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# "Summary of article by Jason Shogren and Clifford Nowell: Economics and Ecology: A Comparison of Experimental Methodologies and Philosophies"

Views of the proper roles of experiments in environmental economics and ecology have developed quite differently. Until recently, the primary engine of research in ecology has been observation-induced description, while in economics it has been theory-induced propositions. From a philosophical or methodological perspective, the ecologist's focus on description appears pragmatic while the economist's focus on the axiomatic has evolved from logical positivism. Pragmatism implies that methods and choices result from the workability of common sense rather than from formal rules of evidence. This can result in a broad methodological base of competing theories without a hierarchy of theoretical axioms, laws and "truths." By contrast, the logical positivism of economists rests on two key assumptions: an objective world view and a value-neutral scientist. In such a paradigm, science can only advance if there is an explicit dichotomy between fact and value. This positivism has led economics to a definite hierarchy of theories based on the neoclassical paradigm, and an assumption that this well defined theoretical structure is inherently correct, thereby eliminating the need for observation.

## Theory Versus Experimentation

Ecologists have developed a broad foundation of competing methodologies where observation and description are the focus, with abstract theoretical work coming second. Armed primarily with the laws of thermodynamics and the evolutionary theory of natural selection, ecology emphasizes observations of the natural environment in both bottle experiments and natural variations. These observations are mediated through organized, formalized models of the structure and functions of a complex system. Clearly this amounts to more than a "stroll through the forest," yet given the extraordinary complexity in ecosystems, ecologists are still far from establishing universal laws.

Some ecologists, such as Lotka, Volterra, and May, have attempted more rigorous modeling. Although the complexity of ecological systems makes the use of mathematical theory difficult, it is not impossible. By developing propositions that identify the key aspects of the natural system, formal theory can reject earlier anecdotal evidence from direct observation. There is thus an antagonism between mainstream, pragmatic, field-oriented ecologists, and mathematically inclined theoretical ecologists, leaving the latter largely isolated from the mainstream.

The hold of logical positivism on the sciences has been in decline for decades, but it has left a lasting effect on economics: a methodological paradigm of theory-without-measurement. It is

presumed that a well argued theory, based on explicit, logically consistent assumptions, will lead to specific correct conclusions - what is there in a theory to test? Armed with axiomatic logic and mathematics, economists have often failed to go beyond logic or theory to observational empirical work. However, despite the benefits of formal theory for clarifying hypotheses and providing rigorous definitions of assumptions, there is growing discomfort with theory for theory's sake. This has led to the increased use of experimental methods which, though not totally accepted, are increasingly acknowledged as a low cost method to isolate and examine abstract theories of individual behavior.

The basic difference between these two fields is the view of the proper place of experimentation. Mainstream ecologists accept experimentation, often at the expense of theory, while mainstream economists do the opposite. There appears to be a need to approach the middle ground in both disciplines.

**The Objective Function: Well Defined or Uncertain?**

One basic reason for this divergence is that economists and ecologists differ in their assumptions regarding the objective function of a model, which describes the cause-effect or dose-response relationship between inputs and outputs. The ecologist's view is that the objective function is unknown, and the major experimental focus is on trying to describe or define how the function works. A major reason for this approach is that often little is understood about the relationship between the cause and effect - e.g., the hotly debated impact of acid deposition on ecosystems. A second reason is that the overall complexity of the ecosystem does not lend itself to axiomatic descriptions.

Economists' perceptions of the objective function are quite different. They generally assume that the objective function is well defined, based on fundamental theoretical axioms of preference or production. They argue that since the market embodies all of the relevant information of the dose-response relationship, specific attempts to observe these relations are not necessary. The key question then is whether or not the basic axioms are satisfied. In the case of utility theory, there is increasing evidence that the answer is no, as both psychologists and economists turn up evidence of systematic deviations of individual choice behavior from the predictions of utility theory. Increasing recognition has been accorded to the argument that economists must step back and further explore the workings of the objective function through direct observation, much like the ecologist.

**Experimental Methods in Environmental Economics**

Today, experimental research in environmental economics falls into two broad categories: institutional and valuation. Institutional experiments consider the efficacy of alternative mechanisms to reduce the negative impacts of pollution. Valuation experiments examine individual preferences or values for non-market environmental goods. The former have largely remained in the lab, while valuation work has generally been conducted in the field through the use of surveys and bidding games.

The foundation for institutional experiments on environmental issues is found in the public choice literature, and it is based on two notions. First, social policy analysis should evaluate the relative efficiency of alternative institutions in the face of market failure. Second, it is believed that principles of rational choice are central to the behavior of social institutions. Following the general public choice viewpoint, institutional experiments have focused on alternative mechanisms for efficient control of externalities such as pollution. The experiments, which examine the efficiency of market-based incentives relative to traditional command and control regulations, have indicated that the former are more cost effective in achieving identical levels of pollution abatement.

Valuation experiments have utilized the contingent valuation (CV) method. A CV experiment estimates the economic benefit of a public good through the construction of a hypothetical market. By carefully constructing understandable preference-revealing mechanisms, benefits are determined through surveys or interviews that elicit a respondent's implicit price for a good. CV experiments are flexible, relatively inexpensive, and can construct markets where none currently exist.

Although CV use has expanded rapidly, the method has significant drawbacks and many detractors. Most questions center on the hypothetical nature of the "market" being probed in CV, and the minimal formal economic theory presently extant to guide researchers in understanding how individuals form values in CV contexts. In response, both psychologists and economists are now attempting to provide a more rigorous structure to CV. Given concern over CV biases and the value formation process, economists have turned to laboratory experiments to isolate and control the preference revelation mechanisms. The introduction of more controlled settings where experiments can be replicated under similar conditions should help to increase acceptance of this valuation research.

**Lessons from the Desk and the Lab**

Economic experiments are designed primarily to test specific economic theories. Though economic theory provides a rich body of material and testable hypotheses, most experiments are based on a few critical behavioral assumptions. Economists need observation-based research to examine these assumptions.

The comparative advantage held by economics over ecology is the long tradition of theoretical modeling. Experimentalists need to recognize that modeling helps theories to mature, encourages consistent use of terms, checks unstated assumptions or boundary conditions, and reduces the derivation of opposite conclusions from the same theory. In addition, ecologists must at times leave their field experiments in complex environments, and go back to the lab to evaluate specific hypotheses under controlled conditions.

The field of ecological economics allows both the pragmatist and the positivist to converse over the relative merits of integrating their approaches. Relaxing methodological constraints can lead to higher rewards for both groups.