The Concept of Applied Economics: A History of Ambiguity and Multiple Meanings

Roger E. Backhouse and Jeff Biddle

The Concept of Applied Economics Historically Considered

The idea of "applied" economics, that is, the notion that there is a class of activities engaged in by economists that can properly be spoken of as the "application" of economics or political economy, has a fairly long history. Jean-Baptiste Say, in the introduction to his 1803 *Treatise*, spoke of applying the general principles of political economy to "ascertain the rule of action of any combination of circumstances presented to us." John Stuart Mill gave his 1848 compendium of political economy the title *Principles of Political Economy with Some of Their Applications to Social Philosophy*. Writing around the turn of the century, John Neville Keynes surveyed some of the meanings associated with the word *application* and the phrase *applied economics* in the writings of current and past economists. He argued that members of the "English school" such as Mill, John Elliott Cairnes, and Nassau Senior believed political economy to be a positive, abstract, deductive science; Keynes also argued that they maintained "a sharp line of distinction . . . between political economy itself and its applications to practice" (1917, 12). The English school believed it possible to construct a general body of theory through abstract reasoning, without wide knowledge of concrete economic facts.

We wish to thank Mary Morgan for her advice in organizing this project and for lengthy discussions on the themes discussed in this paper. We also wish to thank the *HOPE* team for their support and the participants in the conference for their assistance with the refereeing process. Roger Backhouse worked on this while holding a British Academy Research Readership for 1998–2000 and wishes to thank the British Academy for its support.

However, the process of applying this theory was a process of adjustment, of making allowances, of taking account of how factors excluded from consideration in the act of abstraction that accompanied theorizing would affect the operation of causes accounted for by the theory.[1] For this reason, application of theory, although not theorizing proper, was more likely to be successful when accompanied by careful observation and knowledge of specific experience.

Some sense about the ends toward which the English school would apply the principles of economics can be gathered from the language used by Neville Keynes and the authors he surveyed when talking about application. The word *application* was often coupled with the adjective *practical*; Keynes also spoke of applying the hypothetical laws of political economy to "the interpretation and explanation of concrete industrial facts." Economists frequently talked of application when discussing the advisability of making a conceptual distinction between the science of political economy, which involved discovery of the positive laws governing the production and distribution of wealth, and the art of political economy, which involved using those laws to address practical problems. As Keynes understood the writers who promoted this distinction, the goal of those engaged in the art of political economy would be to formulate maxims of conduct or rules of behavior for individuals and governments. When used in association with the idea of an art of political economy, then, applied economics was part of the process of formulating policy.

Keynes noted that not all economists agreed with the English school's view concerning the strict distinction between discovering principles and applying them, or between the positive science of economics and the normatively tinged art of political economy. Historicist and "inductivist" dissenters argued that the determination of the goals to be pursued through statecraft and the best means of pursuing them were all part of the science of economics and could not be separated from the process of discovering economic laws.

1. "When the principles of Political Economy are to be applied in a particular case, then it is necessary to take into account all the individual circumstances of that case; not only examining to which of the sets of circumstances contemplated by the abstract science the circumstances of the case in question correspond, but likewise what other circumstances may exist in that case, which not being common to it with any large and strongly marked class of cases, have not fallen under the cognizance of the science" (Mill 1877, 150).

Keynes himself came down on the side of the English school regarding the distinction between discovering principles and applying them—"theoretical and practical enquiries should not be systematically combined" (1917, 54)—and he accepted the idea that applied economics connoted the use of economic principles in the design of policy, as he proposed using the phrase *applied economics* in place of the phrase *art of political economy*. Keynes believed that talk of the art of political economy as a well-defined field of study promised too much. He felt that development of proper, reliable rules of action in most situations would involve so many noneconomic considerations as to make the relationship between the science of political economy and a field of endeavor devoted to discovering such rules tenuous at best. He thus argued that

> in lieu of such an art, we should then recognize special departments of political and social philosophy, dealing with practical questions, in which economic considerations are of material importance, for the discussion of which, therefore, economic knowledge is essential, and to the treatment of which economists will naturally turn their attention. (1917, 58)

But Keynes went on to acknowledge uses of the phrases *applied political economy* and *applied economics* in the literature of political economy that were unrelated to discovering maxims for behavior or designing policy:

> For a science may be applied in two ways: first, to the explanation of particular facts; secondly, to afford guidance in matters of conduct. The term applied economics or applied political economy has indeed been employed in three different senses: (a) in the sense suggested in the text [in association with the art of political economy]; (b) to designate the application of economic theory to the interpretation and explanation of particular economic phenomena, without any necessary reference however, to the solution of practical questions; (c) to mark off the more concrete and specialized portions of economic doctrine from those more abstract doctrines that are held to pervade all economic reasoning. (1917, 58–59)

Keynes then provided quotations from authorities, including William Stanley Jevons and Cairnes, intended to illustrate each of these senses. He also noted some disagreements between members of the English school over how widely the principles of economics could be applied, comparing Nassau Senior's argument that they could be applied (with proper adjustments and allowances) in all times and places, to Walter Bagehot's assertion that the principles of political economy applied only to well-developed commercial societies.

