] . . . has been used extensively in discussion of public problem-solving processes and in consulting at national and subnational levels [as well as by academic farm management workers]. Note that all the arrows are two-way arrows, indicating two-way flows of knowledge and interdependencies. The process is regarded as iterative as it involves repeated trial and error. It is also regarded as interactive when more than one person is involved in defining and solving problems and in executing decisions.

There are two information banks in the figure. One contains positivistic [value-free] information; the other, normative information. The meanings of the words positivistic and normative [were presented above]. At this point we stress that a part of the normative knowledge is prescriptive knowledge for solving problems; thus, recipes, rules, laws, regulations, and social norms and mores are found in the normative information bank as well as information about values. In [the] figure . . . the decision maker is viewed as *defining* a practical problem on the basis of both knowledge about values from the normative information bank and value-free knowledge from the positivistic information bank.

A decision maker is envisioned in [the] figure . . . as being aware of a difficulty and believing that he or she might be able to take an action that would make the situation better. The figure portrays the decision maker as *carrying out observations* to obtain new information, both positivistic and normative, some of which can be lodged in the appropriate information bank. The decision maker is then seen as *analyzing* both kinds of information, with possible feedback to get more observations or to redefine the problem. The analysis is then fed into the *decision step*, where an attempt is made to process the two kinds of information through a decision rule into a prescription

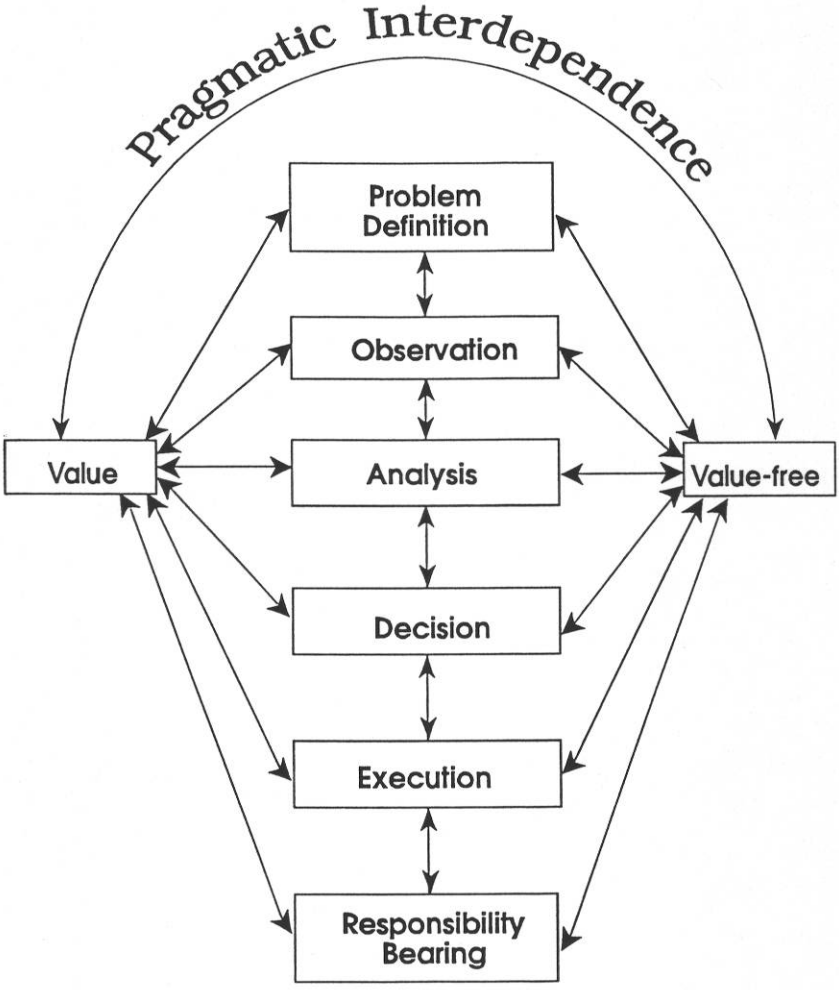

FIGURE [3.1]. Steps in problem solving related to value-free and value knowledge [Johnson 1976].

about "what ought" to be done to solve the problem. Again, feedback is possible.

When knowledge about values and value-free knowledge is imperfect among people with conflicting interests, the incorporation of existing distributions of power into decision rules permits resolutions of conflict. The role of power is considered later in this chapter in discussing the nature of prescriptive knowledge. The next step is that of executing the decision. The *final* step is bearing responsibility for both the decision and its execution.

The six steps are treated as mutually interdependent, with much feedback, iteration, and interactions between them. Some of the feedback is from the future to the present as the decision maker tries to envision the consequences of alternative decisions to carry out different acts. Some pragmatists believe that attention to consequences in the process of solving a problem changes the value and value-free information involved. This results in an interdependence between value-free knowledge and knowledge about values that is shown in the figure with a two-way arrow labeled "pragmatic interdependence." The presence of the arrow in [the] figure . . . should not be taken to indicate that I regard value-free knowledge and knowledge about values as always interdependent; instead, it explicitly provides for them to be so regarded if this seems to be the case. Though the prescriptive content of the normative information bank usually depends on value-free information as well as information about values, this is not the same as interdependence between value-free positivistic knowledge and knowledge about values.

Some people express a concern that such interpretations imply more rationality than is exercised by real-world decision makers. To understand the importance of these concerns, one needs to consider the meaning of rationality. It varies a great deal from one philosophy to another and from one discipline to another as disciplines tend to specialize on different philosophies.

For some, rationality means being logical. For others, it means being objective, which has as many meanings as rationality. For still others, rationality means insisting on objectivity about the acquisition and use of positivistic knowledge and knowledge about values to be processed through an explicitly stated but varying decision rule to solve practical problems. Such a conception of rationality also requires that decision rules, like the knowledge they process into a decision, be selected in an objective manner. Thus, there is an infinite regression of decisions about decision rules to use in selecting decision rules. The last meaning is what I have in mind when I use the term rationality. Objectivity with respect to value-free knowledge, knowledge about values, and decision rules [are] discussed in later chapters [of this book (Johnson 1986)].

One cannot deny that there is a great deal of irrationality on the part of real-world decision makers. That does not prevent the interpretation presented here from being useful to students of research methodology for economists. Much research is done to improve decision making, and research itself is supposedly one of the most rational and objective of human activities. I am aware, though, of Feyerabend's (1975) aversion to doctrinaire rationality and conformism in research methods and of his endorsement of the use of subterfuge, rhetoric, and propaganda in science.

In chapters 6 and 8, Michel Petit and Warren Samuels raise questions about the possibility of acquiring objective knowledge of values. I have

elected to republish in this book some of my additional writings on this subject. I am putting this material in chapter 7 because it is at least as germane for public policy problems and issues considered by Petit as it is for private farm management considered by King. The reader is urged to turn to the digression in the third part of chapter 9. Readers of chapter 7 will also be referred to chapter 9 in response to Petit's similar concerns.

CERTAIN ASPECTS OF FARM MANAGERIAL THEORY AND PRACTICE NOT COVERED BY KING

Space, time, and other considerations made it necessary for King to define, organize, and write his paper in a manner that precluded some topics he probably wanted to include. He focused on selected aspects of the first four of the six managerial functions considered in the figure above entitled "Problem-Solving Steps Related to Kinds of Knowledge Used"—*problem definition*, learning (*observation* and *analysis*), and *decision making*. The six managerial functions or steps studied in the IMS also included *action* or *execution* and *responsibility bearing*. In what follows, I present excerpts from my contributions to the literature that deal either with the two functions or steps King did not consider or with certain aspects of the four steps he covered. More specifically, I will deal with (1) risk preference and aversion (as aspects of decision making) that were partially considered by King, (2) the inseparability of the action or execution and responsibility functions of management from the other four managerial functions, (3) the importance of asset fixity theory for farm management, and (4) the bright promise of the public (multiple person) choice/transaction cost approach for academic and practical farm and home management work.

Risk Preference and Aversion

My thinking on this subject is stated in an article entitled "Risk Aversion vs. Aversion for Losses and Risk Preference vs. Preference for Gain" (Johnson 1987, 109–19) reproduced below in a partially abridged form:

> . . . This chapter deals with a set of unanswered questions in the discipline of economics which are extremely relevant for the future of farm management practice and research . . .
>
> [It] is based upon the following theses:
>
> 1. Risk aversion is substantially different from aversion for losses of wealth and income.
> 2. Risk preference is considerably different from desire for gains in wealth and income.
> 3. Much of the current literature and work on the expected utility hypothesis, risk aversion, and risk preference fails to distinguish between risk

aversion and aversion for losses as well as between risk preference and preferences for gain.
4. The confusions noted in (3) interfere with our ability to deal properly in farm management research, teaching, and extension with the very different subjects of (a) risk preference and aversion, and (b) the values of gains and losses in income and wealth.
5. Risk aversion and preference as well as the utility of gains and losses in income and wealth are of substantial importance for farm management as a field of study in socialistic as well as capitalistic countries.

HISTORICAL BACKGROUND

The expected utility hypothesis has long and respected roots in the works of Bernoulli, von Neuman and Morgenstern, and Friedman and Savage which have been ably summarized by John Dillon (1971). More recently, there has been a virtual explosion of literature on the expected utility hypothesis which has also been ably summarized by Schoemaker (1982).

In their early article, Friedman and Savage (1948) noted that previous utility analysis of choices involving uncertain events had tended to posit either (1) decreasing marginal utility for income which (in the absence of fear of satisfaction from taking chances) eliminates gambling for gain at unfair odds or (2) increasing marginal utility which (in the absence of fear of risks) eliminates insuring against losses at unfair odds but that (3) many apparently rational people both insure and gamble at unfair odds. Borrowing on the formalizations of von Neuman and Morgenstern, Friedman and Savage demonstrated that an individual can rationally both insure and gamble at unfair odds if he (1) attaches increasing marginal utility to *gains* in income, (2) attaches increasing marginal disutility to *losses* in income, and (3) maximizes expected utility. Friedman and Savage concentrated on the shape of an individual's utility function without, for the most part, attention to either the fear of taking chances or the "entertainment value (utility)" of participating in chancy activities. If an individual's utility function for income (and wealth) increases at an increasing rate above his or her present level of income and that individual maximizes expected utility in choosing among risky alternatives, it can be rational for that individual to gamble at unfair odds for gains large enough for her or him to experience increasing marginal utility from the gain. Similarly, if the person's utility function for losses in income and wealth falls at an increasing rate and if expected utility is maximized, then it can be rational to insure at unfair odds. The crucial determining consideration is the utility attached to gains in the case of gambling and, in the case of insurance, the disutility attached to losses. This made a major contribution to our understanding of the insuring and chance taking (gambling) behavior of entrepreneurs but contributed little to our understanding of the fear of or satisfaction derived from risk taking. However, many current "expected utility analysts" use Bernoulli, von Neuman/Morgenstern, and Friedman/Savage analysis in elaborate theoretical studies of risk aversion and preference in the mistaken idea that somehow or another they are dealing with the fears, joys, and entertainment value associated with chance taking.

To elaborate further, Friedman and Savage calculated (by methods now well known) the expected utility of risky events using probabilities to weigh

together the values (utility) of possible outcomes in a manner which treated the utility of any outcome, once attained or experienced, as independent of the risk involved in attaining it. This amounts to an implicit assumption of risk neutrality as the utilities of possible outcomes are treated as independent of the utility or disutility which the decision maker might attach to the act (not the outcome) of running a risk whether for a gain or a loss. The computations simply do not take into account the possibility that negative or positive utility might be attached to bearing risk. To put it differently, the computations do not take into account any utility or disutility associated with the experience of risk.

The "entertainment value" of taking chances is specifically excluded at one point by Friedman and Savage (1948, 304). Also, in the last part of the Friedman and Savage article, reference is made to "inveterate gamblers" and "inveterately cautious" individuals. They are regarded as individuals having different kinds of utility functions than postulated for individuals who both insure and gamble (Friedman and Savage 1948, 299). In labeling Figure 1, page 290, Friedman and Savage label a diagram on insuring "preference for certainty" and one on gambling "preference for risk." Careless reading of such phrases might cause a reader to (1) associate risk aversion with utility functions which are concave down and risk preference with utility function which are convex up, and (2) presume that the utility function of Friedman and Savage's inveterate gamblers or insurers do not display both concavity and convexity. In any event, Friedman and Savage ignore fears of or satisfaction derived from taking chances by treating the utility of any given amount of income as invariant with respect to the probability of attaining it.

By the 1970s, following publication of the 1948 Friedman/Savage article, two confusions were firmly entrenched in both theory and empirical work:

1. Persons perceived to have convex utility functions for wealth and income which increase at an increasing rate were classified as "risk preferring" without attention to whether or not risk taking had "entertainment" or other value to the person involved.
2. Persons perceived to have concave utility functions for wealth and income which increase at a decreasing rate were classified as "risk adverse" without attention to whether or not risk bearing was onerous.

Thus, more than a generation of economists and agricultural economists came to identify (1) evidence of concavity in utility functions with fear of chance taking and (2) evidence of convexity in utility functions with preference for chance taking. This confusion has generated much mischief.

1. Perhaps the most important resulting mischief is that it has kept a generation of scholars researching the shapes of utility functions empirically and constructing elaborate theory about such shapes in the mistaken idea that they were dealing with "true" risk aversion, i.e., fear of chance taking, and "true" risk preference, i.e., pleasure from taking chances.
2. In some instances, scholars have even proposed biographical studies of entrepreneurs to discover (a) why persons with concave utility functions for wealth and income fear taking chances and (b) why those with convex utility functions for wealth derive pleasure and satisfaction from bearing risks.

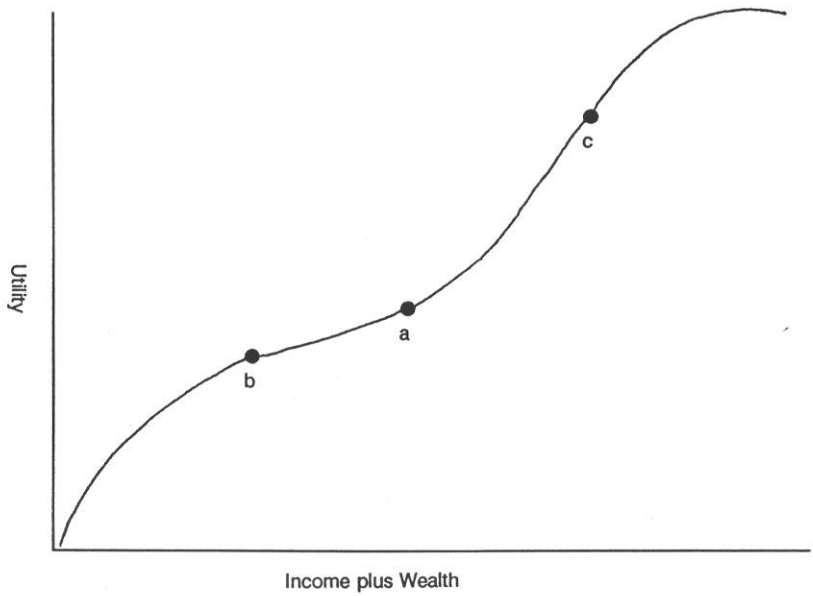

FIGURE [3.2].

3. Unfortunately, this confusion has also prevented many scholars from researching what might be called "true risk aversion" and "true risk preference" (a) *empirically* and (b) *theoretically*.

Agricultural economists such as this author have complained about this confusion both informally and formally (Johnson 1978, 123–35; Johnson 1982). A recent article by Krzysztofowicz (1983) tackles the problem rigorously. In agricultural economics, Robison and Fleisher (1983) now explicitly recognize the confusion.

THE SHAPES OF UTILITY FUNCTIONS

This section is divided into subsections. The first subsection discusses some of the available evidence on the shapes of utility functions of wealth and income. The second subsection deals with the importance of these shapes for farm management. The next section deals with the risk aversion (fear of chance taking) and risk preference (enjoyment of chance taking).

Gains, Losses, Social Status, and the Shapes of Utility Functions

The last section of the Friedman/Savage article presented some very interesting and tentative explorations of the relationships between income (and wealth) on the horizontal axis and utility on the vertical axis.

Friedman and Savage postulated a utility function somewhat as pre-sented in [the figure] below. The Friedman/Savage article did not specifically include wealth along with income; however, by implication, real income would include changes in one's stock of wealth as well as one's flow of income per unit of time. Thus, the horizontal axis of [the figure] is labeled "income plus wealth" for the period under consideration. Though Friedman and Savage speculated as to whether poor people were at different locations on such functions than richer people, that subject seems less important for farm management than for the study of policy and is not pursued further here except for the following observations.

A person in the vicinity of point "a" in [the figure] would be expected both to insure and gamble at odds of some degree of unfairness for sufficiently large gains or losses. A person at point "b" would be expected to insure against modest losses at odds of some degree of unfairness but not be expected to gamble at unfair odds for anything but very large gains well up into the area where the utility function increases at an increasing rate. Individuals at or above "c" would not be expected to gamble at anything less than fair odds for any gain appearing on the function and to insure at odds of some degree of unfairness only for very large losses.

When Friedman and Savage considered poor and rich people, they did not discuss whether the rich had been rich long enough to be adjusted to their richness or were "maladjusted" *nouveau riche* by nonparallel shifts in their utility functions. Conversely, they did not discuss whether they were dealing with the maladjusted poor or *nouveau pauvre*. This subject is important in farm management when farm managers experience disasters and extremely good fortune. Generally speaking, nouveau riche and pauvre are regarded in literature, the theater, and in practice as strange, somewhat abnormal or maladjusted persons. An individual at point "c" in [the figure] could be regarded as a nouveau riche who had not yet learned the importance of (1) conserving newly acquired resources with insurance and (2) taking risks for still further gains whose goodness is yet beyond his comprehension. Conversely, a nouveau pauvre at point "b" might also be a strange sort of person who has not yet learned to attach increasing marginal utility to modest gains from his new position of poverty. Such reasoning tends toward the conclusion that people become adjusted to various wealth positions in the sense that they develop utility functions displaying both increasing marginal utility for gains and increasing marginal disutility for losses. A graduate student, for instance, can be envisioned as willing to pay unfair odds for nondeductible insurance on his five-year-old automobile while buying a lottery ticket at unfair odds for a new automobile. We can envision the same person thirty years later as a well-established full professor, unwilling to pay unfair odds for less than a $400 deductible policy on a new automobile, unwilling to buy a lottery ticket on a new automobile at unfair odds, but very willing to buy a lottery ticket at equally unfair odds for a quarter-of-a-million-dollar prize because such a prize would now change his relative social status and, hence, utility function as much as a new automobile would have thirty years earlier when he was a struggling student.

In socialist societies, one can conceive of nouveau riche and pauvre public enterprises, societies, and nations. Socialized decision-making units are also required to take chances, sometimes at unfair odds, for important gains. On other occasions, they develop informal and formal insurance schemes to protect their resources and the capital they have. As these schemes can be operated only at a cost, they necessarily involve unfair odds, at least for the whole of the society involved.

The Importance of Utility of Gains and the Disutility of Losses in Farm Management

Friedman and Savage provided insights about the importance of gains and losses which can easily be further developed by farm management teachers, extension workers, and researchers to improve their work.

Risk-neutral, truly risk-adverse, and truly risk-preferring farmers (as managers) can all be expected to take formal and informal gambles at unfair odds to attain important gains and to insure (both formally and informally), again at unfair odds, to avoid important losses. Though the location and nature of managerial units differ between socialist and capitalist societies, risk is encountered by farm managers in both kinds of societies when they make decisions involving imperfect knowledge of gains and losses. Capitalist countries have private formal insurance companies to provide protection against losses. The necessary expenses of these companies are paid by the premiums which are "unfair" in the sense that they more than cover losses by a margin sufficient to cover the necessary costs of running the insurance program. Socialized countries have, of course, socialized the bearing of different risks—often without setting up formal insurance contracts specific to individuals and kind of misfortune. Many insurance schemes are also informal in capitalistic countries, but whether formalized or not and socialized or not, costs have to be borne and the "odds" for some entity—private or social—have to be "unfair." Thus, the decision unit has to be asked the question: Is it advantageous to insure against loss or to take chances for gains at unfair odds?

Research in the north central region of the United Stated of America (Halter 1961, 137) has shown that the gains required to get persons to accept unfair odds in gambling schemes were several times as large as the losses which elicit acceptance of equally unfair odds in insurance schemes. Most farm management research in recent years has dealt with losses and only very modest gains. Such research has indicated increasing marginal disutility for losses and decreasing marginal utility for gains. Consequently, one gets the impression that farmers mainly have utility functions for income and wealth which are concave down (risk adverse in the confused sense in which the term is so often currently used). The shapes of such utility functions do not provide evidence for the absence of convexity in utility functions for larger gains. Such evidence would, of course, be contrary to widespread participation of farmers in unfair lotteries, other formal gambling schemes, and the informal chance taking engaged in by farmers. Halter's research (Halter 1961) provides evidence that many Midwestern U.S. farmers have utility functions consistent with simultaneous insuring and change taking at unfair odds.

The Pleasures and Fears of Taking Chances and Farm Management

Like the previous section, this section is divided into two parts. The first subsection deals with "true" risk averters who fear taking chances and with "true" risk preferrers who enjoy or derive pleasure from taking chances. The second subsection deals with true risk aversion and preference in farm management.

The Pleasures and Fears of Taking Chances

It seems obvious that different farm managers attach different utility or disutility to taking chances. These utilities are separate and apart from the utility of the events which may result from decisions made. There are farm managers who "are afraid of their shadows." There are also those who enjoy gambling so much that they take risks for their entertainment value. The moderate fears and pleasures associated with taking chances appear to be a part of the "normal" variation among decision makers in the satisfaction they derive from their environment. Extreme variations, however, tend to be regarded as pathological. As in the case of the *nouveau riche et pauvre*, literature deals with daredevils and overcautious `fraidy cats.

True Risk Aversion and Preference in Farm Management

Daredevil farm managers take undue chances, eventually losing their private net worths and social resources or, in socialized economies, wasting the resources of their enterprises and societies. The *'fraidy cats*, on the other hand, are so cautious they let resources sit idle while they try to avoid making decisions involving any chance of error. Clearly, farm management teachers, extension workers, and consultants have to deal with pathological risk aversion and preference in their teaching, extension activities, and consulting. Pathological tendencies seem to be at least as important in socialistic as in capitalistic agriculture. In the socialized sectors of capitalistic countries and in the enterprises of socialist countries, there are examples of managers who can be characterized as careless daredevils in managing public resources and of other managers who can be characterized as overcautious managers afraid to run a chance of being blamed by their superiors for being wrong.

The teaching and training of managers requires that they be taught to have normal fears or joys of chance taking and to avoid (1) pathological, immobilizing fear and (2) equally pathological gambling tendencies to risk resources at unfair odds.

HOLISTIC CONSIDERATIONS IN FARM MANAGEMENT

The above is not the end of the matter in farm management. Management processes are often viewed as involving six highly interrelated steps: problem definition, information accumulation, analysis, decision making, execution, and responsibility bearing (Johnson et al. 1961).

Daredevils attach little value to additional knowledge while the 'fraidy cats attach high value to it. Pathological risk aversion disturbs the normal relationship between decision making and information accumulation. The practical problems which managers face are typically complex and require

for their solution several kinds of knowledge, some about values and some positivistic. As knowledge improves, the probabilities associated with events are changed and the variance of estimates of means is reduced. The "economics of learning" as part of the information accumulation step in problem solving involves equating the marginal cost of learning with the marginal return from what is learned (Johnson et al. 1961). The fears and joys of chance taking are thus important in the economics of learning.

In the English language, there are two words "insure" and "ensure." When a manager *en*sures, he takes steps to make sure that an action results in the desired outcome. A good executive does a better job of *en*suring an outcome than a poor executive. By contrast, when a manager *in*sures, he does not attempt to control the probabilities of different events occurring; instead he protects against unfavorable events by "averaging" gains and losses among managers at a point in time or for his own unit through time. A manager who insures pays to shift a risk from his own unit to a number of units, if he insures across managers at a point in time. If he insures through time, he shifts a risk from a point in time to a number of points in time for his own unit, generally at a cost which lowers average physical or monetary returns but increases the average utility of the expected physical or monetary returns after adjusting for the disutility of the cost.

Though the above discussion is far from complete, it is sufficiently complete to indicate the unity or wholeness of the six steps in the managerial processes. Failure to distinguish between the curvature of utility functions and true risk aversion and preference prevents understanding of (1) other steps in the managerial process and (2) the important interrelationships among the steps. The managerial process is holistic with the total being more than the sum of its unrelated parts. Thus, straightening out the mischief caused by confusing the curvatures of utility functions with "true" risk preference and aversion requires that the group of expected utility analysts presently mired in this confusion deal with the entire process not with just one possible decision rule within the decision-making step.

AN IDENTIFICATION PROBLEM

The confusion of curvature of utility functions with "true" risk aversion and preference constitutes an identification problem for (1) expected utility hypothesis analysts and (2) students of management. As soon as the confusion becomes apparent, the questions arise: How do we eliminate or hold constant the effects of "true" risk aversion when estimating utility solely as a function of income and wealth? How do we estimate the utility of chance taking while eliminating or holding constant the utility of income and wealth? What use can be made of confounded utility function estimates which reflect both the utility or disutility of income and wealth and the utility or disutility of chance taking? In what follows, these questions are taken up in reverse order with the last being discussed first and the first discussed last.

The Usefulness of Confounded Estimates

Reflection indicates that utility function estimates confounding the effects of changes in incomes and wealth with true risk preference and/or aversion

are unique with respect to (1) the decision maker involved, (2) the particular set of probabilities associated with the different possible outcomes, and (3) the particular set of outcomes considered in the experiment used to elicit the responses used in estimating the utility function. For any given set of outcomes for a nonrisk neutral decision maker, changing the set of probabilities will change the estimated utility function by changing the risk aversion and preference which he associates with each different outcome. Changing the set of possible outcomes for any given decision maker without changing the set of probabilities also changes the estimated utility function. These two conclusions follow because utility is calculated in a manner which does not permit the utility of any actual outcome to vary with probabilities associated with attainment of that outcome. In any case, each estimated utility function will have an ability to predict which gambles and insurance schemes the unique decision maker will accept and reject for the unique sets of outcomes and probabilities considered. However, we have no ability to interpret what the estimated utility function has to say about either the utility of income and wealth or risk preference and aversion when they are varied independently of each other. Thus, there is virtually nothing salvageable about the utility of wealth and income or about risk preference and aversion from past estimates of utility functions for individual entrepreneurs.

Estimating the Utility of Chance Taking ("True" Risk Preference) or Disutility of Chance Taking ("True" Risk Aversion) While Holding the Utility Function for Wealth and Income Constant

The basic difficulty here is that we have not conceptualized the influence of true risk aversion and preference on the indifference map between (1) income plus changes in wealth and (2) chance taking. There are at least two important complex questions: (1) What is chance taking and how can it be measured? and (2) How do true risk aversion and preference affect the indifference map between (a) this measure of chance taking and (b) income including changes in wealth? We do not know the answers. All we know is that answers to these questions would help us straighten out the confusion we have created by not differentiating between true risk aversion or preference and the utility of income including changes in wealth (Krzysztofowicz 1983).

Estimating the Utility of Income and Wealth While Holding True Risk Aversion and Preference Constant

Here again, the problem is both conceptual and empirical. How can we fix true risk aversion and preference until we know how they are related to risk taking which we have not yet defined or measured? (Robison and Fleisher 1983)

Implications for Farm Management in Socialist Economies

The managers of socialist farm enterprises or those on whose behalf they manage (the state and enterprise participants) derive nonmonetary value from the income and capital stocks of such enterprises. Such managers make decisions on the basis of probabilities, the weather, insects, diseases, and

socialist markets being what they are. The expected utility hypothesis is, therefore, relevant in the management of socialist as well as capitalist enterprises.

Socialist enterprise managers (and the state and enterprise participants on whose behalf they manage) also obviously display "true" risk adversity and preference—there are "`fraidy cat" and "daredevil" managers of socialist as well as private enterprises.

This strongly suggests that farm management scholars in socialist countries

1. avoid the confounding of the shapes of utility functions with "true" risk aversion and preference which has occurred in the United States and Australian literature while
2. proceeding to help solve the identification problem discussed above. Solving the identification problem will involve
   a. further conceptualization of the relationship between the utility or disutility of taking chances and the utility of income and wealth,
   b. much survey or experimental design work on how to measure utility in these two dimensions, and
   c. much empirical work to actually make such measurements.

This paper also strongly suggests that farm management scholars in both socialist and capitalist countries keep in mind the "wholeness" of managerial processes. Risk preference or aversion and the utility of gains and losses in income are but parts of an interrelated whole. We investigate parts of the whole in isolation from the rest at the peril of failing to understand both that part we elect to investigate and those parts we do not.

INSEPARABILITY OF EXECUTIVE AND RESPONSIBILITY BEARING FROM THE OTHER MANAGERIAL FUNCTIONS OR STEPS

Management is holistic in the senses that (1) it has to address the entire domain of a problem before it and (2) the problem solving process outlined above as six managerial functions is so laced with feedback loops that the functions or steps cannot be realistically studied independently of each other. More specifically, the executive or administrative and responsibility-bearing functions are essential integral parts of management that, unfortunately, are often neglected by farm management researchers.

The following excerpts indicate something about the holism of the managerial functions.

Chapter 8 from *Managerial Processes of Midwestern Farmers* (Johnson et al. 1961) addresses the action or executive and responsibility-bearing functions of management. It is reproduced in abridged form below:

Though IMS [Interstate Managerial Study] researchers initially regarded observing, analyzing, deciding, acting, and responsibility bearing to be five important functions of managers, the functions of acting and bearing responsibility were not given much attention in designing the IMS . . . [King's

chapter, like the IMS, is not very concerned with the action and responsibility-bearing functions of management.]

REASONS FOR NEGLECT

The neglect of these two functions in the IMS is partly a matter of happenstance, partly of the absence of classifications and theory to guide empirical work and, also, partly of the philosophic set of IMS researchers. Each of these restrictions on IMS researchers is discussed briefly before turning to suggestions for further research.

The vastness of management as an area of research precluded complete coverage of all the managerial functions. Thus, the neglect of action taking and responsibility bearing is in part a consequence of the need to neglect a portion of the area.

The absence of classifications and theory with respect to acting and responsibility bearing in contrast to the ready availability of classifications and theories in other areas made it reasonable to neglect acting and responsibility bearing. This same deficiency now makes it important to formulate such classifications and theories, if empirical work is to go forward.

The conditionally normative (modern welfare economic) set of mind of IMS researchers caused them to assume that managers had well-defined normative concepts and well-defined problems . . . Responsibility bearing relates normative concepts or values to decision making via action. Thus, the neglect of the normative, as a consequence of the conditionally normative set of IMS researchers led, logically, to the neglect of responsibility bearing and acting.

SUGGESTIONS FOR FURTHER RESEARCH

Further research on managerial processes should include specific attention to action taking (the executive function) and responsibility bearing.

If such research is approached from a more normative philosophy than followed by IMS researchers, the relevant questions concerning responsibility bearing will probably be more apparent.

Such a more normative approach would include attention to problem definition in terms of both normative and factual concepts (see Chapter 9). [Robert King's commendable Chapter II (of this book) makes important contributions concerning problem definition.] The investigation of normative concepts held by managers would indicate the nature of the responsibilities they bear. What a manager tries to avoid and what he tries to attain would indicate something about the responsibilities he feels. Such investigations would be more detailed than the investigation of utility reported in Chapter 7. [They] would, in effect, deal with the different dimensions of normative structures of managers.

Once more detailed understanding of normative structures is available, detailed questions will arise about the relationships between such normative structures and specifications for decisions.

Questions about specifications [for decisions and choices] will also likely involve other questions about ability to execute decisions. The skilled executive, it can be hypothesized, is able to carry out less accurate decisions than

> the less skilled executive. Further, the executive skills of a manager may vary according to the nature of the process being organized and supervised. For instance, much different executive skills are involved in carrying out decisions about people than about animals, about land than about machinery, about construction than about crops, or about taxes than about marketing. Thus, knowledge about different kinds of executive skills is important in understanding specifications for decisions, observation, and analysis . . .

More recently, I wrote the following about action or execution and responsibility bearing that was published in *Social Science Agricultural Agendas and Strategies* (Johnson et al. 1991, IV–84):

> The PS [problem-solving or managerial] process also involves *execution of decisions* about what ought to be done (Barnard 1938). In this step, an attempt is made to do what is prescribed in the decision process. No complete treatment of the PS process can omit . . . execution, the next to the last step in [the PS process]. For instance, what [a prescription to solve a farm manager's problem] "ought to be" depends on . . . ability to execute the different prescriptions that might be made on such matters. It makes little sense to prescribe that which cannot be executed unless it is worthwhile to fail as it may be when great value is attached to trying.
>
> An important step in the PS process is that of *bearing responsibility* for the goodnesses and badnesses of the consequences of actions taken. Responsibilities are borne not only by choice and decision makers but by others affected by actions taken to put prescriptions into effect. The goodnesses and badnesses of actions taken and of their consequences become evident to decision and choice makers and affected persons who experience them. Again, in Figure [3.1 in this chapter], there are two-way arrows from the responsibility-bearing step to the two information banks.

The Importance for Farm Management (FM) of Asset Fixity Theory

It is important to stress the usefulness for FM of the asset fixity theory to be considered in more detail in both parts II and III of this book. That theory treats the logical consequences of recognizing that many durables have finite acquisition costs greater than nonzero salvage values. In such theory, investment/disinvestment theory is endogenized. To make the optimal reorganization of a firm a function of its initial organization with respect to its durable assets, some of which will prove augmentable or liquefiable while others will remain fixed. By contrast, the usual form of neoclassical production theory treats fixed resources as having infinite positive acquisition costs and infinite but negative salvage values, while variable inputs are treated as having acquisition costs equal to their salvage values. More realistic asset fixity theory provides farm management with a theory of the firm that

1. Substantiates the importance experienced FM advisors and consultants attach to becoming thoroughly acquainted with the initial organization of

a farm before advising or consulting on its reorganization while the traditional theory of the firm leaves optimal reorganizations independent of the initial amounts of resources other than those with infinite positive acquisition costs and infinite negative salvage values.
2. Much more thoroughly handles within firm and external opportunity costs for durable assets and expendable, one-use inputs in contrast with traditional theory that has numerous shortcomings with respect to opportunity costs including the absence of the bounding of internal opportunity costs by external opportunity costs consisting of acquisition costs and salvage value.
3. Recognizes that the optimal use of a multi-use durable is defined not only by the equi-marginal returns (internal and external opportunity costs) but by an accounting identity equating the amount of durable used for all purposes with the amount originally on hand plus purchases (if any) minus sales (again, if any).
4. Calls attention to the economics of determining the optimal rates at which to extract services from fixed durables, which is the subject of Baquet's important paper published as chapter 4 in part II of this book.
5. Provides a more realistic analysis of supply and demand function than the reversible supply and demand functions of "economics 101" and standard graduate theory texts.

The Bright Prospects of the Public (Multiple-Person) Choice/Transaction Cost Approach (PC/TC) in Academic and Practical Farm and Home Management Work

As part of the Social Science Agricultural Agenda Project (SSAAP) (Johnson et al. 1991, II-6–7), I published the following:

> The transaction cost approach of Williamson (1985) and others can be extended as suggested . . . Extended, it becomes consistent with: early farm management planning techniques (Bradford and Johnson 1953), the case study approach of the Harvard School of Business Administration, general systems simulation analyses (*European Review of Agricultural Economics*, vol. 3, no. 2/3, 1976), the more recent project by the national Agriculture and Natural Resources Curriculum Project on "Systems Approaches to Food and Agricultural Problems" (Wilson et al. 1990), and the recent Fox/Miles (1987) book on systems economics. Williamson's transaction cost work is regarded as part of the "public choice" literature even if Williamson addresses private sector, corporate "institutions of capitalism." Use of the adjective "public" in the term "public choice" is somewhat unfortunate because the approach really deals with "multiperson" choices that, of course, are important in the private as well as in the public sector, as Williamson clearly recognizes. With respect to farm management, a high proportion of the choices are multiperson, involving husband, wife, mature children, partners, and creditors and other business contacts in input and product markets. In Part III of this [SSAAP] book, the section on ethics, private decisions, and public choice that considers the general need to extend the public choice/transaction cost (PC/TC) approach

in several ways is noted and agendas for making such extensions are presented. This need is also relevant for home management and for farm and home management combined as will be noted in the section on home management . . .

Though the interdependency of the firm and household parts of a family farm seem too obvious to be noted here, this interdependency is not always recognized in agricultural research, extension, and resident instruction programs involving farm business and home management. The home aspect of family farms has often been left to the home economists who, in turn, have left business management mainly to farm management specialists in the departments of agricultural economics, with little interaction between the two. Prior to World War II, one or two farm management specialists estimated the monetary value of a farm wife in the business/home-farm complex and came out with large figures to the gratification of farm women and home economists, even if the computations were somewhat degrading of women. There is a current related study by Nils Westermark (1986) from Finland.

After World War II, two management books appeared, one on home economics and one on farm management. Both books approached management in similar ways although their authors were never in contact prior to the publication of their books. *Management for Modern Families* by Gross and Crandall (1954) viewed home managerial processes in a manner similar to that in *Farm Management Analysis* by Bradford and Johnson (1953). Bradford and Johnson viewed the home and business ends of farming to be so intimately interrelated as to make it impossible to separate them in dynamic farm management analyses of the type they developed in their book and of the type found in the Gross/Crandall book.

It was in the post-World War II period that Albert Hagan, at the University of Missouri, took the lead in developing Missouri's Balanced Farming Extension Program. The program was balanced in the sense that it gave appropriate attention to both the farm and home components of a family farm and, in doing so, drew heavily on the work of extension home economists and researchers at the University of Missouri and elsewhere. The Missouri program influenced the Bradford/Johnson effort and was consistent with, even if it did not influence, the Gross/Crandall book. The success of the program in Missouri led to the initiation of a farm and home development program by the University of Kentucky's extension service [(Johnson 1988)]. The Kentucky and Missouri extension programs were subsequently incorporated into a national agricultural extension program under the title of "Farm and Home Development." The title of the national extension program, like that of the Kentucky program, made explicit the contributions of farm wives, the home, and home economists to farming.

The national farm and home development program tended to succeed best in states with smaller farms where there was less opportunity for extension workers to specialize in the business problems of farming versus the home management problems of farming. In the main corn-belt states, home economist extension workers and farm management extension workers could more easily go their separate ways than they could on smaller, more subsistence, limited-resource farms of the mid-South where the interdependencies of business and home expenditures and investments were almost always too tight to be ignored . . .

In the years before and just after World War II, home economists gave major attention to such multidisciplinary subjects as nutrition, home man-

> agement, marriage and the family, clothing, and the like. Such multidisciplinary subject-matter research by home economists served the extension home economists well as they carried out useful activities and projects to serve homemakers, family members, and, indeed, farmer/husbands on both large and small farms.
>
> It seems fair and accurate to assert that an identity crisis developed for home economists in the 1960s and 1970s [(Bubolz and Sontag 1988)]. Cooking, homemaking, family, child rearing, and clothing appeared mundane and not very satisfying academically. Some home economists sought a new identity and found it in what they called "human ecology" which, while extremely multidisciplinary, seemed to some to be more academic . . . Currently, human ecologists and extension home economists are interested in such topics as aging, health care, AIDS, crisis and stress management, environmental pollution, gender equality, substance abuse, food safety and food-chain contamination, child development, spouse and child abuse, off-farm work, and rural latch-key children. Family financial management has always been important in home economics and continues to be in human ecology.

In the same book (Johnson et al. 1991, II-158–59), the public (multiple-person) choice/transaction cost approach is appraised for use in farm, home, and other studies. I wrote that rural and basic social scientists should:

> • Recognize that an extended [version of the] PC/TC approach:
> — [Would be] holistic (as contrasted to reductionistic) with the combination of social, biological, and physical sciences, being determined by the domain of the subject (alternatively issue) or problem under investigation.
> — [Would] often [require] enough philosophic eclecticism to address the value and ethical dimensions of the subject or problem under investigation.
> — May involve either noncomputerized or computerized analyses of a size and complexity determined by:
> • The domain of the issue or problem at hand and
> • The detail in which it is advantageous to investigate the issue or problem.
> — Is multidisciplinary in a manner that goes beyond the disciplinary constraints of more specialized economic, econometric, sociological, anthropological, political science, [technical agricultural science], and geographic approaches.
> — Benefits from iterative interaction between analysts, decision makers, and those affected in a socio-politico-economic process involving:
> • Irrationality,
> • Nonoptimal behavior, and
> • In only some instances, optimization and optimal behavior.
> — Requires predictions of individual and group behavior for use in estimating the consequences of institutional changes.
> — Requires that optima be definable and estimable to a degree, at least, if existing proposed . . . changes [are to] be evaluated.
> • Treat [farm and family] institutions in three manifestations as:
> — Rules of the game,
> — Organizations, and

—As properties, facilities, and staffs.
- Perceive of and estimate transaction costs (in both monetary and nonmonetary terms) [as]
  —Flow costs (information, negotiation, and enforcement) [and as]
  —Stock costs (establishment and dismantlement) . . .
  —For all three manifestations of institutional change.
- Perceive of and estimate both monetary and nonmonetary returns to institutions (in all three manifestations) as both flows and stocks.
- Recognize that the essentiality but [individual] insufficiency of any of the four driving forces for progress [technical advances, human development, institutional improvements, and the enhancement of natural and manmade resources] makes it difficult to estimate returns to any one of them, including institutional change but that returns may sometimes have to be estimated for packages of the four.
- Use transaction costs and institutional returns to determine when [resources including] institutions can be advantageously augmented, modified, reduced, dismantled, or regarded as fixed.
- Study quasi-rents [for] fixed resources [including institutions], recognizing that quasi-rents [and] opportunity costs for fixed resources [including institutions] are negative with respect to establishment costs and positive with respect to dismantlement costs, and that optimal use of fixed [resources] institutions involves simultaneous minimizing of negative quasi-rents and maximizing of positive quasi-rents.
- Recognize that perhaps most [resource and] institutional changes are made initially for constructive rather than exploitive purposes [and that]
  —[this] often makes "rent collecting" respectable and socially desirable
  —[and] although less respectable, exploitive rent collecting can be expected to develop in niches within constructive fixed [resources and] institutions [of farm/household complexes].

In my view the bright prospects for the public (multiple-person) choice/transaction cost (PC/TC) approach (extended as suggested above) grow out of several converging lines of experiences in the practical world, in academia and in professional farm and/or home management work. Elsewhere, I (Johnson forthcoming) am publishing a list of lessons, largely historical, based on the converging lines of experiences discussed below.

Throughout history, public, military, and nonmilitary decisions and choices have been *based on attempts to envision the consequences through time, especially, but also in space and in human, institutional, and other dimensions, of alternative decisions and actions to solve problems and resolve issues.* These attempts have been most successful when they have been reasonably realistic with respect to the domains of the problems and issues that are holistic but have unique multidisciplinary dimensions.

Increased interest in envisioning consequences in time, space, and other dimensions of alternative solutions to problems and issues is now converging with tremendous advances in basic academic, scientific, and humanistic disciplines and in data storage, retrieval, and processing technology. The basic disciplinary advances have been in the physical, social, and biological sciences and in the humanities and in mathematics and statistics—in turn,

these basic disciplinary advances have led to other advances in such multidisciplinary areas as agronomy, animal husbandry, home economics or human ecology, farm management, integrated pest management, agricultural marketing, farm and home finances, marriage and the family, human nutrition, and health. These less basic multidisciplinary advances also greatly improve our capacity to model or envision the consequences in different relevant dimensions of alternative actions to resolve or solve practical FM, HM, and FM/HM issues and problems. Advances in electronic data management technology have been accompanied by improvements in software that are helpful in projecting the consequences in time and other dimensions mentioned above. Some of this software is too specialized as to technique, discipline or subdiscipline, and philosophic origin to handle the multidisciplinary dimensions and preoptimization that characterize actual practical problems and issues and the processes used by real-world managers to address them (Johnson 1987). Examples of such specialized models are recursive linear programming, econometric with "time dummy" variables and time-dated variables, and transportation, linear programming and other simple optimizing models. What is needed are general, system simulation analysis (GSSA) models capable of addressing the multidisciplinary nature of problems and issues without premature optimization or undue specialization on any technique or unwise commitment to any philosophic orientation (Rossmiller et al. 1978). The generality of GSSA models is probably more important than the use of modern electronic technology in developing scenario analyses for use in solving practical problems and resolving practical issues in doing FM, HM, and FM/HM work. Informal paper and pencil but *general* scenario analyses such as those used in addressing estate and tax management problems may be preferable to either formal specialized or general analysis due to the higher cost of constructing formal models.

A third relevant important line of experiences that converges with the two discussed above involves an increased awareness of the importance of participation of concerned persons in decision making and choosing processes. This increased awareness if evident in current eastern European reforms, changes in academic governance, changing gender roles, changes in the relationship of children to parents, changes in employer/employee relationships, etc. This widespread societal change requires that general scenario and systems simulation analyses be interactive with persons having stakes in the consequences of the actions based on the decisions and choices being made. FM advisors working on estate and tax management, parent/son partnerships, credit and major farm reorganizations problems have long known the importance of such interactions. In my own book (1988) on research methodology for economists, I point out that such interaction can be regarded as a research tool because it generates both value-free and value knowledge.

With increased awareness of the need for participation (interaction) has come a converging increased need for iteration or "cutting and fitting" in

searches for solutions to problems and resolutions of issues. This need goes beyond the need to envision the consequences of several alternative actions to solve a problem or resolve an issue. Interactions generate additional knowledge about consequences that, in turn, suggests additional possible actions to be considered iteratively. This makes it advantageous to investigate, *iteratively*, the consequences of additional actions. Interaction pragmatically begets iteration. In chapter 8 of this book, Warren Samuels is concerned about the danger of foreclosing valuational processes in searching for determinate solutions. His paper greatly reinforces the point being made here. Samuels is concerned with all practical decisions and choices whether public or private while the concern here is mainly with private FM/HM/FM and HM decisions and choices.

These four lines or chains of converging experiences indicate that the prospects are indeed bright for the use of an extended version of the PC/TC approach in FM/HM/FM and HM work. The extended version suggested above can easily be adapted to deal with time, space, and other relevant dimensions of the domain of a problem or issue being faced. And because the PC/TC is an approach, not a technique, it can employ any advantageous combination of knowledge and techniques available from any relevant discipline in addressing a particular problem or issue at hand. Because the PC/TC *approach* can also be confined, when appropriate, to any given discipline, subdiscipline, philosophic orientation, and any specific technique, it does not exclude appropriate specialization on any technique, subdiscipline, discipline, or philosophic orientation. Fortunately, electronic and software advances have now greatly increased our capacity to combine several techniques and disciplines to model complex domains and to simulate in numerous dimensions. Further, computerization of analysis need not preclude interactions with concerned persons. It is relatively easy to stop computer programs for interaction with concerned people and to incorporate iteratively their knowledge and suggestions for improving decisions and choices and then start them again. Modern-day computers and software are making it possible to do iterative interactive scenario analyses of the domains of problems and issues whose complexity exceeds manyfold the capacity of "seat of the pants" analysts and simple "paper and pencil" projections and scenario analyses.

Robert King's admirable paper brought us up to date, circa 1988, with respect to the managerial functions of problem definition, the acquisition and analysis of information and decision making (including choosing). The developments he surveyed and his own contributions greatly enhance our ability to extend the PC/TC approach to improve iterative, interactive, general systems analysis of FM, HM, and FM/HM problems and issues. His important work is part of the converging lines of experiences I have just considered.

NOTES

1. Fortunately, PERB has recently been changed to FERD indicating that governmental alphabetical changes are not permanent.

2. These reasons include the desire to make efficiency and welfare comparisons which, in the absence of [cardinal] interpersonally comparable utility measurements, are valid. This desire makes it necessary to assume away all changes not known to be Pareto better. Hence, changes in utility functions, asset ownership patterns, technology, and institutions affecting rights and privileges tend to be precluded.

3. The farm and home development idea has the potential breadth but, as yet, has not found adequate organizational expression.

4. By, perhaps, Lionel Robbins (1946), Kenneth H. Parsons (1958), J. N. Keynes ([1890] 1930), Kenneth Arrow (1951), Milton Friedman (1953), and Frank Knight (1956).

5. This is an addition to a long period of interest in the area during which I have read and audited philosophy courses as the press of regular duties permitted.

6. C. I. Lewis (1955) and David H. Boyne and Glenn L. Johnson (1958, 466). The Boyne and Johnson reference provides empirical support for the footnoted sentence.

7. E. O. Heady (1956) argues that establishing values is a task for boy scout leaders and sunday school teachers, not farm management workers!

8. Parsons' attack is, of course, much different from that of Ciriacy-Wantrup who was urging more positivistic work but was not trying so hard to destroy conditional normativism.

9. Some of the connections between pragmatism and institutionalism are found in J. R. Commons' *Institutional Economics – Its Place in Political Economy* (1934), "we therefore . . . follow more closely with pragmatism of Dewey" (154–55) and "herein it is Dewey's psychology that most nearly fits the case" (647).

10. Ciriacy-Wantrup (1956, 1306 f.). Two works, one by Earl O. Heady and John F. Timmons (1956) and another by Earl O. Heady (1956) are criticized as assuming that "a criterion for maximizing social satisfaction has been developed that can actually be used for policy." In short, Heady and Timmons are said, by Ciriacy-Wantrup, to have assumed that the problem of measuring and aggregating interpersonally valid utility functions has been solved. A comparison of Lionel Robbins's (1946) essay on the nature and significance of economic science with the work of one of his students, Tapas Majundar (1958), shows this difference between conditional normativism and modern welfare economics. Robbins, writing in 1932, did not concern himself with the lack of interpersonally valid utility measures, while Majundar devotes a major part of his book to the problem. Heady and Timmons tended to follow Robbins in this respect, while Ciriacy-Wantrup insists that they be cognizant of more recently revealed problems with respect to utility measurements.

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Part II

Chapter 4

A Review of Investment/Disinvestment Theory

Alan E. Baquet[1]

The analysis of the role of fixed assets in production theory has been an enduring aspect of much of Glenn Johnson's work during his career as an agricultural economist. In this article, I do not attempt to review or summarize all of his or his student's writings on fixed asset theory and investment and disinvestment analysis. Rather, I highlight Glenn Johnson's contributions to the development of fixed asset theory and the subsequent concern and development of a theory of investment and disinvestment.

The paper is organized in three sections. The first section will involve a review of the development of investment and disinvestment theory and highlights the work of Glenn Johnson and his students. The second section deals with empirical applications as the theory has evolved. The third section includes comments regarding the current status of investment/disinvestment theory and associated empirical applications and suggests areas where additional developments are needed.

A Partial Review of Investment and Disinvestment Theory

Glenn Johnson's early writings show his concerns with the role of management and the proper analysis of fixed assets. He recognized early in the 1950s that the theory of fixed assets was not well developed and a complete theory of dynamic production economics could not be developed until the role of fixed assets was properly addressed. In his article in the May 1955 issue of the Journal of Farm Economics he stated the following:

> Several theoretical developments are needed to further the application of production economics both dynamic and static to agriculture. One group of theoretical concepts which is the source of much difficulty appears to be the concept of fixed assets. It is becoming increasingly clear that assets remain fixed in a farm business so long as their expected value in their present use does not exceed the cost of getting more and does not fall below what could be realized for them if they were diverted to an alternative use . . . This situation introduces very important problems in defining length of run and hence in isolating unique cost and supply functions.

In the same article, Glenn makes the following statement:

> As so much of the inherited static theory assumes perfect markets with replacement equal to salvage prices, a revision of the theory is needed to take this departure of theory from reality into account.

This fairly succinct statement of the divergence between replacement (acquisition) and salvage prices and hence an economic definition of asset fixity is the basis for one of the major thrusts of Glenn Johnson's professional career. Glenn Johnson and many of his students have pursued the theoretical development of asset fixity and investment/disinvestment theory. Somewhat concurrently with the development of this economic definition for asset fixity was the recognition of the need to be more precise about the role of durable assets in the production process where durable assets are defined as those assets which are not entirely consumed in one production period.

Many economists recognized that durable assets are used in the production process. However, the manner in which the assets are used was not fully recognized nor studied prior to Glenn Johnson's activities in the 1950s and subsequent years. Economists recognized that usage of durable assets involves a stock-flow conversion, and the durable asset represents a stock of services, some of which are used in each production period. The economics of this conversion process was not studied intensely prior to Glenn Johnson's activities commencing in about the mid 1950s.

It appears that Clark Edwards was the first to incorporate this stock-flow conversion issue in his research. In a Journal of Farm Economics article appearing in 1959 Clark Edwards recognized the possibility of varying the rate of use of durable assets but did not address the problem. Instead he assumed it away by fixing the extraction rate for services from durable assets. In doing this, Clark Edwards continued the tradition of separating current production decisions from investment and disinvestment decisions.

The early 1960s saw a continuation of the line of reasoning developed by Clark Edwards. Two of Glenn's students, Curtis Lard and Michel Petit, both recognized the acquisition and salvage price differentials in their Ph.D. dissertations. Lard was concerned with the optimal reorganization of farm firms, while Petit was concerned with developing econometric models of feed grain, hog, and beef sectors on a national scale. Much of the production economic literature in the early 1960s continued the trend of separating production and investment and disinvestment decisions. In the late 1960s, a body of literature developed which recognized the cost of adjusting the capital stock. The importance of this recognition is the linkage between current production decisions and both current and future investment and disinvestment decisions. Kenneth Smith, in his Ph.D. dissertation written at Northwestern University, appears to be the first to consider the utilization rate of assets as an explicit variable in the production process. His simplified treatment of the utilization rate was an important step forward in the combining of production and investment and disinvestment decisions.

Nicholas Georgescu-Roegen, in his 1971 Richard T. Ely lecture to the American Economics Association, treated production relationships as processes which take place over time. He introduced new terminology, new concepts, and basically a different way of thinking about the production process. He introduced the notion of a stock as being a fund of services which can be used at various flow rates. This recognition of variable flow rates or usage rates provided the first definitive mechanism for the interdependencies between production decisions and investment and disinvestment decisions.

Following this line of reasoning, one of Glenn's students in the early 1970s, Frances Idachaba, treated the rate of use of durable assets as an explicit variable in a theoretic model which dealt with production, investment, and disinvestment. His model assumed that the production function is a relationship between output and flow and stock inputs. However, he assumed that the appropriate decision rule or objective function was to maximize current profit. Thus the investment/disinvestment decisions were not accounted for in the decision rule developed by Francis Idachaba.

The work of Glenn Johnson, Clark Edwards, Nicholas Georgescu-Roegen, and Frances Idachaba formed the basis from which this author, under Glenn's direction, developed a theoretical model of production, investment, and disinvestment. The model developed considered the generation of services from durable assets as an explicit part of the firm's production process. By modeling the firm in this manner, the production, investment, and disinvestment activities of the firm are simultaneously determined. Production was treated as a two-tiered, integrated production process where the services from durable assets are generated on one level and then become inputs in the production process for the final product. The interaction between current production decisions and investment and disinvestment decisions was explicitly accounted for in the firm's objective function.

In addition to the time dimension, Glenn and I incorporated a second aspect which needs to be accounted for in the objective function: the initial endowment of durables. The firm operates over time with durable assets which are not entirely used up in each production period. Thus, at the beginning of each production period, the firm has an initial endowment of durables. The optimal organization for the firm is conditioned by this initial endowment of resources. Clark Edwards considered the gain achievable from reorganizing an initial endowment of resources by either buying additional units or by selling units from the initial endowment. We followed the reasoning of Clark Edwards and specified the firm's objective function as maximizing the current profit plus the change in the net present value of the durable assets. Specifying the production activities of the firm in this manner, and using the objective function specified, allowed for the determination of optimal current production decisions and optimal investment and disinvestment decisions.

The optimal current production activities involved the specification of optimal levels for the nondurable inputs and optimal usage rates for the du-

rable inputs. For nondurable inputs, the usual economizing principal of matching added costs with added returns under appropriate second order conditions was determined. The assumption of perfectly competitive input and output markets led to the usual rule of equating input price to the value of its marginal product. In generating services from durables, we matched the marginal value of the services generated with the marginal costs of generating those services. The services are an intermediate good and their marginal value is the price of output times the marginal physical product of services used in generating that output.

We found the marginal cost of generating services to have three components. The first component was associated with the use of nondurables in generating services from durables. The second component was labeled "user cost" and is associated with the opportunity cost of using the durable in this time period as opposed to any future time period. The concept of user cost was not original with our work, but to our knowledge it had not been included as a component in the production investment/disinvestment process.[2] The third component of the marginal cost of extracting services deals with the effect that extracting services in any production period has on the economic life of the assets. Thus there are three components of the marginal cost of deriving services in the current time period. The latter two components give rise to the interaction between current production decisions and investment and disinvestment decisions. Using an asset in a particular time period has an impact on the economic life of that asset. Maintenance and repair activities also have an impact on the life of the assets. Optimal maintenance activities can be determined by equating the marginal factor cost of maintenance with its marginal value where the marginal factor cost is the price of maintenance, and the marginal value of maintenance is the marginal value of the services which the durable asset can render as a result of performing maintenance.

The investment and disinvestment decision principles are fairly easy to state; however, the explicit calculations necessary are quite complicated. For investing in an additional unit of a durable asset the firm should match the value of an additional unit of the durable with its acquisition price. The value of the durable is derived from the services it would generate over its lifetime within the firm. Both the services generated and the number of time periods that the asset will be held are variables that need to be determined endogenously. For disinvestment, the firm matches the present value in use with the salvage price of the durable. Again the present value in use is derived from the services generated in each time period where the optimal number of time periods is also endogenously determined. Determining optimal lives for durables involves matching the present value of using the asset an additional time period with the present value of the cost of using the asset that additional time period. The value of the asset is derived from the services it would render in that additional time period. The cost of using the asset is the cost of generating the services which includes the change in the salvage value of the asset as a result of use. The formal derivation of

these economizing principles has been presented elsewhere and will not be repeated in this paper.

The research contributions which Glenn and I have made in this area of concern may be summarized as follows:

1. The relaxation of the fixed extraction rate allowed the production process considered by Francis Idachaba to be specified in greater detail. This permitted the linkage of the production process with the investment/disinvestment process, something not done by earlier researchers such as Lard and Petit.
2. By specifying the production process in greater detail, the manner in which durable assets enter the production process was more precisely identified. The production process, when viewed as vertically integrated, permitted Glenn and me to move beyond Frances Idachaba's work. By considering the production process in this manner, we were able to identify a cost of production, user cost, and its composition. The concept of user cost has important implications for firms which practice marginal cost pricing. Previous analyses would indicate lower marginal costs than analyses based on these theoretical developments.
3. A further consequence of our vertically integrated production process is in the area of supply response. Our analysis indicates that firms may either expand or contract their supply by using their durable assets either more or less intensely, rather than by investing or disinvesting in durable assets. An explanation of the perceived lack of a supply response by producers to changes in output prices was offered by Clark Edwards with his explicit consideration of divergent acquisition and salvage prices for inputs. Keynes suggested that aggregate output could be varied without a corresponding change in the levels of productive inputs. Producers, in the conceptualization of firm behavior offered by Glenn and me, could alter the amount of services extracted from durable assets to either increase or decrease quantities supplied in response to a price change. Our conceptualization of firm behavior provides the microfoundation for Keynes's aggregate response.
4. Although differences between the durable stock or fund and the flow of services which can be derived from the stock had been recognized by previous authors, our work specified the actual process whereby services are extracted from the stock of durable assets. We extended the earlier writings on the stock-flow conversion problem.

More recently, extensions of the variable usage rate for durable assets and investment and disinvestment decision making have been made by Lindon J. Robison. He has offered a product exhaustion theorem which is required to compute the present value of the future stream of marginal value products generated from services extracted from one durable among several variable factors of production. In computing the optimum rate at which to extract services from durables, there is a need to specify a lifetime

capacity of a durable to generate services. I specified lifetime capacity by arbitrary assumption and Lindon Robison defined capacity in physical terms. The optimum rate at which to use this lifetime capacity, as specified in Lindon Robison's and my research, is determined by using first and second order conditions.

