

COWLES FOUNDATION FOR RESEARCH IN ECONOMICS
AT YALE UNIVERSITY

Box 2125, Yale Station
New Haven, Connecticut 06520

COWLES FOUNDATION DISCUSSION PAPER NO. 679

Limited Circulation Only

This Cowles Foundation Discussion Paper is not for general circulation and is being privately circulated by the author alone. Its contents are strictly confidential and are not to be reproduced either in part or in whole without his authorization. Nor are the materials herein to be used in unpublished or published work without his explicit consent.

ON UNIVERSITY EDUCATION IN ECONOMETRICS:
REMARKS ON AN ARTICLE BY ERIC R. SOWEY

Peter C. B. Phillips

September 1983

ON UNIVERSITY EDUCATION IN ECONOMETRICS:
REMARKS ON AN ARTICLE BY ERIC R. SOWEY

P. C. B. Phillips

Cowles Foundation for Research in Economics
Yale University
New Haven, Connecticut 06520

I

The time is ripe for the econometrics profession to concern itself in public with the problem of education. I say, in public, because, unlike Sovey, I believe it is quite wrong to assert that "virtually no attention at all has been given to the teaching of econometrics." From personal experience I know that leading departments in both the USA and the UK spend a good deal of faculty time in the discussion of course planning, curricula and methods of assessment in econometrics. I am sure it is true in other countries as well. But the statements which motivate Sovey's article and initiate his discussion clearly censure econometricians for what he calls their neglect of this area. These statements are unjustified and deserve immediate correction.

It is too easy to blame econometricians for the lack of public discussion on education in econometrics. There seems to me to be a more deserving target for reproof: the Econometric Society itself. It is self evident that one of the major roles of a professional association is to encourage the discussion of education and provide a regular forum on the subject at the meetings it sponsors. Other

professional associations such as the American Economic Association and the American Statistical Association have done so for many years. Indeed, these associations provide regular outlets for research and discussion on the topic of teaching. By comparison, the Econometric Society seems particularly backward. The solution to this underdevelopment is not simply a matter of heightening the awareness of the leaders of our own professional association. Some significant changes in our major organ of publication, Econometrica are also required and, in my view, rather overdue. Let me focus on one aspect of the problem. To many observers, Econometrica's center of gravity has been slowly moving away from econometrics. On a recent head count published by the Editors of Econometrica (January 1983) the Journal published only one article in high brow econometric theory as against fifteen in high brow economic theory in 1981. There are many other aspects to the changing character of Econometrica and this is not the occasion to explore the subject in depth. But, it must be said that the shortage of outlets for econometric research and the failure of the Econometric Society to promote activity in the area of education both carry a large share of responsibility for the underdevelopment of the subject that Sovey reports.

II

To many members of the profession it may also seem appropriate to widen the terms of reference that Sovey uses in his article. In my view, our major concern should be with education in the widest sense, and not simply the teaching of students. Econometricians do bear a responsibility in this wider role (whether they like it or not), particularly with respect to the continuing education of economists about econometric technique. Every econometrician who has worked in a university department understands this role very well because of the time he has inevitably spent with colleagues who knock on his door clutching anything from a computer output or fortran program through to a check list of mathematical questions that can span half a dozen different fields. Once again, I differ

with Soweby by believing that the frontiers of our discipline are expanding and deepening so rapidly (c.f. Soweby's description of this advancement as "sedate") that those economists whose education in econometrics is based on the leading textbooks of the sixties and seventies suffer from a knowledge that is now seriously dated. It is not so long ago that a well known economist (who has since been President of the Econometric Society) told me that as far as he was concerned econometrics was just linear algebra and that was why he found it so dull!

Serious graduate students of econometrics find out differently very quickly these days. In fact, one of our major problems in econometric education is the widening gap between the level and subject matter of the textbooks and the research frontier itself. Soweby seems to think otherwise when he tells us that "the frontiers are far closer to the graduate student than they are in such long established subjects as physics, mathematics and, indeed, economics." With some (increasingly rare) exceptions econometricians need a good background in mathematical statistics, economics and often applied mathematics to advance the frontier of the subject. This is a feature of econometrics which distinguishes it from mathematical statistics (where you don't need to satisfy economists to get into the leading journals) and economics (where you can achieve a great deal without touching a computer terminal, without knowing much statistics and knowing even less applied mathematics). Students are not slow to recognize this either. In the early days of their graduate studies many of them recognize that a considerable intellectual investment is required in a variety of fields (the mathematics for which must often be entirely self taught) before they can penetrate the surface of recent econometric research and do related work themselves. They see that less investment gives a greater short run return in other fields such as (without intending any disrespect) middle brow economic theory; and many students do choose this route of specialization, allied perhaps to a wing of associated applied research that is not intended of itself to be innovative in technique or methodology.