There were of course nineteenth-century economists besides those discussed by the elder Keynes who used and reflected upon the term *applied economics*. Léon Walras, for example, planned to organize his main work into volumes on "pure," "applied," and "social" economics. This corresponded to a distinction between what is true, what is useful, and what is just (see Jaffé 1983, 127). In using the term *true*, Walras referred to propositions that necessarily followed from the nature of things. Pure economics was a matter of logic. Applied economics considered ways to achieve given practical goals and involved forming a judgment about whether the reasoning of pure economics is relevant to the real world. Social economics also presumed pure economics, but dealt with a different range of questions than did applied economics. This conception of applied economics was also taken up by Vilfredo Pareto:

> We must begin by eliminating everything which is not essential and consider the problem reduced to its principal and essential elements. Hence we distinguish pure economics from applied economics. The first is represented by a figure which contains only the principal lines: by adding details the second is obtained. The two parts of economics are analogous to the two parts of mechanics: rational mechanics and applied mechanics. ([1906] 1971, 104)

He proceeds to make a further analogy, with pure and applied grammar.

This distinction between pure and applied economics is essentially the same as Senior's (1828, 36) distinction between the "practical" and "theoretic" branches of political economy. It is, however, given a strongly Cartesian twist, in that an analogy can be drawn between Walras's pure economic theory and Descartes's universal mathematics. One starts with the simplest and easiest of disciplines, mastering them before moving on, the assumption being that

> there must be some general science to explain everything which can be asked concerning measure and order not predicated of any special subject matter. This, I perceived, was called Mathesis Universalis. (Descartes, quoted in van Daal and Jolink 1993, 4)

This implies a clear relationship between pure and applied economics.

In choosing to juxtapose applied economics against "pure" economics, Walras and Pareto were echoing a terminology that was coming to be used more generally in science and mathematics. The origin of this terminology lay in nineteenth-century Germany, where the natural sciences were struggling to establish a place in universities alongside established humanistic and philological disciplines. When these disciplines became established, the ideology of purity became a means of preserving their autonomy (Ravetz 1973, 164). More generally, the distinction between pure and applied science arose out of the process whereby disciplines were institutionalized in the late nineteenth century. In German mathematics, for example, the professionalization of the subject was associated with what has been described as a "snobbish preference for pure mathematics over applications," and "purism" became an explicit creed of the professional (Grattan-Guinness 1997, 490). Pure science came to be seen as fundamental to applied science but to some extent separable from it.

It seems clear, then, that at least by the turn of the century, and probably earlier, it had become common for economists to talk and think in terms of applying or applied political economy/economics. The term was used at times without explanation, as if informed readers would know exactly what was being referred to, but there were also discussions of the exact nature of applied economics, the purposes for which it was applied, and its relationship to economics that was not applied. It is also obvious from Keynes's book, written at the time of the *Methodenstreit* in Germany and in England, that arguments over what it meant to apply economics, how to go about applying economics and to what end, and the distinction between applying economics and contributing to economic theory were part of much broader debates over the scope and method of political economy. Even within the English school, and within the circle of Cambridge economists of which the elder Keynes was a representative, one found different authors using the label *applied economics* to describe different classes of activities. There was, however, broad agreement among those authors on one matter. Application was something that one did with a previously existing body of theory or set of principles, one that could be developed through a method that was different from that used in applying it, and one whose nature was almost completely independent of whatever might occur in the process of applying it. To this extent, there was agreement on the Cartesian view of science that Walras and Pareto supported so much more explicitly.

There exists today among modern mainstream economists a similar shared understanding about what it means to apply economics, in that there is held to be a body of economic theory that is considered the "core" of the subject, and that applying economics involves reducing the degree of abstraction of this core theory in order to throw light on specific problems and situations. The reduction of abstraction can take several forms: attaching more-specific labels to variables and concepts that occur in the core theory; applying additional structure to the theory so that more-detailed conclusions can be drawn; attempting to provide numerical values for key parameters of the theory; interpreting specific real events as members of some general class of events with which the abstract theory purports to deal; and so on.

There are, no doubt, many reasons why this understanding, rather than any other, has come to dominate the profession. One possibility is that isolating theory from certain types of application fits in with a professional conservatism, enabling theorists to disengage (or at least to claim that they are disengaging) from politically or ideologically sensitive issues.[2] It was argued during the conference that the notion of a core that stands apart from applications offered a way to defend the discipline against the capture of applied fields by their constituencies—development economics by development agencies, labor economics by the unions, agricultural economics by the farmers, industrial organization by regulators, the economics of poverty by the poor, and so on. To answer such questions takes us beyond the scope of this essay, but these points are enough to emphasize that acceptance of this view of the core-applied relationship is not inevitable but has to be explained in terms of a specific historical context.

However, as was the case for the English school, *applied economics* in the modern mainstream literature may refer to a number of activities. In particular, uses of the phrase *applied economics* that refer to the interpretation or explanation of concrete facts live alongside uses referring to policy formation and evaluation. This is because the process of reducing abstraction that qualifies an activity as an application of economics in the mind of a writer may take place at any of several points along a continuum running from the most abstract versions of the core

2. Coats ([1980] 1993) argues this in the context of late-nineteenth-century U.S. economics.

theory to the most detailed analytical descriptions of particular situations or designs of particular economic policy measures. Models that result from applying (reducing the level of abstraction of) certain theoretical constructs may themselves be taken as "theory" that can be applied to certain questions or problems through further additions of structure and reductions of generality. For example, if the core theory is the theory of choice (say as described by a diagram comprising indifference curves and budget constraint), one level of application might involve labeling money and leisure as the goods, so as to obtain a theory of labor supply. The result of that application might itself be applied through the addition of structure, such as the incorporation of a nonlinear budget constraint reflecting wage structures, taxation, or social security provisions, or the placement of restrictions on the form of the preference relation. Further along the continuum, econometric techniques and data from a particular time and place might be used to attach numbers to parameters of the utility function or the labor supply function. Both the analytic results of the structurally supplemented labor supply model and the estimates produced by econometric research might be used to interpret specific events or to evaluate economic policy proposals.