Lindon Robison has extended earlier efforts by Glenn Johnson and his students. With the redefinition of lifetime capacity, Lindon Robison has concentrated on the development of decision rules which address:

1. The choice of the durable with the appropriate capacities.
2. Optimal time to disinvest/invest.
3. The optimal use of the durable.
4. The optimal maintenance.

Interdependence of these decisions is recognized explicitly in his work.

The interdependencies in Lindon Robison's analysis require an iterative approach to solve for the optimal organization of the firm. To determine optimal service extraction levels, knowledge of indirect user costs is required. In order to determine indirect user costs, however, the remaining life of the durable is required. The iterative process developed by Lindon Robison allows for the joint determination of the optimal life and the optimal service extraction rates. An empirical application of this will be discussed.

An article by Marc A. Johnson and E. C. Pasour, Jr., (JP) in the 1981 American Journal of Agricultural Economics attempts to provide what the authors refer to as an opportunity cost view of fixed asset theory. The JP article appears to be based on a misconception about what is meant by acquisition cost. Comments by both Glenn Johnson and Garnet Bradford in subsequent issues of the American Journal of Agricultural Economics point out both the misunderstanding on JP's part of the original theory of fixed assets as developed by Johnson, Edwards, and others and the inappropriate specification of opportunity costs of durable resources by JP. Bradford appropriately points out that for durable resources the appropriate opportunity costs are intertemporal in nature. This aspect of opportunity costs appeared to be overlooked by Johnson and Pasour, but it is clearly specified in both Robison's and my work.

This partial review of investment and disinvestment theory has shown the developments that have taken place since the 1950s. The following section of this paper discusses some empirical applications which have coincided with the theoretical developments.

EMPIRICAL APPLICATION OF INVESTMENT AND DISINVESTMENT THEORY

In the early 1950s, production and investment/disinvestment decision making focused on the specification of optimal farm organizations where that organization involved determining optimal usage rates for nondurable inputs which were treated separately from decisions on investments and disinvestments in durable assets. Linear programming was the tool of choice. Studies done by Lard and Petit while completing their Ph.D. research under Glenn Johnson's guidance recognize the interactions between investment/disinvestment decisions and current year production decisions. However, their research efforts did not fully incorporate the interaction; instead, they fixed the usage rate for durable assets.

Two articles from the late 1960s typify the type of empirical analysis that was being conducted in that decade. Pan Yotopoulos (1967) recognized the stock-flow conversion problem for capital or durable inputs. He pointed out that it is the flow of services from durables that are important for current production decisions. He further recognized that the flow of services from durables can vary over time. Relying on these concepts, Yotopoulos estimated production functions for Greek farms. His basic empirical results indicated that the flow variables provided statistically better estimates in the production relationship than did the corresponding stock variables. Yotopoulos did not extend his analysis to the corresponding investment and disinvestment decisions.

A second article from the 1960s incorporates both production and investment decisions (Boehlje and White 1969). This study looked at two alternative objective functions:

1. Maximizing the present value of disposable income.
2. Maximizing net worth.

The relationships between production and investment are not well specified and the stock flow conversion problem is not addressed directly.

Richard K. Perrin's article in the 1970s specified the optimizing criterion for analyzing machinery replacement decisions. He compared the marginal benefits of using a durable another time period with the annualized average benefits of using a replacement durable.

In the early 1980s, two unpublished masters theses completed at Oklahoma State University incorporated the interactions between production, investment, and disinvestment and allowed for variable usage rates of the durable assets. Both of these studies relied on theoretical developments of the Glenn Johnson lineage. Lawrence Falconer, in his thesis research, applied the advancements in theory made by Alan Baquet to machinery replacement decisions. His thesis research was focused on a hypothetical dryland grain farm with a fixed land base and a given initial set of machinery. Optimal replacement time periods for both fixed usage rates of machinery and variable usage rates of machinery were determined. The fixed usage

rate situation was generated by assuming a constant cropping pattern through time. Thus the machinery would be used in the same manner through time. With given input and output prices the cropping pattern was determined via a linear programming model, and that cropping pattern was assumed to remain optimal for the firm. The variable usage rates were generated by allowing the firm to change its cropping pattern in response to changes in input and output price ratios. Input and output price uncertainties were not incorporated in the analysis. The variable usage rate situation resulted in shorter optimal lives for the durable assets because they were used more intensely as the farming activities were allowed to change.

Jerry King, in his thesis research, incorporated the theoretical developments of Lindon Robison. Determination of the durable ownership costs followed the guidelines developed and explained by Robison. A systems model was developed. The model consists of a linear programming/production subsystem and a subsystem which determines durable asset ownership costs and user costs based on usage rates from the production subsystem. The concentration again was on the optimal replacement period for machinery. A 15-year planning horizon for the firm was assumed. The multiperiod gain function specified by Clark Edwards and refined by Robison and me was used as the objective function in this study. Following Perrin's work, the replacement period was determined by comparing the marginal contribution of the durable asset in the last period to the annualized value of a replacement durable with an identical economic performance.

The model developed by Jerry King was optimized in a sequential process following Robison's developments. Several simulations were run under various assumptions. Some of the key results are highlighted here. The base situation, in which the hypothetical firm was allowed to reorganize its production activities based on known current and future prices, resulted in an optimal economic replacement period of seven years for the machinery.

When the farm was allowed to add to its cropland base, the optimal economic replacement period for machinery was shortened. When the acreage base for the farm was reduced, the replacement period increased. Reductions in estimated repair and maintenance costs increased the economic replacement period. Increases in estimated repair and maintenance costs decreased the economic replacement period.

The above analyses all assumed that the firm manager knew future prices with certainty. A further simulation analysis was conducted in an attempt to analyze the impact of uncertainty on machinery replacement decisions. Probability distributions for gross returns, repair costs, and salvage values were developed. Incorporating randomness in the model led to some interesting results. Applying the investment/disinvestment decision of comparing annualized average returns to the per period net return resulted in an optimal replacement period at the end of year three. However, the annualized average returns did not reach a maximum until period seven. In an attempt to handle this apparent inconsistency, King looked at alterna-

tive replacement criteria. He looked at various moving averages of the period returns and compared this average to the annualized average returns. This resulted in a smoothing and lengthening of the optimal replacement. However, it is not clear that this is an appropriate decision criterion.

The most current [circa 1988] empirical application appears to be done by Reid and Bradford and reported in the February 1987 issue of the American Journal of Agricultural Economics. This article uses a multiperiod mixed integer programming model to determine optimal machinery decisions. Reid and Bradford tie together the production and investment and disinvestment decisions for a firm. They are concerned about the appropriate specification of the objective function for the multiperiod firm as well as the problem of reflecting an infinite series of replacement decisions in a finite life programming model. The objective function that they use is based on and consistent with the maximizing net present value objective which has been used by others. The relationship between production, investment, and disinvestment in their model does not appear to be well specified; in particular, the potential for variable usage rates of existing durable is not discussed or specified. They do discuss machinery capacity and how it changes over time, but it is not clear how that capacity is specified. Changes in capacity is the result of additional breakdowns. It appears that the initial endowment of resources for the firm which Edwards, Baquet, and Robison include directly in the objective function are handled by Reid and Bradford in their programming model as initial constraints on the system. The multiperiod mixed integer programming models may provide a mechanism for further empirical applications which account for both production and investment/disinvestment decisions and the interaction of those activities. As Reid and Bradford point out:

> The biggest obstacle in empirical applications of MMIP models historically has been computational restriction. Recent progress in computing technology, however, has made the MMIP model more practical as a method for analyzing complex capital investment problems.

Both the study by King and the study by Reid and Bradford indicate that the empirical application of investment and disinvestment theory has progressed as the theoretical developments have progressed and our computational ability has progressed. Suggestions for the future development of empirical applications are contained in the final section of this paper.

CONCLUSIONS AND THOUGHTS ON DIRECTIONS FOR FUTURE RESEARCH

Where do we go from here? Future developments in analyzing investment and disinvestment decisions can proceed along two somewhat parallel lines. The first line will require some additional theoretical devel-

opments in economics. The second line will involve better empirical analysis based on the existing body of economic theory.

The theoretical developments in economics will follow what Glenn Johnson and others have referred to as a more complete theory of dynamic economics. While the theoretical dynamics of production in the time dimension are reasonably well specified, the dynamics of uncertainty and the impacts of uncertainty on production, investment, and disinvestment decisions where the stock-flow conversion process is incorporated explicitly do not appear to be as well specified. This seems to be the logical next step in the theoretical development. The calculus of variations and optimal control procedures may provide more success in the specification of economic theory related to dynamic considerations.

The empirical application of existing theory is of equal importance to the theoretical developments. The application of the existing theory of investment and disinvestment has been and will continue to be enhanced with improved computer capability. Dynamic programming, optimized simulation models, and similar techniques should allow for the specification of empirical models consistent with the theoretical models.

An area of further work which may overlap the development of economic theory and the specification of empirical models involves the analysis of production, investment, and disinvestment decisions when the firm is faced with financial constraints. The theoretical developments contributed by Lindon Robison and me do not incorporate financial constraints. The appropriate integration of economic and financial concepts does not appear to be well understood by many agricultural economists. There appears to be inappropriate usage of financial and economic concepts and terms in many of the current analytical programs.[3] A contribution could be made by better specifying the appropriate interaction of financial and economic concepts in production, investment, and disinvestment decisions.

We may often wonder about the relevancy of theoretical developments for current and/or future decision makers. What about continuing the development of investment and disinvestment theory? Even a cursory look at some of the situations faced by current farm managers yields a resounding conclusion that investment/disinvestment theory and the interaction between current production decisions and durable asset usage is highly relevant. In particular the conservation provisions of the 1985 Farm Bill (Food Security Act) have some major implications for future usage rates of tillage equipment. One of those provisions relates to the conservation reserve program in which acreage may be idled for a ten-year period in exchange for an annual rental payment. Certainly reducing the farmable acres has implications for machinery usage and hence investment and disinvestment decisions. In making the decision as to whether or not to bid into the CRP program, the individual decision maker should incorporate the impact of changes in expected usage rates for his equipment in his bidding process.

A further aspect of the Food Security Act of 1985, which may have even broader implications than the Conservation Reserve Program, relates to the

development of conservation plans. Those farmers with highly erodible lands who wish to continue to participate in various government programs must have a conservation plan in place by 1 January 1990, and fully implemented by 1 January 1995. Many of these conservation plans will involve reduced tillage operations. Again, this has implications for the usage rates of existing equipment and hence the investment and disinvestment decisions. Applications of investment/disinvestment theory in agriculture will continue to be hampered by a lack of information on the relationship between maintenance and the physical life of durables.

A topic of much current interest is low input agriculture. The impetus for reducing input levels appears to be from a wide variety of sources and for a wide variety of reasons. The economic analysis of low input agriculture should appropriately incorporate the theoretical developments associated with production, investment, and disinvestment activities.

It appears that the livestock sector is getting poised for another expansionary phase which will undoubtedly lead to another contractionary phase; thus, applying investment and disinvestment theory to livestock decisions continues to be important.

In conclusion, the advancement of the roll of "fixed assets" in production and the interactions between investment and disinvestment theories during Glenn Johnson's career has been profound. Durable assets have gone from a physical notion of fixity through an economic definition of fixity to becoming variable in usage rates. There will undoubtedly be additional developments in investment and disinvestment theory. Glenn Johnson has led and will continue to lead the way in developing the appropriate role and analysis of fixed assets in production and investment/disinvestment theory.

NOTES

1. Associate Professor, Department of Agricultural Economics and Economics, Montana State University. Reviews by James B. Johnson and Myles J. Watts are gratefully acknowledged.

2. The literature suggests that Lewis, Neal and Keynes had previously recognized this cost category.

3. Two examples are FINPACK, developed at the University of Minnesota, and IFFS, developed at Oklahoma State University.

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Chapter 5

Work on Asset Fixity or Investment/Disinvestment Theory[1]

Glenn L. Johnson

Part I in this book on managerial processes emphasized the multidisciplinary nature of problem-solving and issue- or subject-matter work in farm management; by contrast, Alan E. Baquet's excellent chapter highlights the importance for agricultural economics of efforts to remedy deficiencies in the basic discipline of economics. Many professional experiences reveal the important synergism between working on practical problems and issues (subjects), on one hand, and basic disciplinary research in economics, on the other. None, however, reveal it more clearly than experiences involving resource fixity and/or variability. It was certain shortcomings in typical undergraduate principles and graduate theory courses and, for that matter, in economic theory itself that got me and my students involved in asset fixity or investment/disinvestment theory. The theory was inadequate for (1) treating resource fixity and/or variability endogenously, (2) explaining differences in supply responses to positive and negative changes in product prices, (3) shifts between "lengths of run" in supply and demand analyses, (4) explaining and evaluating the non-Pareto-optimal consequences of the "free market" adjustments required from farmers in the twenties, early thirties, and, repeatedly, since then, and (5) clarifying the important role of opportunity costs in the real world versus its vague role in the typical treatments of economic theory referred to above. Baquet's chapter is on the cutting edge of asset fixity or, alternatively, investment/disinvestment theory.

Crucial Experiences Revealing Certain Inadequacies in Received Economic Theory vis-a-vis Investments, Disinvestments, Fixed Assets, and Opportunity Costs

Professor Merlin Hunter, an outstanding undergraduate professor of economics at the University of Illinois taught me economic principles. James Buchanan (1992, 69–71) reports that his prewar training in economics failed to give him an understanding of how market forces organize and control resource use, production, consumption, and distribute income in a society. Buchanan states that it was Frank Knight's teaching of Chicago that

provided him with this understanding. I was fortunate to get it from Hunter. Frank Knight later confirmed Hunter's teaching for me when Buchanan and I were Ph.D. students together at Chicago. As I listened to Knight, I heard him explain how a free market and free price system controlled and regulated society. Whatever the superiorities of market controls over autocratic, centrally controlled systems as a communication system and in organizing and controlling resource use, production, and consumption, I did not hear Knight describing the free market price system as one that could "do no wrong" and certainly not as one that produces ethically justified resource ownership patterns.

Because Merlin Hunter taught economic principles so well and so clearly, I perceived inconsistencies between the principles he taught and what went on in our dairy barn back home on the farm. Hunter taught that the marginal costs of producing milk would be equated by my father with the marginal revenue so generated until (as milk prices fell) the two were equal to each other and to average variable cost, at which point, our farm firm would cease producing milk because total returns would fail to cover total variable costs and residual returns to the fixed factors would become zero or less as product prices fell further. However, I knew that my father sold a cow long before milk prices got so low that she had zero value in the herd—Dad would say, "That cow is worth more at the slaughter house in Chicago than in this barn," and then arrange to sell her before returns to her fell further. Hunter's principles did not provide me with an understanding of the economics of moving from the ultimate short run (that he did teach about) when all factors of production are fixed through an infinite number of intermediate lengths of run only one of which he considered to the ultimate long run which he also taught when all factors are variable. This inadequacy in theory was not remedied in my study for an M.A. in general economics at Michigan State College or for a Ph.D. in general economics at the University of Chicago.

In several economics classes, my professors conveyed to me that market adjustments maximize welfare and are for the good of "all concerned"—this exceeded the credibility of this depression-era farm boy! In chapter 3, my account of farm life indicates my experiences with the non-Pareto-optimal hardships imposed by "the market" on me and my family in the 1920s and 1930s. From my earliest recollections until well after leaving Hunter's class, I knew from "gut experience" that markets do not operate exclusively for the good of all concerned and that something had to be wrong with that conclusion. In 1939, John Hicks's Value and Capital established Pareto-optimality in neoclassical economic theory which I learned about at the University of Chicago. Those at Chicago who are referred to as allocationists by Buchanan (1992, 71) embraced an abstract ideal market in their theory. Neither they nor their ideal market seemed to me to know about the hardships imposed by markets operating subject to (1) imperfect knowledge of changes in forces assumed constant or perfectly known in static Pareto-optimal theory with

(2) investment costs substantially higher than liquidation values for many factors of production.

Before and after my World War II service and before going to the University of Chicago, I did (1) short term statistical economic analyses in the U.S. Department of Agriculture Bureau of Agricultural Economics on the impacts of proposed changes in government price supports, price ceilings, production control, taxes, subsidies, and war-time programs and (2) outlook and situation reports for cotton and tobacco. In doing this work, empirically derived supply and demand curves repeatedly revealed serially correlated unexplained residuals indicating different supply responses to product price increases than to decreases. These responses depended on how long prices had been moving in which direction. Something was wrong with the perfectly reversible supply curves found in texts for undergraduate principles courses, graduate theory courses, and in most award-winning research papers of mature scholars of economics.

As indicated in chapter 1, this chapter (and chapters 3, 7, and 9, as well) is a mixture of reprinted material from my past and that written specifically for this book. Some of the former is dated and now acknowledged to have developmental shortcomings. To help the reader distinguish between my past and current writings, all quotations from my earlier publications are indented from both margins. Further, the reader will find two vertical gray lines, one in each margin running the entire length of each quotation regardless of whether only a few lines or several pages are quoted.

At the University of Kentucky, James Wells' empirical research, under me, of long, intermediate and short term costs of producing milk showed big differences among the three "lengths of run" but lacked an endogenous basis for explaining shifts among the three. We published his cost estimates, as reported below, in Farm Management Analysis (Bradford and Johnson 1953, 267–69):

> For a given short run in which the size and quality of a given herd are not variable, average total and marginal cost schedules composed mostly of feed and labor costs exist. The average total cost schedule when plotted is tangent to another average cost schedule. This other average cost schedule is the average cost schedule for the length of run in which size and quality of the herd is variable.[2] It has a corresponding marginal cost curve. In turn, this average total cost schedule is tangent to a third average total cost schedule. The third average cost schedule is for the long-run period in which buildings, forage programs, etc., are variable but in which management is fixed. It also has a corresponding marginal cost curve. Sketches of such average and marginal cost curves are presented in [the] figure [5.1].
>
> It is important for the student to realize that the average cost schedule ATC (2) for the intermediate length of run plotted in [the figure] is not the only cost schedule for that length of run which is tangent to the long-run average cost curve in which buildings are variable. For instance, there is an intermediate length of run, average total cost schedule for every conceivable size of barn which might be fixed by long-run decisions. Similarly, within

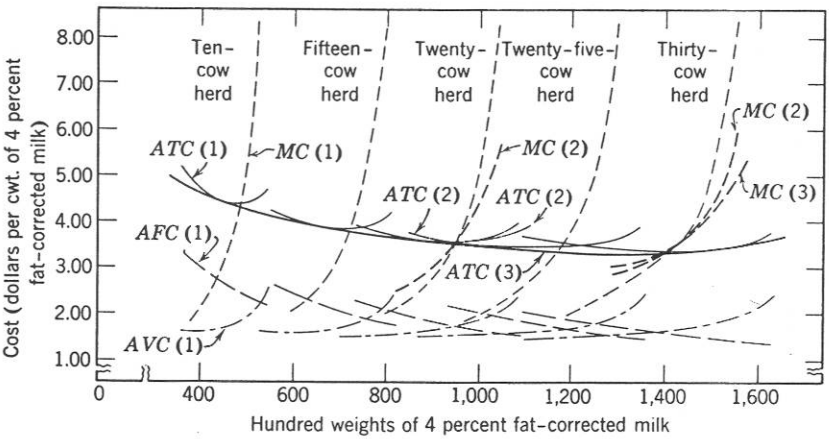

FIGURE [5.1]. Overall structure of milk production costs for south central Kentucky (based on data . . . prepared by James A. Wells).

(1) Lengths of run in which only feeding level is variable, herd size and barn fixed.
(2) Lengths of run in which herd size is variable and barn size is fixed.
(3) Lengths of run in which barn size, as well as herd size and feeding level, is variable.

Source: Synthesized from secondary data.

every one of the intermediate, average total cost curves are a large number of short-run average total cost curves. In fact, there is one such average cost curve for every conceivable size of herd which might be handled under the fixed conditions determined by longer-run decisions. The picture, of course, is infinitely complex. Cost of production and management are also infinitely complex. This is why it is so difficult for researchers to do cost of production research applicable in a large number of practical situations. This is why there is such a tremendous diversity among dairy setups. This is why farm management students must necessarily be taught principles rather than precise practices.

[Figure 5.1] permits the student to see how varying feed inputs changes MC, ATC, AFC, and AVC in milk production with herd size fixed. At the left of that diagram is a set of such cost curves (ATC (1), etc.) for a ten-cow herd. From this set of curves it can be noted that, for the poor-quality cows involved, MCs vary from less than $2.00 a hundred to over $8.00 as feeding levels are changed. AVCs over about the same feeding range run from about $1.50 to $2.50, while AFCs fall from over $3.00 to almost $2.00. ATCs range from over $5.00 down to a low of about $4.40.

For a thirty-cow herd the cost curves are much different—in general they curve upward much less abruptly. MCs vary over about the same vertical

range as for the ten-cow herd. The same is true for AVCs. AFCs, however, are much lower than for the ten-cow herd and, as a consequence of this, the ATCs are lower, ranging down from around $3.60 to around $3.40.

The "envelope curve" going around all the smaller ATC curves is ATC (3) for lengths of runs in which barn size, as well as herd size and feeding level, is variable.

The data have considerable significance as they show the economies attainable by changing herd sizes, i.e., ATCs are lowered almost 25 percent and AFCs are cut almost in half by going from a ten- to a twenty-five-cow herd.

Before leaving the University of Kentucky to join the faculty of Michigan State College, I was also asked two pivotal questions—one by a faculty member, John Bondurant, and the other by a graduate student, Joseph Willett. Bondurant wanted to know whether, when maximizing profits on the USDA's published pork production function, he should use the price a farmer nets when he sells his corn or the cost he has to pay when he buys corn, the difference at that time being between five and ten cents a bushel to cover transportation and other transaction costs associated with buying and selling corn. Willett had a different but related question. When teaching production economics at that time, I arranged the factors of production in the order of what I presumed was their order or degree of "fixity." Willett, then a student in the course, wanted to know how I knew the order of fixity and how I knew which ones were fixed and which were variable at any given time. Bondurant's question focused on acquisition/salvage price differentials while Willett's reiterated the question I had faced before World War II in Professor Hunter's class about my dad's cows, and which was not addressed by Wells. Both questions prodded me to reflect on the shortcomings of the conventional production economics I had been taught and was teaching.

At Michigan State College, G. Edward Schuh's M.S. thesis presented empirically based cost curves similar to those developed by Wells for representative dairy farms in the Detroit milk shed. Schuh then aggregated these cost curves into empirical milk supply functions for the Detroit milk shed. The problem was that Schuh's supply functions, like those in our undergraduate and graduate courses in economics, were perfectly reversible for any of the three lengths of run and failed to explain endogenous shifts between lengths of run reflected in the farm consolidations and exits of dairy farms and farmers then characteristic of Michigan's dairy industry. Again, attention was called to deficiencies in commonly used economic theory that needed attention before the theory could be used in doing realistic cost of production and industry supply response research.

OVERCOMING DEFICIENCIES WITH RESPECT TO INVESTMENTS, DISINVESTMENTS, FIXED ASSETS, AND OPPORTUNITY COSTS

In the North Central Farm Management Research Committee (NC54), a related difficulty arose about how to price forage both as a feed input and as a product of forage enterprises. Lowell Hardin from Purdue University and I (Johnson and Hardin 1955) wrote a Purdue University agricultural experiment station bulletin entitled "Economics of Forage Evaluation." This bulletin used salvage values, acquisition prices, and MVPs to determine how forage (an expendable input) and forage stands (durable assets) should be priced and their use contracted, expanded, or left fixed. The bulletin used the marginal productivity of forage and forage products and off-farm opportunity costs in evaluating forage stands. The work was done in the practical context of a forage evaluation problem faced by a hypothetical farmer, Ivan Jones. On pages 5 and 6 of the bulletin, reasons for difficulty in evaluating forages are discussed. The theoretical insight gained in producing this practical bulletin was a synergistic result of tackling a practical problem rather than an independently pursued disciplinary end. The bulletin was reviewed by practical farm management peers, some with substantial disciplinary competence in economics rather than by peers from the discipline of economics. The following excerpts are from the bulletin:

> Harvested forage, forages in the field and forage stands have the common characteristic of being costly, bulky items to move. The cost of baling loose hay and hauling it to market can easily account for half of its market price. For chopped hay and silages, handling costs are even higher relative to their market prices. The cost of purchased hay and silage laid down at the barn door may exceed their market price by more than a fourth. In effect, the farmer ordinarily faces two [market] prices for hay and silage—one when he buys them and one when he sells the, the difference between the two being due in large part to the cost of transferring them from field to storage to market to farm. To utilize forage as pasture means grazing it where it is—in its particular location during the season when it is available.
>
> A farmer with an excess of forage in the field may get a small cash return for it by renting it out as pasturage or by selling it to someone desiring to put it up for hay. If allowances are made for the value of fertilizer nutrients removed from the farm, the realized net return may approach zero. Robbins (1953, 71) estimated the market value of the N, P_2O_5, and K_2O removed from the farm in 2.81 tons of alfalfa hay or equivalent pasturage (one acre in his study) as $32.92 when sold as hay and $9.86 when sold as rental pasture. Prices used were N, 14.5 cents per pound; P_2O_5, 8.5 cents per pound; K_2O, 6 cents per pound. On the other hand, the person who rents the forage stand for hay or pasture often finds the gross cost of the feed obtained to be high in terms of what it would have cost to produce the feed from regular forage stands. This is especially true if account is taken of the hauling costs and of the costs of driving livestock to and from a rented pasture. On certain small intensive farms, however, the earnings of forage may be so high and the cost of establishing more forage-producing stands so high that rental is justified.

Forage stands display these same characteristics in an even more pronounced way. For instance, a new stand of fescue-ladino in western Kentucky may cost $35 an acre to establish (acquisition price). Yet, once the resources represented by this $35 are invested in fescue-ladino production, they may have little or no disposal or salvage value—that is, no net value in alternative uses or on the market . . .

USE VALUE ON AN INDIVIDUAL FARM OFTEN DIFFERS FROM MARKET PRICE

In a perfect market, price of forage feed would tend to equal its marginal value products (MVP) . . . which would be equal in all feed uses. The MVP (use value) of feed forage on a given farm is what it is worth at the margin in producing livestock and livestock products. The MVP of the fertility contribution of forage may be similarly defined in terms of its worth at the margin in crop production.

Evidence exists to support the hypothesis that the MVP of forage both as a feed and as a fertilizer falls as more forage is used and additional uses are adopted within a given farm organization. Use value on a particular farm, therefore, depends on that farm's organization—its enterprise combinations, production relationships, markets—at or during a particular period. This use value may be greater than the acquisition price, less than the disposal price, or somewhere in between. The relationship between use value and the two market values is important in decision making. If a farmer's use value exceeds the acquisition price, logically he enters the market to obtain more. If his use value is less than disposal price, logically he sells.

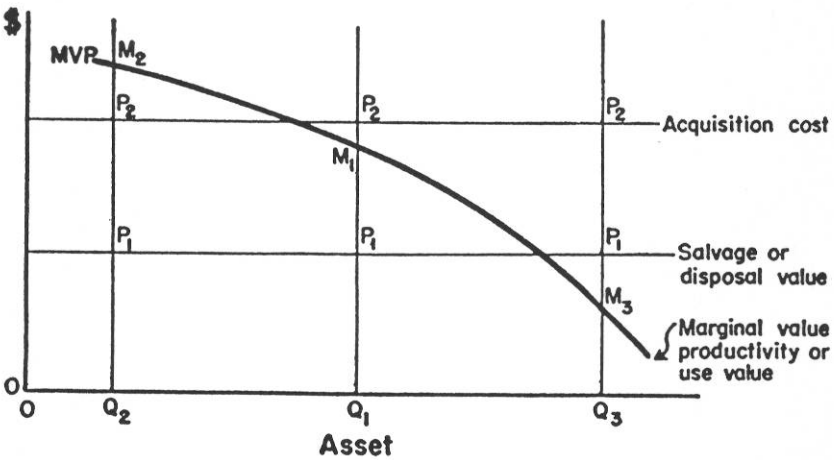

FIGURE [5.2]

For an individual farmer, use value rarely equals either of the two market prices. His own appraisal of the differentials that exist for him between use values and the two market prices guides him in his decisions to enter the market as a buyer, seller, or not at all. The spread between acquisition (cost) price and off-farm disposal (sale) price for his forage maintains itself over time because of high transportation and handling costs and fixed pasture locations. Further, weather and price levels are seldom perfectly forecast at the time production plans are made. Thus realized forage production on an individual farm is often greater or smaller than would be ideal . . . for the price relationships and farm organization that exist at harvest. As a result, the individual farm business is usually long or short on forage in any particular year. Over many years, this balance improves little because many causes of poor adjustment occur continuously in an unpredictable pattern . . .

[The figure above] contains three lines that represent concepts of basic importance in evaluating forage and forage-producing stands. [Note: At this point in our thinking we had not realized that the three lines in figure [5.2] must be consistent with each other in the sense of being either stock or flow values—this was later made explicit. Baquet's chapter explores in rather minute detail the advanced topic of determining the optimum rate at which to extract flows of services from durable stocks. Even without explicit recognition of the stock flow conversion problems, figure [5.2] is superior to "Econ 101" (undergraduate) and "Econ 801" (graduate) course diagrams that still treat acquisition costs as equal to salvage values or acquisitions costs as infinite and salvage values as either zero or infinitely negative.]

The most important of these three lines is the marginal value product (MVP) line. This line represents successive additions to the gross income of the farm business that result from using successive additional quantities of the asset being evaluated. In general, beyond some limit within a given farm organization, additional quantities of an asset tend to be used less efficiently in a given use and/or devoted to less efficient uses; hence, a portion of the MVP line slopes to the right.

Two other important lines appear in [figure 5.2]. One of these is labeled "acquisition cost," the other "salvage or disposal value." Acquisition cost is the cost of adding one more unit of the asset to the business. Salvage or disposal value is what could be realized from one unit of the asset now on hand, if it were to be disposed of either within or outside the business. Although the acquisition cost and salvage value lines are drawn straight and parallel in [the] figure . . . , they may vary as to level and in relation to each other. Acquisition cost is the marginal factor cost (MFC) if the asset is purchased. In the case of uniform assets bought in a competitive market, the price of the asset and the MFC are the same. For nonuniform assets purchased in an imperfect market, MFC may differ from the price of the asset; it may be either a negative or a positive function of quantity. Acquisition cost is the marginal cost (MC) of producing more of the asset if the asset is produced on the farm. In some instances, both MFC and MC are relevant as the asset may be both purchased and farm-produced . . .

If, as in [figure 5.2], a farm has a quantity, Q_1, of an asset on hand, that quantity has an MVP of Q_1M_1 which is greater than Q_1P_1 (the revenue realized by salvaging another unit of the asset) and less than Q_1P_2 (the cost of acquiring another unit of the asset). In this case, there would be no reason to acquire more of the asset or to dispose of it. The asset is fixed. Its value, under these conditions, is its use value (MVP). In this case, the MVP is

greater than salvage value and less than acquisition cost. In this situation, the asset is worth more to the farm concerned than if placed on the market, though less than the cost of buying it from the market and getting it to the farm.

If, on the other hand, a quantity, Q_2, were on hand, an MVP of Q_2M_2 would result which is greater than Q_2P_2, the acquisition cost. In this case, it would be advantageous to acquire more of it. Under these conditions, the asset must be regarded as variable. It is unreasonable, however, to value the asset at its MVP, as this value exceeds the price at which the market stands ready to supply additional quantities. One cannot say or assume that the asset is worth more than the price at which one can have it delivered to the business.

To explore the framework still further, what are the consequences of having a quantity Q_3 on hand? Such a quantity would have an MVP of Q_3M_3 which is less than Q_3P_1, its salvage value. In this case, it would be advantageous to dispose of at least a portion of the asset as the market would pay more for it than the business can get out of it. Disposal of part of it would increase its MVP to a level equal to its salvage value. It would be unreasonable to value the asset at its MVP if such is less than its salvage value. The market stands ready to take the asset at a value higher than its MVP and it is worth at least what the market will pay for.

From a decision-making viewpoint, two of the three cases just analyzed call for reorganization of the business by changing the quantity of the asset used. In the other case, the asset remains fixed even though other changes in the business are called for, such as . . . the introduction of a technology.

Such changes could easily shift the MVP line to the right or left, thus increasing or decreasing Q_1M_1 in the figure . . .

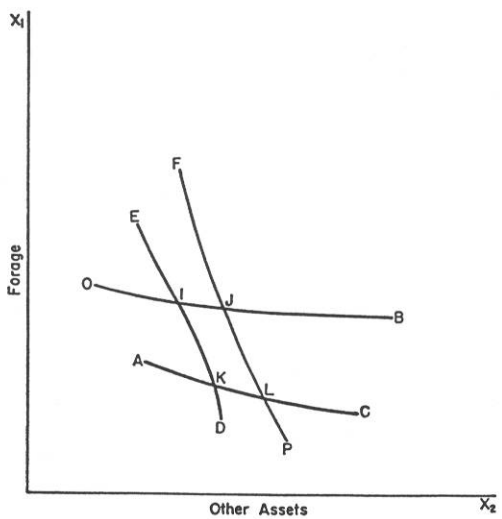

FIGURE [5.3]

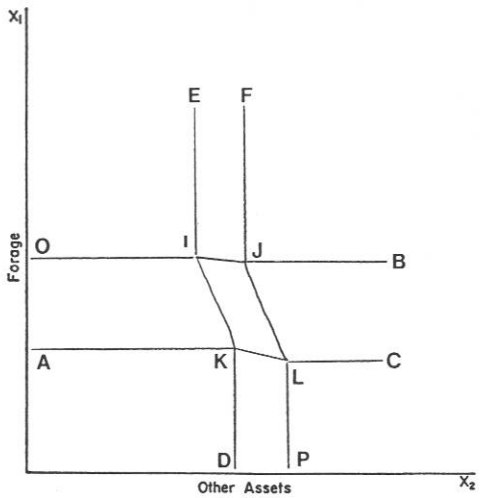

FIGURE [5.4]

The above was followed by a section dealing with forage stands as durable assets which contrast with pasture (nonstorable) and hay (storable) as products generated using the forage stand. Both products are expendable "one use" inputs. The bulletin introduces two ideas important in later asset fixity theory: (1) the use of iso-marginal revenue lines in two input diagrams, two for each input—one equal to salvage and the other to acquisition prices (see figure 5.3), and (2) the division of an input/input diagram into nine areas pertaining to the possible fixity or variability of the two inputs.

The iso-MVP line AC in figure 5.3 is the locus of all points for which the MVP of X_1 is equal to its acquisition cost (when both are measured either in stocks or flows). For X_2, the corresponding line is ED. There are also corresponding MVP lines for the salvage values of X_1 and X_2—OB for X_1 and FP for X_2—in figure 5.3 Point K represents the ex ante optimum amounts of X_1 and X_2 to use. In the very special restructive Econ 101 case, lines AC and OB coincide as do lines ED and FP, while the IJLK area collapses to a point that includes points I, J, L, and K. Point K is missed in the real world as a result of imperfect knowledge. When acquisition costs equal salvage values, it is costless to correct the error and the market adjustment is for the "good of all concerned"; however, when acquisition costs exceed salvage values, loss-minimizing adjustments based on opportunity costs are the best that can be done. Some of these adjustments impose ex ante losses on the firm while conferring benefits upon users of the product(s) being produced.

Later mathematical investigations indicated that the earlier figure in the bulletin was misdrawn. Of the two figures below, the one on the left is the original and the one on the right is the mathematically correct version. In figure

Table 5.1. Situations Encountered and the Appropriate Value to Place on Forage When It Is One of Two Inputs or Two Products

GEOMETRIC AREA IN FIGURE 5.4	ALGEBRAIC CONDITION	ACTION CALLED FOR	APPROPRIATE VALUE TO PLACE ON X_1 A FORAGE ASSET
IJLK	Acq[a] X_1 > MVP X_1 > Salv[b] X_1 Acq X_2 > MVP X_2 > Salv X_2	Leave both X_1 and X_2 unchanged	MVP
AKD	Acq X_1 < MVP X_1 Acq X_2 < MVP X_2	Expand use of both X_1 and X_2	Acq
AKIO	Acq X_1 > MVP X_1 > Salv X_1 Acq X_2 < MVP X_2	Leave X_1 unchanged, expand use of X_2	MVP
DKLP	Acq X_1 < MVP X_1 Acq X_2 > MVP X_2 > Salv X_2	Expand use of X_1, leave X_2 unchanged	Acq
OIE	Salv X_1 > MVP X_1 Acq X_2 < MVP X_2	Contract use of X_1 and expand use of X_2	Salv
CLP	Acq X_1 < MVP X_1 Salv X_2 > MVP X_2	Expand use of X_1 and contract use of X_2	Acq
BJLC	Acq X_1 > MVP X_1 > Salv X_1 Salv X_2 > MVP X_2	Leave X_1 unchanged and contract use of X_2	MVP
EIJF	Salv X_1 > MVP X_1 Acq X_2 > MVP X_2 > Salv X_2	Contraction of X_1 and leave X_2 unchanged	Salv
FJB	Salv X_1 > MVP X_1 Salv X_2 > MVP X_2	Contract both X_1 and X_2	Salv

[a]Acquisition cost.
[b]Salvage value.

5.4, all that remains of line AC is KL. Similarly, IK remains of ED, IJ of OB, and JL of FP, as AC, OB, ED and FB are drawn in figure 5.3

The analysis in the bulletin concluded that the appropriate actions and values to place on forage for each of the nine areas in figure 5.4 above were as indicated in table 5.1.

Figure 5.4 was later developed to demonstrate why a competitively organized firm (both farm and nonfarm) tends to overinvest and hence overproduce. Figure [5.5], the extended version, is reproduced here. It includes the iso product line that passes through point A which corresponds to K in figure 5.4. This iso product line helps to clarify the tendencies of a firm to overinvest and overproduce when experiencing imperfect knowledge with acquisition prices (costs) of durable assets in excess of their salvage price (values) capital losses on the overinvestments. The following (including figure [5.5]) is from the interstate managerial study (Johnson et al. 1961, 160–63).

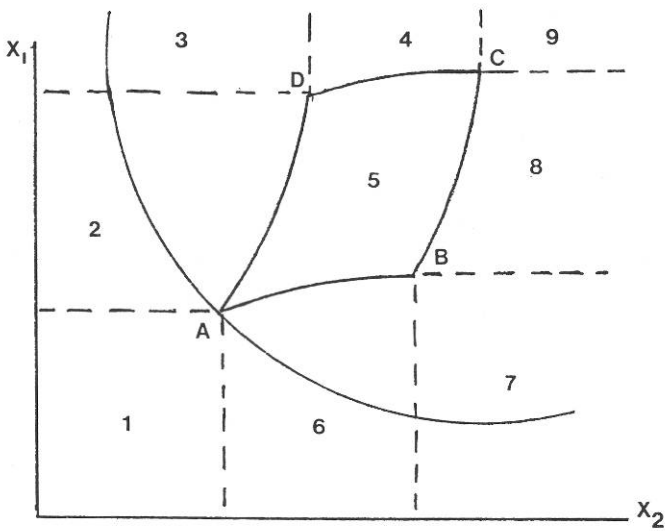

FIGURE [5.5]

In considering the case for two inputs, iso-marginal value product lines are important . . . [As previously pointed out,] the four lines trace out an irregular rectangular area on the production surface. One of the corners of this rectangle is labeled A. At this corner the marginal value productivities of both inputs are equal to their respective acquisition costs . . . Point A can be called the high profit point. All other points in the area bounded by the four iso-marginal value product points are points of equilibria but are less profitable than point A. At point D, the marginal value productivity of X_2 is equal to its acquisition price, but the marginal value productivity of X_1 is equal to its salvage price. At point C the marginal value productivities of both inputs

are equal to their salvage prices. At point B the marginal value productivity value of X_2 is equal to its salvage price, while the marginal value productivity of X_1 is equal to its acquisition price. In addition to the four iso-marginal value product lines which trace out the solid rectangular area in figure [5.5] we are interested in the dotted lines presented in these figures. These dotted lines are horizontal and vertical to the corners of the central rectangular area. The dotted lines plus the four solid lines making up the central rectangular area divide the production function into nine areas. In area 5 both inputs are fixed. So long as a farm is organized in area 5, it will not respond to changes in the price of the product and in the prices of the two inputs. However, we should note that the changes in the prices of either the inputs or of the products will change the location of area 5. Eventually changes in prices of the product and of the input would get large enough to shift area 5 away from any farm organized to fall within area 5 under initial conditions. Within area 5, the marginal value productivity of both inputs is not equal to the acquisition price of the inputs if the inputs are nondurable. If the inputs are durable, the marginal value productivities of the inputs are not sufficient to maintain their capital value equal to the acquisition prices paid for the durables. Thus, when farms are organized so as to fall into area 5, capital losses are imposed on the owners of the business. All points in area 5 other than point A are points of overproduction. It is impossible for the operators of a business to contract production from a point in area 5 to point A without losing more money than they would by maintaining the over-expansion in production which occurs when so organized.

All points in area 1 are points of underproduction. In all instances, it is profitable for a firm organized in area 1 to be [re]organized at a profit so as to reach point A. In areas 2 and 6 some organizations are producing more output than would be produced at point A. Other organizations in areas 2 and 6 produce less output than point A. However, it is extremely important to note that those organizations in areas 2 and 6 which produce less output than point A cannot be adjusted to reach point A. It is equally important to note that those organizations in areas 2 and 6 which produce more than the output at point A can be made more profitable (or less profitable) only by expanding production despite their previous position of over-production. The best that an operator of a firm organized in areas 2 and 6 can do is to reorganize his farm in such a way as to reach the edge of area 5 at something other than point A. All such points at the edge of area 5 are points of overproduction which will involve capital losses for firms so reorganized.

Firms organized so as to fall into areas 3 and 7 can contract the use of one input and expand the use of the other so as to reach either point D or point B as the case may be. In any event the best of the possible reorganizations open to the firm involves a substantial amount of overproduction. Firms organized in areas 4 and 8 can contract the use of one of the two inputs but cannot change the use of the other. Such reorganizations also place then on the boundary of area 5 at a point of overproduction. In area 9 a firm can contract the use of both inputs but cannot do better than reach point C, an area of extreme overproduction. In all areas other than area 1 the best reorganization of the firm involves (1) overproduction and (2) capital losses.

The above analysis explains how overproduction would be maintained if imperfectly informed managers made the mistake of organizing their farms

> in areas 2 through 9. It does not, however, explain why farmers would make the mistake of organizing their farms at anything other than the high profit point, point A in the first place. In order to explain why such mistakes are made, it is necessary to consider risk, uncertainty [imperfect knowledge], and the managerial process. Mistakes in the organization of farm businesses would involve imperfect knowledge about future product prices, future input prices and technological relationships. To the extent that institutional and human factors would affect future prices and technological relationships, imperfect information on institutional changes and human behavior would also account for mistakes of farmers in organizing their businesses. Expansion of the three-dimensional analysis presented above to include the large numbers of inputs which farmers actually work with would indicate how very easy it would be for real world entrepreneurs to make the mistake of organizing their farms in the large number of areas (spaces) in a d-dimensional production function which would correspond to the 8 areas of overproduction in our greatly oversimplified three-dimensional model.

Figure [5.5] is essentially the same as figure [7.8] in chapter 7. Figure [7.8] is also made readily available there to expedite discussion of what is involved in evaluating the rightness and wrongness of programs to alleviate capital losses resulting from overinvestments.

A later more advanced treatment of the actions, values, capital gains and capital losses and internal opportunity costs is to be found in The Overproduction Trap (Johnson and Quance 1972, 190–94).

When asset fixity and/or variability affect the marginal cost functions of firms, they also affect industry supply functions to create the kinds of difficulties that (1) perplexed me as a student and as an economic statistician in the old Bureau of Agricultural Economics and (2) were not handled in Schuh's study of supply responses in the Detroit milk shed. Thus, I republish here what was both an empirical and theoretical chapter entitled "Supply Functions—Some Facts and Notions" in Agricultural Adjustment Problems in a Growing Economy (Johnson 1958). This chapter received the American Farm Economics Association award of Merit for research published that year. It contained a lengthy footnote reviewing agricultural supply response work of economists published here as an endnote (3). The chapter, in a somewhat abridged form, follows:

> Historical perspective is ordinarily desirable; for this conference it is essential if we are to avoid repetition of past work and concentrate on areas requiring further development. Space limitations do not permit an historical recounting of works on supply responses in this paper. As, unfortunately, I am unaware of a suitable reference to cite, the long [endnote][3] . . . sketches, hastily, some of the main contributions in recent decades.
>
> When studying the works of Galbraith and Black, Schultz, D. Gale Johnson, Cochrane, Brewster and Parsons, the reader finds himself in general empirical agreement with the input-output facts presented by authors trying to explain supply responses. As far as short-run changes in the supply of individual products are concerned, economists appear to be in substantial

agreement both conceptually and empirically as to the factors affecting supply and their quantitative influences. Even T. W. Schultz in his more critical moods has not really questioned the adequacy of our quantitative knowledge of supply responses for individual products; instead, he has stressed the inadequacy of our knowledge concerning changes in the aggregate supply of farm products. Galbraith-Black's depression presentation, D. Gale Johnson's depression-prosperity contrast, and Heady's more detailed examination of the full-employment situation seem lacking, conceptually, in explaining asset fixities and their influences on the aggregate supply function. The Cochrane and Schultz technological analyses do little to remedy the situation, though the earlier secular analysis of growth in the supply and demand for farm products, made by Schultz, appears to remain very satisfactory. Thus, what follows is based on the conviction that the deficiency in our past attempts to understand agriculture's aggregate supply function is not in omitted variables; instead, the difficulty appears to be primarily in the analytical apparatus.[4]

A slightly modified form of neoclassical marginal analysis is available and promises to handle fixed assets, quasi-rents, capital gains, marginal costs, and supply responses more adequately than the unmodified neoclassical analysis used by Galbraith-Black, D. Gale Johnson, and Heady. This analysis, in turn, can be combined with analyses which include technology, education, capital growth, risk, etc.

The Modified Analysis

The most neglected aspect of current aggregative supply analysis for agriculture is the theory of fixed assets. This neglect can be traced back into the classical and neoclassical marginal apparatus on which many of the existing supply analyses are based. Analytically, the law of diminishing returns (or of variable proportions) operates when different amounts of variable inputs are used in conjunction with a set of fixed assets. The law of diminishing returns, in turn, determines the nature of the marginal cost curve for individual enterprises and, ultimately, of the aggregate supply curve for an industry. The rate at which the marginal productivity of variable inputs declines depends on the proportion of fixed inputs, the levels at which they are fixed, and the degree of substitutability or complementarity between fixed and variable resources. Thus, it is extremely important that the framework employed in analyzing supply problems be capable of determining: (1) which assets are fixed and (2) the levels at which they are fixed. Furthermore, it is important that the analytical framework define fixity with respect to: (1) assets used in multiple-product firms, (2) single-product firms, (3) single-product industries, and (4) multiple-product industries.

The neoclassical, marginal apparatus includes the opportunity cost principle for purposes of pricing multiple-use, fixed assets within multiple enterprise firms.[5]

Similarly, neoclassical analysis has a well-developed body of theory for treating land as an asset which is fixed for the agricultural industry as a whole. The neoclassical framework, however, is almost devoid of explanations as to why assets are fixed for a firm, making it necessary to apply the opportunity cost principle. Similarly, it does not explain why assets become

fixed for industries but not for firms within industry. When it became apparent in the development of economic thought that land and fixed capital goods have many things in common, this difficulty was met, in part, with the concept of quasi-rents. After that, came the question of whether quasi-rents could be negative as well as positive. Stigler has argued this question without producing a worthwhile conceptual solution (Marshall 1920, 426n; Stigler 1946, 179–81).

Microproduction economists conducting empirical work in the field of farm management also encountered related problems involving fixed assets. First, it is clear that a different subproduction function exists out of, say, $y = f(x_i, \ldots, x_j \ldots, x_n)$ for each of the infinite number of combinations of x_i and levels at which the x_i can be fixed. Instead of (1) an ultimate short run in which all are fixed, (2) [an intermediate] run in which some are fixed, and (3) an ultimate long run in which no assets are fixed (Marshall 1946, 376–77), there is a multiplicity of lengths of run. Secondly, it is also clear that there is more than just a short and a long run in the pricing of fixed assets. In the short run, farmers do not stay in production until marginal revenue equals marginal cost at the minimum point on the average variable cost curve (Marshall 1946, 376). In milk production, the number of cows in a herd is sometimes fixed and sometimes variable. Furthermore, the quasi-rents on cows sometimes appear to be both positive and negative simultaneously; in 1953, quasi-rents appeared negative with respect to what had been paid for cows in 1952, but positive with respect to what the nonfarm economy would pay for them in 1953. Cows become variable when they are worth less in the herd than they are to someone else, either another farmer or the packing house. Hence, farmers shift from the "length of run" in which cows are fixed to the one in which they are variable, long before marginal costs equal average variable costs on the particular subset of cost curves which treats cows as fixed assets (Schuh 1957). If cows flow from farm to farm, both the supply of milk and the aggregate supply curve for agriculture are relatively unaffected. However, if they flow from farm to packing house, both the milk supply function and the aggregate supply function shift downward because of less milk and upward because of more meat unless changes in the dairy cow inventory are taken into account.

These questions involving fixed assets, lengths of run, negative and positive quasi-rents[6] tend to be avoided in the neoclassical analysis by assuming either perfect factor markets (Stigler 1946, 104 f., 180n) (i.e., markets in which firms can buy and sell or industry acquire and dispose of inputs at the same price) or completely imperfect markets (i.e., markets in which the costs of acquisition are infinitely high and salvage values are zero for economies).

At the individual firm level, most factor markets are perfect in the sense that firms can buy and sell factors, including land, at the same price. If for some reason a factor market is imperfect and market prices are inappropriate, the principle of opportunity cost is used to price the factor within firms. The neoclassical analysis does not explain clearly how or why resources move into or out of industries as variable inputs, and then become fixed. For purposes of explaining aggregate supply responses in agriculture under condition of widely fluctuating absolute prices and price relatives, it seems essential that our analytical apparatus be capable of dealing with such problems.

In what follows, an asset will be defined, very simply and crudely, as fixed "if it ain't worth varying." More elegantly stated, an asset will be de-

> fined as fixed so long as its marginal value productivity in its present use neither justifies acquisition of more of it or its disposition (Glenn L. Johnson and Hardin 1955).[7] If the acquisition cost and salvage value[8] of an asset are substantially different, the asset can remain fixed while the price of the product it produces varies both absolutely and relatively over wide ranges. If on the other hand, as is commonly assumed in using the marginal apparatus the acquisition cost of an asset is equal to its salvage value, any variation in product price relative to the price of the asset will cause either acquisition or disposal of the asset.

Critics (M. Johnson and Pasour 1981) have faulted asset fixity theory for neglecting the role opportunity costs play in allocating resource use. In the presentation republished immediately above, in the forage evaluation presentation, and, especially, in the Edwards contributions, the opportunity cost concept is repeatedly involved. The Lagrangian multipliers in the Edwards analysis are all identified as "within farm opportunity costs" while acquisition costs and salvage prices are treated as "external opportunity costs." It has been difficult for me to understand the failure of M. Johnson and Pasour to have read the above and the Edwards article carefully enough to see this before publishing their criticisms of those works (Glenn L. Johnson 1982, 173–75). My mystification is only increased by their having attended my class in a year for which my dated lecture notes indicate that Edwards' opportunity costs were covered in lectures on resource fixity! In this connection, see note 7 above with its definite reference to opportunity costs. This footnote is in the key asset fixity, award-winning (JFE) article—it was published in 1958, thirteen years before Johnson and Pasour (1981) wrote this critical article, which should have given them enough time to read it!

The following continues the reprint of the "facts and notions" chapter:

> . . . Our examination of previous work on supply responses has indicated that the work on individual commodities is more adequate than that on the aggregative response of the farm sector.[9] Furthermore, it indicated that the main difficulty is of a conceptual nature, involving the treatment of asset fixities as they depend on shifts in the acquisition costs, salvage values, and expected marginal value productivities of assets. Thus, the problem at hand appears to be improving the conceptual treatment of fixed assets, analyzing existing data, and explaining changes in the aggregate inputs and output for the farm economy as a whole.
>
> **A Classification of Productive Resources**
>
> . . . it appears desirable to classify the inputs used in the agricultural economy into categories which are reasonably homogeneous with respect to the behavior of acquisition costs, salvage values, and marginal value productivity. Since the object is to explain aggregate output, the primary interest is in the movement of resources between the farm and nonfarm sectors as contrasted with movements within the farm sector. Acquisition costs and

> salvage values for the farm sector, rather than within the farm sector, are relevant considerations in setting up the input classifications. Each category in the following classification includes resources which are reasonably homogeneous in the above respect:
>
> 1. Nonfarm produced durables—tractors, combines, tiling, etc.
> 2. Unspecialized farm durables—fence posts, pasture seedings, soil improvements, etc.
> 3. Specialized farm durables—dairy cows, orchards, sows, ewes, beef breeding stock, etc.
> 4. Unspecialized farm expendables—corn, hay, etc.
> 5. Specialized farm expendables—seed corn, grass seeds, etc.
> 6. Nonfarm expendables—fuel, oil, and commercial fertilizers, etc.
> 7. Hired labor
> 8. Family and operator's labor
> 9. Land

The next section of the "facts and notions" chapter is reprinted in chapter 7 because it deals with the macro relationships of agriculture with the rest of the economy, a topic taken up by Michel Petit in chapter 6. Some readers may want to read that part of chapter 7 at this point in their reading of this chapter.

The contributions made to asset fixity theory by Clark Edwards were stressed by Baquet in chapter 4. Baquet covered the most important of the four cases researched by Edwards in his thesis (1958) which is one of the two cases he published in the Journal of Farm Economics (1959). Edwards' four cases were (1) the usual undergraduate principles or graduate theory course treatment of the static theory of the firm, (2) a capital restriction case, (3) a shifting asset structure case involving acquisition/salvage price differentials for all assets and services as appropriate and, finally, (4) a case involving both capital restriction and shifting asset structures. Edwards (1959) published the first and third case in the Journal of Farm Economics. Few people know of the important insights derivable from his second and fourth cases. Baquet (1979) extended the third case in his dissertation to make the basic disciplinary improvements in user cost theory he presented in chapter 4.

The following excerpts are from the conclusions of Edwards' (1958) Ph.D. thesis entitled "Resource Fixity, Credit Availability and Agricultural Economics":

> . . . The major points of departure from other writings on associated subjects are (1) the formalization of investment and working capital supply functions for use in conjunction with static flow models, and (2) the use of on-farm opportunity costs, relative to off-farm opportunities for acquisition and salvage of factors, to determine the best list of fixed factor services. These departures assume answers to intertemporal questions and produce specific rules for optimal adjustments by farmers whose lists of fixed factors change and whose credit facilities are limited.

Beginning with results from the latter pages of this thesis and working backwards, the analysis explains net revenue as a return to fixed assets. This reminds one of the rent theories of the classical economists. Each farmer is regarded as owning an equity in his business. He supplements the equity with borrowed funds for additional investment and working capital and uses the funds to control productive services in a fashion which maximizes the flow of net revenue to the equity.

Improvements in either the rate of returns to equity or in the size of the equity improve farmer welfare. Changes in environmental factors which farmers do not control, such as product and factor prices, technology and offers of credit, change the well-being of farmers by changing both the rate of returns and the measure of equity.

Adjustments to changes in environment, or fixed conditions, may result in product supply responses on individual farms which are not reversible. Nonreversibility of supply response means that reversal of fixed conditions to a former state need not be accompanied by a complete reversal of output to its former level. The expected consequence of an increase in demand for farm products followed by a reversal to the previous demand, for example, is increased farm output and lower prices relative to prices and quantities in the initial situation. Lower farm incomes and capital losses are probable but not necessary results of such a cycle . . .

The interrelation of credit offers and fixed asset structure probably contribute a more meaningful explanation of optimal farm size than either element can offer alone. For example, the supply of funds helps determine the fixed asset structure, and the fixity helps determine the rate of returns to services which are variable to the farm.

The optimal organization of resources on farms depends on opportunities for profitable adjustments in the existing organization. Whether the quantity of a service should be varied from its existing use depends on the on-farm opportunity cost of the service relative to off-farm opportunities for (1) acquisition of more of the resource, and (2) salvage of some of the existing quantity. [Attention is called to note 7 of this chapter.]

A necessary, but not sufficient condition that a resource remain at its initial level during reorganization by economizing farmers is that on-farm opportunity costs for services are bounded by off-farm opportunities for acquisition and salvage.

Such off-farm opportunities are characterized by the condition that acquisition costs are frequently greater than salvage values. When they are greater, the supply function for services from a stock has a discontinuity located at the existing quantity of services, and the services are subject to fixity.

Such are the consequences of assuming (1) acquisition costs greater than salvage values and (2) upward sloping supply functions for investment and working capital funds. The framework used to derive the above results was the static theory of the firm. However, an important part of the mathematical apparatus was developed by Kuhn and Tucker for nonlinear programming where maximization is subject to inequalities. The similarities of [this] marginal analysis and activity analysis as vehicles for examining fixed asset structures and capital restrictions appear more striking than the differences. Analogous procedures to those applied in the marginal analysis of this thesis would produce similar results in an activity analysis framework.

> Several limitations of this thesis depend on restrictive assumptions in the models. Most important among these, perhaps, is that static-micro models were used. The role played by risk in fixing assets and influencing decisions to invest is thus neglected. Aggregate responses are not adequately examined. These and other restrictive assumptions . . . limit the range of application of the models developed . . . The effect of these limitations on the usefulness of the results was not fully determined.
>
> The results of this study are supported in two ways. First, the two fundamental restrictions on resource fixity and credit availability have empirical as well as theoretical origins. Secondly, the rules for optimal allocation of resources subject to these two restrictions were shown to be consistent with (1) observed changes in farm prices and quantities and (2) established principles of farm management. There remains the task of making objective, statistically valid tests of confidence in the results . . .

As Edwards indicated, linear programming is well adapted for firm-level modeling of investments, disinvestments, and asset fixity so long as (1) it is not used to model the economics of extracting various amounts of services from durables and (2) it does not turn out to be advantageous to expand the use of all inputs. In 1976, I (Johnson 1976, 192–203) briefly summarized some of the efforts to linearly programmed investment and disinvestments and published the results in the European Review of Agricultural Economics, an abridged version of which follows:

> Not long after Schuh completed his [M.S. dissertation in 1954, summarized above], the North Central Farm Management Research Committee organized a study of the adjustment problems of the Lakes States dairy industry in view of the price changes taking place. At [that] time, linear programming was coming into vogue, and the personnel of the Lakes States dairy adjustment study were anxious to develop their capacity to use this technique which estimates the consequences of maximizing returns to fixed resources. After examining a number of studies, including the Wells and Schuh efforts, it was decided that the responses of representative firms to changes in prices would be programmed. The linear programs used did not provide either for investments or, conversely, for disinvestments in durables. Further, there were no provisions for farm consolidation and off-farm migration. As such, [the studies] were of little potential value for studying immediate and long-term response to price and were virtually useless for studying firm and industry growth processes. In this respect, the Lakes States dairy adjustment study was very similar to the earlier Schuh studies. However, the study had a greater objective than predicting the short-run responses to price, given herd and barn sizes, as was the case with the Schuh study. Before the study was complete, it was clear that it was in difficulty; it was not possible to study the adjustments being made to changes in product and factor prices with a simple maximization model. Investments, disinvestments, farm consolidation, and off-farm migration of labor needed to be considered.
>
> Because the LP models in the Lakes States dairy adjustment study did not contain acquisition activities for investments or salvage activities for disinvestments, the analyses were unable to handle such price responses as farm

consolidation, off-farm migration, investments in new technology, and disinvestments in old technology. These were the very things involved in adjusting the dairy industry of the Lakes States.

Following the Lakes States dairy adjustment effort [study], a new regional committee was set up to study the feed-grain livestock economy of the Midwestern states (NC54). Again, the decision was made to base the study on linear programming analyses of representative firms. Because of the lack of the investment and disinvestment activities, credit activities and constraints, and activities to permit off-farm migration of labor in the Lakes States [dairy adjustment] study, the LP tableau used was partitioned, with acquisition (entry and/or investment) and salvage (exit and/or disinvestment) activities being excluded from one part. It was agreed that each cooperating state would run two LP's in different phases. Phase 1 omitted investment and disinvestment activities while the second included them. All states ran Phase 1, but only two states ran Phase 2 in an unmodified form. Of the two states running Phase 2, only one reported the results and that only in a Ph.D. thesis (Lard 1963). Results for Phase 1 were markedly different from Phase 2. A difficulty which arose from inability to account for exits and entries of farms in Phase 2 was that the numbers of farms (by size and kind) after adjustment were not ascertainable for use in aggregating micro responses into macro responses. Thus, the committee was faced with a difficulty in attempting to use linear programming results for representative firms. It had to choose between (1) maintaining weights, under the Phase 1 assumptions, to use in aggregating unrealistic micro results, and (2) getting more realistic micro results but losing the weights with which to aggregate.