It is always a serious mistake to judge a field of research by the level and coverage of the prevailing textbooks, particularly in a subject like econometrics where much of the teaching even at the graduate level comes into the service course category. Kmenta (1983) in a recent comment for this Journal falls into this trap when he chooses to evaluate a field of research by the extent to which it has penetrated through to textbook subject matter. Textbooks are not always written by educators who are active in the front line of research. This is particularly true of the more technical areas where it is too easy to dissipate the tension that is necessary for creative research by talking too much about it. The distinguished counterexample in econometrics is Malinvaud's treatise. When it first appeared in 1964 (in French) and in 1966 (in English translation) this book was at the vanguard of the subject. So much so that the material it contained on the theory of linear estimation and non linear regressions decisively broke open new research ground (although this was never openly recognized in the excellent reviews Malinvaud's book received): the former predating Kruskal's article on the equivalence of OLS and GLS and the latter providing the first rigorous asymptotic theory for non linear regression in mathematical statistics. But few econometricians would claim that Malinvaud's text remains close to the research frontiers today, particularly in the more technical areas. In short, students or researchers who need help in following the technicalities of ongoing econometric research often find little to help them in Malinvaud's treatise in spite of the fact that it is in its third updated edition and is still widely recognized as the most advanced treatment! For these customers, the textbooks are visibly inadequate. Fortunately, there are emerging handbooks and advanced monographs of econometric research that they may now use for reference.

It is also a mistake to assume that what appears in textbooks is what is actually taught in the classroom. The fact that many of the textbooks are said to be based on classroom material has always surprised me since they all exhibit what I would consider to be

major deficiencies even with respect to the most basic material. Let me give two examples from the theory of the linear model. Both are relevant to first year graduate education. First, no textbook on the market offers the simple matrix Lagrange multiplier approach to BLUS residuals. Second, none of the textbooks even mention Kruskal's theorem (in spite of the fact that it has been well known for 15 years and appears in undergraduate statistics texts on regression) let alone its convenient application to the SUR model. How then are these subjects taught in the classroom by textbook? Those students who are subjected to the traditional textbook menu on BLUS residuals must suffer a severe case of indigestion. Their plight is comparable to that of students in micro courses before duality and convex analysis. And those students who are not shown Kruskal's theorem miss out on one of the modern pinnacles of regression theory. To bypass textbook failures such as these, most econometricians must use their own lecture material, as I have always done myself.

It is perhaps an inevitable consequence of the enormous growth in econometric research during the last decade, that compartmentalization of knowledge has become a more permanent, albeit regrettable, feature of our intellectual landscape. To take another example from the pages of this Journal, Quandt (1982) recently reviewed at length the subject of disequilibrium econometrics. Neither Quandt nor his three reviewers make a single mention of the extensive research on disequilibrium models in continuous time, a subject that was thoughtfully considered by Koopmans, actively promoted by A. W. Phillips and Quenouille and brought to maturity under the influence of Bergstrom (1976) in recent years with significant empirical applications. Such an extraordinary omission speaks of poor reconnaissance in research. There must be many other examples of this type of compartmentalization of knowledge in our subject. We must all be vigilant to avoid its trappings in our own work; and in the best traditions of scholarship educators must continue to educate themselves rather than rely on the inevitably imperfect filter of the editorial mill.

III

In his discussion of specialist training programs in econometrics I think it would have been helpful to Soweif if he had clarified the nature of these programs before considering the curriculum, expositional techniques and methods of assessment. Some major differences exist between North American and British programs in this respect. At the graduate level North American courses are geared to doctoral programs which involve at least two years of coursework. The major objective of these programs is to train professional economists. Typically the best graduates proceed to academic positions and are already well established in their careers as research economists by the time they leave. Course work aims to provide a uniform horizontal education in all fields during the first year and a vertical deepening into the research frontier in fields selected by the student during the second and third years. The econometrics sequence can achieve these objectives in several ways and there are differences in the offerings amongst the major schools, which are partly determined by faculty interests. But most schools offer at least one advanced theory course in econometrics which takes students well beyond textbook level and additional applied courses which focus on microeconomic or macroeconomic techniques and empirical results. In certain schools applied research papers are required of all students to demonstrate their competence in the use of econometric methods, their handling of data and in the analysis of results. All this, prior to dissertation research.