It would be wrong to suggest, however, that the twentieth century has been marked by a gradual refinement of and consolidation about a modern variant of the English school conception of the relationship between economic principles and their applications. One frequently finds, in the twentieth-century literature, concepts of applied economics that are very different from the mainstream view we have just outlined. Two are especially important. The first is shared by economists who have denied that good theory can be formulated independently of the situations to which it is applied. This was true of the historicists of the nineteenth century, but also marks the thinking of many twentieth-century institutionalists. Wesley Mitchell's controversial presidential address to the American Economic Association in 1924, for example, spoke of economists in specialized fields such as banking, transportation, and labor problems who already found little use for the qualitative theories of Alfred Marshall and Jevons. He predicted that, when supplied with data from "real markets," economists would formulate their own theories about relationships between variables they could observe and measure and gradually change the complexion and content of economic theory (Mitchell 1937, 26–28). Milton Friedman shares Mitchell's view that useful theoretical concepts arise out of careful analysis of data, the classic example being his work on the consumption function, and that concepts based on no more than casual observation are unlikely to be very useful (Hirsch and de Marchi 1990, 43–45). For both of them, the process of inquiry involves a constant interplay of fact gathering and the formation of hypotheses.

The second concept is a consequence of the fact that economists do not necessarily practice what they preach.[3] Even economists who, if pushed on their beliefs about economic theory, would sound thoroughly orthodox, may in practice not use this theory when doing what they regard as applied economics. They may work at a more inductive, less formal level, not applying economic theory in any recognizable way. Both groups of economists may describe their work as "applied economics," but this is no more than a shorthand way of referring to economics that deals, or is purported to deal, directly with real-world problems. Thus Eli Devons (1961, 155) could write, "Although I have been an 'applied economist' for many years and have frequently tried to be introspective about my activities, I am, I fear, not yet able to give a clear and methodical account of what it is I am applying." He took "problems of applied economics" (such as distribution of industry or monopoly policy) as his starting point and discussed the extent to which economic theory could be used to shed light on them. The notion of applied economics was thus independent of any theory that might be applied. G. C. Allen, regarded by himself and others as an "applied economist," went even further, claiming that "whatever applied economics is, it is not the application of economic theory."[4]

Such views of applied economics, however, are difficult to disentangle from the mainstream view because of the variety of levels at which application can be made. At one extreme, one can argue that even to use concepts or language, of necessity more abstract than any concrete situation that may be analyzed, amounts to an application. What is applied need not be economic theory, as the term is conventionally understood, but something more basic. Thus within the category of economic theory, Devons distinguished between theoretical models, commonsense axioms, and theoretical concepts. The significance of this

3. This is related to McCloskey's (1986) point about the divergence between the official and unofficial rhetoric of economics. It can be argued, however, that it has little to do with "modernism" or "positivism."

4. Allen, in a personal communication with Denis O'Brien, who passed Allen's quotation on to Backhouse.

point is twofold: not only does it draw attention to the variety of ways in which the term *applied economics* can be used, but it also emphasizes the two-way interaction involved in the process of "application."

Applied Economics and the Sociology of Economics: Applied Fields

In the twentieth century, the idea that there is a distinct set of activities that can be labeled *applied economics* has come to be reflected in the institutional structure of the discipline as well as in the way economists have tackled specific problems. Writing in the 1940s, Joseph Schumpeter (1954, 23) referred to the applied fields in economics, offering a discussion of them that reflects the ambiguities involved in defining an application. He distinguished between five types of applied fields: (1) Fields that are considered part of general economics, but which are considered separately so that they can be treated in more detail. These include money and banking, trade, cycles, and location. (2) Fields that have, historically, preserved their independence from economics but are indispensable to economics and offer either instruments of economic analysis or opportunities for applying it. These include accounting, actuarial science, and insurance. (3) Fields that are based on public policy: agriculture, labor, transportation, "utilities," control of industry, and public finance. (4) Socialism, comparative systems, and population. (5) Area studies. Reflecting on this, Schumpeter commented,

> There is evidently no permanence or logical order to this jumble of applied fields. Nor are there definite frontier lines to any of them. They appear or vanish, they increase or decrease in relative importance, and they overlap with one another as changing interests and methods dictate. And . . . this is as it should be. (23)

Since Schumpeter wrote, this division of the subject into applied fields has become more thoroughly institutionalized, and it has increasingly come to mirror what we have identified as the modern mainstream view of applied economics (involving reductions in the level of abstraction of a core body of theory). The core consists of micro- and macroeconomics, with labor economics, development economics, monetary economics, public economics, and other types of applied economics existing around this core. Each of these has its own journals and conferences, is usually taught as a distinct course, and is populated by economists who engage more with other members of the same field than with economists in other fields. There is a clear hierarchy in that the core is regarded, along with necessary mathematical and statistical techniques, as an essential part of a training in economics, whereas applied fields can be left as optional choices for students.

The basic view that there is a theoretical core that can be applied seems so completely accepted as to be taken for granted in mainstream economics. It relies, however, on the discipline being dominated by theory that is believed to have specific characteristics. It is of very wide scope and can stand and be developed, to a large extent, independently of individual applications.[5] As with the overall meaning of applied economics, however, there exist in the profession differences of opinion regarding what theories belong in the core, where one draws the line between research that is contributing to the core and research that is applying the core, and the relative importance or significance of research on topics in the core versus applied economics research.