In early deliberations, it was agreed [in NC54] that (1) supplemental time series analyses would be run at the aggregate level and (2) 'outlook type' studies of the feed-grain livestock industry would be made. Michel Petit (1964, 1965) did the aggregate analysis and became the first person to set up general equilibrium, simultaneous equations using irreversible supply functions based upon theories giving explicit attention to the bounding of opportunity costs by acquisition and salvage values. The other state doing aggregate analysis was Iowa which concentrated upon North Central regional differences using unmodified, more conventional econometric supply response functions. Originally, it was planned that the results of the Phase 1 and 2 LP analyses and the two time series analyses would be combined with many kinds of information from various sources. It was hoped that this somewhat eclectic approach would permit projections and conclusions to be drawn on a less formal basis to reflect the totality of information about the future of the feed-grain/livestock sector at the completion of the study.

Unfortunately, inappropriate results from Phase 1 models, the difficulty in solving the aggregation problem for Phase 2 results, and the failure to combine results of the two LP studies with results of the time series analyses and 'outlook type' information caused the work of the committee to bog down. What was needed was the originally planned eclectic, flexible approach, using a wider variety of sources of data and techniques. NC54 had planned an appropriate approach but allowed itself to specialize unduly on limited, single-period LP techniques. Eventually, a summary bulletin[10] was written by George Irwin and Dale Colyer (1967) which dealt mainly with the

> Phase 1 LP computations. The results sere similar to those for the Lakes States study.

In sharp contrast to the NC54 was a closely related study conducted by Robert Young (1965) of the beet sugar industry in eastern United States that investigated the competitive position of sugar beets vis-a-vis the livestock and feed grain enterprises considered in NC54. In his linear programming work, [Young] used NC54 survey data to do Phase II for sugar beet producing farms. Like NC54 researchers, he used constant weights to aggregate optimal organizations of representative firms capable of exit, entry, and consolidation. He handled the problem this created with supplemental surveys and more or less ad hoc studies of beet sugar processing, marketing, contracting, technologies, politics, programs, and policies, and, in addition, studies of construction costs for new beet sugar factories. In other words, he did what NC54 researchers had planned (but unfortunately failed) to do—he used many other sources and kinds of information and techniques on an ad hoc basis to overcome the shortcomings of his linear programming analyses to reach judgments sufficiently well informed to be accepted by parties concerned. Young's extensive iterative interaction with concerned people was (1) a source of knowledge (both value-free and about values) as well as (2) a reason why his results were accepted. His results supported the conclusion that it was unwise to expand beet sugar processing capacity at that time in the eastern beet sugar region of the United States with either private capital or public rural development subsidies.

Young's "ad hocery" was similar to that employed by Black and Bonnen (1955) earlier to produce results superior to an apparently more precise econometric analyses carried out by Cromarty. In an article published by the European Review of Agricultural Economics and extensively cited above, I (Johnson 1976, 189–91) wrote the following:

> Two early studies . . . were conducted by John D. Black of Harvard University. The first was with Ronald Mighell (Mighell and Black 1951) of the U.S. Department of Agriculture on the Lakes States dairy industry. The second was of the U.S. agricultural economy with James Bonnen (Black and Bonnen 1955). . . . The Black-Mighell study involved the construction of budgets to determine the consequences over time of various changes in the Lakes States dairy industry. The budgets sought to maximize returns by trial and error with attention being paid to technical change, the ability of farmers to finance responses to price changes, and changing institutional arrangements. However, it was not always assumed that enough was known by farmers about such changes to permit them to maximize their net returns. The attempt was to do a reasonably good job of predicting the responses [including entry, exit, and consolidation] which farmers would make to such changes. The study was done at the micro level with the micro consequences being somewhat informally aggregated into regional estimates.
>
> The Black-Bonnen effort was macro in nature in that it attempted to forecast or predict the consequences of various technical and institutional changes on the operation of the U.S. agricultural economy . . . the Black-

> Bonnen study must be regarded as something of a mixed equilibrium/projection study.
>
> The outstanding thing about these two studies was their accuracy and acceptability. In retrospect, it is clear that the authors did a relatively good job of avoiding premature maximization and inappropriate use of general equilibrium models while at the same time taking into account a wide range of information produced by many different disciplines . . . A U.S. agricultural sector study (Cromarty 1957) was designed to help develop the Klein-Goldberger model of the entire U.S. economy. It was an equilibrium study involving systems of simultaneous equations and employing econometric techniques for estimating [probabilistically] the parameters of systems of equilibrium equations. The model was operated recursively to simulate the operation of the U.S. agricultural economy. It seems fair to observe from an historical perspective that this effort was not as accurate as the earlier, less formal, more general Black-Bonnen study. Retrospectively, the study would have been improved by devoting some of the resources used to formulate equilibrium equations and employing sophisticated parameter estimation techniques to a greater variety of knowledge sources and quantitative techniques. Thus, the study could have explored the consequences of changes in technology, the human factor, and institutional arrangements on the performance of the agricultural economy.

PARTIALLY UNRESOLVED DIFFICULTIES AND CONSEQUENT OPPORTUNITIES WITH ASSET FIXITY OR INVESTMENT/DISINVESTMENT THEORETICAL AND EMPIRICAL WORK

Alan Baquet's chapter 4 of this book focuses on the difficulty of determining in theory and empirically the optimum rates at which to extract services from durables, a difficulty deliberately sidestepped by Edwards who specifically fixed those rates by assumption. It should be emphasized that this difficulty is shared by investment theory with and without recognition of acquisition cost/salvage value differentials. Determination of the optimum rate at which to extract services from a durable is important in deciding whether to invest or disinvest in it. Baquet's literature review covers difficulties addressed by Georgescu-Roegen vis-à-vis stock/flow conversions and of John R. Hicks, John M. Keynes, and others with user costs. Baquet's approach was suggested by significant but unpublished work by Francis Idachaba who reviewed the conflicting works by J. N. Keynes, Arthur Lewis, and others on "user costs." Idachaba's contribution was to recognize that the costs of generating services (flows) from durables included (like any other set of costs) marginal, average total, average variable, average fixed, total, total variable, and total fixed costs functions.

Baquet's contribution to the theoretical difficulty was confined to the case of two durables used to generate services for further use in producing two products. For this simple case, his solution involved many different "opportunity costs," one for each of over thirty Lagrangians. Some of the

opportunity costs are easily interpreted, others are interpretable with difficulty, while the practical interpretations of still others have eluded both of us to date.

Michael Abkin cooperated with Lindon Robison to investigate (with only partial success) numerical (as opposed to analytical) computational procedures to simplify the empirical work required to operationalize Baquet's theoretical accomplishments. Their (Robison and Abkin 1981) applications were for power-generating facilities in the electrical-power-generating industry.

There are major remaining opportunities to do important theoretical and empirical work related to investment/disinvestment (asset fixity). They include:

1. Better integration of investment/disinvestment or resource fixity theory with the dynamic theory of managerial processes.
2. More emphasis on the multidisciplinary nature of investment/disinvestment/asset fixity problems of firms, households, and firm/household complexes.
3. Filling a need to deal objectively with knowledge of values (nonmonetary as well as monetary and intrinsic as well as extrinsic) and a consequent need to be philosophically eclectic enough to do this. (Chapters 8 and 9 of this book elaborate on this opportunity.)
4. The roles of credit constraints, cash flow, and capital gains and losses (both nominal and real) as they influence investment and entry decisions, disinvestment and exit decisions, and resource and institutional fixities.
5. Meeting a need for researchers, analysts, and consultants to work interactively with imperfectly informed decision makers, choosers, and others facing dynamic problems involving investment, disinvestment, and resource fixity. Related to this need is an associated need for iteration in making investment/disinvestment decisions and choices. Iterative interaction becomes an important source of value, value-free, and prescriptive knowledge for researchers as well as decision makers and choosers. (Chapters 2, 3, 8, and 9 of this book elaborate on this need.)
6. Integrating what has been learned about investment/disinvestment and asset fixity theory into what is being called public choice/transaction cost theory by recognizing both fixed institutions and changes in institutions through institutional investments and disinvestments where institutions are regarded as including organizations, facilities, and people as well as "rules of the game."

To help in understanding the six opportunities listed above, it is noted that chapters 2 and 3 of part I at least partially consider numbers 1, 2, 3, and 4 above. The chapters in part III on policy also deal with the macro and policy impacts of investments, disinvestments, and fixity and more practically with numbers 2, 3, 4, 5, and 6. Similarly, the chapters in part IV on methodology deal particularly with 3, 5, and 6. As stated in chapter 1, the four

papers commissioned for my retirement symposium all relate to my life's professional work; hence, it should not be surprising that the four papers that introduce the four parts of this book should be logically and sequentially related to each other and to the six opportunities listed above. Asset fixity or investment/disinvestment theory was briefly considered in chapter 3 of part I. It receives extensive further consideration in chapters 6 and 7 of part III.

NOTES

1. This chapter has benefited substantially from criticisms and suggestions from David Schweikhardt.
2. Quality of cow could also be variable in this length of run.
3. In 1938, Galbraith and Black (1938, 305–23) published an article which reviewed the then-current explanations of the maintenance of agricultural production during depression years. After reviewing and, for the most part, rejecting the explanations, they advanced their own explanation of continued high-level production during depression. As they saw it, and in accordance with classical and neoclassical theory, fixed assets but not fixed charges contribute to the maintenance of output during depressions. The role played by fixed assets in their explanation was the poorly understood role which fixed assets play in neoclassical theory. In other words, the "whys" of asset fixity or variability were not fully explained by either the Galbraith-Black article or the neoclassical theory used therein.

   In 1945, T. W. Schultz published his Agriculture in an Unstable Economy, an excellent secular analysis of differential rates of growth in supply and demand for farm products, the intellectual roots of which are to be found in the works of J. S. Mill (1923). Mill, in turn, built on the works of Malthus. Schultz modified the Malthus-Mill analysis by introducing labor saving, technological growth, and capital accumulation as upward shifters of supply curves for farm products, both individually and in the aggregate. He concluded that, secularly, (1) the growth of supply for farm products tends to exceed the growth in demand, particularly for the high-calorie, low-income-demand elasticity products with adverse effects on the terms of exchange between farmers and others, and (2) the need to transfer capital into and labor out of agriculture depresses labor earnings and maintains capital earnings in farming.

   Also in 1945, D. Gale Johnson (1945) concentrated on price instabilities. His work, too, had respectable, though younger, ancestors; it was based on Knight (1921) and Hart's (1940, 1946) earlier works on risk, uncertainty, and profits. Both short-run and business cycle price instabilities were considered. Capital rationing, as a consequence of price risks, was envisioned as a major restriction on supply responses which deters agriculture from reaching optimum economic adjustment as defined in static equilibrium economics. The forward price proposal is essentially a method for removing price risks to enable to economy to attain more fully the benefits of reaching static optima. Harold Halcrow (1949) also studied weather risk and crop insurance.

Two papers, one by Brewster and Parsons (1946) and another by Ellickson and Parsons (1947), stressed the roles of technology and "workman like" as contrasted with "business like," determinants of agricultural productivity.

Cochrane (1947, 383 f.) (Wilcox and Cochrane 1951, chap. 24; Cochrane and Butz 1951) began to write on the subject of supply responses in 1947. With respect to supply responses for individual commodities within agriculture, he placed heavy reliance on the classical, marginal principle of opportunity cost. He uses this principle to explain the allocation of assets fixed for firms among the different products. He does not explain why such assets are fixed for the firm but not for individual enterprises; but then, neither did Marshall. Supply responses to completely variable inputs were not carefully considered either. The burden of explaining change or lack of change in aggregate farm output is placed almost entirely on technology. While technological advance explains part of the expansions in aggregate output, it (technology, not Cochrane's analysis) does not appear to explain failures of aggregate output to contract or some of the resource flows both into and out of agriculture which, fortunately for Cochrane's analysis, have tended to cancel each other. We need a better set of hypotheses to explain when assets are fixed, when they become variable upward, and when they become variable downward for firms and for industries as well as between the enterprises of multiple enterprise firms.

In 1950, D. Gale Johnson (1950) specifically examined the supply function for agriculture. He related his analysis to the earlier Galbraith-Black article and emphasized the difference between supply responses under depression and prosperity conditions. While he rejected as invalid the belief that high fixed costs are responsible for the failure of farmers to reduce output during a depression, he did consider how the availability of different classes of productive resources to the agricultural industry [varies] under depression and prosperity conditions and, hence, have differential impacts on the amounts of farm products produced. While Johnson's analysis represented a distinct improvement over earlier analyses, the treatment of fixed assets was not complete enough to explain why they do or do not flow between the farm and nonfarm sectors under different conditions.

T. W. Schultz (1953, 1956) has made [two] more recent contributions to the literature on supply responses. As his thinking is changing rapidly, his current position is difficult to determine. By and large, however, it seems safe to say that it is moving in the direction of the Cochranian analysis, i.e., the major burden for explaining changes in the aggregate output of American agriculture is placed on technology and education (improvement in the quality of the human agent) rather than on changes in resources used.

In 1955, Earl Heady (1955, 228 f.) presented a paper on the supply of farm products at full employment. Heady, like Galbraith and Black earlier, and D. Gale Johnson later, stuck close to neoclassical marginal analysis. His analysis of the supply of individual farm products closely resembles Cochrane's. Both analyses explain short-run supply changes for individual products largely in terms of opportunity costs in the allocation of fixed inputs in multiple enterprise firms. The two analyses, however, part ways when the aggregate supply of farm products is considered. Heady, in disagreement with Cochrane and in some disagreement with Schultz (at least as to emphasis), finds in his full employment analysis much greater possibilities for aggregate output to respond positively and negatively to changes in "factor/product price ratios."

While Heady's paper is not empirical, he does marshal enough evidence of aggregate resource flows (both in and out of the agricultural sector) in response to price changes under full employment to suggest strongly that a properly identified aggregate supply function would have a positive slope. He agrees that the elasticity of the supply function is low, though not as low as it appears. Heady explains the low elasticity of the aggregate supply curve in terms of: (1) low reservation prices for family labor in farming, (2) capital limitations, including capital rationing, resulting from risk discounting, (3) asset fixities and miscellaneous forces such as "the close bonds between the firm and household," low reservation prices on particular resources, and a greater degree of short-run fixed costs. Forces contributing to an "apparent" inelasticity of the aggregate supply function include, in addition to Working and Frisch's "identification problem," (1) flexibility in factor prices, (2) technical change, and (3) capital accumulation and redistribution of assets. While Heady identifies more of the relevant variables than D. Gale Johnson and appears to have judged the situation better than Cochrane and Schultz, his analysis still seems somewhat short insofar as the theory of asset fixity is concerned.

4.Schultz feels that we have neglected technology and education, yet Heady considered technology in terms which do not preclude education to "improve the quality of the human agent"—so did Galbraith and D. Gale Johnson. As a matter of fact, so did Schultz (1945) himself in his book Agriculture in an Unstable Economy; if he had not, he would have produced another version of Book IV in J. S. Mill's (1923) Principles of Political Economy.

5.This principle has been used effectively by Galbraith-Black, D. Gale Johnson, Cochrane, and Heady in analyzing supply responses for individual products produced by multiple enterprise firms.

6.Also of capital gains and losses.

7.This definition of a fixed asset is sufficiently flexible to define: (1) an asset fixed in one enterprise such as a corn picker, (2) an asset fixed for a farm but variable between enterprises according to the principle of opportunity costs, such as family labor or a tractor on a general crop and livestock farm, (3) an asset fixed for an industry in the production of one product or type of product but variable between firms, such as a self-propelled combine in the Great Plains, or (4) an asset such as land which may be fixed for an economic sector producing a variety of vastly different products, such as peppermint oil, milk, beans, celery, and pulp wood. Using this definition, quasi-rents are negative if figured with respect to acquisition value, positive if figured with respect to salvage value, and zero if figured with respect to their marginal value productivity.

8.Appropriately adjusted for the life expectation of the assets, for operating costs, to a net, at-the-firm basis, and for risk and uncertainty (economic, institutional, and technological). A fixed asset is fully employed (or it is not fixed); its expected MVP is, of course, dependent on the amount of variable inputs associated with it in most instances.

9.In his doctoral dissertation, W. A. Cromarty (1957) concluded that his estimates of supply elasticities for product categories within agriculture were more reliable than his expected estimates of demand elasticities for the same product categories. While this is contrary to some recently dramatized conclusions, many demand studies appear to be subject to shortcomings and to

lack independence, a factor which decreases the importance of agreement among them. Total (not per capita demand estimates) have, of course, been no better than population, war, and prosperity estimates. An example of the consequences of poor demand estimates in the case of wheat is found in T. W. Schultz's (1945, 246) Agriculture in an Unstable Economy. Writing in 1945, he stated that "The level of wheat storages in central markets of the world has in recent years been excessively large." In 1946, international wheat allocations were made to divide limited [wheat] supplies among countries. In evaluating the reliability of demand estimates, it is desirable to read [Norman Collins and] George Mehren's (1958, 61-73) paper in [Agricultural Adjustment Problems in a Growing Economy].

10. Inexplicably, the American Agricultural Economics Association awarded the summary bulletin (which was a "cut our losses" effort by NC54) its prize for best published research of the year.

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Part III

Chapter 6

Agricultural Policies in an International Context: Implications for Agricultural Economics[1]

Michel J. Petit[2]

The current agricultural policy debate is becoming even more international. No single country can ignore the international environment in which it operates. Furthermore, the small-country assumption is not tenable for such large entities as the United States and the European Community. This means that when they contemplate policy changes, these countries must take into account the impact of their policy actions on international commodity markets and anticipate the reactions of their trading partners. In most developed countries, domestic agricultural policies are kept highly visible by agricultural pressure groups and the special place they have in modern societies concerned about their roots.

The contradiction between the domestic political sensitivity of agricultural policies and the growing need to take international interdependencies into account shapes, to a large extent, the agricultural policy debate in many countries as well as the international discussions engaged to contain the growing confrontation among agricultural exporters. For instance, the 1985 U.S. Food Security Act and the subsequent 25 percent decrease in loan rates can be interpreted as resulting from a compromise between three major objectives: protecting the income of farmers affected by a serious financial crisis, reconquering international market shares, and limiting federal budget expenditures. Eventually, the fiscal objective was sacrificed, which illustrates the importance of international considerations in the U.S. domestic policy debate.

In Europe, international pressure has been felt mainly through the budget. The fiscal cost of the Common Agricultural Policy (CAP) has escalated as a result of the decline in prices, expressed in U.S. dollars, on international markets, compounded by the declining value of the dollar in terms of European currencies. This has been the main cause of changes in CAP. In 1984, milk quotas were introduced in direct response to budget pressures. Since then, support prices for major agricultural products have been decreased not only in real but also in nominal terms. In February 1988, the European Council, i.e., the summit meeting of heads of state or government of the European community, reached an agreement to effectively limit the

growth in CAP expenditures. They also adopted the principles of a land retirement scheme, but it is too soon to judge whether or not this will contribute a significant policy change. International considerations have also played a role in preventing a correction of the distortions in the protection of the various agricultural sectors. For instance, U.S. pressures have been effective in preventing the rise in protection of oil seeds and other protein-rich crops, which benefit from a much lower level of border protection than grains.

Agricultural trade disputes between the United States and the European community have worsened in recent years, however, as illustrated by the current war in export subsidies of wheat. Public officials, at the highest level on both sides of the Atlantic, have become aware of the negative impacts of the current situation, which benefits such major importers as the Soviet Union and Japan, two countries for whom it is certainly not the policy of the United States or of the European community to provide aid. Ministerial declarations in GATT and at OECD, as well as at the end of the Tokyo and Venice summits in 1986 and 1987, have emphasized the need to adjust domestic agricultural policies, so as to minimize their damaging impact on international trade. A fresh set of multilateral trade negotiations (MTNs), under the GATT, was launched in Punta del Este (Uruguay) in September 1986. It is clear that serious efforts have begun to include agriculture in these MTNs. The pressure to do so was strengthened by the creation of the group of Cairns.[3]

This evolution of the policy environment and the growing importance of international considerations raises major challenges for our profession. Economists are uniquely equipped to interpret many of the current issues. They must however be well aware of the limitations of their concepts, theories, and approaches, lest they only strengthen the ideological biases of one or the other party to the dispute. In this paper, I would like to concentrate on two analytical issues: the dynamics of agricultural supply and the dynamics of agricultural policy making. Uncritical acceptance of assumptions, a frequent weakness of economists, could lead to important errors in diagnosis, and in turn justify bad advice to policy makers. Another powerful reason for choosing to discuss these issues here is that they serve to illustrate several significant contributions of Glenn Johnson to our professional outlook and ethos; and this is appropriate for a symposium organized in his honor.

I. THE DYNAMICS OF SUPPLY

Many of the international agricultural problems result from the fact that since the early 1980s, the world demand for agricultural products has increased less rapidly than production capacity. This tends to create surpluses which weigh on international market prices. A broad professional consensus

has emerged on the causes of these surpluses, yet this consensus is not sufficient for guiding policy action. These two points will be successively presented.

1. A Consensus on the Diagnosis

Agricultural surpluses are closely related to the existence of a powerful dynamic process of technical change, associated with specific modalities of limited factor mobility. Government policies, which are themselves very rigid, are held responsible for preventing the adjustment of supply to demand.

In a well-known conference held in Bologna (Italy) in September 1986, G. Galizzi reviewed an abundance of mainly U.S. literature, showing very clearly and convincingly how the adoption of new technology by farmers is an essential aspect of the competition among them which drives the structural transformation of agriculture. This has been vividly characterized as "cannibalism" by Raup, as quoted by Galizzi. In other words, the general modernization process affecting agriculture is driven by competition among farmers faced with a constant flow of new and available technologies. They operate on markets for inputs and outputs having specific features which must be taken into consideration for rendering account of the specific modalities of the modernization process in a given place at a given time. Analyzing the relationships among various aspects of agricultural changes more than ten years ago (Petit 1975), I have proposed a general interpretation, valid for European agriculture, in which Galizzi's analysis would fit very well. Thus, even though most of the references he quotes are American, the conclusion that there is a powerful dynamic of technical change seems valid for European agriculture as well. This dynamic is fueled by a continuous flow of new technologies. In addition, it is likely that the flow of available new technologies and potential productivity gains which they entail will not slow down. On the contrary, there is every indication that it will accelerate (Evenson 1986).

The competition among farmers is not restricted to national boundaries. European farmers are competing with those of the United States, Japan, and other countries. Thus, it seems unlikely that a single nation could or would want to stop technical change unilaterally. One must then wonder whether or not the process could be controlled collectively. Most technical changes are created outside of agriculture, but their adoption depends on the economic situation of agriculture. At issue here is the influence of agricultural prices on the adoption of technical changes. Economic theory treats technical progress as an upward shift of the production function, thus as an exogenous variable. But at the same time, technical progress is most often embodied in new inputs. High prices favor the use of these new inputs and thus, in the long run, technical change is favored by high prices. In that sense, it is endogenous to the economic system. We touch here upon a fundamental question which will be addressed in greater detail below.

The process of modernization described above is strongly influenced by the fact that the main factors of production used in agriculture are mobilized by farmers in specific manners. Markets for land, labor, and many capital inputs are far from perfect. Sometimes they do not exist. This is particularly true, for example, in the family farm for inputs directly provided by the household to the "firm." One result of this situation is that the growth of agricultural production, and therefore the creation of surpluses, is the result of a modernization process which seems difficult to check.

For many economists, the main culprit for agricultural surpluses is the high level of price support. However, there is a debate on this question which is analogous to the old debate between Keynes and the neoclassical school about the role of wage inflexibility in bringing about unemployment.

Whatever this debate, economists generally agree that agricultural surpluses are a structural feature of our economies resulting from the rapid modernization process which has affected agriculture for decades. This modernization process has been fueled by a continuous flow of new technologies, while governments have been unwilling, or politically unable, to set support prices at levels low enough to discourage a rate of growth in production faster than the rate of growth of demand.

2. Limitations of This Diagnosis

This interpretation of the evolution of agriculture and agricultural policies is insufficient to identify suitable intervention measures. It simply leads to the conclusion that agriculture price-support levels must be reduced, or even eliminated altogether, with farmers compensated with direct income support. In Europe, this idea provided the main thrust of the "Siena Memorandum" (1984), of the "Wageningen Memorandum" (1973), and the"Uri Report" (1970). In the United States, the same idea was an essential feature of the Brannan Plan in 1949. Clearly, the idea is not new even if it has recently resurfaced under the new name of "decoupling."

The idea is generally accepted by economists who tend to think that the resource allocation role of price should be restored. Thus, it appears that the consensus is for the diagnosis reported in the first part of this comment as well as for lower price supports. In what way is that recommendation insufficient? Four major limitations will now be discussed:

1. This recommendation assumes a significant downward price elasticity of aggregate agricultural supply in addition to a negative elasticity of aggregate agricultural demand. Evidence on the second is sketchy but consistent with the assumption. The situation is much less simple for the former. Most economists accept that the long-run price elasticity of supply is positive but empirical evidence is needed to provide estimates for a specific time period in a specific context. There are indeed many econometric estimations available. If we accept Glenn Johnson's frequent criticisms of these numbers, we can flatly assert that they are inadequate.

What is really needed is an interpretation of the dynamics of supply in a context of rapid technological change. After long debates in the United States in the 1950s and 1960s, a consensus emerged among students of agricultural supply that the static concept of a long-run supply curve was not satisfactory, and that it was preferable to use the framework of shifting short-run supply curves.

Limited empirical research conducted in France on grain supply indicates that the backlog of technology is such that, in the short run, lower grain prices will not significantly slow down the growth of production—i.e., a conclusion consistent with a complete understanding of asset fixity theory.

2. The recommendation to reduce agricultural prices neglects the importance of the linkages between agriculture and other economic sectors. The labor and land markets on which farmers operate, in particular, are such that the flow of resources in and out of agriculture is far from smooth. The high level of unemployment in Europe and concerns for the future of many marginal regions, where agriculture is the main economic activity, are sufficient concerns that cannot be ignored when discussing agricultural policies.
3. On the basis of his asset fixity theory, Glenn Johnson suggested an analysis of the overproduction trap in U.S. agriculture. Personally, I feel that it has not received the attention it deserves. Perhaps the profession would do well to reconsider this analysis. There is little doubt that agricultural exporters would benefit from higher world prices. The evidence for the poor in the LDCs is less conclusive. In the long run, agricultural production in LDCs may be favored by agricultural trade liberalization. On the other hand, there is very little doubt that the newly industrialized countries (NICs), such as South Korea and Taiwan, benefited from cheap grains at the time of their rapid development. Similarly, the renewed interest in food aid illustrates the potential value of cheap grains, in spite of the well-known limitations food aid has when it is not carefully utilized.

   When investigating the potential impact of international agricultural trade liberalization, I as a European cannot help but be struck by the most certain result, that the benefits would accrue primarily to farmers in rich countries like the United States, Canada, Australia, and New Zealand, and to consumers in Europe and Japan.
4. Finally, the recommendation does not take sufficient account of the political economy of agricultural policy making. This will be further discussed in the second part of this article.

3. Conclusion

The uncritical acceptance of the idea that it would suffice to lower price-support levels, or more generally to discontinue any government intervention having an impact on trade through domestic supply or demand, can be

dangerous. It neglects taking into account the complexities of the dynamics of supply, which Glenn Johnson's work emphasized so convincingly. An apparently simple solution to a complex problem is seldom a good solution. This does not mean that price support levels will not or should not come down. But economic analysis suggests that other measures will also be necessary if current problems are to be resolved satisfactorily.

II. THE DYNAMICS OF POLICY MAKING

The conclusion of the preceding section is made even stronger if one takes the dynamics of policy making into account. The case for political economy will not be made here. Hopefully, it is now widely accepted that one should know why policies are what they are, if one wants to suggest ways to improve or to change existing policies. After all, the award of the Nobel Prize for Economics in 1986 to Buchanan can be taken as recognition by the economic profession of the significance of a field he helped launch. The purpose of this section is, instead, to point out the limitations of the existing static approaches of policy making. They lead to overgeneralized policy recommendations and to a policy norm which is unacceptable. By contrast, recognition of the dynamic nature of the policy process leads to less general normative conclusions and, it will be argued, to more adequate prescriptions. This will permit us to revisit Glenn Johnson's controversial assertion that objective knowledge of values is feasible.

1. Normative and Prescriptive Implications of the New Political Economy Are Often Derived in a Static Perspective

In recent years, very interesting concepts and hypotheses have been suggested to interpret why economic policies are what they are. Together they form what is referred to as the "new political economy," a subfield in the economic discipline for which a complete and consistent theory is not yet available but which provides useful insights.

The precursor of the new political economy was probably Downs. His main contribution is that public policies must be interpreted as the result of the behavior of policy makers seeking, not the maximum of an hypothetical social utility function, but their own individual welfare (Downs 1957). This might entail perhaps maximizing the probability of being reelected or more generally maximizing their political support. Down's approach was fruitful inasmuch as it permitted the application of economic calculus to interpret policy makers' behavior. This approach appeared to be more reasonable than those based on the hypothesis that policies are designed to maximize public welfare, the usual implicit assumption of economists giving advice to policy makers on the basis of what they view as the economic optimum.

Down's idea was integrated by Stigler and his followers in what has become known as the Theory of Regulation (Stigler 1970, 1971; Peltzman 1976).

The main characteristic of this theory is that regulations benefit primarily the regulated and not the public at large, contrarily to what they are alleged to do. For instance, in trying to protect the public against quacks, public authorities regulate the standards of the medical profession. These standards are administered by the profession itself, which restricts entry into the "industry," thereby ensuring the existence of monopoly rents, in other words increased income of the physicians. The theory of regulation proposes an explanation of this general phenomenon. Following Downs, the cost of information is taken into account as well as the cost of mobilizing a group to put pressure on public authorities. The regulated are usually better informed about the issues concerning their profession than the public at large. It is in their interest to be informed, whereas the cost of both informing and mobilizing the general public on the same issues is much higher than any benefit accrued. Hence, an asymmetric situation develops, permitting the capture of the benefits of regulation by the regulated. Stigler and his followers presented their argument in a U.S.-specific institutional mold. The merit of the rent-seeking theory, as suggested by Krueger (Krueger 1974) and then developed by others (see Buchanan, Tollison, and Tullock 1980), is to show that activities aimed at influencing governments or at taking advantage of government regulations are widespread and not restricted to the United States.

Rent seeking is an activity which, instead of mobilizing resources to produce more goods and services useful to society, mobilizes them to capture an institutional rent created by government intervention. Thus, these resources are not productive for society even though it may be perfectly logical from the individual's standpoint to engage in such an activity. The foregone production of goods and services are dead-weight losses, due to the fact that resources have been wasted. Bhagwati coined the expression "directly unproductive profit-seeking" activities (DUP) to convey the same idea and avoid the ambiguities of the concept of rent (Bhagwati 1982).

Applied to agricultural policies in developing countries, the theories of regulation and of rent seeking provide interesting insights. Agricultural policies benefit farmers who are organized in order to influence public institutions. The benefits which the farmers derive from these policies can be viewed as rents created by public authorities. There is no doubt that much of the agricultural policy debate involves farm organizations attempting to influence public authorities to maintain those rents or to increase them. This example illustrates the relevance of collective action in the policy process.

In this perspective, the work of Mancur Olson on collective action appears particularly relevant (Olson 1965). Olson has identified a major obstacle to effective collective action which must be overcome by a group with common interests and a common goal. The group faces the problem of the "free rider," that is, each individual has an interest in the group acting together but in himself not paying for it. A classic example of this problem is faced by agricultural marketing cooperatives. In order to increase prices, producers must often control supply. The cost of collective action is the

amount produced which each cooperative member must withhold from the market. The free rider benefits from the higher price resulting from market-supply-control behavior of other producers but does not himself withhold supply. One can see how the incentive for free riding may indeed be very high.

Olson has analyzed many ways to overcome this problem which organizations have invented. His theory throws light on the behavior of collective agents trying to influence public authorities. They are one form of rent seekers.

These approaches are clearly useful for interpreting, in a positive fashion, why policies are what they are. But the normative and prescriptive implications which most of these authors derived from their theories are less convincing. Broadly speaking, they view government intervention as bad. Stigler asserts that regulations benefit the regulated and not society at large; Krueger and her colleagues view rent seeking as socially wasteful, resulting from the existence of government interventions which create institutional rents. Olson has even gone so far as to argue that, in the absence of major political upheavals, the accumulation of government interventions benefiting a multitude of special interest groups leads to the "decadence of nations." Such a blanket condemnation of government intervention cannot be accepted, even if it underpins the free-market ideology which led to massive "deregulation" in several countries at the beginning of the 1980s. The issue is not whether deregulation of a specific industry is warranted but that the maxim "government intervention is bad always and everywhere" cannot be accepted.

What is the source of this faulty normative conclusion? I believe it stems from the static perspective in which the implications are derived, whereas policy making is a dynamic process. Following Glenn Johnson, two features make it dynamic. First it is sequential, i.e., what happens today depends on what happened yesterday and it will influence tomorrow. Secondly, uncertainty plays a major role in the behavior of policy actors because the future can never be perfectly predicted. Marxists might add that dialectical relationships between policies and institution play a major role in shaping the policy process. The main elements of an approach embodying these dynamic features will now be briefly sketched before reflecting on the role of values in the policy process.

2. Towards a Dynamic Paradigm of Policy Making

In order to stress the dynamic nature of the policy process, one may concentrate on the interactive process among policy actors in the policy debate. In this perspective, policies are viewed as "resultants" of that process. This approach requires one to identify policy actors, to interpret their individual behavior, and then to analyze the interaction among these actors.

Identification and Individual Behavior of Policy Actors—Clearly many individuals are involved in any policy debate. For the sake of clarification, and at the cost of simplification, attention is focused here on collective actors interacting among themselves. A collective actor is a set of individuals whose actions are coordinated because they belong to the same organization, i.e., their role is to contribute, in a prespecified manner, to the objectives pursued by the organization to which they belong.

To identify policy actors by their objectives leads one to an investigation of why these objectives are what they are. The adaptative behavior paradigm (Day 1976; Petit 1981) is very useful in this respect. It suggests that an actor's objectives are closely interrelated with his situation, i.e., with his constraints and possible actions. For an organization, many of these constraints will be defined by its institutional setting; for example: How was it established? For what purpose? With which resources? Under which procedure? A greater understanding of the role of these factors can be derived from organizational sociology, as illustrated by Allison's organizational model (Allison 1971).

The behavior of an organization is usually quite predictable. As explained by Allison, an organization can only perform specific tasks according to standard procedures. A leader cannot usually do whatever he pleases, lest he run the risk of losing his position as leader. Thus, for instance, a farm organization leader does not have the freedom of neglecting the impact of a possible policy change on farmers' incomes. Similarly, in most countries, the first role of any minister of agriculture is to maximize the political support (or to minimize the opposition) of farmers to the government to which he belongs. His situation dictates the objectives which he pursues in the policy process. The same is true for other policy actors.

With this background on the behavior of all policy actors, it is useful to distinguish between those who pursue specific, narrow interests, often of an economic nature, and those who are part of public authorities. Private organizations have their own bylaws and procedures. Their objectives are defined by their compositions, the purpose for which they are established, and their history. They often pursue specific economic interests, but their objectives may be broader than economic, as when a consumer organization worries about the healthiness of a food. A private organization cannot directly decide or implement a public policy. To influence public policies, it has to exert pressure on one or several government agencies.

By contrast, government agencies are, as their name indicates, part of the broader set of public authorities constituting the government. Their objectives are dictated by the function which they perform within, and often for, that set. No single agency typically has the power to decide or to implement a public policy. It is part of a greater state apparatus which holds the monopoly of public action. Thus, government agencies differ from private policy actors both in the way their objectives are determined and in their possible actions. But each government agency has its own agenda, pro-

cedures, and limitations. Thus, it has autonomous objectives and can be identified as a specific actor.

Interaction Among Actors Involved in Agricultural Policy Making—In the short run, policies result from a process of interaction among policy actors, which is mainly of a political nature. Power relationships are essential in determining the outcome of the process. In agricultural policy matters, farm organizations are usually much more powerful than consumer organizations. The political process depends critically upon the political institutions, and pressure groups organize themselves in order to exert as much influence as possible. If institutions change, significant readjustment may be required. Political scientists have long studied the process of political interaction and their work provides very useful insights. Yet it is very difficult to arrive at precise hypotheses rendering account of the interaction process among policy actors in the short term.

More can be said, however, about the interaction process in the long run. This has to do with the interrelationship between economic and political phenomena in determining agricultural policies. Simple observation and various econometric studies have shown that in the long run, economic forces have an important impact on the evolution of policies. For instance, agricultural policy makers in developed countries could not have opposed the rise in the general price of labor relative to other prices in the economy. Agricultural policies had to accommodate that powerful long-term trend. In the same fashion, the CAP must adjust because domestic agricultural supply in Europe has for decades been growing much faster than domestic demand.

The link between these long-term economic pressures and the short-run political process of interaction results from the simple fact that economic changes affect the distribution of interests among policy actors at any point in time. Thus, the economic stakes of the policy debate are determined by economic phenomena. In the long run, the evolution of the interests at play can be so great that it has a critical influence on the outcome of the policy debate, which means on economic policies. In that sense, economic constraints shape the feasible domain of policy choices.

3. Role of Values in Policy Analysis

The dynamic perspective provided by the approach suggested above permits us to reexamine the possibility of assessing the impact of values on objectivity, a controversial claim very forcefully made by Glenn Johnson (Johnson and Zerby 1972). Hopefully we will show that the policy process can be viewed as leading to a consensus on value issues and, in that sense, towards more objectivity regarding value questions. Glenn Johnson asserts that in the field of values, namely whether things and events are good or bad, knowledge can be objective. That is in direct contradiction with the popular proposition that in matters of tastes and colors, strict subjectivity is the rule. The concept of an economic constraint in the policy-making process

may help us clarify this point. In traditional economic analysis of policy problems, one often speaks of political constraints. A political constraint is a consideration resulting from social and political phenomena which prevents policy makers from pursuing a policy that would lead to the economic optimum. It is on this concept that the whole literature on second best is based. If one cannot reach the optimum, then pursuing a second best may be legitimate.

The approach suggested in the previous section has no place for the concept of political constraint. However, it may allow for another concept, somewhat analogous, which we label an economic constraint. In the long run, economic forces have an impact on the policy process. It happens that policies which are pursued in contradiction with some economic trend eventually appear impossible. They cannot be sustained because the economic cost or the economic consequences of maintaining the policy become unbearable. For this to happen, a political consensus is necessary and the political process will then recognize the existence of an economic constraint limiting what is politically feasible. Examples may be useful to illustrate this concept. The budget cost of the Common Agricultural Policy, particularly for milk and dairy products, became so high in 1983 that policy makers at the highest level, namely heads of state or of government making up the European council, recognized that something had to be done and that the dairy policy had to be changed in accordance with what the European commission had been recommending for several years. This awareness led to the adoption of milk quotas in March 1984. In this instance, the escalation in budget costs became an economic constraint forcing the change in policy.

Many other examples could be given. For instance, in the United States, the Graham-Rudman Act limiting overall federal budget deficits can be viewed as a political recognition of such an economic constraint. In the field of international agricultural trade, the consequences of the domestic policies of developed countries have become so grave that a consensus is emerging that trade distortions are bad and can no longer be supported. This conclusion, however, remains very tentative.

For the purpose of this paper, it is worth stressing that the recognition of an economic constraint can be viewed as reflecting a consensus on values. More precisely, this implies a consensus on a set of priorities among competing and conflicting values. One can thus understand why it is always difficult to reach such a consensus. Does this mean that when a consensus emerges, society has gained an objective knowledge of these values? Yes, if we agree that objective knowledge can only be manifested by the fact that sensible persons will agree on statements of truth. The consensus on values brought about by the policy makers can then be viewed as the emergence of greater objectivity in the knowledge of those values. In that very specific sense, Glenn Johnson's general assertion on the possibility of reaching an objective knowledge of values seems to be supported. Two limitations must however be immediately noted. First, this consensus is temporal. It is valid at a specific time in a dynamic process that will continue on into the future.

Secondly, the definition of objectivity is based on the existence of a consensus among sensible persons. While this is the practical and ultimate test proposed by most philosophers of science, it is not fully satisfactory. Among researchers the validity of the truth of a proposition is not decided by a majority vote. The minority may be right. In fact, the whole history of scientific discoveries shows that new discoveries are the result of the thinking of individuals who at one point in time were in a very small minority indeed.

CONCLUSION

The examination of two major analytical issues impeding the analysis of agricultural policies in an international context, namely the dynamics of agricultural supply and the dynamics of policy making, led us to conclusions very much in line with the teachings of Glenn Johnson. Indeed, as agricultural economists, we must be concerned with the applied dimension of our analysis. In other words, the relevance of our analysis to practical problem solving is essential to our professional identity. At the same time, we must be full-fledged economists, aware of new theoretical and methodological developments as well as participating in the developments of these new concepts and methods. It is on this basis, and with the confidence afforded us by this participation, that we can be aware of and emphasize the limitations of our concepts and our methods. We must convincingly argue, as Glenn Johnson did all his life, that problem solving often requires multidisciplinary approaches because of the conceptual and methodological limitations of any one individual discipline, including economics. Therefore, we must be at the same time intellectually humble and ambitious. And if we are able to do that, we will be the worthy followers of Glenn Johnson, our great teacher.

NOTES

1. Presented in June 1988 with only technical editing to date since then.
2. Michel J. Petit is World Bank's Director of Agriculture and Natural Resources.
3. The group of Cairns is made up of 13 developed and developing countries (Argentina, Australia, Brazil, Canada, Chile, Colombia, Hungary, Indonesia, Malaysia, New Zealand, the Philippines, Thailand, and Uruguay). The total volume of their agricultural exports is approximately that of the United States or the European community. Calling themselves "fair traders," they suffer from the current depression in international agricultural commodity markets. Their main purpose is to reduce the interventions of other governments, particularly the United States and the European community, which have a depressing impact on international prices.

The significance of the group of Cairns can be illustrated by the reversal in the tactical position taken by the European community in GATT between the Tokyo round of MTNs in the 1970s and the current Uruguay round. This reversal reflects the growing international pressure applied by groups such as the Cairns group.

During the Tokyo round of MTNs, the European community refused to discuss its variable levies and export subsidies, arguing that these were two major instruments of its CAP, an essential element of its domestic affairs and, as such, not negotiable in an international forum. By contrast, during the preparation of the Uruguay round, the European community took the position that all forms of government support to agriculture should be discussed. Although this was done to deflect US pressure on export subsidies, the reversal of their tactical position was complete.

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Chapter 7

Doing Policy Work[1]

Glenn L. Johnson

Michel J. Petit's paper on "Agricultural Policies in an International Context: Implications for Agricultural Economics" deals admirably with the international aspects of the agricultural policies of both the developed (particularly of European, North American, and some Asian countries) and less developed worlds. His extensive experiences in India and France, with multinational studies of international trade, with the Ford Foundation, with the International Association of Agricultural Economists, and in the United States provide a strong empirical (experiential) basis for his paper. Although his focus is on the practical multidisciplinary subject of policy, he also addresses methodological issues that have roots in the shortcomings of our specialized discipline of economics.

I rejoice that these shortcomings are important to him because I have long been concerned about them. His work has concentrated on practical problems and subjects or issues and, in doing so, has often encountered these disciplinary and methodological constraints on our ability to work on practical policy problems and issues. Before taking up Petit's three main concerns, I present some additional autobiographical information relevant for understanding my views vis-à-vis agricultural policy work. Chapter 3 recounts experiences relevant for farm management and a section in chapter 5 relates these past experiences to the theory of asset fixity. While the basic methodological and theoretical issues have a surprisingly conceptual similarity between farm management (private policy) and agricultural policy (public management), the empirical situations in which the disciplinary issues arise differ so markedly that different past experiences are relevant for understanding my policy views than for understanding my views on farm management. Another reason for presenting this biographic material is to indicate my rather extensive policy experience for readers unfamiliar with it so that I may more effectively support Michel's positions on policy analysis.

Some Relevant Biography

Various experiences during the farm depression of the twenties and the great general depression of the thirties shaped my agricultural policy views much as other experiences shaped my vision of farm management.

When my farmer father went broke in the farm depression of the 1920s, we learned that the market can impose major unjustified losses on farmers. I later learned in economics courses that these losses were expost "Pareto non-optimal," even if Pareto optimal results had been anticipated when the original free-market decisions to invest were made by a competitively organized farmer such as my father. From the great depression and New Deal farm programs of the 1930s, I also learned empirically that (1) there can be beneficial consequences of price and production controls, credit programs, and conservation assistance for consumers as well as for farmers, but that (2) the ex ante consequences of free-market choices (even given such programs) can still involve the imposition of unjustified non-Pareto losses on individuals.

Individualism was held in high value in my farm family and rural community. Yet the problems created for us in the 1920s and 1930s made it apparent to me that group actions are often necessary to: (1) protect individuals from the non-Pareto better consequences of market adjustments, (2) use public means to attain objectives not attainable from the market by private action, and (3) recognize that initial inequalities in the ownership of income-producing assets and power tend to be augmented rather than alleviated by the operation of markets through time. My views on individualism and the roles of government are not as absolute as those expressed by James Buchanan in his book *Better Than Plowing* (1992, 78). Buchanan and I were fellow students at the University of Chicago. I hold individualism in such high regard that I also view it as what Buchanan calls a "relatively absolute absolute." The difference between Buchanan and me on this point seems to be that my "relatively" is more relative than his. Buchanan's mid-Tennessee early life which he views as spent in poverty was spent in a ten-room home of a former governor of Tennessee. My rural poverty was far more absolute than his (compare portions of chapters 3 and 5 of this book with pages 20–27 of his book [Buchanan 1992]). Apparently, I am more sensitive to the non-Pareto consequences of market operations than is Buchanan.

After completing an M.A. at Michigan State College in economics with a split minor in sociology and farm management in early 1942, I worked in 1942–43 and again in 1946 in the Bureau of Agricultural Economics of the U.S. Department of Agriculture under Oscar Stine. In this position, I (1) learned quite a bit about U.S. agricultural data bases, (2) participated as a young agricultural economic statistician under Stine's tutelage in short-term analyses of agricultural policy problems and issues in close iterative interaction with members of the "Farm Bloc" of Congress, farm organizations, and of the Roosevelt and Truman administrations. Stine was a Wisconsin-trained agricultural economist who was influenced by the historicism of the University of Wisconsin's institutional economics and by the German historical school. Thus my neoclassical economics was tempered not only by a farm depression background (1924–40) but by land economics and rural sociology courses at the University of Illinois, my split minor in sociology at Michigan

State, and, above all, by my work with Stine in his division of the old Bureau of Agricultural Economics, that division being named by Stine the Division of Statistical and Historical Research. During these experiences, I witnessed firsthand the importance of the interactive processes Warren J. Samuels advocates in chapter 8 that were kept open by Stine when dealing with members of Congress and the executive branch. As recounted in chapter 3, World War II provided case study training at the Harvard School of Business Administration followed by administrative and naval staff work (for the admiral commanding U.S. destroyers in the Atlantic) where practical, multidisciplinary, non-Pareto optimal problems had to be addressed on a daily basis. As the post-World War II author of the USDA cotton and tobacco "situation reports" in 1946, I dealt extensively with the price, production, and marketing policies and programs for those two major commodities. Again, processes and iterative interaction were important.

My Ph.D. dissertation at the University of Chicago dealt with the allocative effects of changes in farm product prices and the relationship of agriculture's terms of exchange with the business cycle.

At the University of Kentucky, I conducted a study of burley price support, production control, and marketing programs and policies that received an award from the American Association of Farm Economics (the American Association of Agricultural Economics' name at that time). Late in 1952, I accepted a position at Michigan State College (Michigan State University [MSU] now). Here I worked with the North Central Farm Management Research Committee (NCR4) on the micro/macro linkages so important for agricultural policy (see chapter 3, part I, of this book). Other more specific policy and program analyses at MSU included projects for the Committee on Economic Development (CED) and a major study of the bracero program for Mexican nationals working temporarily in Michigan's pickle industry. Early in the Kennedy administration, I did policy work in Thailand with a presidential group under the leadership of Howard Bowen. We studied and made policy and program recommendations on economic and military aid to Thailand. For MSU and the Agency for International Development (AID), I also established and administered the Economic Development Institute (EDI) at the University Nigeria. The EDI was concerned with policy and other problems at local (farm and household), regional, and national levels in Nigeria with emphasis on linkages among the three levels. My EDI work led to the directorship of the Consortium for Nigerian Rural Development (CSNRD) involving four Nigerian universities, four Nigerian states, approximately 12 state ministries in Nigeria, four national Nigerian ministries and commissions, three federal U.S. departments and AID, four U.S. universities, FAO, the World Bank, and the bilateral assistance agencies of several countries. Had I not previously known the importance of participation and successive iterations in policy processes, I would have learned it in this administrative assignment. Hardly a development problem, project, program, or policy important at that time for Nigerian rural development escaped CSNRD study and research. CSNRD operated before, during, and after the

Biafran war. I learned still more about the multidisciplinarity and the value dimensions of policy studies and of the importance of the interactive (and iterative) processes stressed by Michel Petit in chapter 6 and, again, by Samuels in chapter 8.

Closely related to my two Nigerian experiences was the Korean Agricultural Sector Study (KASS) of the early seventies. Like the Nigerian experiences, virtually no important Korean agricultural policy issue, program or problem escaped study by KASS under the direction of myself and/or Ed Rossmiller and Kim Dong Hi who was Director of what was then called the Korean Rural Economics Institute (KREI). Again, iterative interaction proved essential in the processes of addressing the multidisciplinary policy and program problems and issues confronting Korean agriculture.

My policy experiences also include consulting assignments with the Tennessee Valley Authority, the Norges Lansbruk Economist Institut in Oslo, AID (in Asia, Africa, and Latin America), the Ford and Rockefeller Foundations, AID (Washington), and with other various foreign and domestic agencies conducting physical and social agricultural science research.

The work and experience summarized above support my strong conviction that the four driving forces for rural and farm improvement and development are the same for society as for farms. Those forces are: technical advance, human capital improvement, institutional (including policy, program, staff and facilities) improvement, and the enhancement of natural and manmade physical and biological resource bases. I perceive these forces to be related to production via complex social, political, and administrative relationships incapable of being adequately described with a production function. In this poorly known and understood complex relationship, I perceive the four driving forces to be individually necessary but insufficient and, in that sense, complementary. These two perceptions would make estimates of marginal returns to improvements in any single one of the four forces unreliable (Johnson 1985b) even if I could believe it appropriate to view them as factors of production in a conventional production function. Increasingly, I perceive of agricultural policy as a multidisciplinary field of study concerned with public problems and issues involving institutional, human, technological, and resource improvements. My experience also confirms the importance of iterative/interactive processes in consultative, advisory, research, and administrative efforts to resolve development problems and issues involving these four forces especially when non-Pareto optimal alternatives have to be considered.

The Social Science Agricultural Agenda Project (SSAAP), for which I recently served six years as Executive Secretary and as the main editor of its reports and book, dealt extensively with needed work on (1) policies pertaining to each of the four driving forces, (2) values, prerequisites for optimization, and processes for evaluating non-Pareto optimal changes, (3) opportunities to develop further what is known as the "public choice/transaction cost" (PC/TC) approach to policy and program analyses of institutions established to improve the four driving forces of agriculture

and rural societies, those opportunities involving the iterative interaction (stressed by Petit in chapter 6 and to be restressed by Samuels in chapter 8) that takes place in policy processes and the asset fixity theory considered in part II of this book.

THE ORGANIZATION OF THIS CHAPTER

In his paper, Petit discusses his concerns about the following:

1. Problems in handling the dynamics of supply with respect to (a) technology as a driving force and (b) investments, disinvestments, and fixed assets as determinants of supply responses.
2. Difficulties in researching values when doing policy work.
3. Inadequacies in handling the dynamics of policy making, time sequences, and the roles played by policy actors.

These same concerns also received attention in King's article, part I, and Alan E. Baquet's article in Part II. My chapters 3 in part I and 5 in part II elaborate on some aspects of the concerns of King and Baquet. In this chapter, I discuss and republish some of my own efforts to deal with these concerns as they arise in connection with policy work. What I present here differs from what was presented in chapters 3 and 5 in that the focus is on policy rather than on private (farm) management as in my chapter 3 or on the disciplinary aspects of investment, disinvestment, and resource fixity theory as in my chapter 5.

Petit argues in his chapter under consideration here that "the creation of surpluses is the result of a modernization process" (mainly with respect to technology) but that for many economists "the main culprit . . . is the high level of price support." This he writes "leads to the conclusion that agriculture price-support levels must be reduced, or even eliminated altogether . . ." He considers four reasons why this conclusion is insufficient: (1) low supply elasticities with respect to decreases in product prices, (2) neglect of important linkages between agriculture and the rest of the economy, (3) inadequate consideration of asset fixity (investment/disinvestment) theory, and (4) inadequate attention to the political economy of decision making. These four reasons combine with his three concerns also listed above to suggest that I present previously published materials, in the sections to follow, that pertain to the four reasons listed immediately above. I first republish here some past work on investment/disinvestment and asset fixity that pertains to Petit's closely related first and third reasons. Because of Michel's concern about technology, I then republish some material on it and the other three driving forces. I strongly agree with Michel's second reason about the importance of micro/macro linkages and support it by republishing here some material based indirectly on my Ph.D. dissertation. I wholeheartedly agree with Michel's fourth reason as does Samuels in

chapter 8. Although chapters 8 and 9 constitute an elaboration of Michel's fourth reason, I republish here some recent work on needed developments in the public choice/transaction cost (PC/TC) approach to policy analysis.

This chapter is long for two reasons. *First*, Petit has expressed concerns and cited reasons about which there is considerable disagreement. Further, this disagreement involves my work. Thus, I try in what follows to provide support for Michel by freely republishing what I have written on these subjects. *Second*, much of what I republish in this chapter is germane to my chapter 9 response to Samuels's chapter 8 thereby reducing what would otherwise appear in that chapter. This is especially true for the material dealing with the transaction cost approach to multiple person choices and decisions, both private and public.

INVESTMENT/DISINVESTMENT AND FIXED ASSET THEORY AND SUPPLY RESPONSES

Asset investments, disinvestments, and fixity in firms determine industry supply responses and supply elasticities. In partial macro analyses, investments and disinvestments influence supply responses; in macro analyses, the two depend on each other. In a world characterized by change and imperfect knowledge, both become dynamic.

Petit writes, "Personally I feel that [investment/disinvestment/asset fixity theory] has not received the attention it deserves. Perhaps the profession would do well to reconsider this analysis." The writings on asset fixity that I reproduced in chapter 5 are also relevant here and should be read before reading more here if the reader is not thoroughly familiar with asset fixity theory. They pertain to the subject at the individual farm firm level which is related in this chapter to macro supply responses with a focus on the firm-level cost functions that aggregate into the industry supply functions that are so crucial for policy analyses.

The standard "Econ 101" teaching I experienced throughout my graduate and undergraduate training is modified in the following abridged and adapted excerpt from material I prepared for an undergraduate text entitled *Economics and Management in Agriculture* (Vincent 1962). I could have republished the much less readable mathematical appendix of *The Overproduction Trap* (Johnson and Quance 1972) that uses mathematics to state essentially what is stated in what I republish here. Unfortunately, that appendix is seldom read carefully enough even by the critics of "asset fixity" theory for them to discover that the printer omitted one of the equations necessary for the Kuhn-Tucker solution of the problem of optimally allocating the use of fixed assets among alternatives. Paradoxically, some such critics (Hoover 1973, Johnson and Pasour 1981) state that the analysis ignores the allocative impacts of opportunity costs when the mathematical appendix has a λ_i and an μ_i (both opportunity costs) for each of n inputs used to produce m products and provides that the λ_is and μ_is be equal across all processes using any

input χ_i, ($i = 1, \ldots, n$), to produce more than one of the y_j ($j = 1, \ldots, m$), in the system!

As indicated in chapter 1, this chapter (and chapters 3, 5, and 9, as well) is a mixture of reprinted material from my past and that written specifically for this book. Some of the former is dated and now acknowledged to have developmental shortcomings. To help the reader distinguish between my past and current writings, all quotations from my earlier publications are indented from both margins. Further, the reader will find two vertical gray lines, one in each margin running the entire length of each quotation regardless of whether only a few lines or several pages are quoted.

I wrote the following (pp. 123f) for an undergraduate text entitled *Economics and Management in Agriculture,* edited by Warren Vincent (1962), trying to be careful and rigorous in specifying (even in an undergraduate text) which resources are fixed and at what levels:

> [Most presentations of production costs are] based on the assumption that fixed resources were charged at an arbitrary book price between the acquisition cost and salvage value for these resources. It will be of very real interest to see how the manager's actions would be affected by considering the cost schedules derived from charging the fixed resources *anywhere* in the range between acquisition cost and salvage value. For example, let us assume that the price of X_2 ranges from 25 cents = salvage value to \$1 = acquisition cost and that the price of X_3 ranges from 50 cents = salvage value to \$2 = acquisition cost. These assumptions may be abbreviated
>
> $$\$1 > P_{x_2} > .25 \text{ and } \$2 > P_{x_3} > .50$$
>
> The effect of these assumptions is summarized in table [7.1]. Clearly, changing the prices of the fixed resources will not affect the variable cost schedules. Neither will it affect the marginal cost schedule since fixed costs are not needed to compute marginal cost. Therefore, AVC and MC are [unchanged]. The schedules that are affected include TFC, AFC, TC, and ATC . . . [now] there will be two of each . . . indicating a range within which the particular cost may be. The lowest total cost would result if the fixed resources are figured at salvage value and the highest would result if they are figured at acquisition cost. Figuring TFC at the lowest range, we have 60 units of X_2 @ 25 cents plus 30 units of X_3 @ 50 cents = \$30. Figuring TFC at the upper range, we have 60 units of X_2 @ \$1 plus 30 units of X_3 @ \$2 = \$120. Dividing these amounts by the various levels of Y_1, we obtain AFC_1 and AFC_2 as shown in columns (4) and (7) of table [7.1]. The ATC_1 (lower range) schedule is obtained by adding AVC to AFC, and the ATC_2 (upper range) schedule is obtained by adding AVC to AFC_2. These figures have been recorded in columns (5) and (7) of table [7.1]. These various average schedules have been plotted in figure [7.1].
>
> The marginal cost curve MC intersects the lower range for average total cost at point L and intersects the upper range for average total cost at U.

Table [7.1]. . . . [Cost] schedules given P_{x_1} and [ranges] for P_{x_2} and P_{x_3}

		X_2 AND X_3 PRICED AT SALVAGE VALUE			X_2 AND X_3 PRICED AT ACQUISITION COST			
Y	AVC	TFC_1	AFC_1	ATC_1	TFC_2	AFC_2	ATC_2	MC
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0	?	$30	$∞	$∞	$120	$∞	$∞	
50	1.60	30	.60	2.20	120	2.40	4.00	$1.60
100	1.50	30	.30	1.80	120	1.20	2.70	1.40
150	1.33	30	.20	1.53	120	.80	2.13	1.00
200	1.20	30	.15	1.35	120	.60	1.80	.80
250	1.10	30	.12	1.22	120	.48	1.58	.68
300	1.00	30	.10	1.10	120	.40	1.40	.52
350	.92	30	.08	1.00	120	.34	1.26	.50
400	.87	30	.08	.95	120	.30	1.17	.48
450	.82	30	.07	.89	120	.27	1.09	.44
500	.80	30	.06	.86	120	.24	1.04	.58
550	.79	30	.05	.84	120	.22	1.01	.72
600	.80	30	.05	.85	120	.20	1.00	.84
650	.81	30	.05	.86	120	.18	.99	1.00
700	.95	30	.04	.99	120	.17	1.12	2.70

Product prices can increase until marginal revenue equals RU and decrease until marginal cost equals SL without making it necessary to reorganize the business by varying X_2 and/or X_3. Such reorganization would entail moving from $Y = f(X_1 \mid X_2, X_3)$ to $Y = f(X_1, X_2 \mid X_3)$, $Y = f(X_1, X_3 \mid X_2)$ or $Y = f(X_1, X_2, X_3)$.