The British system of graduate education, at least as I remember it in the 1970's, is rather different. There the degree program is typically a one year intensively taught masters (with a short research paper written during the three month summer sequel). Inevitably, there is less education in both horizontal and vertical directions than in the North American system. Graduates are typically well equipped for professional careers in selected areas but often find doctoral dissertation research hard going. This explains, in part, the high proportion of incompletes in British

doctoral programs. Those that do graduate usually know well the meaning of independent research.

While on the subject of British education in econometrics, I think it is worth pointing out that the era of separate departments of econometrics began to draw to a close in the late 1970's when the econometrics and economics departments merged in several universities. Having initiated the move at Birmingham University during 1977, I know that the merger was designed to achieve economies and coordination in the teaching of quantitative economics and coherence in the graduate masters economics program. These mergers effectively improved lines of communication between subfields in the economics area and had a particularly important effect on the structure of the masters degree and the curriculum of required courses. As I understand it, none of the major British schools at LSE, Essex, Warwick, Southampton or Birmingham now have separate econometrics departments. These developments may therefore be of relevance to Sovey's discussion and the extent of his audience since his stated perspective is that econometrics is taught by a separate university department.

IV

Sovey's article provides one personalized view of econometrics teaching. His view will no doubt encourage a series of opposing views from his critics based upon their personal experiences. While some valuable ideas are likely to emerge from this activity, it will be an unproductive educational exercise unless it can progress beyond the mere expression of opinion and counteropinion. To facilitate such progression, what is needed is a framework in which opinion and personal experience can be seen to relate to well defined precepts in the theory of education. When such a framework is provided there will exist a meaningful context for productive discussion.

To take an example, consider the following assertion made by Sovey: "it is a matter of common observation that students understand best what they do themselves." In response to this observa-

tion, SoweY advocates a "learning by doing" strategy whereby students adopt highly active roles in their own learning through the use of such devices as applied projects. This position is very unlikely to elicit negative reactions. But I think it is fair to say that there remains much private support for the more traditional approaches to teaching, such as the formal lecture. Can such apparently divergent opinions on teaching strategy be reconciled? If one accepts that learning takes place on many different levels, then they can.

Educational theory identifies the following degrees of learning: knowledge, comprehension, application, analysis, synthesis and judgment. Educational research indicates that some teaching methods are more conducive to promoting a given cognitive skill than others. For instance, programmed learning methods may be highly efficient in promoting knowledge; guided reading and the formal lecture may be the preferred choice in aiding comprehension; tutorial systems may help to evoke analytical skills; and "learning by doing" techniques such as those advocated by SoweY may best stimulate the higher order activities of synthesis and judgment. In this way we are reminded that the selection and advocacy of teaching strategies should depend upon the cognitive level of learning that we, as educators, wish to develop in our students as well as the stage of learning they already have attained.

This example presents one area in which a meaningful theoretical framework can help to build upon individual opinions and experiences. There are many opportunities in other aspects of education to do the same thing and the field is wide open in econometrics.

V

In recent years there has been increasing disquiet in the profession concerning traditional principles of econometrics. Much of the disquiet concerns methodological issues which in one form or another have troubled members of our profession since the early work of Tinbergen. But, while there is little that is new in the

nature of the criticisms when they are carefully inspected, some of the voices in the present chorus are particularly censorious in tone and unedifying in content. Against this background, SoweY has chosen to open up a public discussion of econometrics teaching. No doubt professional views on this subject will be as disparate as they are on methodological issues.

Let us hope that the educational debate will take a scientific direction that will be of lasting value to the profession. SoweY and Econometric Reviews are to be congratulated for initiating the program. We will all benefit if the Econometric Society will pick up the torch that has kindled.

ACKNOWLEDGEMENTS

The ideas herein were extensively discussed with Deborah J. Blood whose detailed comments helped the final form to take shape. To her much more is due than the usual acknowledgement and expression of thanks. The manuscript was typed by Glenna Ames who, as always, deserves my thanks for her skill and effort.

REFERENCE

- Bergstrom, A. R. (1976). "Statistical Inference in Continuous Time Economic Models." North Holland, Amsterdam.
- Kmenta, J. (1983). "Some Notes on the Relevance of Finite Sample Distribution Theory," Econometric Reviews, 2, 55-60.
- Quandt, R. E. (1982). "Econometric Disequilibrium Models," Econometric Reviews, 1, 1-63.