For example, the precise content of the core is subject to debate, as happens in individual institutions whenever teaching programs are negotiated. Take the example of macroeconomics. In the 1960s and 1970s, macroeconomics was clearly part of the core of the subject. The reasons for this were twofold: not only was macroeconomics regarded as sufficiently important to be an essential part of any economist's training, but it was also regarded as embodying a set of concepts and principles that could not be found in microeconomics—it was not reducible to microeconomics. With the advent of new classical macroeconomics and its successors, it became possible for macroeconomics to be regarded as no more than an application of microeconomics. This remained, however, sufficiently contested such that macroeconomics has remained within the core.

5. The exemplar for this type of theory is Samuelson 1947, in which the core is the theory of constrained maximization, which is then applied to the specific problems of the firm and the consumer. Samuelson is explicit that in applying the theory of constrained optimization to these two situations, all he needs is to change the labels and make minor changes to the structure. The notion of a fundamental theory supporting a variety of applications was an important part of the background of the group of mathematicians associated with Karl Menger's seminar in Vienna, including Abraham Wald, John von Neumann, and Oskar Morgenstern, who played an important role in the mathematization of economics in the 1930s and 1940s (Punzo 1991). See also Weintraub and Mirowski 1994 on the notions of pure and applied in Gerard Debreu's work.

That the boundary between core and application depends on more than simply the structure of the theory—that it depends on "social" factors as well as content—is illustrated by the fields of international economics and development economics. Development economics was, in the 1950s and 1960s, regarded by many, if not most, practitioners as not being an application of standard "core" microeconomic theory but as a field based on principles that differed from those used in the theory of developed economies (Peter Bauer and a few others dissented). Inhabitants of underdeveloped countries were assumed not to be imbued with the commercial mentality that was required for standard microeconomic theory to be applicable and hence a different theory was required. Yet, at least in developed countries such as England and the United States, development economics remained outside the core, as an applied field, because it was not regarded as sufficiently important to be part of every economist's training. It was acceptable for individual economists to ignore the problem of development and to focus on developed economies. With the advent of neoclassical techniques, on the other hand, the status of development economics as an applied field became much less ambiguous. Modern textbooks in development economics provide applications of core theory, along the lines sketched above, in a way that their predecessors did not.

International economics, however, was very much an applied field in that it was based on applying core microeconomic theory, adding structure by postulating more than one country. This was true of Heckscher-Ohlin-Samuelson trade theory and international monetary and macroeconomics as much as it is of the modern, imperfectly competitive theories of Avinash Dixit, Elhanan Helpman, and Paul Krugman, among others. In some institutions international economics has been regarded in this way, but it is also common, especially perhaps in Europe, for it to be regarded as part of the core. The additional structures that have to be introduced to explain problems in international economics are regarded as part of the core—to be applied—rather than as assumptions one brings in to apply the core theory. The core is an elastic concept that changes over time in response to both intellectual and outside influences.[6]

6. Joseph Remenyi's (1979) modified Lakatosian theory of "core demi-core interaction" offers a source of hypotheses and concepts for future research into the evolution of fields and their relationships with one another and to core research in economic theory.

Applied Economics and the History of Economic Thought

Near the beginning of his *History of Economic Analysis*, Schumpeter claimed that "we cannot confine ourselves to the history of 'general' economic analysis but shall have to keep our eye on developments in applied fields as well" (1954, 22). However, with certain major exceptions, notably money and banking, most histories of economic thought assign applied work a distinctly marginal place, with what the authors regard as pure theory being accorded the dominant role. One reason for this neglect is that the emergence of distinct applied fields, along with clear demarcations between applied and nonapplied work, is a twentieth-century phenomenon, while the main focus of most histories is on the nineteenth century and before. Thus, even after such an auspicious start, Schumpeter did not turn explicitly to applied fields for over nine hundred pages, his first passages on the contribution of the applied fields coming in his section titled "From 1870 to 1914 and Later" (944).[7]

Another perhaps more important reason lies in the specific conception of applied economics attributed above to both the classical writers and modern mainstream practitioners, one that involves a strict distinction between building theory and applying theory, with the former activity being regarded as more important from a scientific standpoint. The theory of value (with varying mixtures of distribution and growth) is central, for this covers the fundamental ideas about markets and competition on which all else depends. Developments in applied economics (at least those developments worthy of note) will simply follow and mirror developments in the theory. Related to this is a belief that applied economics is more ephemeral than theory.

The tendency to neglect applied economics in writing the history of economic thought matters, we suggest, for the following reason. A history of economic thought that focused on applied economics (leaving aside the details of precisely what we mean by the term) rather than on value and distribution could lead to a very different outcome from one that does not. It would have a different cast of "canonical works" and "great figures."[8] It also suggests an explanation of the puzzle as to why it is easier to tell the history of economic thought in a relativist way up

7. It is perhaps worth adding that this was among the sections unfinished and not typed at the time of Schumpeter's death.