If all inputs are variable, increasing interest rates accompanying expanded use of resources may increase the cost of using more resources. Thus, an optimum would be assured even if the law of diminishing returns did not operate with all [resources variable].

Before considering the consequences of such reorganizations for cost analyses, it is important to examine certain problems connected with the values of X_2 and X_3. If X_2 and X_3 represent the productive services of durables such as tractors or land, the acquisition costs and salvage values of these services depend on the acquisition costs and salvage values of the durables. Further, when product prices are such that MR intersects MC between U and L, the values in production of the services of the durables fall between their acquisition costs and salvage values.

The difference between the earning power of a durable fixed in production and a price for the service of that durable based on its salvage value is sometimes called a *quasi-* (or semi) *rent*. The value in production of a durable is equal to its earning power (after adjustment for obsolescence, depreciation, and so on) *capitalized* into a [stock] value. Assume, for instance, that (1) the marginal value product of a unit of the service X_2 is $.75 net of obsolescence, depreciation, and so on, and (2) the rate of interest is 5 percent. Under these

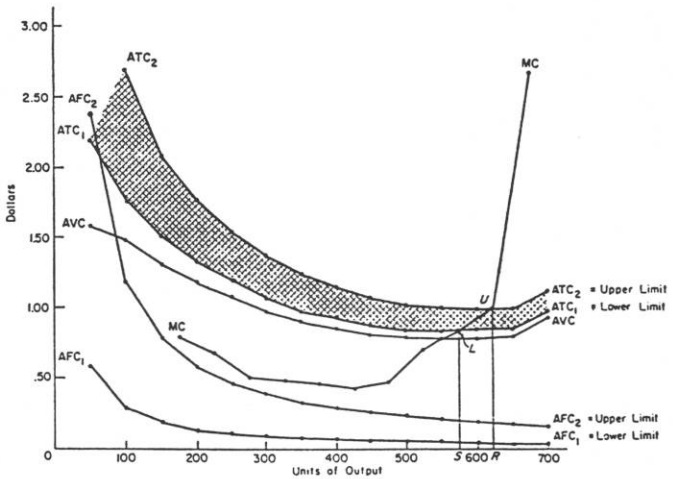

FIGURE [7.1] Ranges in optimum levels of output.

conditions, the durable which produces one unit of service designated X_2 would produce \$.75 worth of income per year and would have a capital value of

$$\frac{\text{current income}}{\text{rate of interest}} \times 100 = \frac{\$.75}{5} 100 = \$15.$$

. . . If the acquisition cost of the durable is \$20 and its salvage value is \$5, the value of the durable in use can range between these two figures.

Obviously, such a situation abounds with opportunities for confusion by cost analysts, accountants, supply response analysts and appraisers. Replacement (acquisition) cost data yield one set of estimates, while market values (often salvage values) produce another set while data on value in use make [the marginal] cost of production equal to product price.

When the value of the durable in use exceeds \$20, it pays to acquire more of it. When value in use is less than \$5, it pays to dispose of some of the durables. Either acquisition or disposal involves a shift from $Y = f(X_1 \mid X_2, X_3)$ to $Y = f(X_1, X_2 \mid X_3)$ . . .

We now must consider more complicated matters.

Shifting to Other [Sub]production Functions

When product price increases cause MR to exceed *RU* on figure [7.1], the MVP(s) of X_2 and/or X_3 begin to exceed its (their) acquisition prices and it pays to acquire more of it (them). This amounts to a shift from $Y = f(X_1 \mid X_2, X_3)$ to $Y = f(X_1, X_2 \mid X_3)$, $Y = f(X_1, X_3 \mid X_2)$ or $Y = f(X_1, X_2, X_3)$. For explanatory purposes, let us assume that

$MVP_{x_2} = P_{x_{2acq}}$ but that $P_{x_{3acq}} > MVP_{x_3} > P_{x_{3salv}}$ and that, hence the shift is to $Y = f(X_1, X_2 \mid X_3)$ as portrayed in figure [7.2].

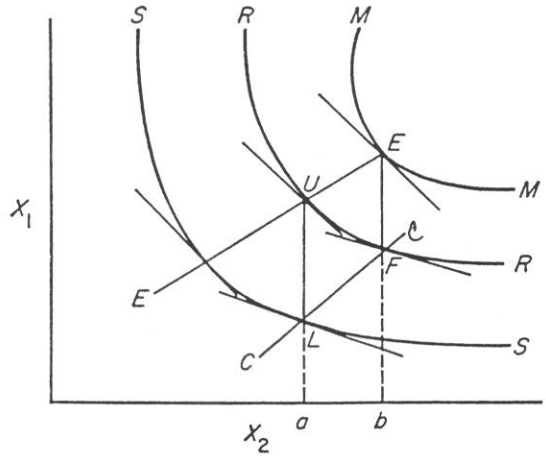

FIGURE [7.2]. Expansion and contraction from changes in subproduction functions.

Cost-Output Relationships When Fixed Resources Are Charged at Acquisition Cost Equal Infinity and Salvage Value Equal Zero

The iso-product line *SS* on figure [7.2] represents the level of output *S* on figure [7.1]. Similarly, *RR* represents output *R* on the same figure. The vertical line between *U* and *L* represents the subproduction function $Y = f(X_1 \mid X_2, X_3)$ along which costs will be studied in the preceding section. When expansion along the line *UL* reaches *U*, further expansion in production occurs most profitable along the line *UE* which is on a different subfunction $Y = f(X_1, X_2 \mid X_3)$. The proportions in which X_1 and X_2 are combined are determined by an expansion path based on

$$P_{x_{1\,acq}} \text{ and } P_{x_{2\,acq}}$$

The relevant portion of the marginal cost function going with the subfunction $Y = f(X_1, X_2 \mid X_3)$ is presented in figure [7.3] as the line *UE*. It is interesting to note that expansions along this line are not immediately reversible as the additional X_2, once acquired, cannot be sold at its acquisition value; instead, only its salvage value can be realized.

Thus, [if] after product prices advance to levels justifying expansion of production to *M* of figure [7.2] by acquiring X_2 as well as X_1, product prices [were to] start to fall, . . . an immediate contraction would be brought about by curtailing the use of X_1 alone, instead of both X_1 and X_2, along *EF* with X_2 fixed at *b* (in figure [7.2]) instead of at *a* as along the line *UL*.

This contraction in production would proceed with further decreases in product prices to point *F* on both figures [7.2] and [7.3]. At that point, the MVP of X_2 would be equal to its salvage value, and it would again pay to

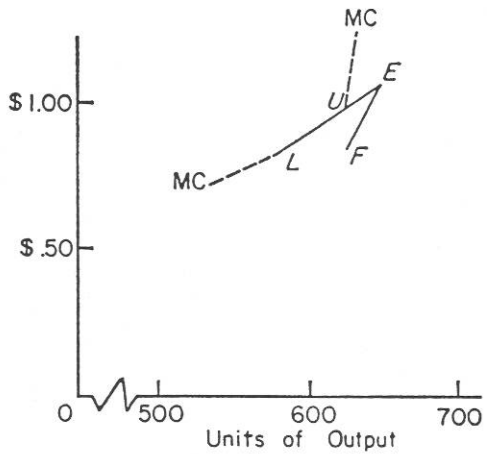

FIGURE [7.3]. Marginal costs associated with different subproduction functions.

SUPPLY RESPONSES

treat X_2 as variable for further decreases in product prices, this time by selling it.

The most profitable combinations of X_1 and X_2 to maintain in disposing of X_2 in response to further falls in product prices are given by the line *CC* in figure [7.2]. The line *CC* is a revised "expansion path" similar to the expansion path *EE* but based on the salvage value rather than the acquisition cost of X_2. [It is better called a contraction path.] Contraction along *CC* eventually returns output to *L*, the starting point on both figures [7.2] and [7.3].

The return to *F* is [inconsequential]. Other changes in product prices and in

$$P_{x_1}, P_{x_{2acq}}, P_{x_{2salv}}, P_{x_{3acq}}, \text{ and } P_{x_{3salv}}$$

would generate any of many haphazard appearing combinations of MC segments based on various combinations of the infinite subproduction functions

. . .

definable in $Y = f(X_1, X_2, X_3)$.

It is common in elementary economics courses to define resource fixity in terms of physical fixity or in terms of length of run. In this type of analysis, it is said that variable resources are those which can be [advantageously] varied with output and fixed resources are those which cannot.

This amounts to saying. . . [assuming] that

$$P_{x_{iacq}} = \infty \text{ and } P_{x_{isalv}} = 0$$

for all fixed inputs [and that

$$P_{x_{iacq}} = P_{x_{isalv}}$$

for all variable inputs].

Under these assumptions, changes in product prices do not shift production between different subfunctions. The fact that a manager would buy more of the resource when its MVP exceeded its acquisition cost (hence making it variable) is ignored. Likewise, the importance of a manager disposing of the "fixed" resource when its MVP becomes less than its salvage value is overlooked. Consideration is given only to one marginal cost curve and the conclusion is given simply that firms will stay in production so long as MR>AVC. The most troublesome conclusion to be drawn from this analysis is that production responses to product price increases are reversible by corresponding price decreases. This analysis sheds little light on the important policy question of why farmers do not contract their operations in the same measure when product prices fall as they expand their operations when product prices rise. More will be said about this [later].

The reader should note carefully that the above (and the supply response subsection that follows) are far more advanced than the research work of Wells and Schuh that are reported in chapter 5. The Wells and Schuh efforts were based on standard "Econ 101" and common graduate theory course analyses of production costs and supply responses. It is also more advanced than the lakes state dairy and feed grain livestock studies also reported in chapter 5.

The total output of all producers of a product or group of products responds to changes in the price of the product or group of products . . .

The Firm and Aggregate Supply Response

The total quantity of a product that will be offered in the market at a particular price will be the sum of the quantities of the product offered by the individual firms producing the product. The kind of marginal cost relations presented in figure [7.3] [above] can be envisioned for each firm producing a product. Such marginal cost relationships indicate how much would be advantageous for each firm to offer at the indicated prices. Output in such a diagram depends not only on the anticipated level of product price but on the *direction* and *duration* of the price changes as well. In addition, an aggregate supply response can be envisioned as the sum of the response of the individual firms producing the product. As such, output on the aggregate function also depends on both the direction and duration of movements in product prices.

In a small hypothetical industry made up of three firms, the process of aggregating firm responses into industry responses can be viewed as in figure [7.4] which shows responses of three firms to six different prices expected by producers in each of seven years. These prices are designated P_1, P_2, P_3, P_4, P_5, and P_6.

At P_1, firms 1 and 3 are maximizing their profits by equating MC with P_1 at O_{12} and O_{31}. Total output for this industry is the sum of the outputs of

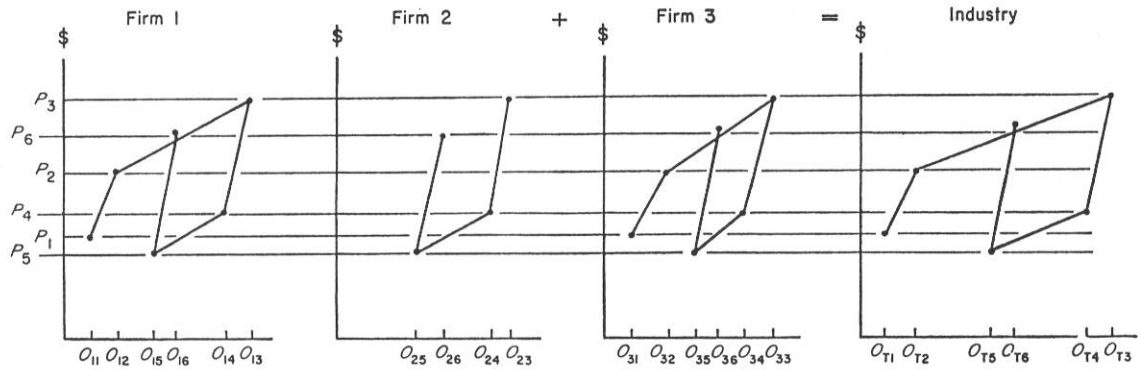

FIGURE [7.4]. Output responses of three firms and the industry to price changes.

firms 1 and 3, which is O_{T1}. Firm 2 does not produce anything. At the higher price, P_2, firms 1 and 3 expand output to O_{12} and O_{32} respectively while the industry expands to O_{T2}. Firm 2 still does not enter. When the expected prices increase to P_3, both firms 1 and 3 take control over formerly fixed inputs and expand their investments in some of these inputs. This, as indicated in the previous chapter, amounts to a shift to another subproduction function. Firm 2 also enters production with expenditures and investments in all inputs, and produces O_{23}. The result is a large expansion in total production from O_{T2} to O_{T3}.

With such an expansion in production, the drop in expected price from P_3 to P_4 is reasonable. At this price, all three firms contract production on different subfunctions than they were on when expanding output in response to the change in price from P_2 to P_3. That expansion involved additional investments in previously fixed durable inputs which cannot now be sold advantageously at P_4 as they are worth more in production than if sold. Thus, the contraction in production is little, despite the greater drop from P_3 to P_4. Total production stands at O_{T4}.

A further drop in price to P_5, however, is great enough to bring about some liquidation of the investments added when price increased from P_2 to P_3 on still another set of subproduction functions. As a result, total output stands at O_{T5}. After this, an increase in price to P_6 is accompanied by output responses not involving greater use of the inputs expanded when prices expanded from P_2 to P_3 nor those contracted when prices fell from P_4 to P_5.

Such are the aggregate output responses which accompany the movement of product prices from P_1 to P_2 to P_3 to P_4 to P_5 to P_6 in our small hypothetical economy of three firms producing one product. Aggregate outputs of industries made up of any number of firms producing groups of products as well as single products can be viewed in a similar manner.

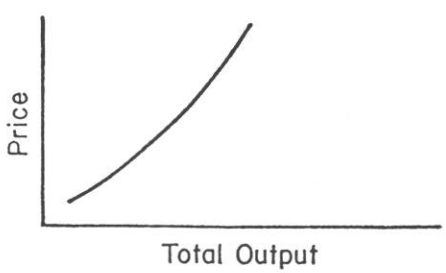

FIGURE [7.5]. A special supply response displaying reversibility and independence from direction and duration of [price changes].

[In the usual] *special* ["Econ 101"] *case* . . . the MC curve does not shift when all variable inputs can be bought and sold at the same price and when fixed inputs have infinitely large acquisition costs but zero salvage values. If or when this special case does exist, the aggregate supply function is perfectly reversible and independent of the direction and duration of changes in product price.

Such a supply curve of an industry for a product would appear as in Figure [7.5]. The [common] assumption that all or most supply responses are of this nature [leads] to erroneous conclusions concerning responses to both increases and decreases in product prices and, hence, to erroneous conclusions concerning supply control [price support] policies whether the objectives be (1) expansion of output in an underdeveloped country or period of national need in a developed country or (2) contraction of surplus production . . .

The use of slope and elasticity concepts in studying supply responses. In using the concepts of slope and elasticity, it is extremely important to keep in mind the distinction between the industry supply response diagram of figure [7.4] and the oversimplified special case of figure [7.5].

Most common presentations dealing with supply responses deal with the special supply response concept illustrated in figure [7.5]. On this figure, both upward and downward changes in price can be considered without regard to previous prices or to the order in which price changes occur. The industry supply response diagram of figure [7.4] which is reproduced as figure [7.6] at this point, is characterized by *directed* segments of supply responses. Each of these directed segments can be studied with the use of slope and elasticity concepts.

In figure [7.6], the "corners" or "meeting places" of two different segments are particularly troublesome. At these corners or points, slopes become indeterminate, as many different lines can be regarded as tangent to the functions at each such point. As slope is a component of elasticity . . . , elasticity is also indeterminate at these points. This difficulty with both . . . slope and elasticity concept[s] is in addition to the need to consider the *direction* of price movements.

The upshot of the matter is that each segment in figure [7.6] must be considered individually and in terms of its direction. Figure [7.5] is a special case of figure [7.6] containing only one segment which is valid irrespective of direction.

Segments of supply functions are commonly referred to in terms of their elasticity. For example, most upward directed supply response functions for the totality of agricultural products are referred to as being relatively inelastic. Such a statement means that such segments do not exhibit a very high degree of responsiveness in the quantity offered to changes in product prices. More precisely, this is understood to mean that the upward elasticity of supply for all agricultural products lies somewhere below one of unity, or that a one percent change in price will result in less than a one percent change in the output of product. Segments corresponding with falling prices are regarded as still less elastic, some people even argue that they are negatively sloped! *Unit elasticity*, or an elasticity value of one, has been taken as representing the dividing point between functions which are relatively elastic and those which are relatively inelastic. Supply response segments with elasticities greater than one are regarded as being *relatively elastic* and those with elasticities less than one are regarded as being *relatively inelastic* . . .

Two other cases are defined for the sake of completeness. Supply response segments which show no change in the quantity of product supplied regardless of change in price are called *perfectly inelastic.* In other words, output does not respond whatsoever to the change in price under consideration. The elasticity of supply for such a segment is zero and it appears as a vertical straight line on a graph. The remaining case is called *perfectly elastic.* In this

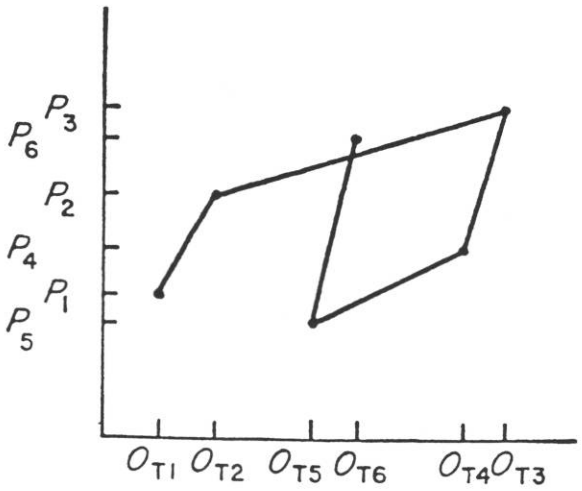

FIGURE [7.6]. Industry Supply Response from Figure [7.4].

latter situation, a small change in price would bring about an infinitely large change in output. The elasticity for this function is infinite (∞). The segment is a horizontal straight line when graphed . . .

SOME FURTHER COMMENTS ON SUPPLY FUNCTIONS

Underlying our development of the individual firm and aggregate supply responses is the assumption that every firm seeks to produce that level of output which will result in maximum profits. If this assumption is fully met in the real world and every producer has complete knowledge of the input-output relationships and prices, then these supply functions do in fact state the equilibrium line of production for which each firm would seek to adjust. These are rather restrictive assumptions and there are several good reasons why they are not and cannot be met in actual practice. First of all, profit maximization is not the only goal of individual firms. Since the firm is an organization of not only physical inputs but also of people, the objective of profit maximization will be conditioned to some extent by other personal objectives. To the extent that other objectives conflict with the objective of maximizing profits, the output of the individual firm and in the aggregate will deviate from the output indicated by the supply function. Therefore, one cannot conclude a priori that such deviations represent errors in the use of resources by the firms or in the aggregate. Fulfillment of the other objectives is just as valid as the fulfillment of the objective to profit maximization. The fundamental question confronting the firms is whether or not the profits lost by not maximizing profits are compensated for by the degree to which the other objectives are attained. This question is one of the more bothersome

questions facing production economists, farm management specialists and the producers themselves in evaluating the use made and to be made of the available inputs in the production of the various alternative products. This difficulty alone, although there are others as well, limits the usefulness of the above supply concepts.

Another point deserving attention is that the actual price of the product is known only in an ex post facto sense. The supply concepts specify the output in terms of a specific anticipated or expected price for the product. Since there is a time lapse between the time production plans are made and implemented and the time when the product is forthcoming and sold, what one needs to know to estimate and use supply response functions is the price of the product at the various points of time. Such estimates are subject to error, the magnitude of the error depending upon the information available, the experience of the person evaluating the information and the distance into the future being considered, to mention but a few of the factors involved. The uncertainty of producers as well as economic analysts with regard to knowing the future affects supply responses and introduces another type of complication into efforts to predict the consequences of price changes on supply.

The area of supply response relationships has been a much neglected area in agricultural economics. In recent years, interest in this area has increased, probably largely as a result of the problems of overproduction confronting agriculture in certain areas with respect to certain products. Some of the most perplexing problems in studying and analyzing supply response are those of resource use concerns, the types of questions we have just been discussing. As a result of research in this area, many of our concepts are being challenged, reconstructed, and improved upon. Also, the more knowledge that is accumulated about the objectives of people and the process by which they make decisions, the more adequate will be the handling of supply response in the predictive sense.

BALANCING EMPHASIS IN POLICY ANALYSIS ON TECHNOLOGY VERSUS INSTITUTIONS, HUMAN CAPITAL, AND ENHANCEMENT OF NATURAL AND MANMADE RESOURCES

Because of Petit's concern with technology as a driving force for development, I present in this section some of what I have written on the subject. In 1985, at a conference on crop productivity, I read a paper (Johnson 1985a) entitled "Agricultural Surpluses—Research on Agricultural Technologies, Institutions, People, and Capital Growth." A substantially abridged version of the paper follows:

An early version of the introductory background paper that Sylvan Wittwer prepared for this conference contained the following paragraph:

> A decade ago it was predicted by some that food shortages would remain commonplace and all-out production would be required, henceforth, to meet diminishing reserves, a rising population and in-

creased purchasing power. Conversely, some are predicting now that we face an age of glut.

[When] Sylvan asked me to read his tentative draft and to give him the benefit of my constructive criticism, I wrote the following memo to him:

> Somehow or another, Sylvan, you have to make the long-run case for increased productive capacity whether or not that capacity is actually used. We made that case in our report (Johnson and Wittwer 1984) and I am making it again in the paper I will present on technology at the American Agricultural Economics Association (AAEA) meeting the first part of next month (Johnson 1985b). The trap which the biophysical agricultural scientists must avoid is that of either saying or permitting others to say that technology automatically expands production in periods of shortages. This trap should be avoided because, first of all, it is untrue. In addition to technology, appropriate institutions and infrastructure, technical and entrepreneurial skills must be in place. If this untruth is accepted in periods of food shortages and, hence, unreasonably high prices for food, then it will also be believed in the much more common periods of surpluses and unreasonably low prices for farm products and food. In the latter instance, the obvious conclusion is that production can be controlled by placing constraints on the generation of new technology and the utilization of old technology. In fact, the agricultural research establishment is now encountering such arguments as a result of having oversold in the 1970s the untrue conclusion that production could automatically be expanded by improving technology.

As a result of my memo, Sylvan redrafted the introductory background material for this conference and asked me to do for the conference that which I suggested needs to be done. I am the "somehow or another" I wanted Sylvan to find for making the long-run case for increased productive capacity whether or not that capacity is actually used.

In what follows, I will indicate why farmers outproduce market demand. I will also present arguments indicating that technological advance is not the major cause of farm surpluses and low prices. I will devote a section to the history of agricultural production in the United States and look fifty years into the future to gain some perspective on our future production possibilities and needs. I will assess the four main sources of growth in capacity to produce agricultural products. A balanced agricultural research program must research all four sources of growth in capacity to produce agricultural products. I will then look at research on new institutions needed when production so far exceeds levels of effective market demand to generate adverse prices for farm products . . .

Why Farmers Outproduce Market Demand

In this section, I explain why farmers outproduce effective market demand in market-controlled economics. This explanation has been carefully and extensively researched by a number of agricultural economists. I draw it directly from a book entitled *The Overproduction Trap in U.S. Agriculture* (Johnson 1972, 5–21) published by Resources for the Future. Explanations of

the tendency of market-controlled as opposed to government-controlled agricultural economies to outproduce effective demand can be based on several facts about agriculture (Johnson 1972, 5-21). Outproducing effective demand is defined as producing so much that the product cannot be sold in the market at prices that cover the current acquisition costs of the inputs and investments used to produce the product. Such overproduction results in unduly depressed prices, if there are no government storage and price support programs. If, on the other hand, there are government and price support programs, such overproduction results in the accumulation of surpluses in the hands of agencies operating the storage programs. The basic facts about agriculture needed to explain this tendency are discussed in each of the following paragraphs.

The first crucial fact is that farmers make substantial long-term investments in such "long-lived" durables as land, machinery, irrigation systems, drainage systems, herds, orchards, and improved pastures, as well as in the production of such important "short-lived" intermediate inputs as feed grains, roughages, feeder cattle, and in the production of such long-lived capital items as breeding herds, orchards, and even buildings and drainage and irrigation systems.

The second crucial fact is that the durables in which farmers invest tend to have acquisition prices that are much higher than their liquidation values. The difference between such prices is due, of course, to the costs of transporting durables to farms (from one farm to another) installing and setting them up, and dismantling them to move them from the farm of a seller to the farm of a buyer. Closely related to this price characteristic of durables is the fact that other durables have acquisition costs and liquidation values which, though near equal, tend to rise and fall directly with the value of the products they are used to produce. An example of such a durable is farmland. Acquisition cost and selling price rarely vary from each other by more than five to ten percent, yet are so closely correlated with the values of the products they are used to produce that the overall use of land is not very responsive to product prices.

The third basic fact about agriculture is that farmers are not and cannot be perfectly informed about conditions affecting the future value of their long-term investments. The values of a farmer's durable investments are affected by declarations of war, making of peace, changes in the value of the dollar, losses of foreign markets, shifting tastes and habits of consumers, changes in the trading regulations of importers and exporters, evolving tax structures and changes in a substantial number of other variables unknown at any point in time. The importance of these potential sources of investment errors changes continuously and unexpectedly. Consequently, farmers are not and cannot be perfectly informed. In this connection, I point out that the very best economists have not succeeded in predicting many of the important changes that affect the value of farm durables.

Because they are imperfectly informed, the fourth crucial fact is that farmers make investment mistakes. Some of their mistakes involve overinventment—others, underinvestment.

The fifth fact is that mistakes of underinvestment are easily corrected. If a farmer underinvests, the durable of concern is capable of producing more than it costs and the farmer can simply correct his mistake with additional profitable investment.

The sixth fact is that mistakes of overinvestment in durables are difficult and costly to correct. To correct a mistake of overinvesting in a durable, a farmer has to dispose of the excessive amount he has acquired. Unfortunately, this involves liquidating his excess investment by selling it at a liquidation or salvage price substantially below current acquisition price. The difficulty of disinvesting is further complicated by the possibility that the liquidation value of the durable involved has fallen for all potential buyers because of general overinvestment on the part of farmers in general.

The seventh factual characteristic of agriculture is its chronic tendency to outproduce effective market demand. This characteristic is explained by the much greater difficulty encountered in correcting overproduction rather than underproduction mistakes. Thus, in a market-controlled agricultural economy there is a bias or tendency toward overproduction, even when the initial errors are randomly distributed with respect to over- and underinvestment.

The eighth factual characteristic of agriculture has to do with consequences of this tendency to overinvest and overproduce (Johnson 1958, 74–93). The consequences are:

1. Low earnings[2] on farm investments and, hence,
2. Capital losses on current as well as historical acquisition prices of investments, and
3. Cash flow problems and bankruptcy for highly leveraged farmers.

I hardly need to tell this audience that these three consequences are characteristic of agriculture in the United States in 1985. While people in this audience know that these consequences are now evident, they may not be aware that the tendency of farmers to outproduce effective demand has been evident in all but about eight of the years since the end of World War I. In most of these years, farmers have produced so much output that the consequences have been either (a) undue adverse pressure on prices in the absence of government price support and storage programs, or (b) the accumulation of surpluses in agricultural storage programs. The data reviewed in the book cited above are consistent for the past sixty-five years with the analysis sketched out above.

It is important for our purposes today to note that the mistakes of investments made by farmers are due to imperfect knowledge of future changes in many variables. Of the variables listed, only one is agricultural technology.

Technology Is Not the Major Cause of Surpluses and/or Low Prices

When we examine market-controlled agricultures around the world at any point in time, or when we examine the history of individual market-controlled economies through time, it becomes clear that imperfect knowledge of technological advance is not necessary for the development or agricultural surpluses and/or adverse prices and that technological advance is seldom the major important cause. In the paragraphs to follow, I examine the situation for Nigerian yam and cassava production in eastern Nigeria during the 1960s. I will also look at the situation in U.S. agriculture from 1918 to 1929 as well as in the first four years or so of the great depression.

In the 1960s, technologies employed by eastern Nigerian farmers in growing yams and cassava could be described only as primitive. While I was

director of the Economic Development Institute at the University of Nigeria, we researched the profitability of yam and rice production in the Abakaliki region (Welsch 1965). In doing this, we also learned quite a bit about cassava prices and resource earnings in cassava production. The eastern Nigerian farmers readily outproduced effective demand with very primitive technologies for yam and cassava production. According to our calculations, yams sold at a price that returned yam farmers about fifteen cents per day of labor devoted to yam production. The minimum wage in industry and government was about a dollar a day. If labor earned as much as fifteen cents per day, returns to the primitive capital used to produce yams had to be around five percent in an economy where interest rates were far higher than that. The yam farmers produced enough product to keep the yam prices so low they suffered from low prices. Primitive low-tech production methods did not spare them. At the time these studies were made, the situation for cassava production was less favorable than for yam production. Advanced technology was not used for cassava production either. It is also interesting to note that there were no governmental price support and storage programs to cause overproduction of yams and cassava. There was only a market operating in the presence of a primitive technology with farmers imperfectly informed about the extent of local markets and partially isolated from larger national markets by high transport costs. In the United States, the end of World War I to the onset of the great depression was a period of relatively low level technology compared to the technologies employed since World War II (VanGigch and Quance 1972, 67-87). Government programs did not exist to cause overproduction relative to effective demand. It was a period in which farmers experienced the consequences of having overinvested in durable factors of production, especially land. The causes of these investment errors by farmers were primarily the unduly high price expectations generated by World War I combined with their inadequate knowledge of the loss of markets that would take place with the reestablishment of peace in Europe. Overproduction and adverse prices developed despite the then relatively low level of technology and in the absence of governmental price support, production control, and storage programs. Clearly, neither technological advance nor government programs could have caused the adverse pressure on agricultural prices and the capital losses imposed on farmers in the 1920s . . .

I believe it is important for us to keep in mind the parallel between the mid-1980s and the 1920s. Farmers were in trouble in both periods because of earlier mistakes of overinvestment and overproduction. Their mistakes were not caused primarily by imperfect knowledge of new technology or by the existence of high technology or government price support, or production control and storage programs for agriculture. Rather, their mistakes arose mainly out of imperfect knowledge of international trade and national and international monetary and fiscal policies and programs of the United States and her trading partners.

SOME AGRICULTURAL PRODUCTION HISTORY AND THE FUTURE

Figure [7.7] displays data on the history of agricultural production over the last century from 1880 to 1982. In this period, the U.S. agricultural economy increased its output about sevenfold (Johnson and Wittwer 1984). This

was, of course, a remarkable achievement. For the most part, we have needed the increase in production. However, as indicated above, in all but eight of the last sixty-five years we have suffered the consequences of producing more than the market would absorb at acceptable prices. Those consequences have appeared either in the form of adverse prices in absence of storage programs or in the form of accumulating surplus stocks in government hands when price support programs have prevented prices from falling to the low levels required to equate effective demand with production.

Four Sources of Growth in Capacity

Study of agricultural development processes around the world indicates that growth in capacity to produce agricultural products depends on four important variables:

1. Improved technology,
2. Better institutions to serve agriculture,
3. Improved human skills and capacity (T. W. Schultz, University of Chicago, calls this human capital), and
4. An increase in the biological and physical capital base of agriculture.

Africa contains many countries where the greatest constraint on agricultural production is inadequate institutions, including poor agricultural policies and governmental programs. Improving technology and educating people will do little good in many African countries, unless institutions and policies are improved (Avery 1985). Two outstanding examples in world agriculture that illustrate the importance of removing institutional and policy constraints when human skills and technologies are already available can be found in the Peoples Republic of China and in Hungary. In both countries, production was adversely affected by poor policies and institutions. When policies and agricultural institutions were reformed, dramatic increases in agricultural production took place. India and Pakistan clearly demonstrated the advantages of overcoming technological constraints in rice and wheat production when policies and institutions were also moderately improved.

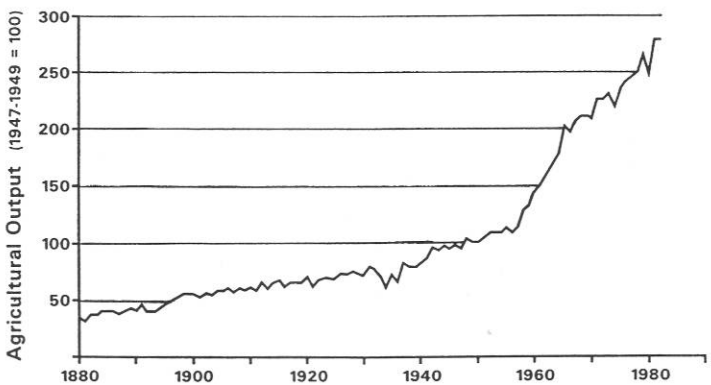

FIGURE [7.7]. Agricultural output, 1880-1982 (source: note 3).

When examining the history of agricultural development around the world, one concludes that these four sources of growth are individually necessary but individually insufficient. I have become so convinced of this that I am now distrustful of estimates made by my fellow agricultural economists concerning the contributions of technological advances independent of the presence of adequate institutions, human capital, and stocks of biological and physical capital. It is important to advance simultaneously on all four fronts or, if one or more of the four individually necessary sources of growth is inadequate, to concentrate attention on the inadequate or limiting source. If I am correct on this, it makes little sense for us to debate here about which of the four sources is more important or which has the highest payoff or to attempt to promote one at the expense of the others. What is needed is a balanced research program—a program balanced with respect to research on the four sources of agricultural growth of a program concentrating on the constraining source or sources, whether the constraints be in the form of inadequate technologies; institutions, policies, and programs; human capital; or the base of biological and physical capital.

When I look fifty years into the future either at U.S. agriculture or world agriculture, I find technological advance to be essential. I believe I should supplement the defense and advocacy of biological and physical science researchers with those of a social scientist. I am convinced that arguments I have presented above are useful in promoting essential technological research for agriculture over the long pull.

In return for my defense of the essentiality of both basic disciplinary and applied research in the biological and physical agricultural sciences, I, in turn, ask you to defend the essentiality of both disciplinary and applied social science to improve:

1. The institutions that serve agriculture,
2. The human skills and capacities used in agriculture, and
3. Agriculture's base of biological and physical capital.

In addition, I ask you to defend the essentiality of both basic disciplinary and applied social science research to help increase the incomes of the poor and hungry so they may be able to convert their needs for food into effective demand.

New Institutions Are Required When Short-Run Cuts Are Needed in Production

In market-controlled economies, production almost inevitably exceeds effective demand to create either adverse pressure on farm product prices or, in the presence of price support and storage programs, the accumulation of expensive governmentally held agricultural surpluses. Production cannot be readily controlled by disposing of technology. Technology, once created, is available and cannot be easily eliminated. It is also extremely difficult to control production by disposing of human capital once we have generated human skills and capacities specialized to agriculture. Production cannot even be controlled effectively by letting the market lower prices, impose capital losses on farmers, and drive leveraged farmers into bankruptcy. [Because] farm production does not respond significantly in the short run to

lower prices, prohibitive costs must be imposed on farmers and society at large to cut production.

Since the mid-1930s, government programs have provided a great deal of short-term relief to farmers from the consequences of outproducing effective demand. At the same time, these programs have permitted substantial growth in farm production in the long run. Figure [7.7] indicates that the record is not such a bad one. The drawback is that these programs have been expensive to government and, hence, to taxpayers. If the explanation I advanced above of the tendency of agriculture to outproduce effective demand is true, simply getting rid of production control, price supports, and storage programs will not eliminate the problem. Just as in the 1920s and in the early 1930s there will continue to be a need to protect farmers from adversely low prices, the imposition of capital losses and bankruptcy. It makes little sense to think that the tendency to outproduce effective demand and create adverse pressure on farm prices can be cured by eliminating government programs. It makes even less sense to expect that failing to support technological research for agriculture will affect production enough in the short run to offset the long-term disadvantages of failing to generate yield-increasing, land-conserving and enhancing, intensive-cropping, and energy-efficient technologies.

We will continue to need, in the future as in the past, institutions, policies, and programs to control production in the short run. As the programs, policies, and institutions we have developed to date for this purpose are far from satisfactory, our agricultural research programs should include basic disciplinary research in the social sciences relevant to the applied design of new institutions, policies, and programs. New institutions must provide and permit long-term growth which, at the same time, providing short-term control over production. In some senses, we have not done so badly. We have had a growing productive agriculture based on improved technology, rather effective institutions, and an adequate supply of increasingly well-trained people (human capital), not to mention a growing base of biological and physical capital of improving quality. In many of the years, we have been able to protect farmers in significant ways from the adverse consequence of outproducing effective demand. The main complaint is that our short-term production control price support and subsidy programs have been too expensive. An important challenge ahead for agriculturalists, including especially the rural social scientists, is to design more effective institutions, policies, and programs for the short-run control of production.

The following is an abridged and modified portion of an unpublished consulting report to the Economic Development Institute of the World Bank, dated August 4, 1986, that considers policies and public choices with respect to obtaining balance among the four driving forces for the advancement of societies:

My experiences in dealing with agricultural and rural development both in the United States and in such countries as Norway, Thailand, Nigeria, Colombia, Tanzania, and Korea indicate that rural development originates with (1) technological advances, (2) institutional improvements, (3) human development, and (4) growth in the biological (including natural resources)

and physical capital bases of a society. These four driving forces for rural development need to be monitored and analyzed almost continually.

While economists have spent a considerable amount of effort estimating the separate returns to technological advance and human development, I seriously distrust their computations. As I read the record, all four of these forces must be in place in order for any one of them to be effective. For instance, in Nigeria, a highly advanced oil palm technology was unproductive due to adverse policies, programs and institutions, whereas in Malaysia the same technology accompanied by favorable policies and programs was very productive. In other instances, advanced technology and reasonably good institutions have not paid off because of the lack of investments in human skills and capacities and because of human failures involving corruption, dishonesty, and concentrations of power in the hands of dictators and elitist parties of both the right and left. Currently, we observe the countries of eastern Europe floundering despite reasonably good agricultural technologies while they try to upgrade their policies and institutions. The four driving forces under consideration here appear to be so interrelated that, given the paucity and crudity of our data, it is virtually impossible to differentiate and estimate their separate impacts on agricultural production and rural development. Further, the complexity of the nonmonetary values being sought and avoided in agricultural and rural development efforts of government makes it extremely difficult to aggregate the different values attained through technical, institutional, human and resource improvements. This increases the importance of policy analyses of what is happening in agricultural and rural areas with respect to technology, institutions, human development, and natural and manmade resource bases.

TECHNOLOGICAL ADVANCE

Analyzing agricultural science policy requires governments knowing what is happening to acreages, yield, livestock numbers, production per unit of livestock, the use of modern factors of production, and the like. It also requires knowing about the production and utilization of marketing services. Marketing involves the acquisition, distribution, and utilization of modern factors of production as well as the sale, processing, and utilization of commodities produced in the agricultural sector. A framework for policy analysis requires a data collection system and provision for maintaining data and information on the production ends of farming, rural communities, and agribusinesses and on the consumption of agricultural products. Without such crucial data series with respect to technical agriculture and technology, policy analysts cannot determine the needs of production agriculture, what is required to improve and develop the input supply industries for agriculture or the needs of marketing and distribution systems.

Once needs are known, policy analyses are required to investigate how those needs should be met. In some cases, simple adaptation of existing technology is adequate while in other instances new technologies must be created to meet specific location-space and climate conditions . . .

While the decision-making units of a government are seldom responsible for directly obtaining, using, and managing technical change in the public and private sector, decisions made in such units determine the ability of a country's public and private sectors to generate new technology, produce or

import the modern inputs which carry new technology, distribute those inputs, and establish incentives for their utilization. A number of economists have been concerned with what they call "induced technological" change (Hayami and Ruttan 1971; Ruttan 1972). Induced technological change analysts view scientists and inventors as responding to the costs and values of different scarce resources. They point out that agricultural scientists in the labor-rich, land-poor Japanese economy concentrated on the land-saving and labor-using technology whereas in the labor-poor, land-rich society in the United States agricultural scientists responded with technologies that use land extensively but labor intensively. In my view, the induced technological change analysts have made an important contribution to our understanding of the generation and utilization of new technology; however, I believe there is more to technological change than incentives originating in the prices and relative scarcity of resources. Basic disciplinarians in the biological and physical sciences are often psychologically driven to understand the phenomena of concern in their discipline. Their success is also conditioned by luck and personal interests as well as by the stage of development of their disciplines. The induced technological change analysts materially improved our knowledge of how new technology is generated but have not fully explained the creation and generation of new technology or its overall impacts on society. It seems to me to be important that decision makers and their staffs in public sectors be aware of both the induced technological change hypothesis and the need to go beyond it.

Institutional Improvements

It is also important that the institutional framework in which decision makers operate provide for the monitoring and analysis of changes in policies, programs, and institutions. Monitoring these changes involves relatively more nonquantitative information than is involved in monitoring technology and the related productive activities of agriculture, rural communities, agribusinesses and consumer units.

Historical analyses of policies, institutions, and programs are required. Typically, such studies are subject matter in nature involving several of the social science disciplines including agricultural history, political science, anthropology, and sociology, as well as agricultural economics. Some development specialists have concentrated on technical change to such an extent that the main institutional changes of interest to them are changes in the [technical] agricultural research institutions of the country. In addition to the [technical] research institutes, decision-making units need to monitor and analyze changes in agricultural credit, education, public safety and marketing institutions, cooperatives, and the governmental agencies that service farmers, agribusinesses, and rural communities . . .

As in the case of technological change, there is a need to go beyond induced institutional change to consider the nonmaximizing activities that change institutions and the nonmonetary motivations that drive political and social leaders.

Human Development

It is also important that a framework exist for monitoring human capital development in agriculture, rural communities, the agribusiness subsector,

and in households. In this case, the data are likely to be more quantitative than encountered when monitoring policies, programs, and institutions. Decision makers and their staffs need to know the numbers of people involved by sex, age, skills, capacities, and educational levels. Information on nutritional and health status is also important as well as employment status and whether farm people live in villages or on separate farms. Such monitoring is essential for establishing needs to develop human capacity for agriculture, agribusiness, rural communities, and households. Skills and capacities are required, among other purposes, to generate new technologies, to teach and transfer information, to improve policies and institutions, to administer public agencies, and to provide private entrepreneurship.

Though agricultural and economic development decision makers and their staffs are unlikely to have direct responsibility for generating human skills and capacities, their agencies are likely to be involved in making important decisions influencing the ability of the private and public sectors to generate human skills and capacities.

One of the most vexing issues that arises in connection with human development is the establishment of reliability, will, motivation, and honesty where substantial proportions of a population lack these essential characteristics for development. Human capacity and institutional structures interact in ways which affect human behavior. In this connection, the Nigerian books by Achebe entitled *Things Fall Apart* (1958) and *No Longer at Ease* (1960) are instructive, as is Mitchener's (1959) *Hawaii*. Achebe's books deal with the consequences for human behavior of change from indigenous to British laws and institutions. Mitchener's book deals with the consequences of melding Polynesian, New England, Chinese, and Japanese cultures and institutions into a new Hawaiian society and with the "consequences" of those consequences for the development of Hawaii and its different ethnic groups. I sometimes think that persons concerned with development can learn as much from reading such books as from reading the development texts produced in academia.

Much work has been done by agricultural economists on human development under the rubric of "the economics of human capital formation." Like induced technical and institutional change, the economics of human capital formation has made substantial contributions to our understanding of human development. However, there seems to be more to it than merely response to monetary incentives. The preceding comments about the importance of establishing reliability, motivation, and honesty tend to highlight the importance of going beyond the economics of induced human capital formation in monitoring, analyzing and managing human development in an economy.

Growth in the [Manmade Physical] Capital and Natural Resource Bases of Agriculture and Rural Communities

Managing rural development and making decisions to encourage it require that growth and/or deterioration in the [manmade physical] capital and natural resource bases of agriculture, agribusinesses and rural communities be monitored. In addition to the quantities of land and water of different qualities and productivity, it is important to know about the stocks of such capital items as livestock, orchards, vineyards, oil palm groves, irrigation facilities, power equipment, other forms of equipment, and buildings. It is particularly important to know something about the quantities of conven-

tional versus high-tech capital. While human skills and capacities are often regarded as "human capital," inventorying human capital was considered in the previous section dealing with human development.

It is also important to monitor the performance of the existing [manmade physical] capital and natural resource bases in terms of their earning capacity. The input supply industries and the agribusinesses which assist in marketing, processing and distributing agricultural products also use and possess important capital and natural resource stocks. The stocks and resource bases of agricultural sectors and rural communities must be monitored in order to see what capital, conservation and resource development efforts are needed to promote rural development.

In turn, getting what is needed involves self-generation of capital and resource improvements, domestic borrowing, international borrowing, and international grants. Some of the capital will be privately owned and some governmentally owned. Probably the most important source of capital and natural resource improvements for agriculture is self-generation. I remember encountering, when working in Nigeria, considerable publicity being given to an external loan of $10 million to assist in the development of Nigerian agriculture. A moment's reflection on my part indicated that that was a mere pittance. The value of Nigeria's cattle herd of 10 million cattle at 30 Nigerian [pounds] per animal was well over $600 million. In addition, Nigeria had the self-generated capital of its national cocoa, palm, and rubber groves. The monetary value of these self-generated forms of capital was so large that the $10 million capital assistance item was of little consequence.

One of the nice characteristics of self-generation of capital in agriculture is that such capital tends to be produced, saved, and reinvested simultaneously without significant use of expensive formal capital markets. Despite this, domestic saving of money to be loaned to agricultural producers and rural communities can be of considerable significance, as can international borrowing . . .

Monitoring the capital base of agriculture requires that attention be given to the transfer of capital and incomes generated in agriculture to the nonfarm economy for the purpose of developing industry and trade. In many countries, schemes for directly transferring capital and income from agriculture to the government for development of the nonfarm economy have destroyed private incentives for the production, saving, and investment of self-generated capital such as livestock herds, orchards, buildings, and irrigation systems. It is important, therefore, that the decision units in government carefully analyze the impacts of such arrangements for transferring capital and income out of agriculture so as to detect possible adverse impacts on capital formation (Johnson 1968, 1969).

One of the more effective ways of transferring capital and income from farming for nonfarm development is through off-farm migration of farmers or the children of farmers who have built up capital resources. Over the past two centuries, vast amounts of capital were transferred from U.S. agriculture to the U.S. nonfarm sector by off-farm migrants who either took capital with them or who inherited it at the death of their parents. Perhaps no country in the world has been more successful than the United States in transferring capital to the nonfarm economy from the farm economy in a relatively painless way.

Decision-making units and their staffs in government need PS and SM research on the capital base of agriculture and rural communities. Some of this

> research can be done on an in-house basis, but some can also be done in branches of government other than in the planning bureaus of ministries of agriculture and economic development. Domestic universities and even foreign universities may be of some help in doing the necessary SM research.
>
> In connection with technical, institutional, and human change, the above sections stress the need to go beyond theories of "induced" change. In the case of growth in the capital base, induced technical change seems to me to have been neglected while the emphasis has been placed on nonmarket interventions to improve the capital base. This emphasis seems unbalanced. In this instance, it seems necessary to go beyond governmental interventions to induced growth in the capital base. Much more attention is needed to the establishment of incentives for the self-generation, saving, and investment of agricultural capital and the improvement of the natural resource base.

For purposes of understanding and promoting the growth of both advanced and less advanced agricultures, I find it convenient to regard agricultural policy as composed of four parts, one for each of the four driving forces: (1) agricultural technology, (2) human development, (3) natural and manmade resources, and (4) institutional change policies. Thus, in developing social science agendas, the Social Science Agricultural Agenda Project (SSAAP) report contains part III consisting of 191 pages including four sections, one for each of the four driving forces. The overall report places great stress on giving balanced attention to the four forces. Policies may be deficient with respect to any of the four forces. SSAAP criticizes U.S. colleges of agriculture for overstressing technology at the expense of the other three forces. In my visits with Michel since he wrote chapter 6, he has argued convincingly that the agricultural division of the World Bank neglects technology. While serving as an administrator's fellow to Administrator Roskens of the Agency for International Development (AID) early in 1992, I became convinced that that agency also neglects agricultural technology despite its support for the international agricultural research centers. On the other hand, it is my opinion that the National Science Foundation, the National Academy of Science, the U.S. Department of Agriculture, and colleges of agriculture in U.S. land-grant universities stress technology to the neglect of the other three forces.

MICRO/MACRO LINKAGES BETWEEN AGRICULTURE AND THE REST OF THE ECONOMY

Petit has stressed the importance of this topic in relation to the creation of agricultural surpluses. My doctoral dissertation (1949) dealt with the allocative efficiency of agricultural prices as affected by changes in the general level of employment. In 1958, I combined conclusions from my dissertation with asset fixity theory as developed up to that date and published the results in an award-winning article (Johnson 1958). The relevant part of that article strongly supports Petit's stress on the importance of micro/macro interactions and is reproduced below:

Three Facts Concerning Prices and the General Level of Employment and Business Activity

First, the terms of exchange between the farm and nonfarm sectors are related positively to the general level of employment and business activity with wars and increased foreign or domestic demands tending to strengthen the terms of exchange and vice versa. (See table [7.2].) *Second*, farm product prices (measured in current dollars) are related positively to the same factors. *Third*, prices of farm products relative to each other, though far from stable, tend to be independent of the general level of employment and business activity (Glenn L. Johnson 1949, 62–70).

Some Hypotheses About Resource Employment and the General Level of Employment and Business Activity

Table [7.2] has been set up to present some hypotheses about relationships among acquisition costs, salvage values, and expected marginal value productivities as they influence resource employment in agriculture. Influences of technological growth on employment are indicated with pluses or minuses as the case may be. Economic growth (excluding technology) can generally be expected to cause resource employment to be higher, i.e., expanding instead of stable, more expanding than indicated, less contracting than indicated and, possibly, expanding instead of contracting.

For instance, a twenty percent expansion of population in a ten- or fifteen-year period keeps the marginal value productivities over all levels of employment and business activity of farm inputs high relative to what they would be in the absence of such growth. This, in turn, stimulates resource flows into and retards resource flows out of the agricultural economy. This influence is particularly noticeable in the resource employment data, 1946 to date.

The Employment Hypotheses Tested. Table [7.2] contains data on the employment of twelve different resources, at least one for each of the nine resource categories. Each chart shows the ratio of prices paid to prices received by farmers.

The resource employment hypotheses advanced in table [7.2] were tested against the data. Table [7.3] of the thirty-six hypotheses concerning resource employment all are verified in the sense of being generally consistent with the resource employment data in this table.

Conclusions About Resource Use, Aggregate Output, and Changes in the General Level of Employment and Business Activity

Under conditions of increasing prosperity with the terms of exchange moving in favor of agriculture, the hypotheses call for no expansion in the employment of five resource categories and stability or slight expansion in the employment of a sixth. One case calls for expanded employment and two for contraction. The expansion occurs for nonfarm expendables while the contractions occur for (1) hired labor and (2) family and operator's labor. In general, the verified hypotheses indicate little change in aggregate input under conditions of increased prosperity, ceteris paribus; if considerable

growth is occurring, as in the period 1946 to date, input use may change considerably.

Under full prosperity conditions, the situation is not much different. Three hypotheses call for stable employment, three for stable or expanding employment, one for expansion, one for stability or contraction, and one for contraction. With three categories which are stable, four which are stable or expanding, and two which are stable or contracting, little increase in output is likely, ceteris paribus.

With declining prosperity, five hypotheses call for stable employment and two for stable or decreasing employment, with two uncertain. The indications are that aggregate output is stable or slightly contracting, ceteris paribus.

Under depression conditions, four hypotheses call for stable resource employment, two for stable or decreasing employment, and one for decreases, and two are uncertain. No hypothesis calls for expansion. Clearly, curtailed production is indicated under depression conditions, insofar as resource use is concerned, ceteris paribus. This set of hypotheses is the least verified of the four sets dealing with the general level of employment and business activity as we have not had long periods of prolonged depression to use for testing. During the years 1921–29, agriculture, rather than the general economy, was primarily depressed. From 1929 to 1932, we were going into a depression. After 1937 or so, we were recovering. How much contraction would occur under prolonged conditions similar to those that prevailed from 1933 to 1936 is not observable.

In general, the analysis indicates a stable supply of agricultural products over the business cycle given the price, acquisition cost, and salvage value patterns which usually occur. *This does not mean that the elasticity of the aggregate supply curve is zero.* It merely means that resource use and, hence, changes in output due to changes in resource use, ceteris paribus, do not change much in agriculture over the business cycle.

The Aggregate Supply Curve for Agricultural Products

While the above analysis explained the stability of aggregate agricultural output over the business cycle but told us essentially nothing about the aggregate supply curve, this general approach can yield some information about the supply curve itself.

We can, for instance, inquire about the consequences of, say, doubling farm product prices, ceteris paribus, for each of the four stages in the business cycle. Also, we can inquire concerning the consequences of halving farm product price at each of the four stages. While the available data do not permit hypothetical answers to these questions to be tested empirically as was done for table [7.2], analysis in that case lends some confidence to the answers.

In table [7.4] are the hypothesized relationships among acquisition costs, salvage values, and marginal value productivities *with doubled "normal" farm product prices* for each of four levels of business activity for each of the nine resource categories.

In table [7.5] are the hypothesized relationships among acquisition costs, salvage values, and marginal value productivities *with halved "normal" farm product prices* for each of the four levels of business activity for each of the nine resource categories.

Table [7.2]. Some Hypotheses About Acquisition Costs, Salvage Values, and Expected Marginal Value Productivities in Relation to the General Level of Employment and Business Activity, by Resource Categories

RESOURCE CATEGORY	RECOVERY	PROSPERITY	RECESSION	DEPRESSION
Nonfarm Durables Acq, MVP, Salv[a], Employment[b]	MVP ≤ Acq Stable +	MVP > Acq Expanding +	Acq ≥ MVP > Salv Stable +	MVP ≤ Salv Stab or Contr +
Unspec. Farm Durables Acq, MVP, Salv[a], Employment[b]	Salv ≤ MVP ≤ Acq Stable +	Salv ≤ MVP ≤ Acq Stable +	Salv ≤ MVP ≤ Acq Stable +	Salv ≤ MVP ≤ Acq Stable +
Spec. Farm Durables Acq, MVP, Salv[a], Employment[b]	Salv < MVP ≥ Acq Stab or Exp -	Salv < MVP > Acq Stab or Exp -	Salv < MVP ≤ Acq Stable -	Salv < MVP ≤ Acq Stable -
Unspec. Farm Expend. Acq, MVP, Salv[a], Employment[b]	MVP ≥ Acq Stab or Exp -	MVP ≥ Acq Stab or Exp -	MVP ≤ Acq Stab or Contr -	MVP ≤ Acq Stab or Contr -
Spec. Farm Expend. Acq, MVP, Salv[a], Employment[b]	Salv < MVP = Acq Stable +	Salv < MVP = Acq Stable +	Salv < MVP = Acq Stable +	Salv < MVP = Acq Stable +
Nonfarm Expend. Acq, MVP, Salv[a], Employment[b]	MVP > Acq Increasing +	MVP ≥ Acq Stab or Exp +	MVP ≤ Acq Stab or Exp +	MVP < Acq Contracting +
Hired Labor Acq, MVP, Salv[a], Employment[b]	Salv ≤ MVP < Acq Stab or Contr -	Salv < MVP < Acq Stab or Contr -	Salv $\lesseqgtr$ MVP ≤ Acq Uncertain -	Salv $\lesseqgtr$ MVP ≤ Acq Uncertain -
Fam. and Opr.'s Labor Acq, MVP, Salv[a], Employment[b]	Salv > MVP Contracting -	Salv > MVP Contracting -	Salv $\gtreqless$ MVP Uncertain -	Salv $\gtreqless$ MVP Uncertain -
Land Acq, MVP, Salv[a], Employment[b]	Salv < MVP < Acq Stable	Salv < MVP < Acq Stable	Salv < MVP < Acq Stable	Salv < MVP < Acq Stable

Note [a] for **Table [7.2]**.

All acquisition costs, salvage values, and expected marginal value productivities apply to agriculture as an industry. The MVPs are the present value of the expected future stream of annual MVPs in the case of durable resources.

The three price generalizations, page [187], support the following generalizations about the behavior of acquisition costs, salvage values, and marginal value productivities for the nine resource categories:

The *expected* marginal value productivities of all nine of the input categories will move up and down with the changes in product prices (measured in current dollars) over the business cycle as modified by the presence or absence of war and abnormal domestic and foreign demands.

Acquisition prices for both nonfarm durables and expendables rise less rapidly with prosperity than their expected marginal value productivities. Salvage values for nonfarm, specialized durables are essentially zero or, if not, are determined by their value in nonspecialized uses, i.e., scrap iron for tractors.

Salvage values for nonfarm expendables are largely irrelevant as farmers do not carry significant stocks; the same is true for farm-produced, specialized expendables. However, salvage values for unspecialized farm expendables (such as corn) are relevant; these salvage values rise and fall with their expected marginal value productivities and with farm product prices.

Both salvage and acquisition values for unspecialized farm durables rise and fall with farm product prices and their expected marginal value productivities as these change over the business cycle.

Salvage values for specialized farm durables are essentially zero; their acquisition costs, however, rise with the costs of items used in their production and, as nonfarm inputs are also used in their production, rise and fall more slowly than farm product prices and their MVPs but more rapidly than nonfarm prices.

The acquisition price of land is much above its marginal value productivity while its salvage price is zero (except in rural-urban fringe areas).

The acquisition price for family and operator's labor is, if relevant, generally above its marginal value productivity while its salvage value (appropriately adjusted for risk and personal wants and preferences) is below its marginal value productivity in depressions but above it during prosperity. As hired labor is a substitute for family and operator's labor, the acquisition cost of hired labor is relevant here.

The acquisition price of hired labor, in addition to containing a secular upward trend, rises and falls faster than its marginal value productivity (on farms) with respect to changes in the general level of employment and business activity. Similarly, its salvage value rises faster than its marginal value productivity when going into a prosperity period; its effective salvage value, however, may not fall as rapidly as its MVP due to certain institutional restrictions on the hiring of labor by nonfarm employers.

Note [b] for **Table [7.2]**.

In addition to the influence of the business cycle on acquisition costs, salvage values, and marginal value productivities, consideration should also be given to the influence of technological advance. For any given set of price relationships, improvements in technology increase the marginal value productivity of the inputs concerned relative to their acquisition costs and salvage value. Plus or minus signs denote influence of technological advance on employment.