8. See, for example, Backhouse 1994.

to 1870 than after that date. In the work of John Locke, Adam Smith, and even David Ricardo, theory is often embedded in application; that is, the explication of the "theory" or "model" runs in terms of some concrete question the author is addressing with the model. Thus, it is hard to discuss the theory without also discussing the "applied work," and these applied elements provide material for a relativist interpretation. In contrast, in the work of Walras, John Hicks, or Paul Samuelson, one more often finds the theory presented in a very abstract form, with the result that relativism has less to work with. Historians of economic thought have chosen, for whatever reason, to play down applied work after 1870. Adam Smith, for example, looks very different in the light of Albert Hirschman and Walt Rostow or even public choice or transition economics than in the light of Kenneth Arrow and Debreu. One can argue that he has as much, if not more, to say on applied problems of growth and development as do contemporary economists, whereas from the perspective of mathematical general equilibrium theory, his work cannot appear other than primitive.

The common, often implicit, justification for the neglect of applied economics is that it deals with issues that are by their nature ephemeral and therefore of less intrinsic interest today than theoretical ones. This may be correct, but it is an unacceptable justification for a historian to make. To understand the past it is necessary to understand the issues that were of concern at the time. Moreover, if economics, like other social sciences, is about understanding the contemporary world, it is by definition dealing with phenomena that in many cases will be ephemeral. So-called ephemera are a vital part of the subject, and to neglect them is to distort the history.

An attempt to write a history of applied economics, or to increase the focus on applied economics in writing the history of economics, should begin with a premise that was advanced in the first section of this introduction. This is the idea that the notion of applied economics itself is an object of historical investigation—that the meaning of the term *applied economics* and the perceived relationship between applied and nonapplied economics are subjects of negotiation and controversy at any point in time and have changed significantly over the past century.

When one gets to the twentieth century, in particular to the middle of the century, it becomes really crucial to focus explicitly on applied economics, both work labeled as *applied* by the research community of the time and work that has come to be regarded as applied. For, as noted above, in the works of many nineteenth-century writers, even those who maintained the desirability of separating theorizing from the application of theory, applied economics was often found side by side with nonapplied economics, making it difficult for the historian to avoid considering both. It is when one reaches the 1950s that any failure to focus explicitly on applied economics can lead to a seriously distorted picture in which the bulk of the discipline is neglected. The separation of theory from applied problems means that it becomes possible to write histories of, for example, general equilibrium theory that relate to no applied problems whatsoever. Even if one does discuss theory that is applied to practical problems, the increasing tendency to develop theory independently of discussion of empirical work, usually by developing theories in separate sections of an article,[9] means that it is possible to focus on the theory and to neglect the applications. Underlying all this, if one accepts that micro- and macroeconomics are fundamental, the result can easily be a neglect of numerous applied fields on the grounds (possibly mistaken) that once one understands the core, applied fields will fall into place. Thus as historians increasingly turn their attention to the twentieth century, it will become more and more important to keep focused on the history of applied economics.

A history of economics in the twentieth century that gives special attention to applied economics is likely to be an interesting one. We have sketched what we believe to be the currently dominant concept of applied economics and the way in which graduate training programs and the organization of the profession by fields have come to reflect and reinforce that concept. The story of the emergence of this state of affairs is bound to be a fascinating one, one that is intertwined with such subjects as the professionalization of the discipline and the transition "from interwar pluralism to postwar neoclassicism" (Morgan and Rutherford 1998). It will involve debates and conflicts between alternative views of applied economics that coexisted in the earlier decades of the century, including those that considered marketing, accounting,

9. This is illustrated by the survey of journal articles reported in Backhouse 1998, which shows that the format, now commonplace, of treating theory and application separately in articles on applied topics is a recent phenomenon in the leading academic journals. As late as 1950 such articles constituted no more than 3 percent of articles in the *AER, JPE*, and *QJE*, but they rose to 10 percent in 1960 (Backhouse 1998, 91). Such separation between theory and application involves the use of a more formal structuring of economic arguments than was normal in earlier periods.

and other elements of the curricula of the emerging business schools as fields of applied economics, and those that held that "whatever applied economics is, it is not the application of economic theory." The essays in this volume offer glimpses of what that story might look like and the sorts of research questions that may command the attention of those who attempt to write the story.

The Interplay of Facts, Theories, and Techniques

There is a conventional wisdom about the relationship between core theory and the applied fields among modern mainstream practitioners. It holds that workers wishing to shed light on some concrete situation do so by taking a previously developed theoretical model "off the shelf" and tinkering with it—adding structure to fit the situation, giving the abstract variables of the model more-specific labels, and so on. The direction of influence runs one way, in that the theory helps change and enrich our understanding of the situation, but the use of a model from the core in application does not alter the basic content of the core. In writing the history of applied economics it will be important to explore how often the actual relationship between theory and applied economics in the recent decades of this century has followed this pattern.

Warren Young's essay is in a sense a case study of this question and seems to provide an example of the conventional wisdom. In Young's story, we see Herbert Simon drawn to the question of the economic impact of atomic energy in part because it offers an opportunity to "apply" models of technological change in which he has developed an interest, although Simon ultimately concludes that more progress could be made by applying a different preexisting theoretical framework, that of activity analysis. Likewise, Walter Isard sees input-output analysis as the theoretical model best suited for exploring the macroeconomic impact of atomic energy. Young's narrative follows the decisions these men make as they attempt to translate the most salient features of the reality they are examining into forms that correspond to the categories of the models they have chosen to use, and the insights at which they arrive having made these translations.

Robert W. Dimand's article on applied game theory also deals with researchers who seem to embrace the modern understanding of application, and it underscores the notion that, within this conceptualization, application can be said to be occurring at several points along a continuum from highly abstract theorizing to very concrete description. The researchers surveyed by Dimand clearly see themselves as being involved in the application of game theory, in spite of the absence of statistical analysis, an explicit policy focus, or other characteristics that many might consider hallmarks of applied economics. Instead, their understanding of application is that of reducing abstraction, of redefining the "players," "payoffs," and "strategies" of "pure" game theoretic models as specific actors, actions, and consequences in particular social settings, even though the resulting models remain highly stylized representations of "reality."

The conventional wisdom about the relation of theory and application is fundamental to Thomas C. Leonard's chapter. Leonard briefly reviews over a century of controversy concerning whether the classical and then neoclassical theories of competitive markets "applied" to labor, that is, whether they enhanced understanding of the processes of wage and employment determination and whether they provided an appropriate guide for policy pertaining to the working class. This history provides a context for recent controversies over the minimum wage. Leonard argues that the reason why economists have been so resistant to the findings of David Card and Alan Krueger suggesting the absence of any effect of minimum-wage legislation on employment is that those findings raise doubts about core theory. Theory is there to be applied, in the sense that models can be fitted to data and policy conclusions can be drawn, but the relationship is one-way. If empirical data should challenge the general theory (as with Card and Krueger's results), the evidence is called into question. Applied economics is the application of a core of generally applicable economic theory. This creates a tension for labor economists such as Card and Krueger who adopt an empiricist approach in which data are fundamental and should influence the theories that economists hold, but whose work is based on applying standard theory.

In contrast, the essay by Robert S. Goldfarb and H. O. Stekler argues that there has been two-way interaction between theory and data leading to the testing of a core theoretical concept, rational expectations. Macroeconomics spawned an applied field—forecasting and the building of macromodels—which generated data on the performance of forecasters. This could then be used to test the assumption of rational expectations. What makes this a special case is that it is a case where the economic theories concerned are theories about what economists can, or cannot, do. Participants in the applied fields are themselves participants in the economies that they are seeking to model. On the other hand, while there has been no protest against the challenge to the rationality assumption implied by this work comparable to the protest against Card and Krueger's, economists have maintained the theory of rational expectations despite increasing evidence that the data on forecasters' performance do not support it. In this sense, therefore, the story told by Goldfarb and Stekler about forecasting supports the lessons that Leonard draws from the minimum-wage controversy.

It may be that the bulk of the stories of the application of economics in the modern era manifest the relationship between theory and application embodied in the conventional wisdom. If this is the case, the essence of these stories will comprise two main themes. The first will be the steps taken, or not taken, as economists modified a preexisting model and attempted to redescribe certain situations of interest in terms of that modified model. The second will be how such decisions influenced subsequent interpretations of, or policy responses to, those situations. These are important themes in Stephen J. Meardon's article, which reviews a century of attempts by economists to use mathematical models to understand and explain the geographic distribution of economic activity. Meardon's story often runs in terms of the tension between the questions these economists wanted to address and the tools, that is, models and modeling strategies, they wanted to use to address them. Judy L. Klein's essay on statistical quality control, however, reveals a different sort of relationship between pure theory and applied work, in which attempts by economists to solve practical problems ultimately led to innovations in core economic theory. Statistical quality control (SQC) began as an application of statistical theory to handle the very practical problem of minimizing the number of defective items emerging from a production process. The techniques of SQC were promoted by the government as a part of the war effort during World War II, and a number of prominent economists recruited for the war effort were given very practical SQC problems to solve. The results, in addition to more-efficient methods for testing artillery shells, included advances in statistical decision theory and a new way of thinking about the behavior of rational decision makers that began to show up in the postwar theoretical models that economists used.

Questions concerning the conventional wisdom about the relationship between economic theory and applied economics persist when we turn to the sociological dimension of applied economics and the historical questions surrounding the establishment of applied fields, each with its own journals, conferences, collegial networks, and so on. Several of the chapters in this volume look at questions concerning the emergence, development, and sometimes disappearance of such applied fields. Steven G. Medema and Pedro Nuno Teixeira examine instances in which applied fields grew up around attempts to use models derived from the core of neoclassical microeconomic theory to understand phenomena that had previously attracted relatively little attention from research economists. Teixeira describes how Gary Becker and Theodore Schultz's model of human capital became an organizing principle for a new field, the economics of education, and how the vicissitudes of the new field followed to some extent the fortunes of the human capital model in the theoretical literature. He is also careful to note the influence of external events such as macroeconomic trends on the development of the new field, and he makes the interesting point that early promoters of the "economic view" of education did not build a field by winning over an existing community of education researchers but by forging links to researchers in already established fields of economics. It is important to this story that the field involved the application of already existing "core" theory.

There is also a story to be told of how the idea behind the modern field of public choice came to be embodied in theoretical models and to motivate empirical research, and of the intellectual debates that accompanied this process. Steven G. Medema's article, however, is concerned more with how this idea became the basis of conferences, line items in the budgets of academic institutions, specialized training for graduate students in economics, and a journal—in short, of the institutional accoutrements of the large, self-conscious, self-perpetuating body of researchers that constitutes a modern field of applied economics.