Table [7.3]. Ratio of Prices Received to Paid, Percent of Labor Force Employed and the Employment of Twelve Resource Categories, 1910 to Date

YEAR	RATIO PRICES RED'D./ PAID	% OF LABOR FORCE EMPLOYED	RESOURCE CATEGORIES											
			DURABLES				EXPENDABLES					LAND	LABOR	
			NONFARM		FARM		FARM		NONFARM					
			Tractors	Machinery & Equipment	Unspec.	Spec.	Spec.	Unspec.	Fertilizer & Lime	Operation of Motor Vehicles	Other Expenses	Planted	Family	Hired
					Livestock	Fruit & Nut Trees	Seed Bought	Feed Fed						
	1910-14 = 100%	%	1000s	Billions of 1910-14 Dollars		Millions	Billions of 1910-14 Dollars					Million Acres	1910-14 = 100%	
1911	96	97	4	1.5	6.0		65		166	12	569		100	99
12	98	98	8	1.5	5.1		74		161	20	595		100	100
13	101	99	14	1.6	5.4		62		182	27	625		100	100
14	98	95	17	1.7	5.7		62		208	35	645		99	101
15	94	94	25	1.7	6.2		62		172	46	648		99	101
1916	103	96	37	1.8	5.4		76		179	74	718		99	103
17	120	102	51	1.6	4.3		122		236	132	869		97	101
18	119	105	85	1.6	4.4		132		317	190	1033		93	98
19	110	100	158	2.0	4.4	4.8	138		347	232	1129		91	96
20	99	96	246	2.3	4.5	4.8	178		382	296	1314		93	100
1921	80	87	343	2.6	5.0	4.8	123		221	254	1098		93	100
22	87	90	372	2.4	4.0	4.9	109		212	252	1057		93	101
23	89	96	428	1.9	4.2	5.0	111		230	271	1065		93	100
24	89	94	496	1.9	4.0	5.0	120		231	305	1049		93	99
25	95	95	549	1.9	3.4	5.0	136		250	377	1056		94	100
1926	91	96	621	2.0	3.6	5.1	142	103.4	250	444	1075		93	104
27	88	95	693	2.0	3.8	5.1	140	107.7	230	443	1003		90	102
28	91	95	782	2.0	3.9	5.1	134	107.2	292	477	1029		91	102
29	92	97	827	2.1	4.1	5.1	122	104.9	293	509	1024	363	91	103
30	83	91	920	2.3	4.9	5.0	124	95.7	288	496	951	369	91	98

1931	67	84	997	2.2	5.0	5.0	177	103.8	202	420	873	370	93	93
32	58	77	1022	2.1	4.9	5.0	79	111.0	125	384	735	375	96	87
33	64	75	1019	1.8	4.3	5.0	65	91.8	128	374	679	373	97	86
34	75	78	1016	1.5	3.9	4.1*	104	71.3	158	406	675	338	97	84
35	88	80	1048	1.5	3.1	4.0*	108	94.1	177	435	667	361	100	87
1936	92	83	1125	1.6	4.4	3.9*	147	75.4	196	459	687	360	98	94
37	93	86	1231	1.7	4.0	3.9*	194	97.0	248	521	757	363	97	97
38	78	81	1368	1.9	4.5	3.8*	206	98.9	226	533	750	354	97	97
39	77	83	1447	2.1	4.8	3.8*	169	102.1	240	564	730	342	85	80
40	81	85	1545	2.1	4.7	3.8*	197	108.0	261	584	766	347	82	79
1941	93	92	1675	2.3	3.9	3.8*	203	118.7	292	645	858	347	79	78
42	105	101	1885	2.8	4.1	3.8*	301	142.0	352	812	975	351	78	75
43	113	109	2100	3.2	4.9	3.7*	406	138.8	423	932	1041	361	79	72
44	108	111	2215	3.3	4.9	3.7*	440	128.8	476	1068	1070	365	79	66
45	109	108	2422	3.6	4.3	3.7*	435	132.8	562	1048	1103	356	78	62
1946	113	98	2560	3.5	4.0	3.8*	428	122.6	675	1295	1257	352	80	64
47	115	98	2735	3.4	4.1	3.8*	514	110.4	746	1505	1546	355	80	67
48	110	99	2980	3.8	4.2	3.8*	81	120.0	811	1697	1678	359	79	69
49	100	95	3315	4.4	5.3	3.4*	544	127.3	882	1735	1775	364	76	66
50	101	95	3609	5.2	4.6	3.1*	536	129.8	927	1901	1810	353	71	61
1951	107	97	3940	5.1	5.1	3.3*	646	131.6	1022	2045	2125		69	58
52	100	98	4170	5.7	6.4	3.3*		122.8					66	57
53	92	98	4400[a]	5.9	5.4	3.2*		125.7					65	57
54		95												

*Commercial apples only.
[a]Preliminary.

Table [7.4]. Some Hypotheses About Acquisition Costs, Salvage Values and Expected Marginal Value Productivities With "Normal" Farm Product Prices Doubled, for Different General Levels of Employment and Business Activity, by Resource Categories

RESOURCE CATEGORY	RECOVERY	PROSPERITY	RECESSION	DEPRESSION
Nonfarm Durables Acq, MVP, Salv[a], Employment[b]	MVP > Acq Expanding +	MVP > Acq Expanding +	Acq ≤ MVP > Salv Stab or Exp +	Acq ≥ MVP > Salv Stab or Exp +
Unspec. Farm Durables Acq, MVP, Salv[a], Employment[b]	Salv ≤ MVP ≤ Acq Stable +	Salv ≤ MVP < Acq Stable +	Salv ≤ MVP ≤ Acq Stable +	Salv ≤ MVP ≤ Acq Stable +
Spec. Farm Durables Acq, MVP, Salv[a], Employment[b]	Salv < MVP > Acq Expanding -	Salv < MVP > Acq Expanding -	Salv < MVP > Acq Expanding -	Salv < MVP > Acq Expanding -
Unspec. Farm Expend. Acq, MVP, Salv[a], Employment[b]	MVP ≥ Acq Stab or Exp -	MVP ≥ Acq Stab or Exp -	MVP ≤ Acq Stab or Contr -	MVP ≤ Acq Stab or Contr -
Spec. Farm Expend. Acq, MVP, Salv[a], Employment[b]	Salv < MVP = Acq Stable +	Salv < MVP = Acq Stable +	Salv < MVP = Acq Stable +	Salv < MVP = Acq Stable +
Nonfarm Expend. Acq, MVP, Salv[a], Employment[b]	MVP > Acq Expanding +	MVP > Acq Expanding +	MVP ≥ Acq Stab or Exp +	MVP ≥ Acq Stab or Exp +
Hired Labor Acq, MVP, Salv[a], Employment[b]	Salv < MVP ≥ Acq Expanding -	Salv < MVP ≥ Acq Expanding -	Salv < MVP ≥ Acq Stab or Exp -	Salv < MVP ≥ Acq Stab or Exp -
Fam. and Opr.'s Labor Acq, MVP, Salv[a], Employment[b]	Salv ≤ MVP Stable -	Salv ≤ MVP Stable -	Salv < MVP Stable -	Salv < MVP Stable -
Land Acq, MVP, Salv[a], Employment[b]	Salv < MVP < Acq Stable	Salv < MVP < Acq Stable	Salv < MVP < Acq Stable	Salv < MVP < Acq Stable

[a]See Note [a], Table [7.2].
[b]See Note [b], Table [7.2].

Table [7.5]. Some Hypotheses About Acquisition Costs, Salvage Values and Expected Marginal Value Productivities With "Normal" Farm Product Prices Halved, for Different General Levels of Employment and Business Activity, by Resource Categories

RESOURCE CATEGORY	RECOVERY	PROSPERITY	RECESSION	DEPRESSION
Nonfarm Durables Acq, MVP, Salv[a], Employment[b]	MVP < Acq Stable +	MVP < Acq Stable +	MVP ≤ Acq Stable +	MVP < Salv Stable +
Unspec. Farm Durables Acq, MVP, Salv[a], Employment[b]	Salv ≤ MVP ≤ Acq Stable +	Salv ≤ MVP ≤ Acq Stable +	Salv ≤ MVP ≤ Acq Stable +	Salv ≤ MVP ≤ Acq Stable +
Spec. Farm Durables Acq, MVP, Salv[a], Employment[b]	Salv < MVP ≤ Acq Stable -	Salv < MVP ≤ Acq Stable -	Salv < MVP < Acq Stable -	Salv < MVP < Acq Stable -
Unspec. Farm Expend. Acq, MVP, Salv[a], Employment[b]	MVP ≤ Acq Stab or Contr -	MVP ≤ Acq Stab or Contr -	MVP < Acq Contracting -	MVP < Acq Contracting -
Spec. Farm Expend. Acq, MVP, Salv[a], Employment[b]	Salv < MVP = Acq Stable +	Salv < MVP = Acq Stable +	Salv < MVP = Acq Stable +	Salv < MVP = Acq Stable +
Nonfarm Expend. Acq, MVP, Salv[a], Employment[b]	MVP $\gtrless$ Acq Uncertain +	MVP $\gtrless$ Acq Uncertain +	MVP < Acq Contracting +	MVP < Acq Contracting +
Hired Labor Acq, MVP, Salv[a], Employment[b]	Salv > MVP < Acq Contracting -	Salv > MVP < Acq Contracting -	Salv ≥ MVP < Acq Stab or Contr -	Salv ≥ MVP < Acq Stab or Contr -
Fam. and Opr.'s Labor Acq, MVP, Salv[a], Employment[b]	Salv > MVP Contracting -	Salv > MVP Contracting -	Salv ≥ MVP Stab or Contr -	Salv ≥ MVP Stab or Contr -
Land Acq, MVP, Salv[a], Employment[b]	Salv < MVP < Acq Stable	Salv < MVP < Acq Stable	Salv < MVP < Acq Stable	Salv < MVP < Acq Stable

[a]See Note [a], Table [7.2].
[b]See Note [b], Table [7.2].

Tables [7.4] and [7.5] indicate that, ceteris paribus, the aggregate supply curve for agriculture:

1. Has an elasticity greater than zero at all of the four different levels of employment and business activity considered.
2. Is more elastic upward than downward.
3. Is more elastic upward at full prosperity and during recovery than during recessions and depressions.
4. Is less elastic downward during prosperity and recovery than in recession and depression.

These generalizations can be checked against the seventy-two resource employment hypotheses in tables [7.4] and [7.5].

Some Important Factors Affecting the Aggregate Supply Curve for Farm Products

In addition to cyclical instability which was considered in detail above, the aggregate supply function is affected by:

1. Technology
2. Intrasector resource movements: (a) between geographic regions, (b) between firms, and (c) between enterprises within firms
3. Changes in risk
4. Redistributions of asset (rights, property, and skill) ownership as a result of: (a) direct governmental action, (b) inflation and deflation, and (c) capital accumulation.

When the object is to predict output instead of to isolate the supply function, these supply shifters must be considered also. While space and time precludes adequate treatment, cursory analysis seems preferable to omission.

These supply shifters have a tendency to move together. Hence, it is discouragingly difficult to differentiate empirically their separate influences. Technological advance makes intersector specialization and resource flows possible and necessary. It does the same thing with respect to intrasector flows. Risk and technology, too, are related, as much technological advance is risk-reducing as is apparent when insecticides, fungicides, pesticides, and vaccines are considered, not to mention timeliness and large-scale, fast, high-powered machinery. Technology, too, is an asset—it cannot be produced and used without influencing asset ownership patterns.

Technological Advance and Intersector Resource Flows—Both technological advance and specialization between the farm and nonfarm sectors can produce increases in agricultural output with no net increase in inputs (Reder 1947, chap. 2).[4] Thus, the ratios of incremental output over incremental input which Schultz observes to be greater than one may be due to technology, specialization, or a combination of the two (Schultz 1956). Probably both are involved with the specialization often following technological change but with specialization sometimes being a precondition for adoption of a technological advance. Only a moment's reflection is needed to see how important intersector specialization has become in agriculture. Dean Young delivered a paper at the Helsinki meeting of the International Conference

of Agricultural Economists which stressed the importance of supplying industries in achieving the productive level which U.S. agriculture has reached. At last winter's joint meeting of the American Economic Association and the American Farm Economic Association, John Davis stressed the intersector specialization (he called it vertical integration) which has occurred between the farm and nonfarm sectors in the production of marketing service. Whereas, a few years ago, many marketing services were performed by farmers who prepared products for market, transported them to market and, sometimes, retailed them, many of these services are now being performed by the nonfarm sector.

Intrasector Resource Flows--Geographic specialization as well as intersector specialization is also capable of increasing output without increased input. This has been known since before the days of Adam Smith (Smith 1937, 415 f.). While technological advance may encourage regional specialization and interfirm specialization, it is by no means a prerequisite for it; in fact, specialization can be a prerequisite for adoption of a technological advance. The empirical importance of this shifter is shown in census reports for 1950 (U.S. Bureau of the Census 1950), presenting scatter diagrams for major farm products which indicate a large amount of regional specialization in recent decades.

While less adequate data are available to support the assertion, it is also clear that significant amounts of interfirm specialization [are] occurring. Generally speaking, farms are less self-sufficing than formerly insofar as milk, eggs, vegetables and fruit, and possibly meat production, are concerned.

Risk and Capital Rationing—The discussion of the influence of risk on the aggregate supply curve for farm products must be very cursory. Certain points are worthy of speculation, however.

Of the many risks besetting agriculture, price risks associated with the business cycle are of prime importance. D. Gale Johnson and Schultz have placed great emphasis on price risks as a cause of capital rationing. In terms of the fixed asset definition employed in this paper, such risks can be interpreted as adding subjectively to acquisition costs thereby making acquisition costs greater than salvage value for a farmer even in a market as perfect as the one for money. Risk, then, becomes a basic cause of capital rationing.

It then follows that elimination of price risk eliminates asset fixities, thus making production more responsive, especially upward. In our economy, a significant reduction in price risks occurred in the late thirties as a result of price control programs and some recovery optimism. A further reduction in price uncertainty occurred with the outbreak of World War II and the Steagall Amendment. Some writers have attributed the expansions in agricultural production which occurred during these periods to widespread adoption of new technology. Inasmuch as these were periods in which (1) reduced price risk helped eliminate capital rationing and (2) considerable amounts of specialization occurred, all of the expansion in output probably cannot be attributed to technology.

Inflation, Asset Ownership Redistribution, and Capital Rationing—Capital rationing, as a general form of asset fixity, may be overcome in a number of ways, any one of which is capable of expanding output through: (1) permitting the use of more resources and (2) specialization in the use of the same quantity of resources. From 1933 to 1952, inflation has served repeatedly to

overcome capital rationing, making possible both specialization and expanded resource use. Some of this expanded production was achieved through long available but unadopted technology. Economic conditions had to be conducive to adoption of the technology. Thus, in a sense, the expansion of production has more in the nature of an economic than a technological adjustment (Hendrix 1951).[5] Technologies are not automatically adopted even if profitable and communicated to farmers; the "wherewithal" must be available.

Asset fixities may be overcome in other ways. The right to produce a product may gain value under production control programs and then be redistributed, thereby overcoming capital limitations (Thompson 1952). Also, agencies such as the AAA, SCS, TVA, and PMA may redistribute rights, income, and assets, thus overcoming certain asset fixities and capital limitation. The land-grant system should not be forgotten in this connection as an institution designed to produce and distribute information at public expense (Schultz 1953, chap. 7); Johnson 1955, 27 f.). These asset redistributions can increase output by increasing inputs or without (if they make . . . possible [additional economizing]) increasing inputs. Again we find more than one factor affecting the aggregate supply function often tending to shift the supply function in the same direction.

Summary—The general conclusion is that the supply shifters are numerous with highly interrelated impacts on the aggregate supply curve for agriculture.

Clearly, it is extremely hazardous for anyone to attribute the shifts in the aggregate supply function which have occurred in recent decades to any one of these shifts alone. It is also clear that further upward shifts in the supply curve are easily brought about.

The fixed asset theory used herein would indicate that a high proportion of the influence of these shifts on the aggregate supply function is only partially reversible.

Some Prospects for the Future

The above analysis indicates that:

1. Output should not be expected to change much as a net result of the complex set of price changes occurring with inflation, deflation, prosperity, and depression.
2. Farm output can be increased by raising farm prices, ceteris paribus.
3. Farm output could be reduced somewhat by lowering farm prices, ceteris paribus; however, the price reductions required to reduce output are larger than those required to bring about a corresponding increase in output.
4. Shifters play important but individually undetermined roles.
5. Shifters and the elasticity of the aggregate supply function are jointly capable of bringing about considerable expansions in output for the foreseeable future . . .
6. Expansions in production brought about by both the elasticity of the aggregate supply function and the shifters are difficult to reverse.
7. Instead of contractions in production, large-scale capital losses can be imposed on the owners of fixed assets (or assets which become fixed) as a

> consequence of losses in demand after production is expanded in response to war demands, temporary foreign demands, and price supports. [Neither the] imposition of these gains and losses on farmers [nor their removal can] be supported in terms of efficiency or general welfare criteria . . .
> 8. Needed empirical research on aggregative supply responses must consider the partial irreversibility of the aggregate supply function . . . Also, it will be necessary to take into account the shifters (technology, redistributions of asset ownership, risk and specialization). Because of high intercorrelation among the shifters, the synthetic approach may be very useful.
> 9. Additional empirical research is needed with respect to the incidence on owners of fixed agricultural resources of gains and losses resulting from fluctuations in the demand for farm products.
> 10. Still other needed research would involve institutional arrangements to reduce the incidence of capital losses on owners of fixed agricultural resources.

Items 7, 9, and 10 indicate that the imperfect knowledge and acquisition cost/salvage price differentials may jointly impose non-Pareto-optimal losses on investors. This makes it necessary when doing policy analyses to address the theoretical difficulties in economics pertinent to Pareto-optimality. I present the material below on researching values in response to Petit's concern with this topic. What is presented here also supports Samuels's chapter 8 with its concern about preventing the foreclosure of processes for evaluating, among many other things, whether or not such market-imposed losses should be compensated and, if so, by how much.

DIFFICULTIES IN RESEARCHING THE VALUE DIMENSIONS OF PRACTICAL PROBLEMS AND ISSUES PERTAINING TO AGRICULTURAL POLICY

Policy analysis involves values, monetary as well as nonmonetary and intrinsic as well as extrinsic (exchange). If policy questions involving the justification for either existing or changed ownership patterns for income-producing rights and privileges are to be precisely answered, interpersonally valid, cardinal measures of a common denominator of values will be required—this is true even if we assume perfect knowledge of the present and future and equality of acquisition costs equal to salvage values. Both Petit and I are concerned with non-Pareto optimal consequence of free market operations and of institutional changes that establish greater freedom in international trade. In addition to the rigorous work of Kenneth J. Arrow (1951), building on Hicks and Pareto, we have the following extremely insightful annotations from Frank Knight that are included in the following from my Michigan State University Centennial Review address entitled "Economics and Ethics" (Johnson 1986):

THE MORALITY OF MARKETS AND THEIR CONSEQUENCES

Among those in the early neoclassical period who greatly extended our understanding of the morality, immorality, or lack of morality of markets in their broad sense was Frank H. Knight. In his book entitled *The Economic Organization*, Knight (1951, 59-66) clarified how markets determine prices, income distributions, patterns of resource utilization, production and consumption and, less explicitly, savings and dissavings. In his *Ethics of Competition*, Knight (1936, 56) also wrote that

> . . . income does not go to factors but to their owners, and can in no case have more ethical justification than has the fact of ownership. The ownership of personal or material productive capacity is based on a complex mixture of inheritance, luck, and effort . . . What is the ideal distribution from the standpoint of . . . ethics may be disputed but of the three considerations named above certainly none but the effort can have ethical validity.

He also wrote (Knight 1936, 58)

> It [the market] distributes the produce of industry on the basis of power which is ethical only insofar as right and might are one. It [again the market] is a confessed failure in the field of promoting social progress, and its functions in this regard are being progressively taken over by other social agencies.

In another book entitled *Freedom and Reform*, Knight (1947, 67) noted that the savings and dissavings determined through time in a market characterized by nonequal initial endowments of income earning rights and privileges can be expected to lead to "cumulative increase in inequality of . . . power."

In Knight's view, markets, for the most part, do not justify either the rules and regulations which structure them or the consequences of their operations. Both are jointly justified or unjustified mainly on the basis of criteria external to themselves. Neither the market nor its consequences justifies who owns what right or privilege or who is restricted from interfering with those rights and privileges. These are justified and are judged moral or immoral on the basis of criteria external to markets. Inheritance (both private and social) is necessary but the criticisms which justify or condemn particular patterns of inheritance are mainly external to the market and to the process of inheritance. Inheritance patterns, as Knight indicated in the quotation cited above, cannot be regarded as ethically justified on the basis of criteria internal to markets . . . philosophy and ethics have much to say about how to establish such external criteria. Probably the most important exception to this statement about external criteria is the goodness of freedom to choose and participate in decisions at all levels and of the constraints which make such free participation possible. Such freedom and constraints have value in and of themselves (intrinsic value) as well as instrumental value in attaining the most welfare permitted within the rules and regulations of the market. The problem of organizing or reforming a society or market is sometimes posed as one of finding that combination of restrictions for which the goodness of the resulting freedom is greater relative to the badness of the restrictions than for any other set of restrictions.

> For both those who do and those who do not know the modern liberal's caricature of University of Chicago economics, [it should be pointed out that] the above radical quotes are from the father of what modern liberals often simplistically regard as the conservative laissez-faire Chicago school of economics. [Knight] was also a teacher of the supposedly arch conservative Milton Friedman (1962). No wonder another of Knight's students [Don Patinkin] refers to Knight as "the radical economist and the conservative" (Patinkin 1962).

It was from Knight (but also from Friedman) that I came to understand that the market does not justify *either* the initial distributions of the ownership of income-producing rights and privileges *or* all of the changes in such distributions resulting from the operation of the market. From both Knight and Friedman, I learned about the effectiveness of prices and markets as communication and allocative (control) mechanisms. From Friedman, I learned that attempts to modify market operations in pursuit of redistributive objectives would likely (1) fail to attain the intended redistribution while (2) reducing the allocative effectiveness of the market and price mechanism. I developed a preference for direct redistribution of ownership over indirect redistributions through price manipulations and market regulations.

When neoclassical economists recognized that knowledge is imperfect (Knight 1946) and that acquisition prices exceed salvage prices for durable income-producing resources, the ex post consequences of market choices often become non-Pareto optimal, however Pareto optimal they appeared to be when made. This theoretical consequence is often denied and subjected to benign neglect by those who apparently want to believe that the market can do no wrong (Hoover 1973, Johnson and Pasour 1981, Johnson 1982b).

The following abridged citation deals with the evaluation of the non-Pareto-optional consequences of imperfect knowledge of farmers when acquisition costs exceed salvage values (Johnson and Quance 1972, 41-48):

> A *basic problem* for present-day evaluative economic analysts arises from the inability of economists to measure losses and gains imposed on different persons in such a way as to permit their summation into a measure of change in total welfare (Arrow 1951). Such a statement as "the greatest good for the greatest number" is vague and unclear. Yet [as we saw earlier in this chapter] U.S. agricultural policies and programs and the day-to-day operations of [the market mechanism] both impose losses and confer gains on different people.
>
> The classical writers who established the rationale behind our systems of economic analysis were not concerned with the problem of making interpersonally valid measurements of welfare, because they assumed that such measurements could be or had been made. This led some of them to the erroneous conclusions that an economy which reached competitive equilibrium would be the best of all possible economies. The idea is still widely held by some economists and also relatively well-educated laymen. However, few reputable economists argue that an economy is necessarily in an optimum organization just because the competitive adjustments of a free economy are made and a point of equilibrium reached. Most recognize that redistribution

of rights, privileges, and benefits might (note that neither "would" nor "could" is used) establish a different equilibrium (also, a free, competitive equilibrium) superior to the old one. However, while recognizing this possibility, many economists feel unable to determine whether the new equilibrium is better or worse than the old.

The theoretical circumstance under discussion in the above paragraph is another application of the "theory of second best" presented and generalized by Lipsey and Lancaster (1955–56). That theory indicates that when a new constraint prevents attainment of a previously possible Pareto-optimal situation the new Pareto-optimal alternative among the new or remaining open alternatives may be inferior to, superior to, or equal to the original Pareto optimum. The theory of second best has been used to deal with the consequences of introducing or removing taxes, monopolies, subsidies, import duties, and so on. The situation dealt with [here] results from the introduction of the particular constraints growing out of the mistakes of one or more managers. When such a mistake is made, non-Pareto-better losses are imposed by the constraining consequences of the mistake unless, of course, as pointed out above, the mistake is completely correctable. The reasoning presented in this chapter indicates that the loss-minimizing adjustments necessary when a fixed resource has to be priced according to the opportunity cost principle involves an application of the theory of second best. It is comforting to note, therefore, that the conclusions reached herein concerning the operation of a free market system under uncertainty and in the presence of acquisition costs greater than salvage prices leads to the same indeterminant evaluations reported in considering scientific tariffs (Harry G. Johnson 1960) and in considering the consequences of imperfect markets (Fishlow and David 1961).

Economists tend to avoid facing up to [this] problem. As they become more aware of their inability to make interpersonally comparable measurements of welfare, they restrict their evaluative analyses to situations in which it is unnecessary to make such measurements. Consequently, present-day systems of economic analysis are of limited usefulness in evaluating precisely the kinds of changes that have been made in policies and programs [for] U.S. agriculture and that occur in freely operating economies such as [that of] the United States.

In addition to the above problem of attaining interpersonally valid utility measures, which was examined by Hicks (1941), there are three other problems that plague the evaluative analyst.

The *second* is the question of whether or not all values are expressible in terms of a common denominator, even for a single person. Economists tend to use "utils," or dollars and cents, or something called welfare as if these constituted common denominators (Parsons 1949). This question combines with the one on interpersonally valid welfare measures to make it extremely difficult to judge non-Pareto-better changes involving such disparate "goods" as income, freedom, pride of workmanship, and self-reliance, and such disparate "bads" as expenses, hunger, ego damage, and the feeling of dependence. Yet all of these goods and bads (and many others) are consequences of the changes that have taken place in U.S. agriculture before and since 1917, as a result of public programs and policies and of the ongoing operation of the economy.

The *third* problem is the frequent encountering of changes that are not so ordered that we can conceive of a maximum difference between the good

and bad consequences of following the various alternatives, even if we grant the possibility of an interpersonally valid, universal, common denominator of values. With respect to institutional change, technological advances, and the education of people, nothing is apparently comparable to the laws of diminishing returns and utility to ensure the second order conditions necessary for a maximum difference between the "goods" and "bads" produced by public action and by the ongoing operation of the economy.

The *fourth* problem is the basis for choices under risk and uncertainty. In evaluating a policy or a program, do we conclude, for instance, that a certain program is better than another because the value of the expected future stream of net differences between the "good" and "bad" consequences of the program is higher than for the alternative? Or do we follow a minimax rule in making the choice? Perhaps, if an interpersonally valid universal common denominator of value is not present, we should vote. If so, would it be one vote per man or two senators per state? Or, perhaps it would be better to flip a coin or fight a civil war?

The four difficulties discussed above are so horrendous for the evaluative analyst that he despairs of objectivity in evaluating the way our agricultural economy has allocated its resources under public policies and programs of the 1917-70 period. [These same four difficulties are also considered in chapter 9 of this book.] Yet, somehow or other, agriculture policies and programs and the operations of the agricultural economy have been assessed and evaluated by political bodies, deliberative committees, and economists helping to make such evaluations. Thus, our study is required to go beyond competitive, perfect-knowledge, equilibrium economics, and the poor measuring ability of modern welfare economists. We need to use whatever knowledge we can find of the processes of human, technical, and institutional change, and, further, of the bases for choice. Only in this way can we try to evaluate what has gone on with respect to the allocation of resources in the U.S. agricultural economy from 1917 to 1970 and to suggest improvements.

EVALUATIVE METHOD

In the evaluative method used in this book, a sharp distinction is drawn between "goods" and "bads" on one, and "rights" and "wrongs" on the other (C. I. Lewis 1955). Situations, conditions things, attitudes, etc., [even acts] are described as good or bad; in contrast, actions are [also] designated as right or wrong. Right or wrong actions represent compromises among the goods and bads involved in a given situation in view of what is, will be and/or what is possible. An action which accomplishes more good than is sacrificed by not executing an alternative action is more right than the alternative, other things equal. An action which only avoids more bad than an alternative would, while neither attains any good, is probably more right than the alternative, other things equal. An action which accomplishes the same good but is accompanied by less bad than an alternative is more right than the alternative, other things equal. If the reverse were true in the above examples, the actions would be less right or more wrong than their alternatives.

The discussion in the above paragraph presumes that all difficulties discussed before with respect to universal interpersonally valid welfare measures, second-order conditions, and the choice of decision rule have been handled. Yet, in practice, they have not. However, before discussing how we

will face up to these difficulties, we must look at the prior problem of whether it is possible to have objective knowledge of the normative as well as the nonnormative.

Evaluation of farm programs and policies and the operation of the economy requires nonnormative concepts of conditions, situations, and things. Nonnormative or positive concepts have nothing to do with the goodness or badness of conditions, situations, or things. Normative concepts are those having to do with "goodness" and "badness" or conditions, situations, and things. As outlined above, it is in the light of both nonnormative and normative concepts that actions taken with respect to agricultural policy and programs are evaluated as right or wrong.

Nonnormative concepts about how the economy operates, how it would operate if various changes were made, and how it would operate regardless of changes are required in evaluating the operation of the economy. Similarly, normative concepts—about goodness and badness—are also required in such evaluations. Practical situations can be judged in terms of (1) not enough of one or more "goods," (2) too much of one or more "bads," (3) combination of (1) and (2). Thus, normative information is required to evaluate, but as for nonnormative information, normative information alone is not enough. We need nonnormative as well as normative concepts.

By *normative concepts*, we mean concepts having as their meaning information about the goodness or badness of conditions, situations, and things. We regard "goodness" and "badness" as primitive undefined terms. By nonnormative concepts we mean concepts having as their meaning information about situations, conditions, and things other than information about their goodness and badness—i.e., information about what one refers to with such terms as weight, mass, volume, color, location, etc., primitive and undefinable as some of these terms are in such sciences as physics and chemistry. In both the normative or nonnormative cases, concepts deal with relationships among events and laws as well as with isolated events.

Whether we are dealing with the normative or the nonnormative, the evaluation of programs, policies, and performance requires objectivity and we must ask how we obtain objectivity with respect to, first, both normative and nonnormative information and, second, decisions as to "right actions." Knowledge is viewed as concepts, i.e., words and sentences with specifiable meaning. Our problem is to discuss the closely related subjects of the meaning of (1) objectivity of the concepts themselves and (2) objectivity of the process of carrying out research and investigations to establish concepts.

One way to understand the meaning of objectivity is to discover what objectivity does *not* mean. Some investigators hold that an objective concept is one which corresponds to reality, and at first blush, this seems to be a very acceptable meaning. According to this view, the objectivity of a concept is readily testable: all one has to do is compare the concept with reality to see whether or not it is, in fact, an accurate representation of reality. Some forthright people refer to this as the "snapshot" test. Somewhat deeper reflection on this point, however, indicates that the only things we have to compare one concept with are other concepts. Thus, the comparison of one concept with another does not provide a test of reality but rather a test of consistency among concepts.

Another meaning of objectivity is empirical truth, and the question becomes one of whether or not a sentence expressing a concept is true. When

we ask what is meant by a "true" concept, the answer takes us back to the "snapshot" definition of objectivity discussed above.

In what follows, we argue that the essential meaning of the word "objective," when we use it to characterize a researcher's [or manager's] activity, is a willingness on the part of the researcher [or manager] to refrain from identifying himself and his prestige with a concept, so that, in the absence of the pride or humiliation which comes with being identified with a concept, he is willing to subject the concept to various tests of objectivity. Among the commonly employed tests are those for consistency, clarity, and workability. Failure to meet any of these tests is reason enough to reject a concept, for certain purposes. Thus, more specifically, objectivity on the part of a researcher consists in detaching himself from a concept enough to submit it to tests for objectivity and willingness to reject and revise a concept which is, itself, not objective in terms of the tests of consistency, clarity, and workability. An objective concept, as contrasted to an objective researcher, is one which is subjected to the tests of consistency, clarity and workability and does not flunk such tests for the purposes for which the concept is used.

We emphasize that those who hold a "snapshot" theory of objectivity believe that certain propositions are objectively true because they are outside the domain of evidence and justification, whereas the notion we defend here defines objectivity in terms of evidence and justification. To establish that a concept is objective is to show that it (1) has a clear and specifiable meaning; (2) is consistent with other acceptable concepts, laws, and theories; and (3) is useful in solving the problems with which one is confronted.

The test of consistency is both internal and external. Internal consistency is a logical or analytical matter. The internal test requires that a set of concepts must bear logical relationships to each other whether they pertain to the past, present, conditional future (if . . . , then . . .), or the unconditional future. There is also an external consistency test. This is the test of experience; as such, it is synthetic (derived from experience) as well as analytic (deduced by logic from propositions). Experience provides a basis for forming new concepts. To apply the test of external consistency, an existing concept is compared with concepts based upon new experience; [when] the new concept is synthetic, the process of comparison is likely analytic.

A new or independent experience (one which is outside a presently accepted body of knowledge) may involve observations of the operation of an ongoing system such as a farm, the universe of planets circulating around the sun, the chemical and physical activities going on in a cubic foot of soil, the operation of a biological organism, or the operation of the U.S. agricultural economy. Observations may also be generated by controlled experiments. In either case, observations or experience provide a basis for formulating new concepts which must be consistent with a given body of concepts if both they and that given body of concepts are to pass the test of external consistency.[6]

The test of clarity is both simple and difficult. One knows when a concept passes the test of clarity and can be communicated between people. Ambiguity and vagueness block such communication. It is difficult, however, to indicate the exact nature of the test of clarity. A concept is clear if it is understood and communicated from one person to another. For a concept to pass the test of clarity or communicability, two persons in possession of information derived from the same set of experience and with the same set of initial knowledge of that concept should both accept or reject the concept. [Knowledge,

thus, is culturally dependent as those know who seek peer review approval and acceptance of the knowledge generated by their research.]

The test of workability is pragmatic. Concepts are used to solve both analytical and practical problems. Concepts are also often used to predict positivistically that a certain outcome will be forthcoming; if the outcome does not materialize, the concept has failed to pass the test of workability or usefulness. Similarly, if a normative concept of "goodness" is used in selecting a goal, the goal, when attained, must turn out as predicted or the normative concept flunks the workability test. Thus, the workability test is pragmatic and rather closely related to the test of external consistency.

A moment's reflection indicates that the meaning of objectivity just discussed is such that objectivity is not limited to the physical and biological sciences. It is as easy for concepts in the social sciences to be objective—in the sense that they possess internal and external consistency, clarity, and workability—as it is for concepts in the physical and the biological sciences to be objective. In either case, failure to pass any of the tests calls for reformulation.

Similarly, it is also obvious that objectivity is not confined to nonnormative as contrasted to normative concepts. Both types of concepts may or may not pass the tests of internal and external consistency, clarity, and workability. The test of external consistency with respect to a normative concept is more easily applied than is commonly supposed. For instance, I remember vividly one of my colleagues coming into my office after recovering from an unusually severe case of chicken pox. My colleague's comment simply was, "You're right. Chicken pox is bad." Quite simply, he had experienced chicken pox and thus knew it was bad.

Further reflection on the above meaning of objectivity will emphasize that "absolute" concepts, either nonnormative or normative, are not objective. Willingness to accept or reject concepts on the basis of workability tests indicates that the concepts are likely to work for some purposes but not for others. Thus, for purposes of sighting a rifle, we find the nonnormative concept that light travels in a straight line to be adequate. Yet Einstein found it necessary to modify this concept for his purposes. So it is with economic theories. [Earlier in the article from which this is taken], we remarked that, for some purposes, it is was sufficient to accept the concept that acquisition costs equal salvage values while for other purposes it was not sufficient. Neither normative nor nonnormative absolutes, then, are objective and neither are very helpful in "muddling" through the tough problems encountered while one is doing evaluative research in the presence of uncertainty.

One of the least objective arguments advanced is that of the positivistic absolutist who claims that there cannot be an objective normativism because there can be no absolute normative derived from observations of reality. And one of the more objective arguments which can be advanced is that any concept, normative or nonnormative, is tentative, relative, and likely to flunk the tests of external consistency and workability, however clear, internally consistent, and irrefutable it is if applied at any period in time.

Despite the relation of objectivity to purpose and despite the unacceptability of [the idea of] absolute knowledge, the criteria of objectivity in research and of conceptual objectivity require that concepts be divorced from their originators. Thus, to raise the question of "whose concept" is almost tantamount to raising the question of objectivity. The question can be raised with respect to either nonnormative or normative concepts . . . [Lack of ob-

jectivity] leads to wrong evaluations, whether the lack of objectivity occurs with respect to either type of concept.

PARTICIPATORY INTERACTION—ITS IMPORTANCE IN ADDRESSING POLICY PROBLEMS AND ISSUES

Under the heading of the Elements of Our Evaluative Method, the citation above continues (Johnson and Quance 1972, 48–51:

Briefly, our evaluative method consists in: (1) seeking objective, normative and nonnormative facts, laws, and theories; and (2) attempting to reach judgments as to the rightness and wrongness of past and proposed policies and programs while recognizing (a) those consequences of programs, policies, and the ongoing operation of the economy that simultaneously impose losses on some and benefits on others; (b) the lack of a common denominator in terms of which all goods and gads can be expressed as a basis for determining which policies, programs, and/or operations are right or wrong; (c) the likelihood that the second-order conditions do not hold which are necessary to guarantee the existence of a set of policies and programs that maximizes the difference between good and bad; and (d) the lack of a generally agreed-on basis for choice in making socio-politico-economic decisions concerning a right set of policies and programs.

In seeking objectivity, . . . heavy emphasis [is placed] on the tests of both internal and external consistency. Long-standing, well-used assumptions (concepts) [about acquisition costs and salvage prices, supply responses, capital gains and losses, and opportunity costs] flunked the test of external consistency. The inconsistencies were with concepts (based on observations) about the characteristics of American agriculture . . . Internal consistency checks were also important; thus, . . . the acceptance of different concepts about the characteristics of American agriculture made it necessary to introduce substantial modifications in the assumptions for the theory of the firm. These modifications, in turn, led to the conclusion that a freely operating economy populated by imperfectly informed entrepreneurs would not reach a Pareto-optimal organization if (1) changes were continuous and (2) acquisition costs exceeded salvage values.

The process of applying the tests of internal and external consistency is continuous . . . as knowledge concerning institutional, technological and human changes is accumulated, . . . theoretical concepts . . . are modified. For instance, stock/flow transformation rates are related to technical change, and the factor-share/lagged-adjustment technique for estimating MVPs is modified, etc.

Throughout the writing of background papers and theses by our several contributors, the test of clarity (or interpersonal communicability) was applied time and time again. Further, . . . rejection of [the idea of an] absolute [created expectations] that . . . conclusions . . . would need continual subjection to this (and the other tests for objectivity) and to be modified according to whether the tests are passed or failed. Further, the workability test [needs to be] applied time and time again with respect to (1) theoretical, analytic, and descriptive (synthetic) concepts . . . (2) U.S. policies and programs, and (3) the ongoing operations of the national agricultural economy.

As a result of repeated application of objectivity tests in chapters 1 and 10, we believe we have a considerably improved analytical and descriptive picture of how the U.S. agricultural economy operates and responds to policy and program changes. The new insights grow out of the theoretical reformulation presented [herein with respect to investment and disinvestment or asset fixity] and also out of . . . empirical work on acquisition costs, salvage values, resource earnings, capital gains and losses, and price expectation. All of this . . . resulted in substantial reformulations of . . . original concepts about how the agricultural economy operates and responds to policy and program changes.

However, . . . serious problems [still existed]. In addition to the likely remaining shortcomings in our analytical and descriptive (synthetic) concepts, we [had to face] the evaluative difficulties listed above—i.e., the lack of an interpersonally valid, common denominator of value, the possible absence of the necessary second-order conditions for the existence of an optimum, and the lack of an agreed-on basis for choice.

. . . theoretical, . . . empirical and historical [work revealed] that a competitively operating economy, characterized by imperfect knowledge and resource transfer costs, does allocate resource use so as to impose losses on many entrepreneurs and resource owners. This raises the question of an interpersonally valid common denominator of value among the different participants in the economy, a question that is intensified by the tendency of a free-enterprise economy to concentrate ownership of wealth. For the most part [we did] not address . . . the egalitarian problems of maintaining an acceptable degree of equality of resource ownership and of other rights. Instead, we [focused] more on the task of evaluating how effectively the economy allocates the use of its resources; however, we recognize that, in the final analysis, questions of equity and of allocative efficiency are not separable. Our empirical analysis also reveals that to order alternative institutional arrangements for controlling resources use, production, and prices so as to maximize the excess of "goods" over "bads" by choosing among them is difficult; i.e., no obvious initial order for taking subsequent actions to modify institutions permits us to maximize, whereas such permission is provided by the laws of diminishing returns for production and utility for consumption economics. Still further, even a superficial knowledge of the operation of agricultural lobbyists, agrarian politics, the farm bloc, and the changes caused in agrarian policies by the "one man vote" principle reveals some lack of consensus on what decision-making rule or basis for choice should be followed in changing the institutional structure of American agriculture and the influence of that structure on prices, resource use, and production.

Fortunately, however, this difficulty is neither complete nor uniform. There are substantial cases in which conclusions can be reached with respect to the rightness or wrongness of certain policies, programs, and operations; there are also substantial cases in which conclusions cannot be reached.

The [investment/disinvestment]theory presented [here] provides some bases for evaluative conclusions. For instance, adjustments which permit farmers to cover acquisition costs on their resources can be adjudged to be superior to adjustments which do not. Thus, in Figure [7.8] . . . , point *A* represents the "right action" for an entrepreneur trying to maximize profits, the difference between the "good" of income and the "bad" of expense. When an entrepreneur makes a mistake and misses point *A*, his loss-minimizing adjustment is always in or on the edge of area 5. The subsequent act of

moving to the edge of area 5 or of staying in area 5 is also a "right action" in view of what is possible, once the mistake is made with acquisition costs greater than salvage values. However, it would be better if the mistake of missing point *A* were never made, in which case one or both resources would not be producing less value than expected on its acquisition, resource MVPs would equal acquisition costs, production would not exceed that presented by the iso-product line passing through point *A*, and no losses would be imposed on the entrepreneur as the owner of *L* and *V*. Thus, an economic sector that forces a large proportion of its entrepreneurs to operate in or on the edge of area 5 other than at *A* is regarded as malfunctioning, i.e., it is using too much of resources *L* and/or *V* to produce output that must be sold at prices which make MVPs less than acquisition costs and, hence, imposes losses on both the entrepreneur and society at large. The loss to society results from having the resource(s) fixed in the production of a product that is less desirable than ones that can no longer be produced.

Designing right actions to correct such overcommitment is fundamentally difficult. Mistakes which hurt entrepreneurs benefit some consumers.

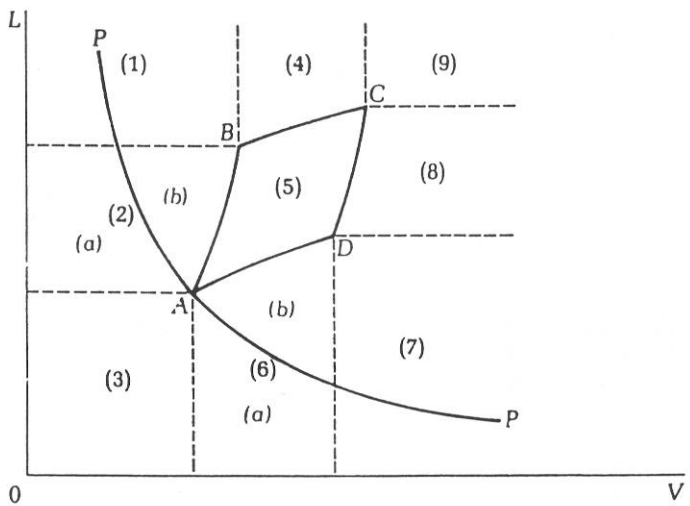

FIGURE [7.8]. The modified neoclassical representation of a firm's factor-factor relationship.

> Actions to ease the burdens of the entrepreneurs damaged would, at minimum, hurt those consumers benefiting from lower product prices. In other words, any action has redistributive consequences.
>
> Preventing errors of organizing other than at point *A* also involves these fundamental difficulties. This is true whether the prevention takes the form of public or semipublic action to (1) reduce imperfections of knowledge (extension), (2) regulate rates of entry and exit (acreage allotments, licensing by association of growers, etc.), or (3) reduce the difference between acquisition cost and salvage values (liquidation subsidies). Such public and semipublic programs almost invariably damage some people in benefiting others. It is difficult to order alternative actions in terms of descending net benefits per unit of effort, and the decision rules or basis for choice are not established. Most possible solutions involve redistributive aspects, despite the primary objective of making the allocative system function better, as contrasted with the objective of redistributing the ownership of resources. In efforts to improve the allocative efficiency of the price and marketing system, politicians and farm leaders may fail to recognize that a freely operating price system can (and should) be expected to malfunction. This lack of recognition can endanger the free price system, since its malfunctions are not corrected. Similarly, when economic theorists and advisors fail in this recognition, they lose the public's confidence in economics as a discipline.

Warren Samuels will like the following paragraph written in the late 1960s and published in 1972:

> With respect to the total evaluation of U.S. agricultural policies and programs and the operation of the economy, we are as a research group modestly constrained to regard ourselves as only one minor element in a complex socio-politico-economic evaluative process. Nevertheless, in the course of this study we sometimes have believed that we are capable of "getting on through" to conclusions about what is right or wrong and on occasion so state. In other instances, we regard ourselves as being helpful in (1) formulating certain new concepts and clarifying old concepts (both normative and nonnormative and both analytic and descriptive or synthetic) and (2) suggesting new and perhaps more appropriate institutional designs. We envision the total socio-politico-economic evaluative process as a creative, original, cooperative enterprise in which insights, new ideas, and new solutions emerge through the cooperative efforts of researchers, administrators, agricultural leaders, and lawmakers. The emergence of these insights, as we see it, is likely to be promoted by projections, speculations, and estimations of the consequences of following alternative policies, programs, and operations. Such quantitative work is most helpful if made with respect to situations of normative importance. As researchers, administrators, farm leaders, and lawmakers interact in originating and designing new policies, programs, and operating principles, such quantitative work can clarify the normative issues and nonnormative questions. It can even suggest bases for making choices even when common denominators and the necessary second-order conditions are missing.

Some idea of the importance of the losses imposed on and gains conferred on farmers by the operation of the market mechanism can be gained from table 7.6 reproduced from *The Overproduction Trap* (Johnson and Quance 1972, 12–13).

The data in table 7.6 are for 1911 to 1959, a forty-eight-year period. Twenty-two of these forty-eight years were prior to the agricultural price production and subsidy programs that started in 1933. Cursory inspection of table 7.6 indicates market imposed and conferred losses and gains prior to 1933. Cash flow problems, bankruptcies, and foreclosures involve the nominal values found in table 7.6. Johnson and Quance (1972, 14–15) also published estimates made by Boyne (1964) of changes in the "real" wealth of U.S. farm operators from 1940 to 1960.

Bringing table 7.6 up to date for purposes of this book was too expensive to be feasible. However, overproduction and capital losses (also gains) did not cease in 1962. Table 7.7 shows changes in farm real estate values and in the value of total assets in the farm sector from 1962 to 1989. After the international "food crisis" of the mid-seventies farmers bid up the price of land and sharply increased their investments in other durable assets. In addition to being uninformed in the 1962–89 period, farmers were *mis*informed by food activists, biophysical agricultural scientists, government leaders, farm leaders, and, yes, even agricultural economists about the permanency of an excess of world effective demand for world supplies of food that existed in the early 1970s following the infamous "Russian grain deal." From 1970 to 1981, land values almost quadrupled while the values of other assets more than double. Because farm product prices exceeded support levels for most of the time after the grain deal, the excess capitalization and investment in productive capacity can hardly be blamed on subsidies and price supports.

Asset fixity theory provided a meaningful and effective way of analyzing the situation that developed in the late 1970s. On January 5, 1980, I published the following article entitled "The big danger facing farmers in the Eighties: Over-optimism about demand for food" in *Michigan Farmer*.

> There are clear and present dangers facing Michigan Farmers in the world food projections and outlook for the 1980s.
>
> In short, optimistic projections that you are entering a "name your price" era for food should be taken with more than just a grain of salt. Otherwise, you could be in for trouble.
>
> - There will be a danger of overpricing land and of sinking too much money into it, especially if the money is borrowed on low equity in the belief that more effective demand for food will materialize.
> - There will be a danger that too many young people will unwisely commit themselves to farming. This danger will be greatest for those with low equity and little assistance from their families. It will also be easy for young people to mistake inflationary gains for earnings. Should inflation be controlled, only the earnings would be left.
> - There will be some danger of overinvesting in machinery and livestock, though, historically, this risk has not been as high as the two above.

Table [7.6]. Changes in Current Value of Assets in Agriculture Due to Price Changes, by Sectors and in Total, 1911-1959

(millions of dollars)

YEAR	NEW CHANGE IN ASSET POSITION OF				TOTAL CHANGE IN ASSET POSITION OF AGRICULTURE
	REAL ESTATE	LIVESTOCK	MACHINERY	CROPS	
1911	932	-155.3	6.5	323.1	1,106.8
1912	822	590.9	7.7	-509.7	910.8
1913	815	347.5	4.3	431.3	1,598.1
1914	-345	-145.0	-4.9	-315.2	-810.0
1915	2,357	-155.2	101.8	67.8	2,371.4
1916	2,922	573.5	65.7	898.2	4,259.4
1917	4,046	1,291.2	590.1	1,742.2	7,669.5
1918	4,153	477.6	841.1	284.0	5,755.6
1919	11,341	-280.4	-228.3	89.0	10,921.3
1920	-5,369	-1,896.5	-368.9	-2,878.9	-10,513.3
1921	-7,029	-1,290.9	-1,150.6	-906.3	-10,376.8
1922	-929	270.7	-279.1	650.1	-287.4
1923	-2,031	-182.3	670.8	232.8	-1,309.7
1924	-546	188.3	-48.0	554.8	149.1
1925	-182	535.7	145.7	-591.3	-91.8
1926	-1,874	220.2	3.1	-348.0	-1,998.7
1927	-849	489.4	-101.9	222.9	238.5
1928	-217	548.9	136.8	-52.2	416.5
1929	-719	-158.1	75.9	74.7	-726.5
1930	-4,765	-1,707.1	-418.8	-553.0	-7,443.9
1931	-7,118	-1,425.5	-175.8	-1,029.5	-9,748.8
1932	-6,899	-665.7	-314.9	-571.2	-8,450.7
1933	999	123.4	70.7	785.0	1,978.0
1934	644	600.6	388.2	816.4	2,449.2

1935	597	1,723.4	159.8	-1,056.6	1,423.7
1936	884	-31.9	157.2	866.0	1,875.2
1937	-78	50.0	185.1	-1,358.5	1,201.4
1938	-1,120	-31.6	-139.3	-335.3	-1,626.2
1939	-483	-188.1	-394.6	362.2	-703.5
1940	697	135.5	273.6	-15.6	1,090.6
1941	2,597	1,461.5	626.1	785.6	5,470.2
1942	3,494	2,079.9	343.8	593.4	6,511.1
1943	6,014	-362.0	-462.7	1,371.6	6,560.9
1944	5,009	-101.6	741.9	-30.4	5,618.9
1945	6,354	1,018.4	-2,079.5	43.9	5,336.7
1946	7,234	2,644.2	954.2	896.9	11,729.2
1947	4,996	1,946.0	2,579.8	2,820.8	12,342.5
1948	2,738	1,393.5	1,038.4	-3,514.9	1,654.9
1949	-1,597	-1,991.5	-22.7	-546.9	-4,158.1
1950	11,316	4,227.0	-534.3	1,181.0	16,189.8
1951	9,197	1,383.0	1,297.3	1,320.2	13,197.4
1952	641	-5,131.8	-1,337.1	200.3	-5,627.6
1953	-1,948	-2,696.9	105.3	-1,289.5	-5,829.1
1954	4,092	-660.0	-415.6	-636.3	2,380.2
1955	3,872	-732.2	690.8	-1,220.0	2,235.5
1956	6,817	633.3	801.2	546.5	8,543.4
1957	6,799	3,160.6	39.3	1,014.7	11,013.6
1958	8,818	4,304.4	1,473.0	15.9	14,611.3
1959	4,009	-2,598.8	579.0	-1,582.3	407.0

Source: Computations by Glenn Johnson, modified by Dale Hathaway and extended by Willard Sparks.

WORLD FOOD SYSTEMS

The dangers arise from difficulties encountered in forecasting what will actually happen. Danger can also arise from misleading projections and forecasts. We should look closely at these difficulties and biases to see the dangers more clearly.

For one thing, while the world's food systems are said to be better integrated than before, the fact remains that there are still major blocs—and innumerable smaller blocs—operating quite independently.

For instance, China feeds more than 900 million people with proportionally little trade with the rest of the world. The centrally controlled economies of eastern Europe and the Soviet Union enter world markets sporadically, in times of need, without becoming a stable part of the world market. They are major sources of supply, demand and price instability—instead of parts of a stable, integrated system.

Europe and Japan, too, insulate themselves in part from world trade. Many less developed countries (LDCs) have isolated their food producers and consumers from world trade—some even have self-sufficiency zones within their borders.

The world monetary system is no longer under the effective controls operating on it from the end of WWII until the early 1970s. Further, OPEC exercises almost arbitrary control over energy supplies and large amounts of income.

All of these factors made it difficult to develop reliable, long-term projections and forecasts on a worldwide basis.

Difficulty also arises in predicting weather, changes in policies affecting food production and changes in technology and people. It's easier for economists to project the impact these policy changes will have than it is for the specialists in sociology, economics and political and military science to predict what the actual changes will be. The same holds true for meteorologists predicting weather; biological and physical scientists predicting technological change; and psychologists and educators predicting changes in human variables. It's always easier to predict the effects change will have than it is to predict what changes will actually occur.

The situation is particularly dangerous for Michigan's commercial farmers because of biases in worldwide food forecasts. Biased projections have been circulated so widely and so often that their supposed "truth" has become part of the accepted wisdom. As [Professor] K. O. Campbell of Australia points out, "[None] of the . . . dire prophecies about world hunger and starvation (predicted since WWII) have come to pass."

Biases appear to originate from analyses that neglect the way in which food price increases simultaneously increase the efficiency with which food is used and that production expands as well.

Also, some models such as the Club of Rome's *Limits to Growth* models, treat the world as if it were entirely uniform, served by a single food system. In these models, human beings multiply like yeast fermenting in wine, until their food supply is exhausted or their environment is poisoned with by-products; at that point the world's population collapses. Fortunately, our world is fragmented enough so that worldwide starvation does not happen.

Table [7.7]. Year-End Values of Real Estate and Total Assets Farm Sector, 1960-1989

Year	Real Estate	Total Assets
	billion dollars	
1960	139.7	210.2
1961	145.8	218.1
1962	151.5	226.1
1963	159.7	234.2
1964	168.7	242.5
1965	180.8	260.0
1966	190.7	273.7
1967	201.4	287.4
1968	211.0	300.5
1969	217.1	311.7
1970	224.5	323.7
1971	240.9	349.9
1972	268.7	392.8
1973	329.2	477.7
1974	369.5	513.0
1975	421.0	578.5
1976	499.8	666.7
1977	556.5	736.8
1978	656.0	861.1
1979	767.8	999.1
1980	850.1	1087.5
1981	851.7	1088.0
1982	819.1	1056.2
1983	829.3	1064.1
1984	735.0	976.4
1985	657.0	892.9
1986	613.0	848.1
1987	658.6	911.9
1988	687.0	956.2
1989	692.7	973.3

Source: Table 1, Kenneth Erickson et al. (1991) Farm Sector Balance Sheet, Including Operator Households 1960-1986, Economic Research Service, USDA Statistical Bulletin 826

Other biases creep into forecasts from people and agencies that stand to gain if their projections are sufficiently bleak. Public appropriations or donations to support their work are more likely to continue if their predictions show dramatic problems that need solving.

Still other biases (both optimistic and pessimistic) result from the tendency to forecast on the basis of contemporary events. In the 1950s and 1960s, projections were unduly optimistic—and after 1974, unduly pessimistic.

Other inaccuracies arise from models and analyses so specialized and incomplete that they are unreliable. For instance, energy, nutritional, demographic, environmental and resource scarcity models often ignore the world's distribution of political, military and economic power, to the extent the forecasts and projections produced are unrealistic.

Therefore, it is not surprising that this year's USDA outlook contains so few world forecasts and projections for the 1980s. Though USDA is to be commended for excluding those that are biased and unreliable, one cannot help but wish they had spent the time to produce reliable, unbiased, longer-range predictions.

The tough variables to predict are weather, changes in policies and institutions and changes in technology. Based on what we do know, the following are a few statements it seems safe to make about the world's food system.

SAFE THINGS TO WRITE

In the 1980s, effective market demand for agricultural exports will continue to be the case for developing countries (DCs) and those less developed countries converting to DC status. Some demands will expand to cover increasing per-capita levels of food consumption, primarily in terms of quality, but also in terms of quantity. Michigan farmers can count on this demand.

In many DCs, effective demand will expand with population, but not fast enough to permit substantial increases in per-capita consumption. Since most increases will be met by increased domestic production within the DCs themselves, these increases will be of little significance to Michigan farmers.

Nor can Michigan farmers count on any subsidizing of food consumption in the LDCs as an important outlet for their products. The record shows that the DCs subsidize only because of a desire to dispose of their burdensome stocks, and, to a lesser degree, because they want to contribute something (but not too much) to the relief of hunger in specific areas of the world in specific emergencies. Donations are not large enough to count for much. Food relief in the LCDs by other LCDs has not been extensive, except when it's part of major revolutions. These have generally reduced food production for significant periods, without generating much effective demand in international trade circles. Michigan farmers cannot count on subsidized consumption as a major outlet for their production, until people become more generous, both privately and through taxes, here and abroad.

In the past 50 years, there has been a major world food shortage (immediately after WWII) and a relatively minor one that increased food prices in the early 1970s. Though similar events could occur in the 1980s, the probability is not high, and farmers shouldn't bank on them producing high food prices.

World food production is likely to meet effective market demand in the next decade, although local and short-run inadequacies may develop as a result of natural or man-made disasters. Generally speaking, effective market demands are not likely to be high enough, relative to supplies, to put any great upward pressure on U.S. farm product prices, relative to production costs and inflation. The reasons are mainly on the supply side.

One reason is that farmers in market-controlled DCs of the world (including the United States) tend, in the long run, to outproduce effective market demand. This puts downward pressure on farm prices in relation to wage rates, land prices, non-land input costs and inflation. Michigan farmers have more to worry about from overproducing and overinvesting than from the opposite.

POOR POLICIES

The greatest deterrent to expanded world food production is poor policies that have to be modified when real pressures arise. These poor policies include low farm product and food price policies, designed to appease the political demands of consumers. There are also destructive attempts to extract income from agriculture to develop the non-farm sector. Interference with internal and external trade is also a poor policy.

Lack of population control causes nutritional need, but not an effective market demand. This nutritional need exceeds food supplies, but not in a way that covers production costs of farmers in Michigan or anywhere else.

We should remember that when countries begin to get into serious trouble with respect to food supplies, they tend to forego the luxury of poor policies and adjust those policies to expand their own food production and to control population.

Existing and prospective technologies are adequate to meet effective and subsidized demands for this next decade, if policy constraints are removed. If these restraints aren't removed, better technology will not be as effective. The restraints from technology will be far less binding than the restraints from poor policies in the 1980s.

Existing technologies provide many forms of capital that substitute for, maintain or augment land. Thus, land constraints are not likely to be as important in the 1980s as commonly thought.

SHORTAGES

While the next decade will see major decisions made on how to deal with exhaustion of resources, constraints on non-renewable resources are not likely to greatly restrict food production during this time. As an example, agriculture is not a major user of energy. If forced to choose between more food and less hot water or less air conditioning, food will win out.

Further, if resource scarcities make the DCs and advancing LDCs significantly poorer, effective market demand for food will fall.

Gasohol will probably be too expensive (even with large subsidies) to compete with synthetic fuels that must be developed for reasons of military security.

Undoubtedly, real energy prices will continue to rise in the 1980s. This will affect transportation, processing, food preparation and farm production costs. These changes will modify the comparative advantages of countries and states. Trade will be affected. Though these prospective changes have not been carefully studied, they will affect Michigan farmers, perhaps substantially—and even favorably.

POLITICS

The politics of food will present clear and apparent dangers for food producers and consumers alike in the 1980s.

Whenever food prices increase, there will be increased pressure for low-food-price politics, enforced with price ceilings, export embargoes, internal trade restraints and rationing. This will be true both here and abroad. Extensive historical evidence indicates the result would be less—not more—food. This would mean higher food prices or unfilled ration coupons for consumers, as well as reduced incomes for farmers.

There will be a tendency to blame agriculture for inflation when food prices increase. Yet there will be a failure to notice that inflation continues when food prices fall. The same will hold true for price increases for energy and other non-renewable resources.

This tendency will delay breaking the political link between increased living costs, on the one hand, and deficit financing and loose monetary policies as the basic causes of inflation on the other. Such failures will further fuel attempts to impose ceilings, embargoes and even rationing to control food prices and—mistakenly—control inflation.

While new technology and nutritional education are necessary, the danger is that they will be substituted for the policy improvements that must accompany them, if the goal is to develop more effective demand for food as a means of increasing production.