While Teixeira and Medema offer examples of applied fields that arose from within economics, Bruce E. Kaufman's essay on personnel management offers a different picture, taken from the early years of this century, of how an applied field might originate. Kaufman makes the case that the research on personnel management, concerned with the actual and ideal policies of employers in dealing with their employees, was in its early years a field of applied economics. This is not because it involved the application of some well-defined economic theory to the study of the employment relationship, but because many of the initial researchers in the field were economists—they were members of the American Economic Association and of faculties in departments of economics. In the face of rising public interest in questions related to employer-employee relations, the participation of economists in the new field reflected the seemingly natural fit between such questions and the economists' traditional expertise in matters related to the labor force and the behavior of business enterprise. The story also involves a key individual in the person of John R. Commons and the demand for qualified instructors created by the rise of professional business schools. Kaufman's paper closes with a brief account of how the study of the employment relationship passed out of the hands of self-identified economists and suggests several tantalizing topics for future researchers in the history of applied economics, including the changing relationship over the course of the century between economics and "business" fields such as finance, accounting, and marketing, and the recent emergence of a new subfield of personnel economics based on the optimization/equilibrium framework of modern microeconomic theory.

Competing Conceptions of Applied Economics and the Applicability of Certain Economic Theories

Competing conceptions of applied economics confront each other most starkly when the article by Alexander Dow, Sheila Dow, and Alan Hutton and the essay by Robert W. Dimand are considered alongside each other. Dimand, as well as the economists whose work he discusses, accepts the mainstream conception of applied economics, according to which applied economics involves reducing the degree of abstraction of a theory, without necessarily going so far as to explain specific historical events. Alexander Dow and his colleagues argue that Scottish economics represented a tradition in applied economics that totally rejected such a view. In this tradition, the essence of economics, as synonymous with applied economics, is remaining in close touch with the real world, and it is hard to see how the game theory that Dimand discusses fits in at all. They contend that a variety of historical and institutional circumstances resulted in the persistence, in Scotland, of a tradition of applied economics that was very different from the one that came to dominate the profession at large during the twentieth century. The lesson to be drawn from their article is arguably that not only do the institutions of the profession influence the histories of applied fields, but they also affect the concept of applied economics itself.

The interaction between alternative conceptions of applied economics in a specific institutional setting, the Department of Applied Economics (DAE) at the University of Cambridge, is addressed in Flavio Comim's paper. Taking as his focus theories of economic growth, Comim shows how successive directors interpreted the "applied economics" of the department's title in very different ways, with significant consequences for the type of research that was undertaken. Richard Stone equated "applied" with "empirical," with the result that research was directed at measurement and the development of techniques for the analysis of statistical data. Under Brian Reddaway, applied economics meant a more practical, policy-oriented approach to economics, with greater skepticism about econometrics.

Comim places these differences over the concept of applied economics within the Cambridge DAE in the context of similar differences in the history of growth theory. For Roy Harrod and Evsey Domar, the pioneers of growth theory, application had to do with policy relevance. For the architects of neoclassical growth theory, such as Robert Solow, it meant quantifying economic theory, even if this involved exploring questions that had no direct relation to policy. This was also the case with the new growth theory, although this interpreted application in yet another way. Quantification (as in cross-sectional regressions) was much more loosely linked to theory than was the case with the "old" neoclassical economics.

Comim's essay is like Leonard's in demonstrating that such questions as whether one economic theory is more "applicable" than another, or whether an economic theory can usefully be applied, can be causes of open conflict in the community of economists. It seems likely that a history of applied economics will contain many examples of such conflicts, for in arguments between economists with competing approaches, a claim that one's research is more applicable is a claim that it is more useful, that it will provide more guidance in solving problems, that it is more worthy of the support and attention of the larger society. On the other hand, at least within the classical and the mainstream conceptions of economic science, there is a view that theory is more scientifically valuable to the extent that it is more general. Thus, we should not be surprised to see episodes in which bodies of research are denigrated for being too applied and others in which research is denigrated for not being sufficiently applicable.

Organization of the Volume and Directions for Further Research

There are many ways in which we could have grouped the chapters in this volume, as each can be viewed from several perspectives. We chose to start with a set of articles on what has happened when economists have applied their theories and analytical techniques to practical problems, in four very different contexts. Klein's essay describes a situation in which applications of statistical and economic theory took place at the behest of and for the narrow purposes of a client. In Young's chapter, on the other hand, the researchers examining the economic impact of atomic energy turned to the problem largely because of the way it fit into their own theoretical research agendas. Economic forecasting has long been an area to which it has been hoped economic theory could be fruitfully applied, but Goldfarb and Stekler examine an episode in the forecasting literature in which the main goal was to *test* a theory, rather than to apply a theory to produce better forecasts. Leonard's article on the minimum-wage debates is concerned with an example of the fairly common phenomenon of economists' applying a theory to draw conclusions regarding the impact of a government policy, and it provides an interesting study of the reaction in the community of economists when the empirical evidence raises real questions about the suitability of the theory for this task.

The papers in part 1 all make it clear that the interaction between theory and application is more complicated than one might first expect. But if applied economics does not connote a simple process using pre-existing theory to analyze a concrete problem, the question arises as to what else it might mean. The essays in part 2 address this, forcing readers to confront directly the idea of what we understand by applied economics. Comim uses the example of growth theory to explore how, as the literature developed and theories changed, so too did the concept of applied economics that underlay it. At some stages, application meant drawing policy conclusions, while at others it meant econometric estimation of theoretical models. Dow, Dow, and Hutton offer an example, in the Scottish tradition, of a particular institutional setup leading to the establishment of an approach in which economics was considered synonymous with what is conventionally considered applied economics. Dimand's chapter on early applications of game theory is not explicitly concerned with the meaning of applied economics, but in dealing with a literature that called itself application while appearing to fall squarely within the realms of economic theory, it raises the question of where the boundaries of applied economics lie.

Part 3 turns to the institutionalization of applied economics in the form of applied fields. By examining a body of research that was once considered an applied field of economics but gradually lost its identification with economics, Kaufman's study of the relationship between personnel management and labor economics in the early twentieth century reminds us that the arrangement of social science research into disciplines, applied fields, and subfields is subject to change over time. The essays by Teixeira and Medema, on the economics of education and public choice theory respectively, examine cases of a more recent phenomenon sometimes called "economic imperialism," in which economists apply neoclassical reasoning to research questions previously believed to fall within the bounds of other social sciences. In both cases an institutional manifestation of successful imperialism was the emergence of a new "applied field," with journals and well-defined networks of researchers. Meardon's article is a bit different in that it looks not at a particular self-defined field but at the history of attempts by economists to explain the particular phenomenon of the agglomeration of industry, attempts that were often represented as efforts to expand or redefine existing applied fields.

Although the essays in this volume cover much ground, they do not encompass the whole of the subject. There is, for example, more to be said about the following topics:

1. The impact of economists and economic research on the actual crafting of policy (the regulation of utilities, the design of social welfare policies, and so on).
2. The relations between economists working in government and business, whose role is solely to "do" applied economics, and economists in academia.
3. The evolving relationship between applied work and theory in macroeconomics.
4. The proliferation of institutionalized applied fields from the middle of the twentieth century.
5. The international transmission of applied versus theoretical work.

On many of these topics, there is, of course, already a significant literature. However, much remains to be done in using this literature to construct a history of economic thought in which applied economics is more central than it has been up to now.

Our hope is that the essays in this volume will provide a useful starting point for further research into the history of applied economics. They make considerable progress toward identifying the changing historical significance of the concept of applied economics and its varied and shifting meaning during the twentieth century. Equally important, the individual articles provide examples of what can be done in the area. They demonstrate clearly that the history of applied economics offers intellectual challenges equal to, if not greater than, those involved in more traditional topics for the history of economic thought.

References

Backhouse, Roger E. 1994. *Economists and the Economy: The Evolution of Economic Ideas*. 2d ed. Brunswick, N.J.: Transaction.

———. 1998. The Transformation of U.S. Economics, 1920–1960, Viewed through a Survey of Journal Articles. In *From Interwar Pluralism to Postwar Neoclassicism*, edited by Mary S. Morgan and Malcolm Rutherford. *HOPE* 30 (supplement): 85–107.

Coats, A. W. (Bob). [1980] 1993. The Culture and the Economists: Some Reflections on Anglo-American Differences. In vol. 2 of *The Sociology and Professionalization of Economics: British and American Essays*, edited by A. W. Coats. London and New York: Routledge.

Devons, Eli. 1961. Applied Economics: The Application of What? In *The Logic of Personal Knowledge: Essays Presented to Michael Polanyi on His Seventieth Birthday 11 March 1961* (no editor named). London: Routledge & Kegan Paul.

Grattan-Guinness, Ivor. 1997. *The Fontana History of the Mathematical Sciences*. London: Fontana.

Hirsch, Abraham, and Neil de Marchi. 1990. *Milton Friedman: Economics in Theory and Practice*. Brighton: Wheatsheaf.

Jaffé, William. 1983. *William Jaffé's Essays on Walras*. Edited by Donald A. Walker. Cambridge and New York: Cambridge University Press.

Keynes, John Neville. 1917. *The Scope and Method of Political Economy*. London: Macmillan.

McCloskey, Donald N. 1986. *The Rhetoric of Economics*. Brighton: Wheatsheaf.

Mill, John Stuart. 1877. *Essays on Some Unsettled Questions of Political Economy*. London: Longmans, Green and Co.

Mitchell, Wesley C. 1937. *The Backward Art of Spending Money*. New York: McGraw-Hill.

Morgan, Mary S., and Malcom Rutherford, eds. 1998. *From Interwar Pluralism to Postwar Neoclassicism*. Supplement to volume 30 of *HOPE*. Durham, N.C., and London: Duke University Press.

Pareto, Vilfredo. [1906] 1971. *Manual of Political Economy*. Translated by Ann S. Schwier. New York: Kelley.

Punzo, Lionello F. 1991. The School of Mathematical Formalism and the Viennese Circle of Mathematical Economists. *Journal of the History of Economic Thought* 13.1:1–18.

Ravetz, Jerome R. 1973. *Scientific Knowledge and Its Social Problems*. Harmondsworth, England: Penguin.

Remenyi, Joseph V. 1979. Core Demi-Core Interaction: Toward a General Theory of Disciplinary and Subdisciplinary Growth. *HOPE* 11.1:30–63.

Samuelson, Paul Anthony. 1947. *Foundations of Economic Analysis*. Cambridge, Mass.: Harvard University Press.

Schumpeter, J. A. 1954. *A History of Economic Analysis*. New York: Oxford University Press.

Senior, Nassau. 1828. An Introductory Lecture on Political Economy. *The Pamphleteer* 29:33–47. Reprinted in vol. 1 of *The Methodology of Economics: Nineteenth-Century British Contributions*, edited by Roger Backhouse. London: Routledge/Thoemmes Press, 1997.

van Daal, Jan, and Albert Jolink. 1993. *The Equilibrium Economics of Léon Walras*. London and New York: Routledge.

Weintraub, E. Roy, and Philip Mirowski. 1994. The Pure and the Applied: Bourbakism Comes to Mathematical Economics. *Science in Context* 7.2:245–72.