Particularly abroad, but also here in the United states, attempts to improve poor policies will be delayed while attempts are made to expand food production by other means. These will include investing in new technology, expanding nutrition education for consumers and Extension training for farmers, as well as instituting additional programs based on existing poor policies. The latter includes more trade restrictions, more price regulations, more government regulation of energy, rationing, subsidizing inefficient producers and subsidizing energy consumption to offset price increases.

Along with this will go failure to redistribute ownership of the means of production to poor farmers (which would limit production of food) and to poor consumers, both farm and non-farm, which will constrain generating consumer income to convert those nutritional needs into effective demand high enough to pay the costs of producing food.

The above article clearly "called the shots" on the overinvestments that took place in the late 1970s and early 1980s and on the non-Pareto optimal losses then to be imposed by the price and market mechanism on farmers in the farm crisis of the early 1980s. Imperfectly informed farmers had invested too much including but not limited to paying too much for land. Disinvestment from 1981 through 1986 involved capital losses because acquisition

costs could not be recovered. Bankrupt farmers were forced by cash flow problems to disinvest at salvage values even when earnings would more than support salvage prices. Historical acquisition prices did matter and creditors wanted to recover as much of them as they could.

By 1986, farm real estate had decreased in value from 851.7 to 613.0 billion while total assets had fallen in value from 1,088 to 848.1 billion dollars. As in the 1911–33 period, the market mechanism imposed losses in the absence of effective price supports, production controls, and subsidies. From 1983 to 1989, overleveraged farmers suffered cash flow problems, bankruptcies, and financial hardships. Without the price supports and subsidies that became effective after the fall, the situation would have been worse. The 1980s and the 1920s were remarkably similar in that agricultural price supports, production controls, and subsidies played minor roles in generating surplus capacity and crises in farming.

It should be noted that the theory used in gaining a better understanding of the consequences of imperfect knowledge of changes and of acquisition cost/salvage price differentials for farming is applicable in the nonfarm as well as in the farm sector. *The Washington Post National Weekly Edition* (1–7 February 1993) quoted R. L. Crandall from the corporation owning American Airlines as saying, "There is nobody to whom I can sell airplanes or to whom I can sell terminal facilities . . . Thus, once I own the airplane, I am better off to fly it rather than leave it on the ground," to which the *Post* added, "The result: more seats available for passengers than there are passengers to fill them, leading to cheaper fares, more frequent-flier miles and other lures to get passengers aboard. And big losses for the airlines."

Persons concerned with overexpansion of commercial buildings and the savings and loan associations (SLAs) fiasco of the last decade or so also know that the theory considered in this chapter has applications far beyond agriculture.

THE PUBLIC CHOICE APPROACH TO POLICY ANALYSIS

The sections above have stressed the importance in doing policy analysis of:

1. Considering resource rigidities and flexibilities (asset fixity—investments and disinvestments).
2. Giving balanced attention to the four driving forces: technical change, human development, institution improvement, and the enhancement of natural and manmade resources
3. Micro/macro linkages between agriculture and the rest of the economy.
4. Devoting attention to the values that must be considered in resolving policy issues and problems.
5. Participatory interaction of policy analysts with decision makers, choosers, and affected persons.

In his article, Petit stressed work on the "new political economy" by such persons as Downs, Buchanan, Stigler, Peltzman, Krueger, Tollison, Bhagwati, Mancur Olson, Day, and Allison. During recent work on the Social Science Agricultural Agenda Project (SSAAP), it became apparent that what is often labeled the public choice/transaction cost (PC/TC) approach to policy (both public and private) analysis in the "new political economy" is a most promising current development for the social sciences. Paradoxically, this promise stems simultaneously from the approach's demonstrated productivity and its present crudity. Anything as productive as the PC/TC approach is in its present crude form can be presumed to hold great potential if systematically improved particularly when there are so many obvious opportunities to improve it! In SSAAP's book are (1) literature reviews concerning the approach and (2) details about needed improvements in the approach from the standpoints of both private choices (policy) and public policies (choices) with respect to agricultural science, education, price production trade and monetary institutions, and resource enhancement and sustainability—in short, all of the institutions designed to enhance the four driving forces.

Portions of SSAAP's different literature reviews vis-à-vis the PC/TC approach follow. The first literature review is in the introduction to the section of the SSAAP book (Johnson et al. 1991, III-4–5) that concentrates on the four driving forces.

> Following earlier work of the German historical school, a school of economics referred to as "institutional economics" was developed at the University of Wisconsin. John R. Commons was instrumental in its establishment, with Thorstein Veblen serving as a precursor. This school was concerned with the "rules of the game" and organizations controlling society including its production, exchange, and utilization (both public and private) activities. The institutional economics of Wisconsin added collective action to neoclassical economics and can be characterized as multidisciplinary with major attention to law, political science, philosophy, and sociology. Wisconsinian institutional economics is linked to the rural social sciences, particularly agricultural economics via the works of such land economists as Ely, Penn, Parsons, Wehrwein, Hobson, Salter, Timmons, and Long.
>
> Later, the public choice/transaction cost (PC/TC) analysis of institutional change grew out of thinking led by the Chicago-trained Nobel laureate economist James Buchanan, the legalist Gordon Tullock, and the works of Frank Knight, Ronald L. Coase, George Stigler, and Richard Posner. Essentially, the public choice approach expanded the narrowly conceived markets of neoclassical economics to include some social and political activities. The introduction of transaction costs (largely information, negotiation, and enforcement costs as flows), measured in both monetary and nonmonetary terms, made it possible to consider the economics of making institutional changes on a relatively broad, but still rather economic, basis. Nonetheless, the public choice/transaction cost approach is sometimes referred to as the "new" political economy. Oliver Williamson, a business administration economist; Douglass North, a historian; Mancur Olson; and Nobel laureate Herbert Simon use the public choice/transaction cost approach for under-

standing institutional change in their important contributions to business administration, history, and development. Williamson builds on the transaction focus of Commons and the organizational theory of Simon . . .

Though some analysts . . . limit the concept of institutions to "rules of the game," the SSAAP editorial group has elected to include, *first*, policies, programs, and organizations along with, *second*, their properties, facilities, and staffs in a taxonomy of three different manifestations or institutional forms. This is done despite Bromley's warning that doing so will confuse "meaningful analyses of the role of institutions in defining transaction costs." SSAAP's editorial group runs this risk because (1) policies, programs, and organizations, along with their properties, facilities, and staffs have establishment and dismantlement costs (as stocks) that together have transaction costs that are often highly interdependent with those for "rules of the game" . . . and (2) policies, programs, and organizations with their properties, staffs, facilities, and the like are included in both lay and several dictionary meanings of the word "institution," although, admittedly, the sociological definition does appear in large authoritative dictionaries.

A narrower branch of thinking that is somewhat related to the public choice/transaction cost approach to institutional change was also developed from thought originating at the University of Chicago with leadership from T. W. Schultz, also a Nobel laureate. This branch is concerned with "induced" changes in institutions (also in technology and human beings). Induced institutional change is more narrowly focused on the *economics* of institutional change than the transaction cost approach to public choices. Although some "induced-change analysts," such as Vernon Ruttan, recognize that sociological, political, anthropological, and behavioral variables influence changes in institutions (including those that create human capabilities, improve natural and manmade resources, and further technical advance), such variables are not provided specific theoretical pegs in either formulation on which one can model their effects in the processes of institutional change . . .

In a multidisciplinary exercise such as SSAAP, it must be stressed that the public choice/transaction cost approach to institutional change seems unduly focused on economics even if it defines economizing and markets over a broader range of political and social variables than the induced institutional change approach. SSAAP's editorial group . . . concluded that the other social sciences cannot be logically or operationally regarded as subsidiaries of economics in institutional analyses. The attractive alternative to such disciplinary imperialism by economists is multidisciplinary team work in investigating multidisciplinary domains of problems and subjects involving the four driving forces. Neither the public choice/transaction cost (PC/TC) approach nor the induced-change approach has had the multidisciplinary breadth of the earlier institutional economics approach growing out of the works of Veblen and Commons. This narrowness creates difficulties in analyzing institutional changes needed for natural resource enhancement and capital growth, technical change, and human development.

There are some other difficulties involved that are worth mentioning here. It is significant to note that the public choice/transaction cost approach to institutional change is now most widely used in the rural social sciences for analyzing natural resource institutions, agricultural price supports, farm lobbies, and production stabilization programs, but has been little used with respect to other rural institutions. This, in turn, means that the section in this part on institutional change draws heavily on the public choice/transaction

> cost approach despite the absence of this approach in the community viability initiatives of the Experiment Station Committee on Organization and Policy (ESCOP) and the community development initiatives of the Extension Committee on Organization and Policy (ECOP).
>
> The induced-change and public choice/transaction cost approaches to institutional change discussed above presume rather specialized economizing or maximizing behavior in markets broadly enough defined to cover a considerable range of political, organization, and some social variables. Rural sociologists, political scientists, anthropologists, historians, and philosophers have become concerned with the agricultural institutions that influence the four driving forces in manners that broaden the list of relevant variables to include values (nonmonetary as well as monetary), ideology, self-limits to opportunism, [and] learning, and often emphasize that markets are embedded in social systems requiring explicit attention to conflict and the use of power.
>
> Among the processes of concern in the making of public choices among institutional alternatives are those of political and social legitimation; validation and verification of descriptive knowledge (a form of legitimation) of both the value and value-free characteristics of conditions, situations, things, and acts; evolution of structures, systems, and institutions; holism; adaptation; and the like. For several years, systems analysts have been helping provide broad, multidisciplinary conceptualizations of the domains of practical problems and subjects. As a result, their work holds great promise for helping to operationalize the use of the PC/TC approach. Domains studied by systems scientists are often simultaneously more holistic, but less stable, than those of concern in the basic academic disciplines.

SSAAP (Johnson et al. 1991, III-6) also reviewed the literature on changes in agricultural and rural institutions in greater detail as follows:

> To expand its knowledge base with respect to institutional change and reform . . . , the SSAAP editorial group devoted considerable effort to agendas for institutional improvements and reforms. This effort involved surveying what rural social scientists have learned about the processes of improving, reforming and building institutions . . .
>
> . . . [Three] subheadings are used in the review. This chapter: *first* reviews the widespread interest society has in the limited set of more or less local institutional and policy reforms important for farms, farm communities, and rural development; *second* treats applied disciplinary, subject-matter and problem-solving work on institutional and policy changes and reforms; *third* focuses on the theories and concepts used by rural social scientists and basis social science disciplinarians in analyzing institutional (including policy) changes . . .
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> ### A Review of Societal Interests in the Reform and Modification of Farm and Rural Development Institutions
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> Local agricultural and rural community institutions and policies are currently under close scrutiny both within and outside of farming and rural

communities. This scrutiny is taking place in the land-grant and non-land-grant universities of the United States, as well as in other institutions, such as the USDA, the Agency for International Development (AID), the United National and the FAO, and various professional organizations concerned with foreign and domestic work that addresses farm and rural development problems.

In 1982, Don Dillman and Daryl Hobbs edited *Rural Society in the U.S.: Issues for the 1980s*, a report that undoubtedly influenced the agendas developed by SSAAP at Houston.

In 1986, rural sociologists identified three national priority research areas for 1986–87 (Klonglan 1986) that are important for rural community institutions:

1. Consequences of technological and economic changes in vital rural industries (particularly agriculture, forestry, and mining).
2. Improved methods of predicting the social effects of proposed developments in rural areas.
3. Strategies for enabling people in rural areas to enhance their well-being through increased access to resources of the larger society.

The Experiment Station Committee on Organization and Policy (ESCOP) has proposed a research effort on community viability. This initiative originated largely with rural sociologists. With leadership from Gene Sommers, a rural sociologist, ESCOP has also published a report entitled *Social Science Research Serving Rural America* (Miron 1989).

The Extension Committee on Organization and Policy (ECOP) also has an initiative entitled *Revitalizing Rural America* (Cooperative Extension System 1986). Again, this initiative originated in substantial part with rural sociologists although other rural social scientists and basic social science disciplines were also involved.

The work of anthropologists that is relevant for this section includes research on peasant communities, rural areas of developed countries, and tribal societies. Studies of agricultural systems, ecological impacts of food production, women in agriculture, and diet are common aspects of these efforts. In recent years, these studies have come to address larger regional, national, and international institutional issues. Studies of family structure, social class, power relations, legitimization, powerlessness, alienation, participation, religion, and ethnicity contribute to a better understanding of agrarian institutions and the full cultural contexts in which they operate. Studies of cultural limitations on adoption of technical changes have been particularly useful. Anthropology stresses the holism of culture, that is, the ways in which all values and behavior patterns are interrelated and interdependent. Medical anthropology, for example, incorporates both cultural and biological perspectives to contribute to research on rural health, health-care delivery, and occupational health risks of farmers, farm laborers, and rural residents.

Much, but not all by any means, of the extensive work of agricultural economists on needed institutional changes and reforms has focused on domestic and foreign price support, subsidy and trade, and other programs and policies . . .

The wide range of policy and institutional issues addressed by agricultural economists is attested to by USDA's *Structure Issues of American Agricul-*

ture (U.S. Dept. of Agriculture 1979) that [considered] structural issues of American agriculture and *Rural Economic Development in the 1980s* (U.S. Dept. of Agriculture 1987) that contains contributions from both agricultural economists and rural sociologists, and, among many others, the USDA book entitled *Another Revolution in U.S. Farming?* edited by Lyle Schertz et al. (1979). Many more works could be cited at state and regional as well as the national level.

Charles Hardin (1946), a political scientist, made a significant contribution to our understanding of the relationships of agrarian political organizations to national agricultural policies and to the Bureau of Agricultural Economics. This is an important piece of sociological and political science research on agricultural institutions at the national level before and after World War II. So too is William Block's (1960) study of the separation of the Farm Bureau from the extension service in Illinois. Despite this, it is only in recent years that political science has acknowledged the potential for public policy studies as an emerging subfield and, again, mainly at the national level. Don Hadwiger and Ross Talbot's (1965) and Hadwiger's (1982) works are pioneer forays of policy studies in agriculture. It is instructive to note that, even now, the subfield is most frequently linked with public administration. Moreover, the only two public policy areas where political scientists have sought specific identities are also related subfields. International relations gives rise to foreign policy experts while subnational government brings us urban, but not rural, political scientists. As public policy scholars, political scientists hasten to note their potential roles in such efforts.

Desire among political scientists to stake out agricultural institutional change as a field of endeavor has been discouraged by their own tendency to view it as one that cuts across several subfields of political science. John Hansen's (1987a, 1987b, 1989) work on the development of an agricultural policy network and William Browne's (1976 with Wiggins, 1983, 1988) several publications on interest groups in this policy domain are two important exceptions. But, for a political scientist to identify herself or himself as an "agricultural" political scientist would raise the disciplinary question, "What kind of agriculture—domestic, comparative, or international?" To satisfactorily answer that question for other political scientists requires both subfield and methodological responses that would paradoxically raise skepticism among other types of agricultural social scientists who are justifiably suspicious of someone satisfied with only knowing a very little bit about an encompassing subject.

That does not mean that important work touching on problems of rural institutions has not been done. Mancur Olson (1965), an economist operating on organizational turf, studied the behavior of people in American farmer organizations and developed a theory of voluntary organizations among large groups of those with small interests versus small groups of those with large interests. Robert Salisbury (1984) and associates (1987, 1990) have done important theoretical work on interest-group behavior dealing with agricultural organizations and comparing them with those in other policy domains.

Historians have contributed important institutional work as well. Three pieces deserve attention for the development and change lessons they teach. Gladys Baker (1939) drew on the institutional role of Extension through the county agent. Richard Kirkendall (1982) examined the work of social scientists in the Roosevelt administration. Murray Benedict's (1942, 1953) analyses of the evolution of institutional rules within agriculture remains seminal.

Pertaining to the need for institutional change and reform, the USDA published *Another Revolution in U.S. Farming?* (Lyle Schertz et al. 1979) and *Rural Economic Development in the 1980s* (U.S. Dept. of Agriculture 1987), which firmly indicated its concern with rural institutions. Joseph Molnar (1986) edited *Agricultural Change: Consequences for Southern Farms and Rural Communities.* The report on *Structure Issues of American Agriculture* (U.S. Dept. of Agriculture 1979) is also instructive. In June 1989, the Rural Revitalization Task Force delivered a report to the Secretary of Agriculture entitled *A Hard Look at USDA's Rural Development Programs.*

Many state agricultural experiment stations, extension services, and colleges of agriculture have or have had community and rural development projects. The same is true of the federal and state governments.

The U.S. Agency for International Development (AID) has administered a series of community and rural development programs and policies that have been ably summarized by Lane Holdcroft (1984) in a report for AID entitled "The Rise and Fall of Community Development, 1950-65: A Critical Assessment." Many of the community and rural development projects and programs have been very applied and more holistic than induced institutional change and current public choice/transaction cost analyses. Rural social scientists have played important roles in designing, establishing, and administering these programs. A large body of "institution building" literature has accumulated, part of which is summarized in *Institution Building: A Source Book* by Melvin Blase (1971). A number of agricultural extension services now have programs or projects for assisting local governments in managing their finances and in analyzing their tax and expenditure programs.

The three arms of the land-grant system—research, resident instruction, and extension—engage in self-examining institutional studies and exercises (of varying quality) designed to improve their service to agriculture and rural communities. The same is true of various natural resource institutions, including, but not limited to, the Soil Conservation Service and various administrative units in state governments.

. . . The areas of societal interest in institutional changes that are considered in this section focus on institutional change vis-à-vis state and local government, community and local nongovernmental organizations, social groups, families, and the like. The kinds of work of interest here include problem-solving (PS), subject-matter (SM), and disciplinary (DISC) . . . Although PS, SM, and applied DISC work are stressed in this section, it is important to note that the PS and applied DISC work experiences of rural and applied social scientists are important for developing the disciplinary theories, measurements, and techniques of the basic social sciences. Such practical experiences help in appraising and improving the basic disciplinary conceptualizations that guide anthropologists, sociologists, economists, historians, and political scientists in their work on institutional changes and reforms of agriculture and rural societies. Reciprocally, the basic social science disciplines serve the PS and SM work of the rural social sciences with theories, techniques, and fundamental disciplinary measurements applicable to institutional change . . .

Since their beginnings, the social sciences have theorized and attempted to conceptualize the processes of institutional change. In economics, Adam Smith's work set the stage for a massive institutional change towards freer markets in the British Empire as well as elsewhere. John Maynard Keynes's work also had major worldwide impact . . . With the major exception of hu-

man ecologists, anthropologists have tended to be more holistic than other social scientists and have considered a very wide range of variables in explaining and conceptualizing institutional change. Rural sociologists have also had a fundamental interest in institutional change . . . Political scientists and historians have also been interested in conceptualizing institutional change . . .

More recently, economic theories of "induced" institutional change (Ruttan 1978) have been developed . . . In neoclassical economics and, particularly, in Pareto-optimal neoclassical economics, institutional change tends to be relegated to the "givens"—that is, existing institutions are taken as "givens" rather than being treated as endogenous variables. The resultant narrow kind of economics has virtually no explanatory value with respect to institutional change and reform. However, before John Hicks, neoclassical economics was broader and more productive. In his final years, John Hicks attempted to rebroaden neoclassical economics (Klamer 1989). Fortunately, neoclassical theory is now being slightly rebroadened by persons such as Vernon Ruttan and Yujiro Hayami (1984) who have expanded the concept of markets to include the optimizing tradeoffs made in political and administrative processes. This permitted them to develop a theory of "induced" institutional change that "explains" institutional change as occurring when it is advantageous for a society or a political body to change its institutions. This modest and far from new extension of the concept of markets has produced significant empirical results. Hayami's (1989, 3–14) Elmhirst Memorial Lecture at the meeting of the International Association of Agricultural Economists (IAAE), in Argentina, related markets to communities. Theories of induced institutional change are now widely used and recognized as significant.

The public choice/transaction cost approach to institutional change that is now being developed is broader than the theory of induced institutional change (Schuh 1981) . . . It seems important to comment on that theory here because it has already been analytically linked to many of the concerns and variables addressed by the individual social science disciplines. It has, in consequence, brought forward multidisciplinary thought for problem-solving use (Bonnen and Browne 1989, 7–33). Public choice theory gives significant attention to transaction costs, a concept that makes it possible to consider a relatively broader kind of economic inquiry in examining institutional change and, more importantly, to go much beyond economics.

Public choice theory has its roots in institutional economics as a departure from (some would prefer "an addition to") neoclassical theory. A school of economics that we now refer to as institutional economics developed at the University of Wisconsin. Thorstein Veblen and John R. Commons were instrumental in its establishment. The Wisconsin school was concerned with the "rules of the game" and organizations that control utilization of all resources including, particularly, natural resources. The institutional economics of Wisconsin can now be characterized as multidisciplinary with significant attention to law, political science theories, and sociology, as well as economics (Schmid 1989, 57-85). The subfield of land economics grew up within agricultural economics largely at the University of Wisconsin as the handiwork of such institutionalists as R. T. Ely, B. H. Hibbard, George Wehrwein, and L. C. Gray.

Land economics eventually waned in agricultural economics, perhaps because it had departed so much in practice from neoclassical economics. Dis-

ciplinary agricultural economics with its neoclassical focus went into ascendancy following World War I (Johnson [1991]). As land economics waned, such agricultural economists as John Timmons, Ranier Schickele, John Brewster, Phil Raup, Marion Clawson, S. V. Ciriacy-Wantrup, Erven Long, and Raleigh Barlowe, in part with leadership from Kenneth Parsons, tried to maintain a rather broad, multidisciplinary institutionalist analysis. Later, this defensive effort was more or less abandoned by such persons as Maurice Kelso, Emery Castle, Alan Randall, Allan Schmid, Richard Noorgard, and Daniel Bromley as they consciously developed public choice theories using many sources.

Led by the Nobel laureate economist James Buchanan and the legalist Gordon Tullock (1962), public choice theory applied neoclassical principles of individual rationality and maximization to the expanded (but still rather narrow) concept of markets to include social, political, and organizational activities. The introduction of transaction costs (largely information negotiation and enforcement costs *as flows*) in both monetary and nonmonetary terms added extra capacity to explain changes in and functions of institutional arrangements. Thus, a relatively broad kind of economics was linked to some political science and sociological thought to focus on the dynamics of institutional change.

In this connection, the reader should consult Daniel Bromley (1991) and Lawrence Busch's (1991) chapters [of the SSAAP book] and Bromley's chapter entitled "Resource and Environmental Economics" in *Agriculture and Rural Areas Approaching the Twenty-first Century* (1988, 208–30). Also in the [latter] book, the reader is well advised to read Paul Barkley's chapter entitled "Institutions, Institutionalism, and Agricultural Economics" (1988, 313–35). Other significant contributions are those of Emery Castle et al. (1981, 393-95) in Volume 3 (*Economics of Welfare, Rural Development, and Natural Resources in Agriculture, 1940s to 1970s*) of the American Agricultural Economics Association's volumes that survey the post-World War II agricultural economics literature. These references more or less summarize the present status of public choice theory as related to resource institutions. Although the stress is on resource institutions in this literature, the theory is applicable to all kinds of institutional change including those considered [herein]. In the literature of disciplinary economics, important references on public choice beyond the works of James Buchanan and Gordon Tullock include [works by] Kenneth Arrow (1951, 1971). For work on the use of transaction costs in business administration, see business economist Oliver Williamson's book entitled *The Economic Institutions of Capitalism* (1985); in history, see works by historian Douglass North (1987); in economics, see Mancur Olson's *The Logic of Collective Action* (1965) and *The Rise and Decline of Nations* (1982) on economic development over time; and, in political science, see the work of Terry Moe (1984) on economics of organizations. Other more eclectic institutional contributions have been made by Kenneth Boulding, Robert Heilbroner, Lester Thurow, Albert Hirschman, J. K. Galbraith, and Michael Polanyi.

Political scientists as well as economists have been instrumental in developing theories of public choice. Robert Bates' (1982) work on political-economic linkages in the development of agriculture in tropical Africa sets a model for inquiry. Kenneth Shepsle (1978, 1979); Shepsle and Barry Weingast (1981, 1987a, 1987b); Terry Moe (1989, 267–329); Vincent Ostrom (1987); and Vincent Ostrom, Robert Bish, and Elinor Ostrom (1988), among others, have done work of lasting consequence in applying public choice theories to the

legislative and administrative institutions. Earlier, William Riker (1962), on coalitions, and Duncan Black (1958), on committees and elections, revised disciplinary thought to allow this work to be done.

Exchange theories, first applied by sociologists such as Peter Blau (1964), have been developed to explain (1) the reasons for membership in voluntary associations as well ad (2) policy-making linkages of these interests to public officials (Salisbury 1969; Hayes 1981). William Browne (forthcoming) has carried this work forward by examining the limiting effects of transaction costs on both interest-group demands and their impact on public policy.

SOME NEEDED DEVELOPMENTS OF THE PUBLIC CHOICE/TRANSACTION COST APPROACH

As indicated in the introduction to this part, institutional change manifests itself in three ways: (1) as changes in "the rules of the game," (2) as changes in organizations such as the Commodity Credit Corporation or the Farm Credit Administration or, for that matter, the Illinois Agricultural Experiment Station, and (3) as changes in the properties, facilities, equipment, and staffs belonging to organizations as institutions. Some public choice/transaction cost (PC/TC) analysts limit their interest in institutional change to changes in the "rules of the game," the works of Daniel Bromley (1988, 1989) being a case in point. However, analyses of the current agricultural reforms now taking place in the eastern socialist counties (Johnson 1988) and of the development of colleges of agriculture in Nigeria (Johnson and Okigbo 1989) indicate that the three manifestations of institutional change are so interdependent that understanding changes in the "rules of the game" requires attention to the transaction costs for organizations as well as for their property, facilities, staffs, and equipment. When these interrelationships are recognized, transaction costs begin to be viewed as the difference between establishment costs, on one hand, and dismantlement costs, on the other. This generates an interest in stock as well as *flow* transaction costs. Stock establishment costs can be advantageously incurred in establishing some durable institutions while stock disinvestment costs can be advantageously incurred in dismantling some existing institutions. To date, in the public choice/transaction cost literature, transaction costs are treated mainly as the *flow* costs of information, negotiation, and enforcement. However, Oliver Williamson (1985, 52-56) makes it clear that without investment in specialized assets that are durable and fixed for some period of time, transaction costs tend to involve minor losses since they rise from decision errors that are easily corrected. Three flow costs—for information, negotiation, and enforcement—necessarily enter into the computation of stock establishment and dismantlement costs. The public choice/transaction cost typology can by further extended to deal with the costs of operating institutions (in either of their three manifestations) and, of course, costs can be viewed as totals and averages (fixed, variable, and all), as well as marginal—seven in all. These speculations indicate that transaction cost theory is as yet still developing and is in need of further expansion and refinement.

In his survey of induced institutional change (IIC) literature, published in this volume as Chapter 5 of Part I, Vernon Ruttan touches on public choice/transaction cost theories but does not envision IIC theories as a special case of public choice/transaction cost theories. He stops short of consid-

ering establishment costs, returns to, and dismantlement costs for creating, modifying, and dismantling institutions in their three interdependent manifestations, i.e., as "rules of the game," as organizations, and as properties, facilities, and staffs of organizations.

Public choice analysts have long placed major emphasis on the vested interests of persons in position to collect "rents" within any set of institutions. The collection of rents is typically viewed as an immoral activity to be deplored and eliminated if possible (Tullock and Hillman; Hartmann, Henrichsmeyer, and Schmitz; Hagedorn in Dasgupta 1991). There is sometimes even an implication that institutions are created largely to enable privileged individuals to collect morally unjustified rents. [See chapter 6 of this book where Petit discusses Mancur Olson's concerns about rent collection as a major threat to modern societies.] As Gordon Rausser (1982) pointed out in analyzing "political economic seeking transfers" (PESTs), it is undoubtedly true that some groups and persons seek institutional changes to establish and collect real income streams or rents whose value exceeds what is spent in order to get into a rent-collection position. However, as he also points out, there are important exceptions to this somewhat limited view of rent collection. These grow out of institutional and organizational changes *made for constructive purposes.* He refers to constructive changes as PERTs (political economic resource transfers). Institutions as organizations are often established to produce and distribute valued services such as new technical advances for agriculture, price stability, the education of farmers and rural residents, stable food supplies, the provision of credit services, resource conservation, environmental protection, food self-sufficiency in case of war, and the like. It is also clear that vested interests in rent collection can create PESTs or, at least, political economic-preserving activities (PEPAs) in PERT institutions. For instance, civil servants, farmers, experiment station administrators, rural residents, agribusinessmen, professors, and many others now have vested interests in the rents they collect in institutions set up with PERTs to accomplish essential constructive research, education, environmental and food chain protection, and stability objectives. Social science research is needed on the PEPAs that often emerge after a PERT is established.

When changing "the rules of the game," establishing organizations for constructive purposes, and when organizations acquire property, facilities, equipment, and staffs for such purposes, the new "rules of the game," organizations, and property and associated resources sometimes fail to generate enough value (often including values that are nonmonetary in nature) to cover their establishment costs (also often nonmonetary in nature). Although crucial difficulties attend attempts to measure the social costs and returns of "Pareto non-optimal" changes in institutions, society is often "stuck with" "fixed" rules of the game, organizations, and/or physical organizational facilities and staff not worth their establishment costs but nonetheless too valuable in attaining constructive objectives to justify dismantlement. Such fixed institutions and institutional resources can be viewed as producing negative returns or quasi-rents relative to their replacement or establishment costs. It is to the advantage of society to employ "fixed" institutions, organizations and properties to minimize negative "quasi-rents" or negative returns on establishment or organization costs. This can be done by maximizing what can be secured from them using the opportunity cost or, in the case of specialized assets, shadow price principle. The interesting point not generally recognized in public choice/transaction cost analysis is that minimizing losses on fixed

institutions and institutional resources involves maximizing the *positive* quasi-rents that are the differences between what such institutions and resources are worth in use and what could be netted for them if they are dismantled. A moment's reflection will indicate that there is little derogatory or immoral about maximizing and collecting positive quasi-rents so defined. This is mentioned here to indicate something about the present undeveloped status of public choice and transaction cost theories and conceptualizations and, hence, the need for further basic research on institutional change in the disciplinary social sciences . . .

James Shaffer (1987), John Staatz (1987, 1989), and, more recently, Petri Ollila (1989) have investigated the usefulness of the transaction cost approach in modernizing the theory of cooperatives as an institutional form important in agriculture. They find the transaction cost approach to have potential for improving more traditional theories of cooperatives. Their work is not unlike the "transactional theory" developed by Raymond Bauer, Ithiel de Sola Pool, and Lewis Dexter (1963) and then enhanced by another political scientist, Michael Hayes (1981). They found that interest-group "services" to the policy-making needs of legislators improved the performance capabilities of Congress.

A shortcoming of [the PC/TC approach], as developed to date, involves undue specialization on economics. The public choice/transaction cost approach is sometimes viewed as the "new political economy" perhaps because it expands the concept of a market beyond that of "induced institutional change" theory to include much more detail with respect to political and social processes, costs, and returns (Schuh 1981). However, even the PC/TC approach is rather narrow when compared with (1) the holistic work of anthropologists and sociologists on institutional change, (2) the work of many practicing rural social scientists who design, consult about, advise concerning, and administer institutional changes, such as George McDowell, Ronald Faas, Philip Favero, Arley Waldo, and Theodore Alter, (3) what is done in human ecology, and (4) the very useful qualitative descriptive analyses by some less quantitative students of agricultural policy. Those in these groups commonly deal with a wider range of variables than considered by public choice analyses to date that have tended to be rather narrow economic analyses of markets conceived broadly enough to include optimizing behavior in political and social processes.

PUBLIC CHOICE/TRANSACTION COSTS IN RELATION TO SYSTEMS ANALYSIS

Some general systems science analysts who conceive their work to be holistic and multidisciplinary, in iterative interaction with decision makers and concerned people have built systems simulation models that have involved broader ranges of variables and processes than are covered in current PC/TC analyses. The survey of systems simulation work by Stanley Johnson and Gordon Rausser (1977, 157–301) in Volume 2 of the American Agricultural Economics Association's survey of agricultural economics literature does not deal with these general systems simulation models; instead, their survey is largely confined to econometric models that "simulate" or operate through time without more explicit modeling of the wider range of technical, political, social, and demographic and anthropological variables. Uses for and the nature of general systems simulation approach (GSSA) models were dis-

cussed by Glenn Johnson and M. Petit (1976) in "Agricultural Change and Economic Method" appearing in a special issue of *European Review of Agricultural Economics*. Such models are conceived to be general with respect to use, techniques, disciplines, guiding philosophies, types of data, and behavioral assumptions, vis-à-vis maximization and other behavioral activities such as learning. This gives them the necessary flexibility to include the wide range of variables considered by anthropologists, technical agriculturalists, political scientists, statisticians, and others using the public choice/transaction cost, game theory, and other techniques. In application, the approach is an iterative process requiring close participatory interaction among analysts, designers, implementers, and administrators, as well as with those affected both adversely and favorably by institutional changes and reforms. Participatory iterative interactions are viewed as sources of descriptive value and value-free knowledge both of which are necessary for defining problems and choosing among possible prescriptions to solve them. It should be noted that although computers reduce computing cost, it is not necessary that such models be computerized. Fundamentally, similar models have been used ever since humankind began to envision the future consequences of alternative courses of action. They were, long before the GSSA was formally described, and are commonly used in farm management, the administrative and legislative circles of government, and business administration . . .

In the SSAAP, it was concluded (Johnson et al. 1991, III-52–53) that the PC/TC approach has great potential for building on systems science analysis and on the investment/disinvestment or asset fixity theory considered by both Baquet and Petit in Chapters 4 and 6 of this book. So used, it is capable of rendering great assistance to social scientists concerned with the analysis, design, implementation, and utilization of institutions working iteratively and interactively with public decision makers or choosers and affected persons. Doing this requires analysts to:

- Recognize that institutional change manifests itself in interdependent changes in:
  - "Rules of the game"
  - Organizations
  - Physical properties, facilities, staffs, and equipment or organizations
- Work on institutional changes (in all of the above manifestations) to examine:
  - Stock establishment costs for new institutional being considered for farming, agribusiness, rural societies, and consumers;
  - Stock dismantlement costs for farm, rural, and consumer institutions being considered for elimination or replacement;
  - Stock nonmonetary as well as monetary costs of and returns from institutions being considered for dismantlement and establishment; and
  - The incidence of such costs and returns.
- Recognize that establishment and dismantlement costs, which sum to transaction costs, include the following:
  - Information
  - Negotiation
  - Enforcement costs

These are generally experienced as flow costs that must be converted to stock costs for valid comparison with the stock costs of establishing and dismantling institutions.

- Distinguish between institutional changes . . .
  - [made] for constructive purposes of providing services and good, and
  - those made mainly to create income streams for noncontributing groups and individuals.
- Consider the potentially protected income (both monetary and nonmonetary) streams that may be generated in institutions originally set up for productive purposes. In this connection, it is important to distinguish between
  - income streams that arise from maximizing positive quasi-rents arising from past mistakes in establishing institutions for productive constructive purposes or, what is mathematically the same thing, minimizing the negative quasi-rents (losses) of those same mistakes, and
  - income streams that do not minimize the losses of past mistakes in establishing constructive institutions but, instead, increase losses by maximizing rents collected by noncontributors.
- Distinguish between
  - operating (flow) transaction costs for a fixed or given institution in any of the three manifestations and
  - the stock costs of dismantling old and establishing new institutions, again, in any of the three manifestations.
- Anticipate that transaction costs conceptions are likely to be further developed to include:
  - Total and average variable and fixed and their sum as well as marginal costs, the lists of fixed and variable and marginal costs depending endogenously on whether it is advantageous to dismantle or establish all or parts of all of any of the three institutional manifestations considered above; and
  - Sharper distinctions between flow and stock costs and returns.
- Help determine monetary and nonmonetary worths of existing and replacement institutions.
- Recognize that it is not advantageous to change an institution worth too much in place to justify its dismantlement and not enough to justify its expansion or replacement. Thus, an important agenda item is that of conceptualizing the nature of institutional fixity and/or variability in terms of establishment and dismantlement stock costs as they relate to the use values (again stock) of institutions in any of their three manifestations.
- Recognize that administrators, employees, and those served by fixed institutions having constructive purposes often receive quasi-rents (opportunity costs or shadow prices) and that
  - maximization of such rents figured with respect to establishment costs is
  - tantamount to minimizing losses on the past mistake(s) that cause(s) the institution to be worth less than what it cost to establish it.
- Expect to find that some institutions were established for the sole purpose of creating and collecting rents (again, opportunity costs or shadow prices). Such institutions can be regarded as "mistakes," in which case maximization of rents with respect to dismantlement costs is of questionable value to society even if privately advantageous to the rent collector.

- Expect that even institutions established for constructive purposes will have components that were established to create rent-collecting opportunities for noncontributors rather than to produce institutional services.
- Do quantitative research on the "rents collected" by administrators, employees, and clientele of our agricultural and rural institutions including rents not justifiable in terms of minimizing losses on earlier errors in organizing institutions for the constructive purposes of generating and disseminating services. This agenda item is related to what is known in the literature of agricultural economics as political economic resource transactions (PERTs), political economic seeking transfers (PESTs), and political economic preserving activities (PEPAs). High on the agenda is the need to relate these concepts more precisely to public choice/transaction cost theory.
- Recognize that public choice/transaction cost theory has potential for extending the applicability of
  - —the "induced" institutional change and
  - —the industrial organization approaches by
  - —including the wide range of social, political, technical, and normative variables dealt with
  - —in less formalized studies of institutional change and
  - —by rural social scientists who advise and consult with those designing institutional changes, creating new, and administering existing agricul tural institutional organizations and developing physical institutional facilities and properties and
  - —by rural social scientists actually participating in the design and imple mentation of institutional changes and, in turn, administering new and modified institutions in all three of their manifestations.
- In extending the public choice/transaction cost approach as suggested in the above agenda items, give consideration to using general systems simulation models developed *iteratively* and *interactively* with institutional administrators and *affected persons*. Such models should be conceived as multidisciplinary, to be general enough philosophically to deal with both monetary and nonmonetary values (*performance* or *criteria* variables), to deal with alternative *structures* and *states* of institutional systems, and with premaximization and both maximization and other *behavior*, and eclectic with respect to techniques from different disciplines and philosophic orientations. In many instances, noncomputerized but iterative and interactive scenario analyses will likely be adequate. In other instances, computerized, general, systems-simulation models built and run interactively and iteratively with concerned persons will be needed.
- Encourage basic social scientists to extend and further develop the theories, measurements, and techniques of their respective disciplines in ways that improve the ability of multidisciplinary teams doing iterative/interactive, problem-solving and/or subject-matter modeling to deal better with social, political, power, psychological, demographic, structural, and related variables.
- Avoid neglect of problem-solving and subject-matter research in developing public choice/transaction cost analyses. Development can be expected to come faster and more effectively with fewer dead ends and omissions if "real world" problematic institutional changes are modeled and analyzed.

IN CLOSING

This long chapter has buttressed Michel Petit's commendable concerns with: (1) the need for balanced attention to technological advances versus institutional human and resource improvements, (2) investment/disinvestment theory, (3) the importance of values, (4) micro/macro and farm/nonfarm interrelationships and (5) the need for political, social, and other interactions between policy analysts and affected persons. The chapter has ended with stress on opportunities to improve the so-called PC/TC approach for use in analyzing public policies, issues, institutions, and programs iteratively and interactively with affected persons. Chapter 2 by Robert P. King, chapter 4 by Alan E. Baquet and, now, chapter 6 by Michel Petit have set the stage for Warren J. Samuels chapter entitled "Determinate Solutions and Valuational Processes: Overcoming the Foreclosure of Processes" and my discussion in chapter 9 of views on the contributions of various philosophic orientations to research methodology for economists.

NOTES

1. David Schweikhardt's comments and criticisms have been extremely useful to me in improving the content and organization of this chapter.

2. In technical economic terms, shadow prices or within-firm opportunity values bounded upwardly by acquisition costs and downward by liquidation or salvage values.

3. Source for Figure 7.7: Linked indices (converted to 1947–49 base) from Frederick Strauss and Louis Bean, Gross Farm Income and Indices of Farm Production and Prices in the United States 1869–37, USDA Technical Bulletin No. 703, December 1940 for 1880–1909; Ralph Loomis and Glen Barton, Productivity of Agriculture, USDA Technical Bulletin No. 1238, April 1961 for 1910–55; Agricultural Statistics 1967, p. 546 for 1956–64; Agricultural Statistics 1980, p. 440 for 1965–77; and Agricultural Outlook, ERS, USDA, December 1982, p. 26 for 1978–82.

4. The possibilities of increasing output without increasing inputs with constant technology through specialization as a result of applying the principle of comparative advantage are [demonstrated by Reder (1947)].

5. See W. E. Hendrix (1951) for discussion of economic conditions necessary for adoption of technology.

If technological change is to be distinguished from economic adjustment, it seems desirable to define a change in technology as occurring when a new input is discovered. If x_i inputs, $i = 1, \ldots, n$ are known to be useful in producing y, then for $y = f(x_i, \ldots, x_d \mid x_{d+1}, \ldots, x_n)$, changes in the use of $x_1, \ldots, x_d$ are the subject matter of economics. In turn, we have seen that the question of which inputs should be treated as variable is also economic. Defining technological change as the discovery of a new input which, like all other known inputs, is fixed or variable depending on economic conditions, yields an unambiguous distinction between technological change and economic adjustment in resource use. If ideas are regarded as inputs, as indeed they are, then new organizations can be regarded as technological changes.

6. Degrees of freedom in statistics can be regarded as "extra" observations whose consistency, or lack of consistency, with a fitted line of relationship is external to the

line; we recognize the independence of these observations from the fitted line by referring to these extra observations as "degrees of freedom."

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Part IV

Chapter 8

Determinate Solutions and Valuational Processes: Overcoming the Foreclosure of Process

Warren J. Samuels[1]

Multiple equilibria are not necessarily useless but, from the standpoint of any exact science, the existence of 'uniquely determined equilibrium (set of values)' is, of course, of the utmost importance, even if proof has to be purchased at the price of very restrictive assumptions; without any possibility of proving the existence of uniquely determined equilibrium – or at all events, of a small number of possible equilibria – at however high a level of abstraction, a field of phenomena is really a chaos that is not under analytic control (Schumpeter 1954, 969).

INTRODUCTION

One of the central findings of economics, shared by members of all schools of economic thought, is that everything has a cost, or a price. Sometimes the point is made by noting that scarcity commands a price; other times, by affirming the idea of opportunity costs. Like other economic principles the idea can be abused in the process of economic persuasion, but it does constitute a truth of substantial consequence.

The purpose of this essay is to consider the price which economics pays for its overriding emphasis on producing determinate solutions. It will surprise no one to learn that the theme is a reprise on Thorstein Veblen's essay on why economics is not an evolutionary science (Veblen 1898).

I would like to make three points by way of preface to what I have to say about the price of the practice of determinate solutions. First, I am not, repeat not, advocating the termination of the practice of reaching determinate solutions. I am advocating a methodological pluralism in which a different practice also has recognized legitimacy.

Second, I am not affirming realism as opposed to rigor. I agree that the issue can readily be misapprehended in those terms but that is not what I have mind. (Nor do I have in mind the frequent practice of what amounts to intellectual puzzle solving.) There is a subtle difference between rigor and determinate solutions. Rigor applies to the exercise of logic, whether deductive or inductive. The practice of determinate solutions is frequently undertaken as a check on consistency and coherence (although, as I shall discuss,

there is another purpose involved), and consistency and coherence are aspects of rigor. My point is that one can pursue logical rigor, consistency and coherence without necessarily seeking determinate solutions, and do so while attempting greater realism as to what the economic process is really all about.

Third, I want to take note that mainstream economists, on the whole, search for a specific type of determinate solution, or determinate solutions in a particular context. It is necessary, mainstream economists believe, to be able to compare the quality of determinate solutions. Since, generally, an appeal to empirical relevance is not possible, the specific determinate solution desired is that arising from maximizing, rational behavior with the fewest number of free variables (the most determinate solution). All other determinate solutions are regarded as inferior. Indeed, it is the result of the attempt to rank determinate solutions that partly causes economists to not deal with "process." The problem is that with disequilibrium dynamic behavior (in which condition the economy is always found) there is no way of ranking solutions. There is no such unique solution arising from maximizing rational behavior. Hence it is not regarded as acceptable to deal with dynamic disequilibrium. If determinate solutions are not found, then how do we say what is empirically correct? How do we rank the nondeterminate analyses? It may well be that this is the main problem rather than the search for determinate solutions, though here I consider it as a part of the larger problem. The search for conclusions as to what is empirically correct and for ranking solutions, generated by arbitrary assumptions which constrain and channel the resulting determinate solutions, can lead to misrepresentation of both what is empirical and the ranking.

THE ECONOMY AS A PROCESS OF WORKING THINGS OUT

I want to present four models which seem to me to nicely indicate what goes on in the economy, doing this in order to identify the price which economics pays for its overriding quest for determinate solutions. But first I must clarify what I mean by the term "working things out." I certainly do not mean anything either mystical, esoteric, or beyond specification for research and analysis. Consider the allocation of resources between the production of any two commodities. Producers form firms, organize production, assemble factors of production, engage in production, market their products, and perhaps sell some or all of their output. In the process, among other things, they must arrange relationships with factor suppliers. Consumers form life styles and preferences for types of commodities and demands for specific commodities both in isolation from and in conjunction with other commodities and other people. Producers and consumers meet in the market under varying structural and behavioral conditions.

We would not say that any or all of the foregoing things, and the resulting phenomena of production and consumption, were either given or fore-

ordained. They involve a generic problem—resource allocation—and a host of technical problems—production arrangements, for example—which are solved and resolved through time via the exploratory choices of individual agents and interactions between agents. It is in this sense that we would say that society, through the aggregated interactions of agents and their respective choices, works out the allocation of resources between commodities. Another way of saying this is that given scarcity, interdependence, the resulting conflicts and alternative allocations must be conducted/worked out/resolved in an ongoing manner. Among the characteristics of this working out are, for example, learning by experience, the comparison and evaluation of values and their application to experience, the exercise of what John R. Commons called a negotiational psychology leading to complex and subtle forms of bargaining, and, inter alia, determining and redetermining the working rules governing the interaction. Indeed, the rules governing how things are worked out are themselves worked out, which opens the door to the politico-legal process which is also inexorably involved as an economic alternative or supplement to buying and selling in the market. The key is that the results are the product of complex socioeconomic processes and are worked out through those processes. Now for the four models with which I hope to illustrate both what goes on in the economy as it works out solutions and thereby what is either missed or finessed by the quest for determinate solutions.

(A) Consider the representation of the economic process given by the conventional diagram in which the production possibility curve is juxtaposed to an actual social welfare function to produce at the point of tangency the socially optimal allocation. The point that I want to make is that there are at least four processes at work underlying this diagram about which conventional practice typically makes restrictive assumptions in order to reach determinate solutions, assumptions about things which in practice must be worked out, so that in making these assumptions economists are both limiting and channeling their results. The four processes are those by which the values on the axes, the shape and location of the production possibility curve, individual preferences, and power structure are worked out. Let me discuss the four processes as follows: First, the process by which is determined which values (commodities or goals) are to be represented on the axes, the values between which choice has to be made.

When a politician states that "such-and-such is the issue in this election" he or she is in effect endeavoring both to get a particular value on the social agenda and to have it weighed heavily relative to a competing value(s).

The values with which we deal may or may not be given by objective reality, but they are worked out through markets, private and group choice, and politics. Economists can produce determinate results by making explicit or, more likely, implicit assumptions as to which values are on the relevant axes, whereas in reality these values have to be worked out.

Second, the process by which is determined the shape and location of the production possibility curve, which governs the tradeoffs which have to be made. Economists have not studied this very much, though they understand that both shape and location are influenced by population size, quality of the work force, quantity and quality of natural resources, level of technology, and so on—factors which change and are themselves in some or many respects a matter of policy. Consider the production possibility curve relating price stability and employment levels. Whatever governs the empirical Phillips curve tradeoffs will help govern the slope and location of this production possibility curve. Among the factors governing the empirical Phillips curve evidently are such things as inflationary expectations (and whatever governs them), the relationship between employment security and productivity, the relative power of managements and workers in arriving at wage rates, central bank money supply policy, and the pricing practices of businessmen. Economists can produce determinate results by making explicit or, more likely, implicit assumptions as to these governing factors, whereas in reality these have to be worked out.

Third and fourth, inasmuch as the actual social welfare function (in contrast to one assumed by the economic analyst) is the product of individual preferences weighted by power structure, the processes by which, first, individual preferences and, second, power structure are formed. Economists have not studied either process very much but in order to reach determinate solutions economists must and do make assumptions as to how these processes—and the values ensconced within them—work out. Individual preferences must be formed and reformed on the basis of experience and subjective perception of experience, encompassing both socializing and individuating processes. And the power structure is not given once and for all time; it too is formed and reformed, in part through processes endogenous to the economy narrowly defined and in part through broader processes.

In all four regards, either the results are empty formalism or a matter of explicit or, more likely, implicit presumptions as to who has what preferences and how much they are to be weighted, that is, whose interests are to count—whereas in reality these have to be worked out. I suggest that these four processes—the processes by which the values on the axes, the shape and location of the production possibility curve, individual preferences, and power structure are worked out—are truly fundamental economic processes. The four processes obviously interact with each other. But my main point is that the conduct of both partial and general equilibrium analyses in order to reach determinate solutions requires that the analyst make assumptions about the results of these four processes which assumptions generate the determinate solution, such that the determinate solution is tautological with the assumptions. The processes of working things out are foreclosed. Let me make three points about that practice of economists. First, there is nothing intrinsically wrong with the practice, however mechanistic it may be. Second, the practice inevitably has its price, which consists of what the assumptions (and the conclusions tautological therewith) exclude,

and the risk that ideological, cultural or class preconceptions will bias the choice of assumptions (that is, the desired conclusion will insidiously if unconsciously govern the choice of the congruent assumptions). Third, what is typically excluded are at least three things: (1) the process nature of the economy, (2) the ongoing, problematic nature of the materials (including matters of putative knowledge) about which the assumptions are made, and (3) the institutional or power arrangements which form and operate through the market.

(B) Consider next the usual context in which the concept of opportunity cost is employed by economists, indeed the context in which most economic analysis is conducted: choice from within a given opportunity set. Economists properly and usefully tend to assume that economic agents know their interests and act so as to promote them. We normally designate this as the rationality assumption. The foregoing analysis of the social welfare function has highlighted the process, neglected by the simple rendering of the rationality assumption, by which preferences are formed. But also notice that in making the rationality assumption (as well as in other contexts) we also tend implicitly to assume that individuals will practice constrained maximization within their opportunity sets. In other words, we also assume given opportunity sets. But in doing so we are making assumptions about what in the real world has to be worked out. The fact is that individual opportunity sets are the product of an extraordinarily complex set of interacting processes.

The problematic, process character of opportunity sets is indicated by the following model, a model which applies not only to the economy but to all 2- or n-party decision making situations (see Samuels 1972, 61-148; reprinted in part in Samuels and Schmid 1981). Let Alpha be an individual economic agent and Beta either another individual agent or the sum of all other agents. An opportunity set by definition is comprised of all the operative alternatives available to the individual actor and between which he or she can choose. The respective opportunity sets of Alpha and Beta are the result, for present schematic purposes, of three sets of processes: power, self-choice, and interaction.

Each opportunity set is a function, first, of power, by which I mean participation in decision making and the bases of that participation, such as legal rights. Included within power in the form of rights may be the right to attempt to have government (courts, legislature, executive) change the relative rights of Alpha and Beta. But overall one's opportunity set is derived from one's power in the form of rights, for example, one's wealth or property.

Second, one's opportunity set over time is a function of the choices which one makes at various ongoing points in time from within one's opportunity sets as they exist at those points in time. The quality of one's portfolio decisions, for example, will affect one's income and wealth and thereby pro tanto one's future opportunity set. Obviously there is an interaction between legal social control and one's decisions insofar as the path of one's opportu-

nity set is concerned. Thus, insofar as knowledge is also a base of power, legal control over the use in trading of insider knowledge will affect one's choices and thereby one's future opportunity set. But given one's rights, knowledge, persuasive ability and so on, the range and content of one's future opportunity set will depend on one's substantive choices in the present and how they come to fruition in the future.

Third, one's opportunity set is not only a function of one's own power (or rights) and one's own choices but is also dependent upon the choices of others. When Alpha makes choices within his or her opportunity set these choices can have impact, positively or negatively, on the opportunity set of Beta; and vice versa with regard to Beta's choices from within his, her or their opportunity set(s). One can call this interaction or mutual coercion, if one defines coercion as the impact of others' choices on one's opportunity set and of one's choices on others' opportunity sets.

The point is, of course, that there are vast processes at work determining individual opportunity sets within which choice in pursuit of constrained maximization takes place. Under a regime of seeking determinate solutions, economic analyses which ignore these processes must make assumptions, either explicit or, more likely, implicit, as to subject matter which in the real world has to be worked out. Alternatively, the analyses are only formal and empty.

(C) Consider the problem of order defined as the continuing resolution of the conflicts of freedom and control, continuity and change, and hierarchy and equality. "Order" can be defined in terms of particular configurations or resolutions of these conflicts. That is what is in effect done by making assumptions in order to generate determinate solutions in the context of the foregoing models: first, that combining the production possibility function and the social welfare function; and second, that explicating the formation of opportunity sets and the rendition of constrained maximization choices from within extant opportunity sets. But one can alternatively focus on the processes involved in working out the conflicts between freedom and control, continuity and change, and hierarchy and equality, including the subtleties involved in their ongoing resolution (see Samuels 1971; reprinted in Samuels and Schmid 1981).

(D) One can also allude to a fourth and broader model, in which the economic process is understood as producing policy, i.e., effective choices, and policy is explicated as a function of power, knowledge and psychology variables. Each of the three is a set of diverse variables which can be variously modeled, and the three interact. The point is the same: given that the economy comprises, or can be understood and analyzed as comprising, such a process, in order to reach determinate solutions economists must make assumptions as to the state of interaction of these three sets of variables (however modeled), assumptions which deal with subject matter which in the real world has to be worked out. It will readily be observed that resident

within each of the foregoing models is the evolution of the power or rights structure of the economy. There is, like it or not, no question of establishing the power structure once and for all time; nor is there any question of establishing the legal foundations of the economy (rights and so on) once and for all time. Both are subject to redetermination and are continually being worked out: We work out the power structure on the basis of which private trade and Pareto-optimal results are worked out, and we work out the alteration of the legal foundations thereof as legal change of legal rights occurs. It is only by foreclosing both the evolution of power structure and the related dynamics of legal change (for example, by assuming the status quo and, in some cases, pejoratively treating the processes governing legal change as "intervention" and "rent seeking") that we can reach ostensible determinate solutions. Which is to say that disciplinary practice focusing on determinate solutions either creates or reinforces exceptionally narrow and misleading understanding of power and the dynamics of legal change.

The price that must be paid in order to reach determinate solutions is complex but fundamentally it ignores and excludes the processes at work in the real world which produce the actual content of preference functions, social values, power structures, rights, opportunity sets, mutual coercion, freedom, change, knowledge and psychic states about which economists tend to make assumptions in order to reach determinate solutions. The price includes ignoring and excluding the valuational processes at work therein, thereby providing opportunities for combinations of wishful thinking and ideology (a particular vision—in the Schumpeterian sense—of how the economy works) to enter analysis surreptitiously. But it especially consists of ignoring and excluding what is actually going on in the economy that underlies the generation of actually achieved economic performance.

Once again the point is that there are vast processes at work about which, under a regime of seeking determinate solutions, economic analyses which ignore these processes must make assumptions which substitute for and exclude what in the real world has to be worked out. This exclusion is effectuated in part by confusing the relationship between economic analysts on the one hand and economic actors and economic processes on the other. It is to this that I now turn.

ECONOMIC ACTORS AND ECONOMIC ANALYSTS

The point that I wish to make is that the pursuit of determinate solutions has led economic analysts to substitute themselves for both actual economic actors and actual economic processes. What in reality is worked out by real economic actors in real economic processes is suspended, foreclosed, finessed, or excluded and replaced by imaginary, often question-begging and presumptuous constructions by the economic analyst. In this way the values, perceptions and judgments of the analyst are substituted for the values of economic agents and for the results of the valuational process.

Certain classes of values are ruled out of bounds—and certain analytical conclusions, often with distinctive policy nuances and recommendations, are thereby generated while others are ignored or repressed.

It seems to me that the quest for determinate solutions confuses the place and role of the economic analyst and that of the economic actor. It has helped create tasks for economic theory which can be accomplished, not by merely placing the analytical self in the position of the economic actor in order to effectuate sympathetic understanding, but only by substituting the economic analyst for the economic actor and for the economic process. I want now to illustrate what I have in mind when I say that the quest for determinate solutions tends strongly to have the economic analyst substitute for actual economic actors and actual economic processes.

And to show that it is not merely orthodox neoclassical economists alone who conduct analyses which substitute the values, perceptions and judgments of analysts for actors, I shall begin with some examples from institutional and social economics.

1. Economists in the Veblen-Ayres tradition often use the technology-institutions, or technology-ceremony, dichotomy as if the two components were independently determined, closed categories, as if they each were unequivocally comprised of definite, unequivocally identifiable sets of arrangements or phenomena, and not something which has to be worked out in the process of living. The same is true of the distinction between making goods and making money (industrial-pecuniary dichotomy).

2. Social economists often invoke values as if they were definitively dispositive of specific analytical or, especially, policy questions. Both institutional and social economists tend to speak of the values of "the life process" or the "higher standards of life" as if by doing so they were establishing something both definite and definitive, something not requiring that some substantive content be worked out so as to adduce experientially relevant meaning to them. The same is true of such concepts or categories as "self-awareness," "authentic self," "human needs," "human dignity," "social cooperation," "meaningful work," and "social consciousness" as well as the "social nature" of the individual—all terms widely found in this literature. (By the same token, so-called methodological individualists do the same thing when they invoke the "individual.")

3. Critics of capitalism often both use and protest concepts such as "excessive materialism and greed," "excessive competition" and "exploitation."

4. Economists tend freely to use such terms as "injury," "freedom," "coercion," and the like as if they were something absolute and definitive, rather than something extremely complex and subjective and which require to be worked out in practice, for example, in the courts.

5. Some economists, and probably some noneconomists, believe that it is the job of economists to oversee, or in some sense to be responsible for, the operation of the economy. To the extent that this is the case, it would be, as

Richard T. Ely once wrote about economic science under mercantilism, "The principal object of this science . . . to secure . . ." desirable features of economic performance (Ely 1889, 109).

6. Public choice and rent-seeking theories invariably make assumptions as to which social preferences are to enter into analysis, thus substituting the desired practices and beliefs, if not ideology, of analysts for those of economic actors and the results of actual economic processes, typically ruling certain classes of social preferences out of analytical, and policy, bounds.

Much the same thing is done through the contrivance of models of public goods and externalities (for example, pecuniary versus technological).

7. General equilibrium theory, in order to reach determinate solutions, assumes either prereconciled prices or a fictional auctioneer. Both are ironic: both effectively disallow any notion of economic process, and the latter asserts what in effect becomes an hypothetical central planner, all in the name of providing determinate solutions in the explanations of how markets in the abstract work.

8. Economists are conventionally preoccupied not only with producing determinate (and optimal) solutions but also with identifying the conditions of equilibrium or of stable equilibrium—but generally without much serious attention to the process of equilibration or adjustment, the process which in the real world produces the phenomena actually observable. Indeed, some economists operate on the assumption that the economy is always in equilibrium, in part because it is difficult to derive disequilibrium results from standard models.

9. Economists reach conclusions concerning "efficient markets" often without much if any detailed attention to how markets operate so as to work out the presumptively efficient results. Some simply assume, in the face of difficulties in working with past and future data (as well as private in contrast with public data), that markets incorporate and have adjusted for all such data. The results are highly formal and empty, but this does not prevent the drawing of substantive and often policy conclusions.

10. Microeconomic and macroeconomic theories are constructed on the basis of preconceived notions of how the science should be developed and/or how the economy should operate, and not on the basis of how actual economic actors and actual economic processes operate. I have in mind, for example, the ratiocinations of rational expectations theory.

11. The assumption of rational maximizing behavior is employed as the all-purpose basis of explaining everything that happens. In order to explain on the basis of utility functions, economists stipulate the arguments, or content, of utility functions, thus substituting their values, perceptions and judgments for those of economic actors. It is assumed that preferences are convex, principally if not exclusively in order to establish proofs of existence of determinate and optimal solutions. (Some of these ideas are now being directly assaulted by psychologists—with some limited receptivity shown by orthodox, neoclassical economists.)

12. Some economists endeavor to predict with regard to the real future economy as if they were predicting within the confines of a model.

13. Some economists attempt to manipulate data, mathematical techniques, and assumptions in order to maintain results which seem either desirable or preferable on a priori grounds.

14. Economists are generally very uncomfortable about a world in which radical indeterminacy is admitted to exist. Thus in a Shackellian world, for example, predictions of the future are highly suspect and this emphasis on indeterminacy is itself unsettling. Most economists, it seems, would prefer a more determinate world. To this end, models and theories which "set minds at rest" have a competitive advantage. (See the discussion by Perlman 1984, 586–88; and also Shackle 1967, 188 and passim; and Ramstad 1987.) For example, in rational expectations theory actors are assumed to have information which economic analysts disagree on, but each analyst interprets what that information is to suit him- or herself.

15. Some economists assume knowledge by economic actors of equilibrium prices, when there is no independent test by which a particular price can be identified as equilibrium and when the precise meaning of equilibrium is not agreed upon (for example, in relation to market clearing).

16. Some economic analysis seems to assume that economic actors are always infallible, whereas information is always limited and profoundly uncertain, and actors always are in a process of revising their knowledge, their preferences, and their plans. One's knowledge at any point in time reflects one's processing and assessment of the available information contemporaneous with one's reformulation of preferences.

17. Some economic analysis seems to assume that the same information available to economic actors (however limited and uncertain) is also available to the economic analyst. This means that the economic analyst is making assumptions and reaching conclusions on the basis of his or her selective perception of the agent's information and preferences, among other things presuming, as it were, that the epistemic rationality of economic agents is analogous to if not identical with that of economic analysts (see Maki 1987, 371).

18. Economic analysts typically assume a meaningful distinction between "private" and "public." But, as Nelson and Winter (1982, 368–69) maintain, "There is no reason to believe that the lines between what society wants to leave private and what society wants to make public will remain constant over time. A central part of society's economic problem, then, is the need to continuously draw and redraw the boundary lines. Whereas orthodoxy stresses achieving optimal provision of goods that by their nature are public, the evolutionary approach focuses on the changing circumstances and demands that call for collective-choice machinery." Let me say that I agree with their main point about the evolutionary nature of the private-public dichotomy. I do question, however, their language which seems to make publicness a function of circumstances and not also of complex social choice processes—for this too is something that has to be worked out by

economic actors in the economic process as part of "society's economic problem"—but this may only be, however doubtfully, a matter of semantics.

19. Most economists most of the time assume competition, notwithstanding widespread understanding that industry, while not strictly monopolistic, is structurally and otherwise not competitive in terms of the conventional definition. This is done to assure the determination of unique outcomes.

Different economists might quibble with one or another of these examples, but I think that I have established my point: that economists typically insinuate themselves into analyses in ways that have them substitute for the actions and consequences of economic actors and economic processes in the real world, and that they do this, in addition to such other causal factors as ideological motivation and unthinking habitual practice of standard models and techniques, because they desire to produce determinate solutions. It is not too much to say that many of these practices, particularly those pertaining to limited and uncertain information and the general subjectivism of economic choice, have been criticized by contemporary Austrian or neo-Austrian economists. These writers emphasize process and also frequently differentiate between prediction in the context of a model and prediction with regard to the future real world. This is not to say, of course, that Austrians and neo-Austrians have not engaged in practices which treat as absolute or given what in practice has to be worked out by actual economic actors in actual economic processes. But their emphasis on process does tend to distinguish them in certain respects from other orthodox economists. We now need to consider why economists desire to produce determinate solutions and other aspects of the matter.

THE MOTIVATIONS FOR DETERMINATE SOLUTIONS

There are good reasons for economists to desire to produce determinate solutions. These good reasons may also be considered sufficient reasons, providing, please note, sufficient reason for doing so but not sufficient reason for denying the legitimacy of practicing economics some other way. Some of these reasons are technical, others are sociological (see, in general, Ramstad 1987).

The use of determinate analyses greatly facilitates the teaching and learning of economic theory. Of this there can be no question, especially as it pertains to inculcating in students skills in working within particular models or theories and mastering the content and logic of microeconomic and macroeconomic choice processes. (Of course, there is a difference between mechanistic, or overly mechanistic, and nonmechanistic analysis.)

The use of determinate analyses also economizes the effort of the professional economist, in that it enables or facilitates working effectively within a

tightly controlled domain. (Of course, the term "effectively" is open to interpretation.)

The conduct of determinate analyses is also useful, in the conduct of both teaching and professional research, as a mode of checking on logicality and coherence. Such analyses, however, are not the only mode of providing checks on logic and coherence.

It should be noted, of course, that facility in teaching, economizing and checking the efforts of economists carry prices, or costs: limiting what the student is exposed to and what the student thinks of as the economy, and limiting the professional economist in pretty much the same way. All three (especially the first and second) may sell short our own intellects and the intellects of our students. But these are credible technical justifications for conducting economic inquiry in the manner of seeking determinate solutions, even if they are not sufficient to preclude the conduct of economic inquiry in other ways, especially inquiry into the processes through which are worked out what determinate solutions made assumptions about.

The foregoing are the three technical explanations. There are also two sociological explanations. First, economists not surprisingly desire to have the status of scientists. At least two things seem to satisfy the requirements of being "scientific:" one is that analyses yield determinate solutions, and the other is that analyses be as mathematical as they can be. Clearly the conduct of determinate solutions ipso facto satisfies the sense of scientificity; and the practice of mathematics, which is conventionally conducted in such a way as to yield determinate solutions issuing from precise proofs, further contributes thereto. There are other connotations of doing "science" that do not necessarily involve determinate solutions. But these have been overwhelmed at the sociologically hierarchically superior levels in the discipline, notwithstanding such criticisms as that methodological features should not govern substantive research. (Notice that Glenn Johnson's inclusion of both subject matter and problem solving research as legitimate kinds of economic research alongside disciplinary research reflects both a sociological and a methodological pluralism.)

Second, economists generally aspire to have something to say about policy. Also noneconomists, and not only politicians, seem to desire that economists have something to say about policy. This may be odd in a discipline which is so much associated with nonintervention, but such it seems is the way of the world (for very few if any economists simply aver, with regard, to policy, that literally nothing ought to be done, or nothing changed). The point, then, of course, is that in order to have something which one (and others) thinks is applicable to policy (the customary penultimate "policy implications" sections of articles), it is convenient if not prerequisite to have analyses which yield specific, determinate solutions.

There is, finally, another explanation or explanatory factor which is perhaps both technical and sociological simultaneously. I have reference to the propensity of economists to envision the economy in purely mechanical terms, as comprising a pure logic of choice or the play of universal natural

laws, rather than a messy world characterized and generated by uncertain expectations and variegated and controversial institutional factors. This is not a matter solely of rigor versus realism but of fundamental conceptualization of what the economy is really all about—and it is apparently the mechanistic conceptualization and mode of discourse which finds determinate solutions so congenial and indeed necessary, and which finds it hard to accommodate what Keynes called animal spirits and others the dirty world of power and power play.

CONCLUSION

I presume that the general purpose of economic studies is to understand and, in some sense, to explain the organization and operation of economic systems. I am aware that the practice of economics can be alternatively specified as the quest for truth or Truth, the use of a set of tools, the telling of one or another story, the provision of psychic balm, and, inter alia, the function of social control, so that one ought to refrain from ex cathedra pronouncements. At any rate, it is not my purpose to affirm either some technique or some definition of the central problem of economics as the exclusive one to be practiced by economics. On the contrary, I want to support methodological and substantive diversity or pluralism. Therefore the point that I want to make is that one does not require determinate solutions in order to understand and explain the organization and operation of economic systems. One can explain, for example, how demand and supply govern the allocation of resources without making the assumptions necessary to produce determinate solutions. One can explain the normative aspects of exchange without making assumptions which make it appear that there is but one unique optimal solution. One can identify the factors and forces operative in the economy without so constructing models to give the appearance, falsely as it turns out, of precisely determinate results.

Without determinate solutions one cannot tell a conclusive story; but while a helpful story, it is also an incomplete and, yes, contrived story that one tells. For it is a story with determinate solutions that are reflective of and channelled by the limiting assumptions necessary to produce "determinate" results. In a very fundamental way the story is economic science fiction. It is the case, of course, that in the real world there are ongoing determinate solutions reached by economic actors through their interaction in markets and other institutions. But there is a difference between these real world determinate solutions and those hypothetical ones which populate the work of economic analysts. The difference lies in this: In the real world of radical indeterminacy or profound uncertainty, the determinate results are worked out through agent interactions and the world is made and remade thereby, because the future does not exist until we have made it through the totality of our actions. In the world of economic analysis, the determinate solutions are reached within the confines of and generated by sets of assumptions.

Another way of putting the matter is this: There is a difference between predicting within the confines of a model and predicting in the real world. In the former, the prediction is formal: assume that demand increases more rapidly than supply, then as a matter of economic logic price will increase. In the latter, prediction is for all practical purposes impossible, as the future will not exist until we have made it, and it will be the result much more of unintended and unforeseen consequences than of deliberate contrivance, though deliberate contrivance is definitely an active factor. In any event, it is the economic actors and processes and not the analyst which produce economic performance results.

The quest for determinate solutions too often results in the manipulation and contrivance of assumptions in order to reach determinate solutions. Such contrivance and manipulation is aggravated when the question is compounded by a desire for ideologically agreeable results. It is my intention in this essay not to categorically reject such efforts but to affirm the necessity and desirability of analysis that will explore how the total political economy (private and public sectors) works out which values are on the axes, the shape and location of the production possibility curve, the formation of preferences and of power structure, the formation of opportunity sets, solutions to problems of interdependence, the nuances of freedom versus control, continuity versus change, and hierarchy versus equality, and so on. The results may not be so neat and elegant and seemingly precise, but they will hopefully help answer important questions, questions the inattention to which constitute the current price paid for emphasizing determinate solutions. If one studies the real world economy and focuses on process, on the working out of solutions, while both determinate results and predictive capacity have checking roles to play, one can concentrate on the operative factors and forces without having to make assumptions which substitute for the actions of economic agents and the operation of economic processes. One does not require presumptuous assumptions about the values on the axes, the slope of the production possibility function, the content or formation of preferences, or power structure, however much such assumptions will give neat and tidy results, in order to explore how economic actors and economic processes go about producing, or working out, economic performance. Because power cannot readily be reduced to a simplistic singular function should not mean that economics should be devoid of substantive attention to power—when every economist who has given serious thought to it knows that "power" is in fact important.

Concentrating on the operative factors and forces can substitute for the practice of economic analysts substituting their own values, judgments and perceptions for what is really going on in the economy, either to advance an ideological agenda or to protect the imagery of a scientific economics laden with determinate solutions. Again, I say that not to exclude the practice of reaching determinate solutions but to enlarge and enrich the practice of economics. It is conceivable that supplementing standard practice with analysis

that does not require determinate solutions might so enrich economics that many of the standard criticisms of the discipline might be overcome.

Frank Knight understood the economy to be an explorative and emergent process. Such a subject matter would not always substitute for human action and economic process contrived, artificial, fictional and mechanistic gimmicks in the form of assumptions but would seem to call, at least in part, for an explorative and emergent economics which paid attention to the process aspects of the economy. Even though limiting assumptions are always necessary, this is no minor point, especially if one recognizes, as is now increasingly being done, that economics is comprised so much of a set of stories about economic life, not a description-explanation of an independent economic reality.

The "analytic control" of which Schumpeter wrote (quoted in the epigraph) is precisely and directly a function of the superimposition of certain assumptions and not others. To the extent that these assumptions foreclose the behavior and process by which economic matters are worked out the stories which we tell are neither very complete nor very accurate. Economics can be both much more robust and much more consonant with its subject matter if it were to sanction work not under the aegis of having to reach determinate solutions. The point is not to terminate work seeking determinate solutions but also to embrace different work. It is a further call for methodological pluralism.

NOTES

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One of the readers of this paper stressed that "Economists always make choices as to what falls within the purview of the analysis and what does not." He notes that "there appear to be very strong conventions as to how these choices are made. For example, it is currently quite difficult to publish an article in macroeconomics that is not based on individual optimization, though there is no difficulty in ignoring the aggregation problems involved in converting individual to market behavior." But, he adds, "there are clearly costs associated with these choices . . . and most surprising, there is virtually no explicit consideration of these choices and their costs." I would add that another convention generally excludes the role of collective action in structuring the range of individual discretion, thereby substantially leading to misrepresentation of the economic role of government and of legal change, but that is another story. For the sociological factors governing the unexamined choices, see the penultimate section of this paper.

The foregoing is due to one reader. Another reader would remind us that no general argument against mathematical determinate solutions is sustainable and that mine is not such an argument but a argument for pluralism. This reader also

suggests that the situation decried in this paper "simply reflect[s] on the backwardness of economics," say, in comparison with the possibilities opened up by chaos theory.

In a diagram with more than two axes, say n axes, all values can be included so that no choice of which values to include is necessary. In the real world, however, there are limits to how many issues, or how many values, can be considered during any one period (which itself is a variable). There are only "so many" (serious) questions, it seems, that a political process can deal with simultaneously. In this respect the economy is more robust.

Of course it is also the case that the politician is trying to get (re)elected and thereby seeking to identify with values which he or she believes can be or are held by the voters (or sufficient of them for him to win election). Politicians do two things in this process which are instrumental to the discussion in the text: first, help form voter preferences; and second, serve as conduits or vehicles for whatever preferences voters come to act upon. Thus politicians will try to reform voter preferences to be consistent with their, the politician's, own preferences or principles but also to "rise above" their own principles so as to better comport with the preferences of the voters (such as they cannot reform) so as to gain reelection (in the latter case the objective function of the politician obviously is not solely to advance his preferences or principles but to gain (re)election, period). As indicated in the text, these are all very complex processes. A principal characteristic of relevant reality is that neither the politicians nor the voters have well defined sets of values or preferences and it is very difficult for them to be effectively communicated. It is also true that communication (information provision) is asymmetrical, though this is rarely studied; see Bartlett 1973 for an exception).

The terminology of "working out" applies whether one believes that values exist objectively in reality and await discovery (that is, apply to the discovery process) or that values are created by man (that is, apply to the creation process).

The text specifies unemployment level on one axis, that is, as a value. In cases where ordinary commodities are represented on the axes, unemployment is an interior solution consequent to not reaching the highest possible social welfare function (level of output).

Notice that I am not dealing with an hypothetical social welfare function as designated by an analyst, even one who intends to represent the actual function extant at the time and place. I am only affirming that the combination of individuals with preferences for values (for example, for private and public goods) and a power structure which weights those preferences across individuals (that is, determines whose preferences count) in effect yields the actual social welfare function. The discussion is not intended to be a mechanistic representation of reality but a tool indicative of what is going on in society.

A further indication of the complexity of these (and other) processes, consider the situation in which the power structure arguably does not change but the beliefs of the (hegemonic or decisive) power holders change, thereby changing the decisional outcome. The more general problem arises with the use of the fourth model presented in the text, in which an outcome can be explicated in terms either of power, knowledge or psychology factors, such that the analyst has to assess the relative weights of the three factors. There are, of course, also definitional and modelling problems, such as defining moral suasion (leading to a change of belief) as a form of power.

Tautological in the sense of restating or giving effect to the assumptions.

To clarify "problematic:" Fundamental interdependence leaves all behavior and prediction subject to radical indeterminacy (the future cannot be known until we have made it by our actions) or at least stochastic.

One reader of the earlier draft of this paper writes about item (3): "I like this. One reason I like economics is that it studies systematically how to break down concentrations of power in the economy, e.g., point out bad effects of concentration. But we only deal with certain types of power."

Although I consider the discussion of opportunity sets and opportunity cost eminently ("old") institutionalist, one reader finds it very Austrian, or at least Austrian coupled with considerations of power. The reader says that this is why he likes game theory and is excited about the "new institutional" economics represented by Richard Langlois and others and its attempt to integrate subjective choice with theoretical analysis of the development of institutions which game theory may provide. On the relation of the old institutional economics and Austrian economics, see the symposium thereon in Research in the History of Economic Thought and Methodology, vol. 6 (1989).

One reader writes that "It is when we reflect on questions such as these that the limitations of economics are apparent. These are questions of broad social science." (He makes the same point regarding the fourth model.) My point, of course, is that economists invariably make assumptions (which channel or dictate the solutions thereby made determinate) on precisely these questions (a) which are of broad social science and (b) which society has in fact to work out in practice.

One reader correctly suggests that "two possibilities must be considered. In either case, one begins with the recognition that there are processes at work which determine . . . the shape of the production possibilities curve. One possibility is that the outcomes of these processes are relatively stable, so that the production possibilities curve remains relatively unchanged over time. In this case, the conventional approach of taking the . . . curve as given and exploring its implication clearly ignores some important issues, such as the determination of the shape of the . . . curve; but at least provides some useful information . . . concerning the implications of a particular stable characteristic of the economy. The second possibility is that the outcomes of these processes are unstable, so that the . . . curve is in constant flux. In this case, ignoring the process and exploring the implications of a given . . . curve provides no useful information, and there is no alternative to studying the process." He adds that, "In the one case conventional economics ignores many important features of the economy, but at least effectively studies the issues it chooses to. In the second case not even this latter claim can be made." The reader says that this "point applies to the other examples in this section and the following section."

By restricting my discussion principally to economic actors and processes (by which I generally mean market), I certainly do not intend to rule out of disciplinary bounds politico-legal actors and processes. Individual interdependence and interaction and the working out of processes and results (for example, the working rules, as already noted earlier in the text) take place in both nominally private and political processes. (I firmly believe that private and public, or economic and political, are not mutually exclusive; each defines the other; but that too is another story.)

One of my readers writes that this long list of illustrations encompasses criticisms against sloppy thinking, injections of values, ignoring process, making unrealistic assumptions about the knowledge agents possess, and so on, and that not all always result from the substituting of the beliefs of analysts for those of agents. I concur. Another reader suggests that I might give specific citations in each case. I disagree: no useful function would be served by singling out specific authors or writings for implicit obloquy.

Notice that the argument of this paper concerns the preoccupation with determinate solutions to the exclusion of legitimized attention to the processes actually at work in the economy and, in this section, how analysts substitute their analysis for actual economic actors and processes. This is not to say that this approach cannot provide workable approximating models of the economy; to the extent that it can, the analysis can be judged by its results. The point of this paper, however, is that the conventional preoccupation with determinate results excludes the study of actual economic processes, for which is substituted economists' stipulations as to what they are and how they work. Much the same thing can be said of drawing ostensibly determinate and optimal policy implications from analysis, rather than studying how policy is actually made (an example of which is Samuels and Mercuro 1979 and 1980).

Such as write for the *Review of Social Economy*. See also Lutz (1990).

It is only in this manner, for example, that rent-seeking theory can reach conclusions as to "waste."

Tullock (1970, 171–72) emphasizes that "most economists refuse to apply the concept of externality" in the area of so-called pecuniary externalities "and argue that individual behavior in which individuals ignore some of the effects their behavior has on others is more desirable than compelling them to take these effects into account. I do not wish to quarrel with this line of reasoning, since I find that this is the way my own personal preferences point." I am indebted to Allan Schmid for recalling this statement to me.

As several readers have noted, it is indeed very helpful to teach microeconomic and even macroeconomic theory in a rigorous, mechanistic, determinate-solution oriented way (and I readily confess to doing so): it enables students, especially the best students, to see certain things with new and more pointed insights. But one can also in theoretically oriented courses, and not solely in (for example) history of economic thought courses, indicate the limits of models, determinate equilibrium analysis, and so on, thereby further enriching the education and horizons of students, again especially the best among them.

Politicians and others joke about one-handed economists but this is a manifestation of their desire for simple, determinate, conclusive policy solutions, whereas I would make the case that the forte of the economist is, or should be limited to, providing policy makers with information concerning the identification, costs and interrelationships among ends and likewise among means and their relationships to ends, rather than policy answers presented with the false cachet of science.

One reader suggests that I indicate that contrary to the work of such economists as Oliver Williamson, by equality I do not necessarily mean markets. Markets can represent great diffusion of power but they do not necessarily do so.

Most neoclassical economists would agree that power is important but that it just is not economics. That is, of course, one difference between neoclassical and other schools of economics, such as institutionalism, social economics, and so on.

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Chapter 9

Disciplines, Processes, and Interdependencies Related to the Problem-Solving and Issue-Oriented Work of Agricultural Economists[1]

Glenn L. Johnson

Since Warren Samuels presented his paper at my retirement symposium, I have reread it several times. I have also rewatched his delivery and listened to his paper using a videotape recorded by my son-in-law. The paper wears well. Its rich content makes for rewarding reading. It is consistent with my lifetime's experience as an economist concerned with practical issues and problems faced by farmers and policy makers in both domestic and foreign settings. His paper also relates well to King's multidisciplinary paper on private managerial processes, to Baquet's disciplinary paper on remedying a deficiency in "determinate, mainstream economic theory," and to Petit's paper with its stress on public policy processes. Samuels provided the symposium with an appropriate capstone for which we are all grateful.

Academics appreciate papers that raise what we think are important questions and issues about our work and disciplines including questions about the roles they play in academia and in society at large. Samuels's paper does this and in doing so provides me with opportunities to contribute ideas and lessons from the experiences my students, my colleagues, and I have had.

As indicated in chapter 1, this chapter (and chapters 3, 5, and 7, as well) is a mixture of reprinted material from my past and that written specifically for this book. Some of the former is dated and now acknowledged to have developmental shortcomings. To help the reader distinguish between my past and current writings, all quotations from my earlier publications are indented from both margins. Further, the reader will find two vertical gray lines, one in each margin running the entire length of each quotation regardless of whether only a few lines or several pages are quoted.

This chapter has four sections. The *first* section examines the remarkable agreement between Samuels's paper and the thoughts and experiences re-

corded in chapters 2, 4, and 6 by King, Baquet, and Petit and chapters 3, 5, and 7. The *second* section presents questions and issues raised by Samuels's paper. The *third* section attempts to answer these questions and resolve the issues posed in the second section by drawing in part on excerpts from my writings and those of others that reflect my fundamental interests in mainstream determinate economics and in practical aspects of farm management and agricultural policy. A *fourth* section draws philosophic conclusions about the roles pragmatism, logical positivism, and forms of normativism play in the disciplinary and multidisciplinary problem-solving and subject-matter work of agricultural economists. This section includes an extensive philosophic digression on values and objectivity. Hopefully, this organization will help agricultural economists benefit from Warren Samuels's excellent and insightful paper.

AGREEMENTS AMONG THE FOUR COMMISSIONED PAPERS

There is solid agreement among the four commissioned papers on the importance of processes in defining and solving practical problems and in defining and resolving practical issues. Whether we look at Robert King's article about how farm managers solve the problems they encounter or at Michel Petit's article on policy making, the emphasis is on processes. Even Alan Baquet's abstract article on asset fixity in mainstream economics deals with the processes whereby resources are mistakenly overcommitted to agricultural production by managers unable to overcome their imperfect knowledge or act in concert to keep from imposing capital losses on themselves, their families, their industry, and, for that matter, society as a whole. The following conclusions are drawn from chapters 1 through 8.

Conclusion I

Processes are important in describing and understanding how problems and issues are defined and solved and/or resolved in an economy and indeed in the total society of which an economy is an integral, inseparable, interdependent part. These processes involve producers; consumers; owners of rights and privileges, including property; and, in short, all persons and groups concerned about the problem or issue at hand—researchers and analysts, alone, are inadequate.

Conclusion II

Defining and solving or resolving problems and issues requires knowledge of the many changes generated by the process of defining and solving or resolving problems and issues.

Conclusion III

Unfortunately, the assumptions required to define and obtain determinate answers to disciplinary questions asked by mainstream economists involves fixing variables that necessarily change during the process of defining practical problems or issues and in solving or resolving them.

Conclusion IV

Among the changes that take place in the process of defining and solving or resolving practical problems and issues are changes in the utility and production functions. These changes are important but are nonetheless fixed in mainstream economics in an unfortunate manner that forecloses evaluative processes (including learning) essential for solving practical problems and resolving practical issues.

Conclusion V

Nonetheless, the determinate theory of mainstream economics can play a useful, if limited, role in solving problems and resolving issues of practical importance.

QUESTIONS

Despite the extensive agreement of chapters 1 through 8 on the conclusions listed in the preceding section, there are fundamental questions remaining about the relationships of disciplinary economics (including its major, mainstream, determinate component) with the practical problem-solving and issue-oriented work of agricultural economists. Such important questions are listed immediately below as part of this section. Each question is considered in more detail in the next main section of this chapter.

Question I

What role do the basic disciplines of academia play in society and how is that role related to the nature of economics?

Question II

Would it be possible to create a single superdiscipline capable of dealing with all of the processes and interdependencies among all kinds of knowledge needed to address all of the problems and issues of the practical world?

Question III

Which kinds of processes and interdependencies among variables are included and which kinds are neglected in mainstream, determinate economics?

Question IV

How is basic disciplinary mainstream economic research important for the work of agricultural economists?

Question V

How do basic and applied mainstream, determinate economics serve agricultural economists working on multidisciplinary problems and subjects?

Question VI

How do the chauvinistic turf problems that exist among the basic disciplines of academia affect the multidisciplinary problem-solving and issue- or subject-matter-oriented work of agricultural economists?

THE QUESTIONS CONSIDERED

This section takes up the questions identified in prior sections. Those questions are discussed, amplified, and partially answered, one by one, drawing on material published elsewhere by myself and others but, above all, on insights gained from Samuels's chapter 8 and the other three papers presented at my retirement symposium.

I. What role do the basic disciplines of academia play in society and how is that role related to the nature of economics?

The following examples distinguish between basic disciplines in academia and other more applied multidisciplinary fields that are also well-established parts of academia: biology vs. agronomy or horticulture, physics vs. engineering or architecture, bacteriology vs. medicine, economics vs. business administration, sociology vs. community development or social work, psychology vs. education, and economics vs. agricultural economics and its subfields such as farm management, marketing, and agricultural policy. The difference just illustrated is not the same as that between biology and applied biology, economics and applied economics, or physics and applied physics. In the former case, disciplines are compared with multidisciplinary fields of work whereas in the latter case a basic discipline is

compared with applications of itself that do not necessarily involve multidisciplinarity.

Turning now to discussion of the question, academia evolved through time a division of labor in pursuit of knowledge. In attaining the advantages of this division of labor, the different disciplines have defined their turfs and engaged in interdisciplinary conflicts over those turfs. Disciplinary boundaries have changed over time as the disciplines have expanded and deepened knowledge of the physical, biological, and social worlds, as well as in the arts, humanities, religion, and such abstract areas as mathematics, statistics, and philosophy. Disciplines sometimes merge. They also subdivide.

Early in this century, Knight wrote in chapter VII of his *Risk, Uncertainty, and Profit* (1946) about the possibility of our having knowledge about the real world and about the nature of the knowledge we think we have. In his writing is an outline of the role played by classification in acquiring knowledge. Because the basic disciplines of academia have defined themselves in terms of a class or category of knowledge of concern to them, Knight's outline provides useful insights about the categories of knowledge sought by disciplines and, hence, about how disciplines are defined. Knight (1946, 206–08) wrote:

> We may sum up . . . in the following propositions:
>
> 1. The world is made up of objects which are practically infinite in variety as aggregates of sensible qualities and modes of behavior not immediately sensible. And when we consider the number of objects which function in any particular conduct situation, and their possible variety, it is evident that only an infinite intelligence could grasp all the possible combinations.
> 2. Finite intelligence is able to deal with the world because
>
> a. The number of distinguishable properties and modes of behavior is limited, the infinite variety in nature being due to different combinations of the attributes in objects.
>
> b. Because the properties of things remain fairly constant; and
>
> c. Such changes in them as take place occur in fairly constant and ascertainable ways.
>
> d. The nonsensible properties and modes of behavior of things are associated with sensible properties in at least fairly uniform ways . . .
>
> 4. It is also fundamental that in regard to certain properties objects differ *only* in degree, that mass and spacial magnitude are *universal* qualities of things, which do not exhibit differences in kind.
> 5. Following out the same principle of (4) many of the most significant properties are common to very large groups; in respect to the qualities most important for conduct, there are a very few kinds. The intelligibility of the world is enormously increased if not actually made possible by the simplicity of the great divisions into solid, liquid, and gas, into living and not-living things, and the like. And there is a hierarchy of attributes . . . in order of generality down to the slight peculiarities which probably distinguish in some manner and degree (other than mere situation) every nameable thing in the universe from every other, giving it individuality.

Members of an academic discipline define the boundaries of their discipline by excluding as well as including variables. Excluded variables are fixed in theory by assumption and in doing empirical work with survey and experimental controls. Variables of primary concern to a discipline are included; these can be subdivided into endogenous and exogenous variables. The endogenous variables may be interdependent with each other. Though endogenous variables depend on exogenous variables, exogenous variables cannot be interdependent with endogenous variables and remain exogenous. Both endogenous and exogenous variables may be dependent on, if they are not interdependent with, fixed or excluded variables—if they are dependent on the fixed variable, which is usually the case or there would be little reason for fixing the fixed variables, the discipline is constrained by the fixed levels of the excluded variables. A discipline handles the dependence of its endogenous variables on fixed excluded variables by recognizing the constraints this places on it. In economics, this is done implicitly with the phrases "other things being equal" or "ceteris paribus." In other cases, economists make explicit statements about what is excluded such as "given the state of the arts" or "given no changes in ownership of income earning property." Even if the endogenous variables of a discipline depend on excluded but uncontrolled variables, the influences of such variables can be ignored in theory and "averaged out" in empirical work using statistical techniques that presume the uncontrolled variables vary at random with respect to the discipline's included variables and over a range small enough to generate "well-behaved probability distributions" both small enough and stable enough to be tolerated *for purposes at hand.*

What is written above applies to all disciplines and is consistent with the above quotation from Knight. If economics differs from other disciplines in the above respect, the differences are mainly in the very large number of interdependent endogenous variables that economics attempts to handle in its mainstream, determinate, equilibrium system. Its endogenous variables include exchange values and the quantities of goods and services produced, consumed, and used for further production. Every chapter in this book is concerned with the neglect of the interdependency of different kinds of knowledge. This becomes more understandable when we explicitly recognize:

1. the distinction between pragmatic, on one hand, and logical positivistic or normativistic orientations, on the other, and
2. that the question of neglected dependency should be focused on the interdependencies between the endogenous and fixed variables of determinate mainstream economics including especially those that fix the underlying utility functions of all decision makers in the system.

If a discipline such as economics attempts to fix a variable that is interdependent with one of its endogenous variables, the endogeneity of the endogenous variable is compromised. If we accept the apparent pragmatic

interrelatedness of our perceptions of all phenomena, it is difficult to argue in principle that there are any variables to fix that are not in some small degree interdependent with its endogenous variables. Thus, all academic disciplines appear to the pragmatist to be generically guilty, in some degree at least, of fixing variables that are interdependent with their endogenous variables. Yet despite this, the basic academic disciplines have developed, maintained themselves, and do make enough contributions to academia's stock of knowledge to earn them support from their members and from society at large. This is consistent with the quotation from Knight. It is also a *pragmatic way* of handling the *constraints of pragmatism*!

Samuels's paper places great stress on the danger encountered when economists ignore process and mishandle interdependencies between endogenous and excluded variables. This danger will be considered further below under Question III preliminary to discussing the contribution mainstream, determinate economics can make to the multidisciplinary problem-solving and subject-matter (issue-oriented) work of agricultural economists. The danger depends on whether disciplinary (both basic and applied) or multidisciplinary problem-solving and issue-oriented work is being done. These three kinds of work are very different. Agricultural economists use mainstream, determinate economics in doing all three. Our task here is to help agricultural economists and indeed all personnel in the practical multidisciplinary (often professional) units of academia better understand the dangers stressed by Samuels and what they can do to avoid those dangers so as to improve their practical multidisciplinary problem-solving and issue-oriented work.

The above is rather abstract. In order to make it more concrete, I will deal with my concrete experiences in teaching a disciplinary, graduate-level, production economics course. Over a forty-year period, I developed a syllabus containing the introductory material reprinted below. Clearly, what I taught was "mainstream, determinate economics." By comparison, the dynamic production economics I also taught (both separate from and as part of farm management) went somewhat beyond the narrow mainstream to provide some broader more adequate support for multidisciplinary work in subareas of agricultural economics such as farm management, agricultural policy, and agricultural and rural development.

My static production economics syllabus started with assignments pertaining to classification:

> Classification and controls—Knight [1946]: *Risk, Uncertainty and Profit*, 205-08; Samuelson [1948]: *Foundations of Economic Analysis*, 311-17; Hicks [1939]: *Value and Capital*, Chapter IX; Marshall [1946]: *Principles of Economics*, 8th ed., 33-38.
>
> 1. Static vs. dynamic market economics
> 2. Three categories of variables—studied, fixed, and random

$$\underbrace{Y_j = f(X_1, \ldots, X_d}_{\text{studied}} \mid \underbrace{X_{d+1}, \ldots X_n)}_{\text{fixed}} + u \text{ where } u = g(\underbrace{X_{n+1}, \ldots, X_r}_{\text{random}})$$

$$j = 1, \ldots, m \qquad \textit{and} \qquad i = 1, \ldots r$$

Then the syllabus stated:

Assumptions of Static Economics—specification of the fixed variables, the elimination of random variables. The term static economic theory has a variety of meanings. Hence, when one tries to outline the assumptions underlying static economics, a rather specific definition of static economics is required. The theory usually considered when the word static is used is a theory of a given number of exact relationships among the same given number of . . . variables. An exact relationship, as used herein, is one [that] has a standard deviation of zero. In a theory of exact static relationships, the magnitudes of certain variables can and are permitted to change as the theory is used to explain changes which occur when the value of one or of a set of "fixed" variables is changed which leads to "comparative statics."

Because of Pareto's question about the interpersonal validity of welfare measures, additional assumptions are made to eliminate Pareto non-optimal changes. These result in what might be called "static market economics" which is the usual form of static economics studied.

What, then, are the assumptions which can be made to secure static equilibrium theory in its usual form? The assumptions fall into three categories: (1) those which make the system static with respect to (a) production functions, (b) consumption functions, (c) institutions; (2) those which eliminate random elements; and, (3) those concerning motivations. Elimination of Pareto non-optimal change is attained with several assumptions in different parts of the classification.

1. Those which make the system static—
   a. Assumptions which fix the production functions of the economy:
      (1) The state of the arts is assumed constant, i.e., the total production of any given set of production factors remains fixed.
   b. Assumptions which fix the utility functions of the economy:
      (1) Tastes, habits, customs (i.e., everything affecting utility functions) are assumed fixed.
      (2) The ownership pattern for resources and, hence, the equilibrium distribution of private real incomes is assumed fixed.
      (3) Population is assumed constant.
      (4) Utility functions are independent among people, i.e., jealousy and "copying" of tastes and value systems are absent.
   c. Assumptions which specify the institutional setup of the economy:
      (1) Government is assumed fixed.
      (2) It is assumed that goods and services are sold in a market where both producing and consuming individuals and groups can make their choices free of force or coercion but with consumers subject, however, to limitations imposed by their real incomes and the socio-politico covenants in which they exist.
      (3) Non-firm and non-household groups are assumed fixed.

2. Those which eliminate random elements—
   a. It is assumed that persons and groups making up the economy possess perfect knowledge. This assumption implies perfect foresight.
   b. It is assumed that the persons and groups making up the economy are rational.
3. Those concerning motivations—
   a. Consumer units (or households) are assumed to be motivated to maximize the satisfactions [utilities] derivable from their incomes.
   b. Producer units (or firms) are assumed to be motivated to maximize money profits.

The syllabus noted that the above assumptions did not limit the course to either perfect competition or to analysis of continuous functions. As part of the preliminaries to the course, it was stressed that static production and consumption economics were interdependent parts of an overall equilibrium system but that the course stressed the production side of the system. Students were told that static production and consumption economics were abstractly the same except for the difference between the cardinality of production versus the ordinality and interpersonal validity questions about utility on the consumption side. Further, students were told in more recent years that the above assumptions plus the law of variable proportions with respect to both production and utility were so "rigged" implicitly as to guarantee the existence (in theory if not in the real world) of a stable equilibrium or what Samuels terms "a determinate solution" for the total system involving both production and consumption. The prerequisite conditions for the existence of a determinate equilibrium solution, under the above assumptions, were stated in the syllabus to be:

- The existence of a normative common denominator among all "goods and bads."
- Interpersonal validity and cardinality of the common denominator if non-Pareto optimal solutions were to be sought.
- The second order conditions required for the existence of a maximum.
- An agreed-upon decision rule.

The assumptions of the course were from Knight (1946) updated to acknowledge John Hicks's (1939) introduction of Pareto-optimality into the mainstream. Following Frank Knight's own classroom procedure, I required each student to write out a description in his or her own words of the basic body of determinate economic theory taught in the course. Also following Knight (1946), two hours of class time were devoted at the end of the course to a participatory exercise in which students generated two lists of "what can" and "what cannot be done" using a theory based on the assumptions stated at the beginning of the term. In constructing these lists, students were asked to presume a pareto-optimal consumption theory paralleling the production economics taught in the course so that they could envision a total determinate equilibrium system. This exercise helped students see the costs

paid for the benefits derivable from the assumptions of the determinate economic theory taught in the course. Because the course also dealt with use of static determinate production economics in doing practical problem-solving and issue-oriented as well as basic and applied agricultural economics work, I believe that the costs and benefits of making assumptions were more clearly understood than in more purely theoretical classes.

In carrying out the "can and cannot" exercise, students learned something about being constructively critical in (1) evaluating static production (and for that matter consumption and overall) economic theory and (2) relating both strengths and weaknesses of a discipline to its assumptions. Generally, students realized (1) that the assumptions can and often have to be relaxed in order to create modified versions of the theory to use in doing applied economics research and (2) that problem-solving and issue-oriented work requires relaxation of the static economic assumptions and use of other disciplines to study important dimensions of the multidisciplinary domains of practical problems and issues.

Students interested in subareas of agricultural economics (such as farm management, marketing, or policy) sometimes complained that the assumptions eliminated or made it impossible to use production economics to address problems in their areas of interest. However, no group of students ever exhausted its ability to list the "cans" and "cannots" or, in Samuels's view, the costs and benefits of the assumptions. Not all of the items the students listed were correct. Many were corrected by other students in the classroom discussions. Dubious items sometimes went unchallenged. Others remained points of dispute. But learning about the limitations of determinate economic theory did take place.

Students interested in doing basic and applied economics seemed more satisfied with the determinate economic theory and its assumptions than were those interested in multidisciplinary problems and issues that do not confine themselves to static economics. The students (as does Samuels) generally saw important uses for mainstream, determinate economic theory despite its inadequacies for addressing the multidisciplinary problems and issues of concern to them as agricultural economists.

In answer to the question posed at the beginning of this subsection, basic academic disciplines specialize in generating a specific body of knowledge. This specialization permits an important division of labor in academia. The advantages of specialization are procured at a cost. One of the costs is that no discipline including economics is capable of handling all dimensions of the problems and issues addressed in a broad practical multidisciplinary subject such as agricultural economics and in even broader areas such as farm management and agricultural policy.

II. Would it be possible and feasible to create a single superdiscipline capable of dealing with all the processes and interdependencies among all the kinds of knowledge needed to address all of the problems and issues of the practical world?

This question is suggested by Samuels's paper and by my own experience. Posing the question here should not be interpreted as indicating that Samuels advocates creation of such a discipline. With such a discipline, we would not have to worry about the assumptions, classifications, and controls that fragment academia's knowledge into specialized disciplines at the high cost of failing to acquire needed knowledge about interdependencies between the kinds of knowledge generated by different disciplines. When concerned with a practical problem or issue, such a superdiscipline would provide the theory, techniques, and empirical knowledge and understanding of processes needed to "work out" an answer. Reductionist logical positivism would no longer be needed by the sciences. Similarly, various forms of normativism would no longer be needed by the humanities. The social sciences would no longer be bothered by their ambivalence between positivism and normativism. The division between disciplinarianism and the practical world would lose its meaning. Pragmatism would reign supreme over interdependent knowledge of the value and value-free dimensions of the world and the processes of defining and solving practical problems. This is a wonderful vision far different from our specialized fragmented basic disciplines of academia that seem painfully isolated from the practical professional units of academia such as colleges of agriculture, business administration, medicine, engineering, education, and the like. The isolation between the basic academic disciplines and the public and/or private problem solvers and issue resolvers outside of academia is even wider.

In the remainder of this section, three efforts to at least start the processes of developing a superdiscipline are examined—in my lifetime, I was very close to two of them and think I understand the third.

In *Social Science Agricultural Agendas and Strategies* (Johnson et al. 1991, II-7), I wrote:

> It seems fair and accurate to assert that an identify crisis developed for home economists in the 1960s and 1970s. Cooking, homemaking, family, child rearing, and clothing appeared mundane and not very satisfying academically. Some home economists sought a new identity and found it in what they called "human ecology" which , while extremely multidisciplinary, seemed to some to be more academic [than home economics]. The transformation of home economics into human ecology is dealt with . . . by Bubolz and Sontag.

Bubolz and Sontag (Johnson et al. 1991, II-44) wrote as follows:

> During the 1960s, the concept of human ecology reemerged as a unifying philosophical perspective for home economics. Many home economics units in public and private educational institutions throughout the United States have incorporated a human ecological perspective, and a growing number have changed their name to human ecology . . .
>
> Recently, integration of the concepts, theories, education, and practice in the several disciplines within home economics has surfaced as a critical need

> and issue in order to address effectively the practical problems of families . . . Given the history, present status, and anticipated future development, [they focused] on integration within home economics as it continues to evolve as a unified field into human ecology. It is recognized that human ecology is a very broad, comprehensive perspective that can incorporate the relationships of humans to all of their environments from the micro to the macro level. The conception of human ecology as it is evolving from home economics is a necessary part of this holistic perspective. To avoid redundancy, we will hereafter refer only to human ecology. Some of the ideas may be particular only to human ecology as it is evolving from home economics, but many of them have application to human ecology in its totality.

Bubolz and Sontag (Johnson et al. 1991, II-45) note:

> The verb "to integrate" is derived from the Latin verb "integrare" which means to make whole. Several dictionaries define integration as (a) a process of making into a whole by bringing all parts together, (b) a combination and coordination of separate and diverse elements or units into a more complex and harmonious whole, and (c) a unification and mutual adjustment of diverse groups or elements into a relatively coordinated and harmonious whole . . . integration means that we view phenomena holistically as a complex system of interdependent parts, bounded through coordinated interaction and functional relationships [i.e., what Samuels, King, and Petit call processes].

To my knowledge, human ecology has not yet succeeded in making itself into a "near super" discipline.

The *second* attempt to create a super discipline involved farm management (FM). Workers in this area also contemplated developing an all-inclusive FM theory containing theories from all academic disciplines that might be required to address any specific problem or issue faced by farm managers. This aspiration was overwhelmed by the immensity of the task. Initial attempts became so large as to reveal the futility of such efforts.

So far, the attempted interdisciplinary integrations of farm management and human ecology have not produced a theory general enough to have been utilized by workers interested in solving the multidisciplinary business and/or home problems of farm people.

The *third* attempt was probably an outgrowth of the pragmatic emphasis on problem solving and on the interdependency of knowledge. The International Encyclopedia of Unified Science was established in 1938. Despite a valiant attempt, this effort did not unify the disciplinary sciences of academia.

Colleges of education have been greatly influenced by John Dewey's (1920, 1938) pragmatism and have stressed, consequently, problem solving processes while down-playing disciplinary knowledge. This has created conflict between colleges of education and the basic disciplines of academia. Pragmatic educationists have not won the battle by far. A related development has to do with Marxist dialectical materialism which is related to the efforts of Marxist governments to bend the disciplinarians of universities in

communist states to do problem-solving and issue-oriented research for the party or state. Despite this pressure, Marxist universities maintained many basic disciplines and the advantages of disciplinary specialization. Similarly, the dialecticism of pragmatism did not permit U.S. colleges of education to dominate the disciplines of U.S. academia much as the dialecticism of Marxism failed to establish the dominance of socialist states over the division of labor among the basic disciplines in Marxist universities.

A super, pragmatically oriented discipline sensitive to dialectic processes does not seem to be feasible. Even if possible, the cost of establishing such a discipline seem to exceed the benefits derivable from it. Yet, as Samuels has pointed out, there are also costs as well as benefits to be considered in establishing the assumptions and controls that define, facilitate, and constrain a discipline such as economics. He has stressed the costs of neglecting processes and interdependencies. The next section will examine how well the discipline of economics handles different kinds of interdependencies and processes of concern to agricultural economists.

III. What kinds of processes and interdependencies are included and what kinds are neglected by mainstream, determinate economics?

To my knowledge, no one argues that the theory of mainstream, determinate economics informs us very well about the processes whereby the actors in an economy move into the general equilibrium defined in the theory. A very recent effort to remedy this deficiency is T. W. Schultz's (1990) book entitled *Restoring Economic Equilibrium.*

Samuels is rightly concerned that use of the determinate mainstream economic theory may foreclose (by benign neglect) consideration of the processes whereby a market mechanism tends to move toward an equilibrium and whereby that equilibrium itself changes. Such foreclosure constrains the practical problem-solving and subject-matter or issue-oriented work of agricultural economists. I share his concern which is not confined to economics. Throughout academia, persons attaching value to serving society have such concerns about almost every basic discipline (see Maxwell 1992).

Samuels's paper stresses the importance of neglected interdependencies among variables. He expresses the fear that mainstream, determinate economies pays too much for the benefits it obtains when it fixes variables that change interdependently with its own endogenous variables. He expresses a special major concern about interdependencies in values that change in the processes of solving problems and resolving issues. In this connection, he is concerned mainly about exchange values but is not specific about intrinsic values.

It should be noted that the equilibrium prices and nonmonetary exchange ratios and quantities of goods and services produced, consumed, and used for further production are all perceived to be interdependent in the equilibrium of determinate economic theory. It should also be noted that all of these values are exchange or extrinsic values. Even though the theo-

retical structure ignores the processes whereby an equilibrium is reached, the beauty, strength, and, in large part, the demonstrated usefulness of mainstream, determinate economics rest on the interdependency of all of its endogenous equilibrium exchange values, levels of use for both products and inputs, and levels of output. These interdependencies are not neglected. Perhaps no other discipline attempts to handle so many interdependent variables. Yet, Samuels's stress on the neglect of interdependencies by mainstream, determinate economics is not misplaced. It is the interdependencies between the endogenous variable of economics and its fixed variables that are often endogenous in disciplines such as sociology and political science that concern Samuels when he contemplates the processes whereby analysts, decision makers, and concerned persons "work out" solutions to practical problems of the kind addressed by many agricultural economists.

Although the neglect of process in mainstream economics can be partially offset by the practice of comparative statics, partial equilibrium, and recursive simulation analyses, the neglect still constrains the problem-solving and issue-resolving work of agricultural economists. Use of these procedures, we will see later, only partly overcomes the neglect of processes that often characterize use of mainstream, determinate economic theory. This neglect constrains, in turn, agricultural economists using that theory to address practical multidisciplinary problems and issues.

Econometricians have gone to great lengths to deal with simultaneity in subparts of general equilibrium systems. They classify variables as exogenous, endogenous, and random. They then select (generally from mainstream, determinate economic theory) a set of structural relationships most of which involve more than one endogenous variable or what they call simultaneity or what Samuels terms interdependency. Such interdependency or simultaneity violates common assumptions underlying statistical techniques for estimating the parameters of the structural relationships. Stimulated by questions raised by an agricultural economist, Elmer Working (1927), econometricians used linear algebra to investigate the "rank and order" conditions necessary for *first* solving sets of simultaneous "structural" relationships involving two or more interdependent endogenous variables to obtain sets of "reduced form" equations whose parameters can be validly ascertained from data using techniques from statistics as an ancillary discipline of economics. Econometricians also investigated, again with linear algebra, the rank and order conditions required to convert sets of parameters estimated for reduced form equations back into estimates of the parameters of the simultaneous "structural equations" from mainstream, determinate economics. Systems fully satisfying the rank and order conditions for reconversion are treated as "just identified" while others are treated as "under identified" (indeterminate) and still others as "overidentified" or "ambiguous." In practice, the prevalence of interdependencies among variables that concerns Samuels requires practicing econometricians to commit at least some perjury in order to attain a "just identified" set of structural equations.

Econometricians have been known to "commit perjury" by ignoring interdependencies between exogenous and endogenous variables thereby attaining spurious identification of their systems of equations. Less precise users of determinate mainstream economic theory often, as Samuels charges, do the same thing without worrying about mathematical rank-and-order conditions.

IV. How is basic disciplinary mainstream, determinate economic research important for the work of agricultural economists?

Some of the work expected of agricultural economists is simply applied mainstream, determinate economics. Without further improvements, applications of mainstream equilibrium economics permit agricultural economists to do price analyses, supply and demand analyses, investment analyses, spatial analyses, comparative static analyses, linear programming—the list continues far beyond establishing an important useful place for applications of mainstream, determinate economics in agricultural economics.

There are also important contributions to the work of agricultural economists that result from efforts to overcome the deficiencies of mainstream, determinate economics. Theories of human capital formation, induced technical change and induced institutional change represent improvements in mainstream, determinate theory obtained by relaxing assumptions about fixed populations and skills, technology, and institutions.

Swedberg (1991) has complained that economists have become imperialistic and are invading the turf of sociologists by investigating institutional and human changes as well as at least part of the social consequences of changes in agricultural technology. Baquet's chapter 4 in this book deals with a line of improvements made by agricultural economists in determinate economic theory that has increased our understanding of supply responses for farm products, changes in demands for factors of farm production, changes in earnings of farmers, and cash flow and bankruptcy problems of farmers. The usefulness of such extensions and improvements in mainstream equilibrium or determinate economic theory indicates that there is ample justification for agricultural economists to do basic disciplinary economic research to remedy the many deficiencies of mainstream, determinate economics that constrain the usefulness of economics in the field of agricultural economics.

Improvements in the techniques as well as in the theory of mainstream, determinate economics have also increased the usefulness of its applications in agricultural economics. A moment's reflection on the benefits of simultaneous equations, linear programming, quadratic programming, distributed lags, systems simulation, recursive linear programming, and other techniques is sufficient to make the point. Also, major improvements in capacity to store, process, and retrieve data have facilitated applications of determinate mainstream economics.

Mainstream, determinate theory was faulted above in discussing the Question III for fixing variables that are interdependent with the endogenous variables of economics and for ignoring interdependencies between exogenous and endogenous variables. The usefulness of mainstream, determinate theory, despite the indisputable truth of such criticisms, indicates that there are many instances in which these criticisms can be advantageously overlooked. Probably all other academic disciplines can be similarly criticized yet they, too, prove useful when applied in connection with efforts to address multidisciplinary problems and issues addressed in colleges and institutes of agriculture, medicine, engineering, business administration, development, education, and the like.

It should not be forgotten that basic disciplines such as economics derive much strength from being specialized and narrow. This includes economics though it is broader than many other disciplines. When agricultural economists engage in team activities to solve a problem or resolve an issue, they must recognize that the relevant disciplinary or applied disciplinary economics efforts they make will typically be only partial contributions to the team activity. Such activities must bring together contributions from several disciplines, evaluate the strengths and weaknesses of these contributions, and then get on with the process of working out (in cooperation with decision makers and affected persons) a solution to the problem or a resolution of the issue at hand. This brings us to the next question which leaves the specialized realm of disciplinary research (both basic and applied) and moves towards the multidisciplinary problem-solving and subject-matter (issue-oriented) work of agricultural economists.

V. How do basic and applied mainstream economics serve agricultural economists working on multidisciplinary problems and subjects?

As members of an area of study usually located in a college of agriculture, agricultural economists are expected to and do participate in efforts to address practical problems and issues. These problems and issues are typically multidisciplinary with differing domains that involve different combinations of disciplines. It is fortunate that they typically do not involve all disciplines. It is also fortunate that only parts of the different disciplines important for the problem or issue are involved. This spares those addressing a problem or issue the task of putting together contributions from all basic disciples into an analyses of the problem or issue, an enormous task declared in response to Question II above to be infeasible and virtually impossible.

When a problem or issue is addressed, the specific dimensions of its domain govern the multidisciplinarity of the investigation. Knowledge from a single discipline (basic or applied) is seldom central—instead, it is usually merely contributory. Those with responsibility for solving a problem or resolving an issue tend to view disciplinarians as potential consultants or advisors. Disciplinary knowledge becomes something to put in a

multidisciplinary information retrieval system. Disciplines and their knowledge become inputs to be used if, when, and as needed. Until disciplinarians learn to suppress their disciplinary chauvinism, they are poorly qualified to administer problem-solving and issue-oriented investigations or to be decision makers (Johnson 1986; chaps. 14, 15, and 16). Disciplinarians and applied disciplinary knowledge by themselves typically cannot solve a problem or resolve an issue because of their specialized natures and because disciplines (as Samuels so forcefully pointed out in chapter 8) neglect interdependencies among the kinds of knowledge generated in different disciplines that are crucial in addressing the problem or issue at hand.

Samuels also pointed out in agreement with Petit and King that understanding the interdependencies among disciplines that are neglected by mainstream economics becomes important in processes whereby researchers, decision makers, and affected persons and groups "work out" solutions. Samuels's criticisms of mainstream, determinate economics can and apparently have to be at least partially disregarded by disciplinarians if the advantages of interdisciplinary division of labor in academia are to be maintained; however, those facing multidisciplinary practical problems and issues are engaged in an exercise in which disciplinary deficiencies and interdisciplinary dependencies are important and relevant for the problem and issue at hand. Such interdisciplinary dependencies must be addressed as part of the process of working out solutions or resolutions.

My lifetime's experience indicates that within agricultural economics, farm management, agribusiness, marketing, development, policy, farm credit, and resource sustainability personnel concerned with practical problems and issues do know the importance for their work of (1) processes, (2) disciplines other than economics, and (3) iterative interaction among investigators, decision makers, and concerned persons and groups. I also find such personnel to be more critical of mainstream, determinate economics than those who view agricultural economics as "applied economics" or "economics applied to agriculture." Agricultural economists addressing problems and issues are "applied economists" but they are more than that because they also participate in processes that use economics along with other disciplines to address agricultural problems and issues.

The size of time and resource budgets for addressing problems and issues often depend on the practical importance of the problem and issues. Large important problems and issues justify large problem-solving budgets and vice versa. My experience indicates that even for large important problems, the role of economics may be small relative to what "turf-conscious," mainstream, determinate disciplinary economists may perceive it to be. Further, the process often requires contributions from more dynamic less conventional forms of economics involving imperfect knowledge of, among other subjects, technical, institutional, human and resource changes. Making such contributions requires relaxation of common ceteris paribus assumptions about such driving forces and attention to the interdependencies among kinds of knowledge generated by different specialized basic aca-

demic disciplines all of which may disregard interdependencies important for the problem or issue at hand.

Samuels's critical conclusions about the costs of ignoring processes and interdependencies when "working out" solutions are much more relevant for the problem-solving and subject-matter or issue-resolving work than for the relevant disciplinary and applied economics work of agricultural economists. In the former case, it is essential to adjust to Samuels's critical conclusions; in the later, Samuels's conclusions are intellectually convincing even though the discipline of economics (and all other basic disciplines) probably remains viable and operational in academia and a contributor to the work of agricultural economists precisely because it is able to ignore partially such criticisms while getting on with its specialized work in its own part of the academic turf.

In chapter 2, King was concerned with managerial processes. In chapter 3, I recounted personal experiences, reviewed the experiences of others, and presented some of my own writings on managerial processes. Experiences with sequential budgeting, scenario analysis, recursive programming, transportation modeling, recursive simultaneous equations, systems analysis, general systems simulation analyses, and developments of managerial theory assuming imperfect knowledge all reveal the crucial importance of processes and iterative interaction in farm management. Experiences of farm management workers also indicated the importance of iterating and involving decision makers and affected persons and groups in the process (in a participatory or interactive manner) because they are sources of information concerning (1) the interdependencies among variables from different disciplines and (2) variables and relationships not yet included in disciplines. The knowledge that originates in and is organized in iterative interaction helps establish the preconditions for optimizing listed above in the discussion of Question I. Those conditions are typically not well enough established to yield "determinate solutions"—this agrees with and strongly supports Samuels's important conclusions.

What is written above with respect to farm management could almost be rewritten to apply to the multidisciplinary problem-solving and subject-matter (issue-oriented) work of agricultural economists in the policy area. Perhaps solutions are even less determinate in policy than in farm management because public policy decisions and choices are often made to attain redistributive objectives somewhat less likely to take place as a result of the private decisions and choices. If this is the case, iterative interaction between analysts, decision makers, and affected persons and groups is probably even more important in the "processes" of "working out" solutions than for FM work (though it is also crucially important for the latter) in establishing (1) the interpersonal validity and cardinality of a common denominator among benefits conferred on some at the expense of imposing damages on others and (2) agreed on decision rules to be used in the processes of working out a decision or choice.

In my own experience, I have been struck with both how useful and limited determinate mainstream economics is in problem-solving and issue-oriented efforts. The general systems simulation models of agricultural sectors with which I have been associated have included input/output, linear programming, and econometric supply and demand components from mainstream, determinate economics put together iteratively and interactively with those planning to use the analysis in making practical decisions and choices. Iteration in creating models has proven essential. In some instances, models have included human as well as "machine" components to allow interaction in their use as well as in their construction. This permits problem-solving models to be operated as well as built interactively and helps maintain processes. Such dual iterative interaction can be formal as well as informal parts of small simple as well as of large complex studies, and can be parts of paper and pencil projections and scenario analyses as well as of highly computerized simulation models. All of these forms of iterative interaction have had great usefulness, in my experience, when addressing practical problems and issues at farm, agribusiness, national, and international levels.

Samuels's paper correctly points out that the difference between doing mainstream, determinate economic analysis, on one hand, and taking processes and interdependencies into account, on the other, does not involve more rigor in the former than in the latter. I emphatically agree and would like to extend his conclusion by considering what constitutes rigor with respect to disciplinary vs. multidisciplinary problem-solving and subject-matter or issue-oriented work. What constitutes rigor depends on what is being sought. When the object is to generate basic disciplinary knowledge, rigor can be regarded as disciplined careful efforts to improve the theoretical and empirical knowledge and techniques of an unambiguously defined discipline. Rigor can also characterize the pursuit of knowledge of solutions for practical multidisciplinary problems and the pursuit of knowledge of resolutions to multidisciplinary issues. It has been my experience that multidisciplinary problem-solving and issue-resulting work is often appraised using standards more appropriate for disciplinary work; a consequence of which is that problem-solving and issue-oriented work are often foolishly denigrated as lacking rigor and disciplinary excellence however successful and excellent it has been in addressing problems and issues and despite objectivity and care exercised in carrying it out.

VI. How do the chauvinistic turf problems that exist among the basic disciplines of academia affect the multidisciplinary problem-solving and issue- or subject-matter-oriented work of agricultural economists?

When agricultural economists do problem-solving and issue-oriented work, they draw on the basic disciplines to obtain as much information as feasible in handling the domain of the problem or issue at hand. All disciplines have their strengths and shortcomings such as those of economics that

were stressed by Samuels. These strengths and weaknesses depend on how the discipline is defined and the nature of the problem or issue being addressed. Problem solvers and issue resolvers engage in a process of filling in information gaps between disciplines and in overcoming some of the disciplinary deficiencies including the neglect of interdependencies between disciplines important for the problem or issue at hand. Thus, how academic turf is divided up among the disciplines is of less consequence to problem solvers and issue resolvers than it is to disciplinarians. Whether disciplinary economists mishandle interdependencies between economics and political science or political scientists mishandle those same interdependencies makes little difference to problem solvers and issue resolvers. They still have to participate in the difficult multidisciplinary task of "working out" a solution or resolution that takes appropriate account of the neglected interdependencies. Doing such work presumes, of course, that the problem or issue at hand is important enough to require handling given the budget of resources required in "working out" its solution or resolution.

PHILOSOPHIC CONCLUSIONS

Warren Samuels's paper with its emphases on processes, interdependencies, practical problems, and concern about the boundaries and deficiencies of economics is highly *pragmatic* (Johnson 1986; chaps. 3, 6, 9, and 17). Samuels's pragmatic views are in accord with those of J. R. Commons's (1934) institutionalism that developed at Wisconsin.

Logical positivism (Keynes 1963, Robbins 1949, Friedman 1953, and Johnson 1975) is another philosophic orientation that has played an important role in economics (Johnson 1986; chaps. 3, 4, 7, and 17). It has and still does provide philosophic orientation for a considerable part of mainstream determinate disciplinary economics and it continues to guide the work of most physical and biological scientists even if it is being subjected to increasing criticism from philosophers and from leading intellects among biological and physical scientists.

In economics, various forms of normativism, including especially the many variants of utilitarianism (Marshall 1946, Hicks 1939, Arrow 1951), have provided economics with philosophic underpinning (Johnson 1986; chaps. 3, 5, 8, and 17). Since Marshall, logical positivism and utilitarianism have tended to provide joint philosophic underpinning for economics unless overcome by pragmatism. Elsewhere I have traced out the historical impacts of pragmatism on agricultural economics (Johnson 1992, 971–1037).

As a discipline concerned with optimizing behavior and with the definition and location of optima, economics has difficulty being either *just* logically positivistic or *only* normativistic. If economics is to define and locate optima, it requires both the value-free knowledge obtainable with a logically positivistic approach and the knowledge of values obtainable with a normative approach; this implies either (1) both a logically positivistic and a

normativistic orientation or (2) a pragmatic orientation that treats value-free and value knowledge is interdependent. Pragmatists argue that neither logical positivism nor forms of pure normativism are acceptable.

The possibility of objectively investigating values arose in Part I of the book that deals with farm management. It also arose in Part III that deals with policy. As a result, chapter 3 in part I and chapter 7 in part III republish and discuss some of my eclectic writings on the possibility of objectively investigating values. Generally, it is helpful in considering this question to distinguish between intrinsic and extrinsic values and between prescriptions and values. It is also useful to keep in mind the social and cultural nature of all knowledge and (1) human fallibility in interpreting impressions of "reality" via our five senses and (2) difficulties encountered in proving systems of theory to be true logically entirely within themselves. Whether our descriptive perceptions of reality pertain to value, value-free, or pragmatically interdependent characteristics of reality, they are not beyond question. Such perceptions are cultural consequences of our past and are likely to change as our societies and cultures change through time—for instance, much of the chemistry I learned in the 1930s and many of the normative racial perceptions generally held at that time are not accepted as descriptively true today. My book, *Research Methodology for Economists—Philosophy and Practice* (Johnson 1986) applies the above arguments in a more fundamental manner than in the materials quoted in chapters 3 and 7.

A Digression on Values and Objectivity

In chapter 6, Petit states that I assert "in the field of values . . . , knowledge can be objective," and in an earlier version of his chapter 8, Samuels refers to my belief "that values have a real objective existence in the natural world." Both statements seem to me to carry me beyond my willingness to consider such possibilities and my rejection of constraints on consideration of such possibilities. My openness in considering such possibilities and my rejection of such constraints does not convert possibilities into complete acceptance of what I regard as only possibly true. The question of objective knowledge of values arose in chapter 2 by King and chapter 6 by Petit as well as in connection with chapter 8 by Samuels. Some of my writings on the possibility of objective knowledge of values and of objectivity in doing descriptive research on values were presented in chapter 3 that relates to King's chapter 2 and in my chapter 7 that relates to Petit's chapter 6. A reviewer and constructive critic of my chapters, David Schweikhardt, has suggested that I need to respond to the Petit/Samuels statements in a more fundamental way than I did in chapter 7 and, for that matter, in chapter 3.

Rudolf Carnap developed a useful diagram pertaining to the truth and falsity of scientific statements. His diagram focuses mainly on the statements generated in the more reductionist and positivistic physical and biologic sciences. However, other contributions from other prominent philosophers make it possible to use his diagram in interpreting statements pertaining to

values and prescriptions. In the pages that follow, I digress to republish excerpts from my book on research methodology for economists (Johnson 1986, 43–50):

> [According to Carnap, three] kinds of statements can be made in an "interpreted first-order language" based on standard logic. By "interpreted" we mean a language in which abstract symbols are treated as standing for something regarded as part of the real world. The three kinds of statements are (1) logically true (tautologies), (2) contingent statements that may be true or false, and (3) logically false statements (contradictions). The job of empirical science is to distinguish true from false contingent statements on the basis of sense data and reason.
>
> Carnap (1953, 123f) has outlined the "truth" and falsity of various statements in the [preceding] simplification of his figure [figure 9.1]. All statements are divided by Carnap into true and false statements (Carnap 1953, 124). Some true statements are analytic (tautologically true), some are empirically or synthetically true, some are both. Those that are empirically but not tautologically true are contingent statements whose truth depends on experience and/or nontautological reasons. On the false side, there are those that are descriptively false as well as those that are logically false.
>
> In Carnap's truth/falsity figure, there are true analytic (tautological) statements that are purely logical and some that, though descriptive, cannot be false because of their tautological structure. Other empirical statements, however, can be descriptively false. There are also descriptive statements based on contradictory logic that are at least partially false as they contradict themselves. Finally, there are purely formal contradictory false statements.
>
> Figure [9.1] is an incomplete version of Carnap's truth/falsity figure. Carnap's original truth/falsity figure can be found in Carnap (1953). At the bottom of Figure [9.1] we see that the tautologically true statements constitute the realm of formal science and that the empirically true contingent statements constitute the realm of the factual sciences. Empirical science also deals with empirically false contingent or synthetic statements.
>
> When we interpret an abstract symbol to have descriptive meaning, we replace the abstract symbol with a term whose meaning is known from experience. Such terms are undefined or experiential and are sometimes referred to as "primitive" or "undefined." They stand for our interpretation of the existential meaning of our sense experiences with something we have "faith" is out there in "reality." Though this discussion is not unique to logical positivism, it does describe [positivistic methods].
>
> The uniqueness of logical positivism is the position that "values" are constructs of the mind, not characteristics of reality. This position precludes experience of values as characteristics of the real world. It also precludes the use of primitive undefined experiential terms in interpreting logical systems as descriptive of values as characteristics of the real world.
>
> It is important to note that despite Carnap's terminology positivistic descriptive knowledge is not regarded as knowable with certainty. It would be better, in a sense, to replace "true" under the contingent statement rubric in the Carnap figure with "warranted by empirical evidence though empirically still unproven." Ironically, though, positivism regards descriptive statements about what really has value as meaningless. Note that this does not exclude from positivistic knowledge, behavioristic knowledge about the values

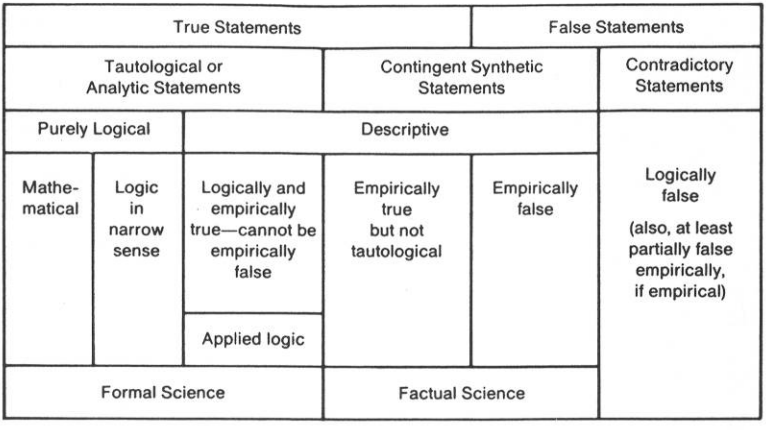

FIGURE [9.1]. An adaptation of Carnap's truth/falsity diagram.

people attach to different conditions, situations, and things found in the natural objective world. By accepting the truth of such limited propositions about values, equally limited prescriptive conclusions can be reached about "what ought to be done."

Such conclusions provide the basis for (1) a positive ethics that concerned Moritz Schlick [1939], (2) a positivistic jurisprudence in law, and (3) what we refer to in chapter 7 as conditional normativism. In positivism, propositions about values based on observed behavior are to be regarded as descriptively true in the sense of truthfully asserting that someone holds those values, but not as true in the sense of describing characteristics of the real world or of expressing something intersubjectively knowable.

Much of the theory of economics is tautologically true and, as such, is part of formal economic science. However, there is much theory and empirical substance in economics that takes the form of empirically testable contingent statements. This portion of economics constitutes factual economic science. It has to do with questions about the numerical values of parameters whose values are not established tautologically in theory. It also has to do with nontautological implications of the tautologies in theory, as when conclusions tautologically true under the conditions assumed in a theory are extended to situations in which the assumptions are questionable. Economists, whether builders of axiomatic systems as part of formal economic science or constructors and empirical investigators of contingent statements, have much to learn about what they do from a careful study of Carnap's original figure (1953).

Three criteria are commonly used in testing the truth of contingent statements. A statement can be disconfirmed by applying *the test of correspondence*. This test can be applied to a contingent or synthetic statement by comparing it with another statement based on sensory perceptions not used in developing the statement being tested. On deeper reflection, it is evident that we cannot compare a proposition or statement directly with reality to see if there is correspondence. All we can do is use additional observations based on additional experiences to develop an independent proposition or statement

about reality to use in testing the proposition being questioned. We cannot do otherwise as it is impossible to put reality into our minds to compare with the proposition being evaluated.

All we can do is experience more of reality through one or more of our five senses, then construct a new proposition on the basis of these experiences that we can compare in our minds with the proposition being tested. For example, in the work of econometricians and economic statisticians, degrees of freedom are observations in excess of the number required to produce a unique estimate of a particular parameter under evaluation. Such degrees of freedom provide the basis for a correspondence test of the parameter that is expressed, in turn, in terms of the statistical significance of the difference between an estimate and an alternative to it.

We also apply the test of coherence—of *logical* coherence. Using the Carnap figure, some descriptive statements can be at least partially disconfirmed as false because they are based on a logical contradiction.

The original positivistic philosophers and others regarded logical (analytical) propositions as provable entirely within a logical system; hence, it was possible, according to that view, to know whether a statement is tautologically true. This view became questionable when Gödel's [Runes 1961] work demonstrated that even a purely logical system is not entirely provable wholly within itself and, hence, logical truth depends on the truth of something outside the system of logic. Thus, even the portion of Carnap's figure labeled analytically true might be better labeled "not yet found to be a questionable tautology because of something outside the system, though coherence testing is thought to be adequate."

Another test is the test of clarity of lack of ambiguity and vagueness. This is a test for the absence of ambiguity in the propositions and concepts being tested. If a proposition or a concept has more than one meaning, it is difficult to apply the tests of coherence and correspondence. Some statements have an infinite number of meanings, others have several, some may have only two. Statements with more than one possible meaning become more difficult to test as the number of meanings increase. In economics this can be illustrated by the econometric concept of "identification" encountered in transforming estimates of the parameters of reduced-form equations into estimates of the parameters of underlying structural equations. An "over identified" system of equations allows more than one estimate of one or more parameters to satisfy the system. An "under identified" system of equations allows an infinite number of estimates of at least one parameter to satisfy the system. In either case, the system suffers from ambiguity—it is vague and, in Popper's terms [Popper 1959], not easily falsified. For a "just identified" system there is one and only one estimate for each parameter of the structural system that can be estimated from the parameters of the reduced-form system. This eliminates the ambiguity present in the other two cases.

Karl Popper's stress on falsifiability originates in part with the realization that no universal contingent statement is ever completely provable by empirical observations. It is extremely important to realize the significance of being unable to obtain complete proof of universal contingent descriptive statements. Popper's concern is with the impossibility of ever examining all possible empirical cases. Before one can prove empirically that all swans are white, one must have observed all past, present, and future swans—an obvious impossibility. In addition we, but not necessarily Popper, stress than even singular synthetic statements are not completely provable because our

only knowledge of the real world comes from our interpretations of our five sense experiences. Our interpretations can be wrong, as has been demonstrated repeatedly in the history of all sciences.

Further, there is always a *leap of faith* in making synthetic statements. This leap involves the presupposition that there is something "out there" in the real world corresponding with, for example, our interpretation of light stimuli of our retinas or of pressure stimuli of the nerve endings of our fingers. Similar statements can be made about observations based on our senses of smell, hearing, and taste. Our knowledge of the real-world meanings of our sense impressions can never be completely objective as it is always an interpretation of stimulation of our sense receptors. No matter how sophisticated our measuring equipment is, its measurements are eventually expressed in our minds as interpretations of sense impressions. In this sense, empirical science, no matter how "hard" or positivistic, is always less than completely objective.

In addition, there is always a degree of social interdependence involved in the community of scientists (or peer groups) whose agreement on interpretation is essential for the general acceptance of a factual proposition. Before an empirical term can be used in the same way by two people, they must be mutually convinced that each is experiencing the same thing and that the term refers to that experience. Two noncolorblind people can develop a mutual understanding that convinces both of them they are describing an experience with the same condition when the term red is used. Even two people—one colorblind, the other not—can both understand that the noncolorblind person can distinguish between two colors the colorblind person cannot, though the colorblind person simply cannot experience all the color differences experienced by the noncolorblind person.

The terms "validate" and "verify" are often used in connection with knowledge. To some, a statement has validity if it is the consequence of the language and presuppositions of the logical system of which it is a part (Carnap 1953)—i.e., if it is *coherent*. Similarly, a statement is verified if its consequences are in agreement with experiences with "reality"—i.e., if it *corresponds* with other propositions about "reality" based on additional experiences.

Though these sentences are crude philosophically speaking, they convey intuitive meanings of validation (passing the test of coherence) and verification (passing the test of correspondence) in much positivistic literature. Note that some "systems scientists" and econometricians invert these meanings of validation and verification. Though the resulting pair of conflicting double meanings can be troublesome, the difficulty clears up as soon as the semantic problem is identified. We note that even greater difficulty results from using the words validate and verify to imply that positivistic knowledge is provable rather than just adequately testable for the purpose at hand.

Despite the above, many practicing scientists do not explicitly recognize and acknowledge that contingent empirical statements are never absolutely proven to correspond exactly with reality. They forget that empirical knowledge is only tested enough for coherence, correspondence, and clarity to be warranted as "true enough for the purpose at hand." This characteristic of positivistic knowledge has been amplified and described here in detail in part to make us aware of the limitations of positive knowledge and, hence, more tolerant of the attempts to develop some objective knowledge of real

values as characteristics of conditions, situations, and things in the real world. . . .

The point is that positivistic knowledge is not immutable. Furthermore, it is culturally dependent, generally not completely provable, and results in part from inspiration more akin to revelation than to the process of amassing knowledge through systematic observation and analysis. Value-free positivistic knowledge is fundamentally [judgmental] in character. Sense impressions are interpreted using the theoretical constructs and logic available at the time in the scientific culture of scientists. At one time, for instance, scientists generally agreed that the earth was flat. At another time, they believed in two physics—one celestial, one terrestrial—rather than one, as they do now. Neither the observations themselves nor the logic employed in interpreting sense impression is beyond question in the positivistic sciences.

The concept of paradigm, which has gained prominence from the writings of Thomas Kuhn (1970), also challenges us to examine the limitations of scientific and, particularly, positivistic objectivity. Each discipline devises general patterns or ways of acquiring knowledge and of viewing the phenomena of concern to it. Such a "disciplinary matrix" (or paradigm), once established, persists for a substantial time, during which it structures the thinking of the people in the discipline who share it. As Kuhn used the term in his early writing (Blaug 1980, 31–32), it refers to major patterns within a discipline—for instance, the neoclassical and Keynesian patterns of thought and work within economics. In his later writings, Kuhn preferred the term "disciplinary matrix" to paradigm, and discussed more or less continuous changes in the disciplinary matrix (Blaug 1980, 30).

Paradigms or disciplinary matrices are eventually exhausted in the sense that they yield the answers they are capable of providing and are unable to answer some of the questions that continue to arise in a discipline. The frustrations experienced when an old paradigm confronts insurmountable anomalies leads to the creation of a new paradigm. Kuhn refers to the introduction of a new paradigm into a science as a scientific revolution. Here we see another way in which scientific disciplines and the knowledge they generate are time- and culture-dependent and, indeed, how disciplinary research depends fundamentally on problem-solving and subject-matter research to reveal the shortcomings of [its] paradigms.

When the above difficulties are recognized, disciplinary researchers expect that what is accepted as true today may be disproven tomorrow, as their discipline improves its logic, experiential base, and observational ability or as it responds to new challenges and struggles with old anomalies. A characteristic of positivistic and other scientific methods is that the results are always uncertain to some degree and properly regarded as not completely proven. The strengths lie not in the absence of subjectivity, avoidance of revelation and empathy, lack of metaphysical leaps of faith, or infallibility but lie, instead, in recognition of fallibility, provision for improvement, and provision of forgiveness for being wrong. This self-correcting or self-healing nature of positivistic and other scientific methods is a great strength.

Positivistic and other scientists do not vilify and scourge each other for accepting hypotheses that are later disproved, because positivistic methods and their underlying philosophy indicate that mistakes are inevitable and to be expected. This leads to the self-healing process of correction and improvement. Being incorrect is not really regarded as a sin even if regrettable. About the only sin not forgiven by scientific positivistic cultures is that of

"playing God"—asserting that one has perfect knowledge and is such an authority that one's results need not be questioned and tested by fellow scientists. This offense results in excommunication from scientific societies. Again, this stresses the subjective, basically unprovable nature of positivistic knowledge.

The positivists have difficulties including those they encounter with respect to values. The excerpts republished below are from my book on research methodology for economists (Johnson 1986, 50–52):

Positivistic scientists keep encountering arguments that they cannot avoid value [judgements]. Richard Rudner (1953), in an article entitled "The Scientist Qua Scientist Makes Value Judgements," has examined four such arguments. The first is that having a science at all involves a value judgement. The second is that all scientists use value judgements in the process of selecting the problems on which they work. The third is that every scientist as a human being is a mass of predilections and that the value predilections among them must inevitable influence all of their activities including their scientific ones. Rudner, correctly in my opinion, rejects these three arguments as irrelevant to what the scientist does as a scientist.

The fourth argument Rudner examines, however, leads him to the conclusion that scientists (positivistic or otherwise) must make value judgements *as scientists*. Because of the probabilities of being wrong and the different risks involved in accepting various uncertain empirical statements, scientists have to determine what level of evidential support is sufficient to warrant acceptance. In statistical terms, they have to specify confidence intervals for their estimates. They deal with what is an acceptable degree of confirmation "for purposes at hand" by specifying confidence intervals for parameter estimates. Such specification entails matching the cost (sacrificed value) of marginal improvements in such estimates against the value of such marginal improvements. Thus, a scientist's specifications for the test of correspondence of the acceptability of an estimate are based on values.

Rudner points out that the "scientist qua scientist" cannot avoid this by letting the director of his or her research institute or the head of the department set the specifications for the test as this is merely one step in an infinitely long regression. Once an administrative superior sets a specification to be met, the scientist still has to set his or her "own specifications" as to when she or he has met the supervisor's specifications. Regardless of how many supervisors one has, one has to develop specifications as to when the specifications of ones most immediate supervisor are met, and these specifications have to be based on the marginal *costs* and *benefits* for the scientist doing the work of getting more accuracy. Thus, argues Rudner, making value judgements is an inherent part of the work of a scientist as a scientist. Positivism, however, encounters other fundamental difficulties with knowledge about values. As we will see later, Rudner's argument constitutes an argument for pragmatism over logical positivism or, at least, for an eclecticism utilizing both pragmatism and logical positivism.

Rudner's argument is significant in part because of the positivistic assertion that there can be no objective knowledge of what "really" had value beyond behavioristic knowledge of who attaches what value to what. That assertion has had considerable impact beyond constraining the methods of

positivism. Combined with the eminence of positivism (almost as *the* philosophy of science), this assertion has led (unreasonably, it will be argued) to widespread rejection of research on real-world values as unscientific and unobjective. Partly because of this, positivism became a wedge that has for too long separated the sciences from the humanities, while exerting pressure on the decision disciplines to become narrowly behavioristic.

Nonetheless, the concept of objectivity in positivism and positivistic methods has a practical and operational significance going far beyond positivistic research on value-free propositions. . . .

Two kinds of objectivity can be distinguished—the objectivity *of propositions or concepts* and objectivity of *investigators*.

A proposition or concept can be regarded as objective in a particular context if it has been subjected to and has not failed tests of coherence, correspondence, and clarity sufficient for the purposes at hand. Following Rudner, what is "sufficient for the purposes at hand" depends on the marginal cost of getting better evidence for the statement in question. This, in turn, depends on the importance or value of the consequences of accepting and acting on a false statement or of rejecting and not acting on a true one.

A researcher or investigator can be defined as objective in a particular context if he is willing to subject his statements to the tests of coherence, correspondence, and clarity sufficient for the purposes at hand and to abide by the results. Conversely, an investigator or researcher not willing to subject his propositions and concepts to the same tests and to abide by the results can be defined as unobjective.

There are still other difficulties with positivism.

Logical positivism, which flowered in Europe between 1920 and 1940 and in the United Stated after World War II, is no longer widely accepted by philosophers, even philosophers of science, though it is still widely adhered to by scientists and many who administer research. In addition to the problems referred to above, philosophers have become concerned about the distinction between the analytic and synthetic ([Barker, S. F. 1960, 229-36]). There are also difficulties with the idea of a purely analytic truth truly independent of prior empirical knowledge. In turn, there are also philosophic difficulties with the supposed certainty of sense impressions apart from interpretive concepts. Nonetheless, scientists in their work use both theoretical concepts and sense experience, though perhaps not exactly as idealized by the logical positivists. This makes it extremely important that the student of methodology be aware of logical positivism's account of scientific method and its philosophic shortcomings.

Gödel demonstrated that no logical system is completely provable entirely within itself, thereby adding logical uncertainty as well as empirical uncertainty about the truth of synthetic knowledge. Page 392 [vol. 12] of the *International Encyclopedia of Social Sciences* indicates the importance of the limits Gödel set out formally in the early 1930s when he showed that a formal system capable of being expressed arithmetically does not preclude statements unprovable entirely within the formal system. This difficulty is important for the disciplinary scientists among economists who work on the crucial logical tautologies of concern in formal economic science.

> Besides the criticisms mentioned above, students of research methodology should be aware of the destructive arguments of Feyerabend (1978) that oppose the strict methodological views of the logical positivists. Feyerabend identifies the methods of science with logical positivism; hence, he sometimes conveys the impression of being anti-science in his book entitled *Against [Method]: An Outline of an Anarchistic Theory of Knowledge* ([1978]).
>
> Karl Popper's ideas were discussed at some length earlier in (unquoted sections) this chapter. There is some disagreement as to whether or not Popper is a positivist. His stress on falsifiability and the unprovability of positivistic knowledge makes him appear (1) as anti positivistic to those who tend to regard the positivistic knowledge of science as proven and immutable, but (2) as a mature positivist to those who understood more about the weaknesses and strengths of positivism. Either way, he does not get far beyond positivism as he offers little that is constructive about how to research values and prescriptions in an objective empirical manner. In this respect, he is positivistic. . . .

It is on pages 57–62 (Johnson 1986) that I consider the possibility of objective research on values.

> Of the normative philosophies, the ones of most interest to people concerned with economics are those that provide some help or hope, at least, of being able to do objective descriptive research on the values that conditions, situations, and things "really have." [Earlier] we saw that positivism, despite its reputation for being objective and impersonal, is culturally dependent, [judgmental], and subjective. In discussing positivism in [preceding excerpts], we noted the subjective nature of our interpretations of sense impressions, Gödel's question about the [un]provability of logical systems wholly within themselves, and the roles of faith, insight, group approval, and intuition in positivistic methods. Still further, Rudner's analysis (1953) demonstrated that value judgements are an essential part of value-free positive investigations. Recognition of these characteristics of value-free positivistic knowledge and research has an advantage. The advantage is that it then appears less ambitious to aspire to objective descriptive knowledge of "real" values. One can even aspire to combining logical positivism, normativism, and even pragmatism into an eclecticism or a synthesis that deals objectively with both values and value-free positivistic knowledge.
>
> Fortunately, considerable progress has been made toward an objective normativism. One path involves the work of G. E. Moore ([1959]) who, at the turn of the century, made substantial contributions to this end. He partially opened the door to use of the methods and techniques of positivism in investigating goodness and badness by arguing that propositions about goodness are always synthetic and never analytic.
>
> Moore believed that good and bad are not defined terms; instead, he treated them as primitive terms whose meanings are known from experience. In doing so, he implied that individuals in a group experiencing the goodness of a given condition, situation, or thing eventually learn to communicate about goodness and badness and to know and understand what is meant when the characteristic of goodness or badness is ascribed to a particular condition, situation, or thing. However, he did not regard goodness and

badness as characteristics of the natural objective world though, as will be discussed later, his reasons for not doing so are not entirely clear to me. . . .

. . . Moore rejected all attempts to define goodness, holding instead to the position that we know different goodnesses and badnesses by experiencing them rather than as a result of definitions.

Undefined value terms make it possible to proceed in a manner parallel to that of the positivist to interpret formal nondescriptive logical statements as descriptive synthetic value statements by substituting primitive value terms for the formal terms in analytical statements. These resultant interpreted statements lead in turn to contingent statements about values that can be tested by the rules of logic and by appeal to experience.

There is a parallel between what takes place in forming value perceptions and value-free positivistic perceptions. A first step in perceiving redness is to experience certain stimuli of the nerve endings in the retinas of our eyes. Similarly, a first step in perceiving the badness of a burn is to experience certain stimuli of the nerve endings of the area of our body that is burned. In the case of redness, the next step is to interpret the meaning of the stimuli of our retinas in terms of a mental formulation (or view of the world) about differences in color and the different consequences of such color differences. Similarly, in the case of the badness of a burn, the next step is to interpret the meaning of the stimuli of nerve endings in terms of a mental formulation about the different amounts and kinds of good and bad consequences of different amounts of heat applied to the skin.

Admittedly, the mental formulations are different, one being evaluative, the other not being evaluative, but both are mental and products of the mind and both require a leap of faith that there is something "out there" in "reality" to correspond to a mental formulation.

The tests of correspondence as well as coherence stressed by the positivists become applicable to contingent-value statements. As on the positive side, comprehensiveness becomes important because the more experiences with values that can be explained, the greater the coherence and the greater the degree of correspondence. Also as on the positive side, clarity is important as it is difficult to apply the tests of coherence and correspondence to ambiguous statements about values.

The above extension of Moore's position receives general support from Michael Scriven, who argued (1969, 199f) in *The Legacy of Logical Positivism* against the positivistic idea of a value-free social science. He found that the idea is an incredible gaffe originating in several mistakes. He argued, contrary to those seeking value-free social sciences, that the preferences of people not only provide a basis for concluding that value is attached to conditions, situations, and things but also a basis for factual judgements about the superiority of, say, the Salk vaccine over physical therapy for preventing infantile paralysis even for a group of people who do not know and, hence, do not hold that Salk Vaccine is good.

[The above] implies that value judgements can be as factual as judgements about the value-free positivistic nature of reality. Both, of course, have to be based on "leaps of faith" that there is something in the real world corresponding to our perceptions and our mental formulations or "views of the world" employed by interpreting the sense impressions of scientists and lay people.

The real question that has to be settled by anyone taking seriously the idea that our knowledge of values can be descriptive of characteristics of the

objective natural world is whether or not we experience the goodness and badness of such things as injustice, justice, a healthy well-developed body, the badness of a lingering death from cancer or starvation, Salk vaccine, the beauty of a colorful sunset, or the goodnesses of family and friends. If one answers this question negatively, saying instead that such goodnesses and badnesses are not experienced but are just matters of emotion and that there is no reality corresponding to such propositions and concepts, one has to remain a positivist and reject methods for deriving objective descriptive knowledge of values from experiences. If, on the other hand, one believes that we experience goodness and accepts the above-described parallel, then methods very similar to those employed by the positivists can be used to develop objective knowledge about values conceived as real.

With respect to value-free positive knowledge, it is important to recall that methods used in acquiring such knowledge involve the subjectivity of sense impressions, the necessity of interpreting sense impressions, leaps of faith from sense impressions to reality, insight, intuition, and the need for interpersonal acceptance of perceptions of reality. This leads to the position that objective descriptive knowledge about the value of conditions, situations, and things is fundamentally similar to knowledge on the value-free positivistic side, and that both value-free positivistic and value propositions are [judgmental] in nature. We also note that on both sides we have to put up with both probability distributions and the possibility of making mistakes in interpreting our sense impressions and in employing our logic. Further, it should be kept strictly in mind that we are only considering knowledge of values here and are excluding prescriptive knowledge of rightness and wrongness.

Rightness and wrongness are more complicated matters involving value-free positivistic knowledge as well as knowledge about values, not to mention (1) decision rules for deriving conclusions about rightness and wrongness from both kinds of knowledge, and (2) the conflict-resolving role of power distributions in decision rules. Self-interest and distributions of power are inherent in making decisions about rightness and wrongness in a manner not inherent in either research on value-free positivistic or value questions other than in the decisions of positivistic and value researchers as to whether their knowledge has been adequately tested (Rudner 1953). There is, of course, the problem that arises from being able to see the consequences of either value-free positivistic or value knowledge for prescriptions as to what is right. Ability to see such consequences can be a source of bias whenever positivistic or value researchers view the prescriptive consequences of objective knowledge as adverse to their own interests.

With respect to values, communities of objective scholars are no more tolerant of people who assert they have perfect knowledge of values than are the corresponding communities of positivist scholars tolerant of those who assert they have perfect value-free positivistic knowledge. To assert one has perfect knowledge is to "play God" and to risk excommunication by communities of scholars attempting to maintain objectivity whether the knowledge sought is value-free or about values. On both sides, the objectivity of researchers can be understood to be a willingness on their part to subject synthetic descriptive propositions to the tests of coherence, correspondence, and clarity, and to abide by the results. . . .

In considering the possible objectivity or lack of objectivity of value statements, it is important to consider two fallacies G. E. Moore regarded as

important. He distinguished between the naturalistic and metaphysical fallacies in connection with knowledge of good and bad. According to Moore, the naturalistic fallacy consists of defining goodness to be that which possesses the characteristic of goodness—e.g., the mistake of defining goodness to be life because life possesses the characteristic of goodness. [By contrast the] metaphysical fallacy consists of asserting something to be good without regard to experience—e.g., of designating a vaccine as good without first experiencing its goodness.

It seems that a logical or semantic difficulty may exist with respect to Moore's naturalistic fallacy. For instance, he wrote, "`Good,' then, if we mean by it that *quality* (our italics) which we assert to belong to a thing, when we say that the thing is good, is incapable of any definition . . ." (Moore 1959, 9). Two pages earlier he wrote, ". . . propositions about the good are all of them synthetic and never analytic." Note that he is writing about the use of the word good as an adjective—i.e., as when we say that a healthy body is good, or state that something possesses the characteristic of goodness just as some varieties of ripe apples may be described as possessing the characteristic of redness.

The naturalistic fallacy consists of defining that which possesses the quality of goodness to be not merely good but to be goodness itself. Whether life or justice "naturally" or "really" possess the characteristic of goodness is a different question than whether either is goodness (a noun). A "yes" answer to the latter question would enable life or justice to serve as a common denominator for the goodnesses possessed by other entities. Moore writes that the "naturalistic fallacy . . . consists in identifying the simple notion which we mean by `good' with some other notion" (Moore 1959, 58).

The confusion about the naturalistic fallacy that seems to need clarification is not one of regarding the goodness one experiences to be a characteristic of the natural world. Instead, the naturalistic fallacy is one of mistaking that which possesses the characteristic of goodness for goodness itself. Though it may be empirically true that an apple is red (an adjective), it is not true that red (a noun) is an apple. Similarly, while it seems experientially true that cancer of the colon is bad (an adjective), it is not true that bad (a noun) is cancer of the colon. Both the redness of apples and the badness of cancer, however, appear to me to be viewable as describing characteristics of the natural world without committing the fallacies of regarding an apple as redness or cancer of the colon as badness.

Moore's justified aversion for the naturalistic fallacy seems to have led him to reject somewhat inconsistently the related important possibility that goodness and badness may in some instances be regarded as "real world" natural attributes. To so view goodness is consistent with Moore's position that goodness in undefinable but experienceable, with his concept of the naturalistic fallacy, and with his view that goodness as a primitive undefined term is always synthetic and never analytic. In this book we extend Moore's ideas about the undefinable synthetic nature of knowledge about values to include the possibility of objective knowledge of the "real" values of conditions, situations, and things in the empirical world we know through our five senses while continuing to deplore and trying to avoid Moore's naturalistic fallacy.

In doing this it is important to stress (1) that we are using methods and procedures already in the tool kit of the logical positivists, and (2) the uncertain nature of positivistic knowledge. To do what is proposed here requires a

leap of faith that there is a reality about values to be known—a leap, however, that seems no more drastic with respect to the goodness of Salk vaccine and the badness of leukemia, poverty, and starvation than it is with respect to a positive proposition about the level of the sea or the straightness of a specific road.

Conversely, the agreed-on superiority of one line of Bach's music with respect to another seems as certain or more certain than an assertion in physics that one of the various competing value-free positivistic propositions about the fundamental particle of matter is the empirically true one. Similarly, the cultural dependency; the fundamental unprovability of descriptive propositions; the roles of insight, empathy, and inspiration; and the questions raised by the pragmatists are as troublesome for those researching value-free positivistic as for those researching value questions. . . .

In view of the importance of pragmatism in Warren Samuels's chapter 8 and because of the constraints positivism, various forms of normativism, and pragmatism place on each other, excerpts from pages 65 to 70 (Johnson 1986) are republished here.

. . . Pragmatists find the meaning of concepts or propositions in their practical consequences. If the pragmatist fully understands the consequences of a concept or proposition, including its consequences in solving problems, he believes he knows or understands the whole truth of that concept or proposition. In the *Dictionary of Philosophy* by Runes (1961, 246), V. J. McGill indicates that "Pragmatism is also a method of interpreting ideas in terms of their consequences." McGill also states, "Although pragmatists (Peirce, James, Dewey) frequently attack older forms of empiricism, or crude empiricism, and necessarily reject truth as a simple or static correspondence of propositions with sense data, they nevertheless continue to describe themselves as empiricists, so that today pragmatism . . . is often regarded as synonymous with empiricism." Yet, there is a difference between logical positivism (which rejects the possibility of objective empirical knowledge of the real values of conditions, situations, and things) and pragmatism (which makes value-free knowledge and knowledge about values interdependent with their empirical truth determined by the consequences). The Oxford empiricist, F. C. S. Shiller, is quoted in Runes ([1961], 246) as stating, "In validating our claims to truth . . . we really transform . . . [realities] by our cognitive efforts, thereby proving our desires and ideas to be real forces in the shaping of the world."

> When the claim or pretention or plan is acted upon, it guides us *truly* or *falsely*: it leads us to our end or away from it. Its active, dynamic function is the all important thing about it, and in the quality of activity induced by it lies all its truth and falsity. The hypothesis that works is a true one and truth is an abstract noun applied to the collection of cases actual, foreseen and desired that receive confirmation in their work and consequences.

Thus we see that the two underlying tenets of pragmatic philosophy are (1) the interdependence of positivistic and value propositions because of the mutual dependence of their truth on their practical consequences in real-world problem-solving situations, and (2) the importance of the test of work-

> ability, which makes truth dependent on use as an instrument in attaining ends determined by the context of the problem at hand.
>
> The pragmatists are interested in "scientific" problem solving. . . . [Pragmatic problem-solving processes are similar to that in Figure 3.1 in Chapter 3 of this book. However, pragmatists tend to exclude separate data banks for value and value-free information] since pragmatists would be uneasy with the separation of knowledge into positivistic value-free and value components however much they may appreciate the figure's "pragmatic" loop between them. Furthermore, because the truth of propositions depends on their practical consequences, the likelihood of data or information retaining truth from one problem to another would tend to be viewed by the pragmatists as justifying less data banking than practiced by logical positivists.
>
> The hypotheses generated by the pragmatists are mainly prescriptive, in contrast to the positivistic value-free and value hypotheses of concern to positivists and normativists . . . A thorough-going positivist . . . would not be able to conceive of objectively testing the value propositions on which a prescription is based if those propositions are interpreted as representing knowledge of the values that conditions, situations, and things really have. Indeed, even the pragmatic test of workability is relatively meaningless or arbitrary to a positivist because he does not conceive of an objective way of knowing whether a consequence is really good or bad and, hence, [of] whether a practical problem really exist[s] and whether it [can be] solved.
>
> In pragmatism, one of two competing hypotheses is [often] treated as a thesis, the other as its antithesis. The dialectics of pragmatism thus involves a conflict between competing prescriptions. Conflict resolution has to do with testing one prescriptive hypothesis against another. Positivism, too, is dialectic in that whatever is accepted as true at one point in time and in one culture is always to be challenged by an opposing hypothesis. It is this special form of dialecticism in positivistic science that makes it self-correcting. The difference between positivism and pragmatism is not so much that one is dialectic while the other is not as that they are dialectic about different things. Pragmatism is dialectic about prescriptive hypotheses. Positivism is dialectic about positivistic hypotheses. There is, of course, a corresponding dialectic about values in various forms of normativism. . . .

There is a lack of clarity about intrinsic, instrumental, and exchange values in pragmatism.

> Philosophers and economists distinguish between intrinsic and extrinsic values. A condition, situation, or thing can be said to have intrinsic value when it has value independent of the value it has as a means of attaining or acquiring something else. For example, a gold coin in a country on a gold standard has intrinsic value as gold that is not characteristic of paper currency of the same denomination, though both have the same exchange value. The exchange or extrinsic values of concern to economists may or may not be monetized. Exchange or extrinsic values of particular importance for economics include the extrinsic values that arise because things are instruments for attaining other things of more intrinsic value—for example, when the value of nitrogen arises because it is a means of producing corn.

It seems to me that the distinction between intrinsic and instrumental or exchange values is sometimes partially lost by the pragmatists, perhaps to be extent of abandoning the idea of intrinsic value entirely. When the consequences of a proposition are regarded by pragmatists as constituting the whole truth about it, the idea of intrinsic values or values independent of problematic situations becomes tenuous.

I find it significant that Runes' *Dictionary of Philosophy* [Runes 1961] contain no references to monetary values in exchange or to Alfred Marshall's and Clark's combination of cost of production and demand explanations of value into a single explanation of values in exchange. Marshall and Clark deduced that equilibrium values in exchange are determined in markets (large and small, monetized and nonmonetized) in the process of balancing off intrinsic as well as extrinsic or instrumental values against each other in the trades that take place in markets and in the totality of society. . . .

The prescriptive hypotheses of pragmatism are tested as to their workability, coherence, and clarity. The test of workability determines whether the prescriptive hypothesis . . . solves the practical problem under investigation. The clarity test (important for using the coherence or correspondence test in positivism) is also important in pragmatism. Clarity or the lack of ambiguity is important in testing for logical coherence and does not lose its importance because truth is regarded as determined by the consequences of prescriptions determined in part by decision rules and, hence, not observable. Before the pragmatic test of workability can be applied to a pragmatic prescriptive hypothesis, the nature of the expected consequences of the hypothesis must be unambiguously stated. The test is one of the determining whether the hypothesis is or is not the logical consequence within the decision rule of the interdependent positivistic and value knowledge accepted as true for purposes of solving the problem.

Note that it is difficult to regard the pragmatic test of workability as a test of correspondence. Testing the workability of value and positivistic judgements conceived to be interdependent is more complex and involved than when they are conceived as independent. In addition, all prescriptions (pragmatic or not) are complex and difficult to evaluate because prescriptions depend on both positivistic and value knowledge from many disciplines, with the prescriptions not being experiential.

Prescriptive hypotheses are difficult to verify with the test of correspondence *prior* to acting on the prescription, as the test of correspondence cannot be applied *ex ante*. Prior to the act, all that can be done is apply the correspondence test to the value-free and value knowledge entering into the decision process that produced the decisions. This, however, is not satisfactory to pragmatists, who hold that value-free and value truths are interdependent and determined by their consequences, which include those of the prescriptions they generate. Pragmatists, therefore, are constrained in their ex ante evaluation of prescriptions to the use of the coherence test and a consideration of the simulated expected consequences of the prescribed act. Ex post (after the act), pragmatists can apply the correspondence test to consequent goodnesses attained, badnesses avoided, and positivistic circumstances that evolve, but hardly to the rightness and wrongness of the prescription that was determined as the consequence of using a decision rule rather than being something that can be experienced.

Another difficulty for pragmatic evaluators of prescriptive hypotheses is that pragmatists regard the observable value-free and value consequences of

actions as interdependent in the context of the problem the act is designed to alleviate. Nonpragmatic prescribers are freer than pragmatic ones to apply independent correspondence tests to value-free positivistic and value knowledge (if they are not so positivistic as to believe that the part of the latter pertaining to "real" values cannot be tested for correspondence). However, like pragmatic prescribers, they must await the outcome of prescribed acts before testing the value-free and value outcomes of a prescription for correspondence. Ex post, both encounter the definitional nonexperiential nature of the rightness and wrongness of prescriptions.

In this connection, it is worth recalling the Rudner argument, [considered earlier], that scientists as scientists unavoidably encounter the need to use values as an integral part of their work. Fundamentally, Rudner's argument is pragmatic because it makes what is warrantable as true dependent on the problem(s) it is to be used to solve.

The prescriptions of pragmatists, like all prescriptions, are relatively ephemeral. Consequently, pragmatists tend not to accumulate banks of tested value-free and value information to be stored and applied repeatedly in the solution of problems. Instead, they conceive their interdependent value-free and value information as problem- and time-dependent. This makes history and case studies more important than data banks and leads to the "story telling" on the part of the pragmatic institutional economists so deplored by Blaug (1980, p. 127). The difficulties noted [above] that are created for the positivists and normativists by the cultural dependency of their knowledge, and the roles that faith, empathy, and intuition play in the creation of knowledge, are multiplied manyfold for the pragmatists, who extend dependency to problems as well as cultures. . . .

It is the pragmatic interest in time and in who is benefitted and harmed that leads to an interest in interactive and iterative processes.

The pragmatic insistence that the truth of a proposition depends on its consequences implies an interest both in time and in who is benefitted and harmed through time. Pragmatic economists are interested in history, time-series analysis of the past, case histories or stories, and informal, if not formal, simulations of the future. Some of the important economic historians such as O. C. Stine of the U.S. Department of Agriculture and Wesley Mitchell were pragmatic institutionalists in their training. Their work and that of the German historical school are closely related. Initially, solutions that are prescriptive and depend on both value-free and value knowledge of problems are stated as goals or targets as states of affairs to be brought about. Knowing the consequences of a prescription requires knowledge of who it will hurt and benefit, how, when and where.

This interest in time, space, and the incidence of benefits and damages often makes it important that there be an interaction between investigators, decision makers, and those likely to be affected by the prescriptions of decision makers. Such interaction is extremely helpful in more fully envisioning the future consequences of any proposition (value-free or about values) or prescriptive hypothesis. Hence, interaction is a source of knowledge for pragmatists and others as well. Interaction of researchers with decision makers is important as the latter bear responsibility for executing prescriptions.

> The same is true for interaction with people who are affected by the consequences of decisions executed.
>
> Iteration is also important because the interactions between investigators, decision makers, and affected people often result in the rejection of poor prescriptive hypotheses and the acceptance of superior ones. This is recognized with the two-way arrows in [the diagram] of the problem-solving process [Figure 3.1 in Chapter 3 of this book]. The interests of pragmatists in time, space, and in who is benefitted and damaged, where, and how, makes interaction important in pragmatism. This iterative/interaction is part of the dialectics of pragmatism. . . .

We have seen in this chapter and in chapters 3 and 7 that there is a close though not well-recognized relationship between the iterative interaction of pragmatism, the simulation techniques used by applied systems scientists, and transaction cost analyses.

So far in this philosophic digression, excerpts have dealt with characteristics (including strengths and weaknesses) of logical positivism, various forms of normativism and pragmatism. The following excerpts (Johnson 1986, 233–35) consider the problems involved in merging the three into a new synthesis.

> We have reviewed the strengths and shortcomings for research by economists of logical positivism, various forms of normativism, and pragmatism. These strengths and shortcomings differ for purposes of doing disciplinary, subject-matter, and problem-solving research. It was seen that all three of the main undergirding philosophies for economics have essential contributions to make to the economist's tool kit. Further, all three place constraints on the ability of economists to benefit from the strengths of the other two. Our need is for justification to reject some of these constraints in order to develop an eclecticism—possible a synthesis—that will enable us as economists to benefit from the strengths of the different philosophies without being hampered by the constraints they place on each other.
>
> In what follows we draw on the different philosophies in an opportunistic way. In doing so, we put aside some of the constraints particular philosophies impose on using the strengths of other philosophies. The position developed in this section is disorderly from the standpoint of an academic philosopher. No apology will be made for this disorder as our objectives have been to summarize what economists do and to relate their activities to existing philosophies. Our important task of philosophers is to establish order by explaining and clarifying what researchers do and how they produce, verify and validate knowledge. Philosophers working with the simpler biological and physical sciences have made considerable progress. However, they have not yet completed their work on research being done in the more complex social sciences dealing with the behavior of people and organizations. Perhaps philosophers and students of research methodology for economists may be able to work together in developing a coherent, more complete synthesis from the somewhat ad hoc eclectic view that follows.
>
> Concerning positivism, we reject the emotivist presupposition that there are no experiences of real values to use in doing objective, descriptive research on "real" values. Rejecting this constraint has two advantages: (1) it

does not interfere with using the powerful methods of positivism to attain value-free knowledge and behavioral knowledge about who values what, and (2) it frees us to use the same methods in the pursuit of descriptive knowledge of real values.

We noted earlier that there are many forms of normativism. We have dubbed the form we find most useful "objective normativism" and have partially identified it with the works of G. E. Moore [1959] and C. I. Lewis [1955]. Lewis has demonstrated how propositions about goodness and badness can be used to derive prescriptions as to what it is right to do in order to solve problems. When forms of normativism reject the possibility of there being objective, value-free knowledge, their constraints on such possibilities, like the corresponding emotivist constraints of positivism on value research, are rejected. Still other forms of normativism commit what Moore calls metaphysical and naturalistic fallacies. These forms of normativism are also rejected as they constrain . . . ability to do objective research on values by ignoring or in other ways misusing concepts of the goodnesses and badnesses of conditions, situations, and things.

Turning now to pragmatism, we find a philosophy and associated methods that have been highly productive in the hands of institutionalists and resource economists for reaching solutions to practical problems under the presupposition that the truth of the propositions is determined by their consequences. When value-free and value propositions are used to solve problems, the prescriptions they warrant have consequences for action and the bearing of responsibility. Pragmatism treats value-free positivistic knowledge and knowledge of values as interdependent. While this presumption is justified by considerable observed interdependence between value-free and value truths, it does not always appear to be empirically true (Johnson and Zerby 1973). When value-free positivistic and value truths are not interdependent, the presupposition that they are is a constraint that imposes unnecessary complexity on the work of economic researchers and interferes with their ability to use the effective methods of independent normativistic and positivistic methods. It seems essential that economic researchers entertain the possibility that value-free positivistic and value knowledge may sometimes be interdependent, sometimes independent.

The above outlines some steps toward either a synthesis or an operational eclecticism that permits economic researchers to continue to do what different schools and groups of economists have done successfully in the past. This eclecticism rejects some of the constraints of (1) positivism on the possibility of objective knowledge of values as characteristics of the "real world," (2) normativism on objective value-free knowledge, and (3) pragmatism on both normativistic and positivistic methods. The rejection of the constraints of these philosophies on each other does not interfere with utilization by economists of their respective strengths in doing problem-solving, subject-matter, and disciplinary research. This provides an outline of a modus operandi for economists while students of research methodology for economists and their colleagues in philosophy work out a more complete synthesis to justify and formalize more rigorously what different groups and schools of economists are already doing with varying degrees of success.

The above "synthesis" is more permissive than definitive—its permissiveness keeps open the possibility of objective knowledge of values and of

researching values in an objective manner. It obtains its permissiveness in part by recognizing the tentative, socially dependent nature of all knowledge and especially of descriptive knowledge that purports to tell us about the nature of reality whether that reality be value-free only or includes values!

The discussion of the questions considered thus far in this chapter indicates that pragmatic insistence on recognizing processes and interdependencies tends to eliminate boundaries between basic academic disciplines including economics to involve us in a cumbersome, unmanageably complex effort to integrate present disciplines into superdisciplines or even a single superdiscipline. Lack of success in creating pragmatic superdisciplines leaves academia with its numerous relatively stable but evolving disciplines, each too specialized for multidisciplinary problem-solving and issue-resolving work. Some of these disciplines have logically positivistic orientations; some have one or more normativistic orientations; and some, including economics, have both. To my knowledge no basic academic discipline has a purely pragmatic philosophic orientation. The last statement was written in full awareness that it excludes pragmatic institutional economics from the list of basic academic disciplines—this is probably more of a compliment for than a denigration of pragmatic institutional economics—at least I think it is. Further, stating it this way permits me to make another important point that is consistent with the following abstract of a recent article by Nicholas Maxwell (1992) entitled "What Kind of Inquiry Can Best Help Us Create a Good World":

> In order to create a good world, we need to learn how to do it—how to resolve our appalling problems and conflicts in more cooperative ways than at present. And in order to do this, we need traditions and institutions of learning rationally devoted to this end. When viewed from this standpoint, what we have at present—academic inquiry devoted to the pursuit of knowledge and technological know-how—is an intellectual and human disaster. We urgently need a new, more rigorous kind of inquiry that gives intellectual priority to the tasks of articulating our problems of living and proposing and critically assessing possible cooperative solutions. This new kind of inquiry would have as its basic aim to improve, not just knowledge, but also personal and global wisdom—wisdom being understood to be the capacity to realize what is of value in life. To develop this new kind of inquiry, we will need to change almost every branch and aspect of the academic enterprise.

My added point is that in academia we find professional and other practical colleges and institutes that have been established to train their students to address practical multidisciplinary problems and issues and to do research and carry on outreach activities aimed at solving the practical problems and resolving sets of practical issues facing various parts of society. These academic units seek what Maxwell calls "wisdom" and what I call "prescriptive knowledge" elsewhere (Johnson 1986, 18–20). Examples of such units are colleges of education, agriculture, natural resources, archi-

tecture, medicine, business administration, engineering, and the like. These respectable and respected units of academia differ fundamentally from the basic academic disciplines. Perforce, these administrative units deal with problem-solving and issue-resolving processes that are multidisciplinary. The importance of such problems and issues is implied by Samuels's chapter. His concern is that disciplinary mainstream economics will foreclose the processes of evaluation before the interdependencies can be worked out (in the context of the problem or issue at hand) between interdependent variables treated as constant in economics but endogenous with the exogenous variables of economics in other disciplines. His concern is valid, justified, and important.

Practical people facing real-world problems and issues have a justified fear of disciplinary academicians including mainstream disciplinary economics on this score. Academia has professional and other practical colleges and institutes that are well served by a pragmatic philosophic orientation to their problem-solving and issue-oriented work. Such an orientation permits a dialectic (iterative) but participatory (interactive) approach that utilizes (instead of forecloses) processes. However, it must be stressed that the basic disciplinary knowledge generated by following logically positivistic and/or normativistic orientations feeds such processes while the interdependencies neglected by disciplinarians are worked out pragmatically for purposes of addressing the problem or issue at hand. The complex, holistic, process-oriented approach of pragmatism seems to work best when we face "one multidisciplinary problem or issue at a time" even if it fails us when we let it entice us into trying to create superdisciplines capable of handling all problems and issues (see Johnson 1986, particularly 233–35).

NOTE

1. Both Warren J. Samuels and David Schweikhardt have criticized an earlier version of this chapter in manners that led me to make what I regard as substantial improvements in it.

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PART IV. UNPUBLISHED CONSULTING, SEMINAR AND MEETING REPORTS.

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"Hybrid, Inbred Line and Open-Pollinated Models." Report on NRE-CARD hybrid models and NIRAP II's resource development component prepared for the Economic Research Service. U.S. Department of Agriculture, Washington, D.C., May 1982.

"Values in Decision Processes; Productivity (PR), Efficiency (EF) and Equity/Equality (EQ) Considerations." Type II Seminar presented for Department of Agricultural Economics on June 3, 1982, and also as a Seminar for Center for Advanced Study of International Development (CASID), June 9, 1982. Michigan State University, East Lansing.

"The Roles of Agricultural Research in National Agricultural Development." Presentation made for course on Organization and Management of Agricultural Research Systems in Developing Countries, College of Agriculture and Natural Resources. Michigan State University, East Lansing, June 24, 1982.

"Agricultural Research—Philosophies and Ethics." Seminar presented at Mississippi State University, March 25, 1983.

"Some Philosophic Considerations Behind Model Validation and Assessment." Paper delivered at the TIMS-ORSA meeting in Washington, D.C., May 1980.

"Discussion of Vernon W. Ruttan's and Yujiro Hayami's 'Induced Technological Change in Agriculture.'" Presented at National Center for Food and Agricultural Policy (Resources for the Future) Workshop on Developing a Framework for Assessing Future Changes in Agricultural Productivity, July 16–18, 1984.

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"Social Science Agricultural Agenda Project: What It is and What It is Doing?" Paper prepared for AID/Social Science Agricultural Agenda Project Conference. Ballston Holiday Inn, Arlington, Va., December 13, 1988.

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"Agendas and Strategies for Rural Southeastern American." *Professional Agricultural Workers Conference*. Tuskeegee University, Ala., November 30 - December 3, 1991.

"Farm Management—its Potential Contribution to Rural America in the Decade Ahead." Presented at NC 113 Conference. St. Louis, Mo., May 16–18, 1993.

"Fixed Production and Institutional Assets as Constraints on the Adjustment of Agriculture in the Industrialized Pacific Rim Countries." Paper delivered at Kyot University, South Korea, October 29, 1993.

"Extending General Systems Science Agricultural Sector Models to Include Asset Fixity Theory and Transaction Cost Analysis of Institutional Change." Paper delivered in South Korea, November 2, 1993.

"The Input of the Social Sciences into natural Resource Policy Formation and Management." Paper delivered at the Sixth International Symposium on South and Resource Management. Pennsylvania State University, May 18–23, 1996.

Glenn L. Johnson

Glenn L. Johnson is a Fellow of the American Agricultural Economics Association, a Past President of the International Association of Agricultural Economists, recipient of Michigan State University's Distinguished Professor Award, an honorary member of the Finnish Science Society, a co-recipient of the Brinkman Award from the University of Bonn, and professor emeritus of Agricultural Economics at Michigan State University. He was born in 1918 at Redwood Falls, Minnesota, and grew up on farms in Minnesota and Northwestern Illinois. He received a B.S. degree in agriculture from the University of Illinois in 1940 and an M.A. degree in economics in 1942 from Michigan Agricultural College. He was supply officer in the U.S. Navy after post Annapolis level graduate training at the Harvard School of Business Administration. His destroyer, the USS *Morrison* DD560, was part of both Admiral Nimitz's and Admiral Halsey's operations in the western Pacific until sunk off Okinawa in May 1945. After that he served as supply officer on the staff of the admiral in command of all U.S. Atlantic Fleet destroyers. He worked as an agricultural economics statistician in the USDA under Dr. O.C. Stine until joining the navy and returned to that position early in 1946 before going to the University of Chicago where he received his Ph.D. degree in economics in 1949.

He was appointed associate professor of farm economics at the University of Kentucky in 1948. He left there in 1952 as a professor to be appointed professor at Michigan State University. He has held visiting professor appointments or assignments at the Universities of Manchester, California, Nigeria, and Arizona; at Mississippi State University; and at the Northeast Agricultural College at Harbin in the Peoples Republic of China. He has consulted with and for the Ford and Rockefeller Foundations (in Africa, South America, and Asia), the Tennessee Valley Authority, the Agency for International Development, the USDA, the National Academy of Science, the National Science Foundation, Texas Energy Advisory Council, Norwegian Agricultural Economics Research Institute, Tamil Nadu University in India, the International Institute of Applied Systems Analysis, the Inter-American Institute for Agricultural Cooperation and the International Sorghum and Millet Collaborative Research Support Program. He was a member of President Kennedy's economic and military aid mission to Thailand, the founding director of the Economic Development Institute at the University of Nigeria, director of the Consortium for the Study of Nigerian Rural Development and director of the Korean Agricultural Sector Study. He served from 1971-84 as a member of TACAC (Trans-Atlantic Committee on Agricultural Change). TACAC members included Ulf Renborg, Theodore Heidhuis, Michael Petit and Richard Day. TACAC received financial support from the Rockefeller Foundation. He collaborated for a number of years

with the International Institute of Applied Systems Analysis in Austria. He served as the executive secretary of the Social Science Agricultural Agenda Project (SSAAP). The SSAAP was sponsored and/or funded by Social Science Research Council; National Science Foundation; the Cooperative State Research Service and the Economic Research Service, U.S. Department of Agriculture; National Association of State Universities and Land Grant Colleges, Ford Foundation, Farm Foundation, National Center for Food Agricultural Policy, Michigan State University, the Rural professional societies; the World Bank; and the American Association of State Colleges of Agriculture and Renewable Resources. After retirement, he edited the SSAAP book and a separate executive summary that provided the terms of reference for a two and one-half day workshop on strategies and agendas for the rural and basic social sciences. The workshop was sponsored by the American Agricultural Economists Association, Rural Sociological Society, and Agricultural History Society. In 1988 he organized and conducted a one-day session on "Public Choice and Agriculture" for the International Economics Association's meetings held in Athens, Greece. The public choice/transaction cost approach was central to the work of the SSAAP.

In his research, he has emphasized, at different times, farm management, outlook and situation work, production economics, the disciplinary deficiencies of economics, international rural development, agricultural policy, research methodology and philosophy, general systems-science simulation analysis, agricultural ethics, science policy, and agendas and strategies for the work of rural and basic social sciences. He has written extensively including co-authorship with Lawrence Bradford of *Farm Management Analysis,* with Lewis Zerby of *What Economists Do About Values,* and with Judith L. Brown of *An Evaluation of the Normative and Prescriptive Content of the DOE's Mid-Term Energy Forecasting Systems and the Texas National Energy Modeling Project.* Major research project books and reports produced under or as a result of his directorships include: *Strategies and Recommendations for Nigerian Rural Development, 1969/85; A Generalized Simulation Approach* to Agricultural Sector Analysis with Special Reference to Nigeria; Korean Agricultural Sector Analysis and Recommended Development Strategies, 1917-1875; Agricultural Sector Planning: A General System Simulation Approach (edited by George E. Rossmiller); and, *The Overproduction Trap in U.S. Agriculture* (coedited with C. L. Quance). See his selected bibliography in this book for more detail on his writings.

Among his more disciplinary research contributions are those to the theory of asset fixity (better called investment/disinvestment theory), summarization and clarification of decision theory for farm management along with empirical investigations of decision processes; and studies of the methodological implication of philosophy for economists. Macmillan published his text entitled *Research Methodology for Economists: Philosophy and Practice.*

He has taught farm management, production economics, managerial

theory and research methodology. He is a member of Sigma Xi, Phi Kappa Phi, and a number of professional societies dealing with economics. He served as vice president of the AAEA and received two awards from the AAEA for outstanding published research. Over a period of twelve years, he served successive three year terms as vice President for Program, President Elect, President and Past President of the International Association of Agricultural Economists. In 1966, he received the Distinguished Faculty Award from Michigan State University; in 1970, he was designated a fellow by the American Agricultural Economics Association; in 1987, he was designated as one of three Distinguished Faculty members from fourteen Michigan universities by the Michigan Association of Governing Boards; and in 1993, the Glenn L. Johnson Appreciation Club was endowed by the American Agricultural Economics Association.

He has personally supervised Ph.D. and M.S. dissertations and programs of over one hundred students. These students now hold major, responsible positions throughout the world and have won a substantial number of awards for the quality of their research and teaching. In 1980-81, four former students were almost simultaneously presidents of the Western Agricultural Economics Association, the American Agricultural Economics Association, the European Agricultural Economics Association and president-elect of the Canadian Agricultural Economics Association.

Family and religion are important for Glenn Johnson. His book on research methodology is dedicated "with love to Sandy, my wife and mother of our children—also my [his] inspiration, teacher, and coworker." He values highly their two children, their spouses, five grandchildren, and three great-grandchildren. A member of two Lutheran churches—University, at East Lansing, and Bethlehem, in Traverse City—he finds academia and his religion to be interacting, complementary components of a Whole.

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