TEACHING ECONOMETRICS TO A LARGE CLASS A CASE IN GREECE *

By E. G. DRETTAKIS *

Athens Graduate School of Economics and Business Science

Introduction

Papers on Econometrics teaching are not published very often. The ones which have been published (see, e.g., Tintner (1955)) are more of a survey type. One possible reason for this is that teaching Econometrics to a relatively large class is not, so far as I know, common practice in West European and other Universities. The author had that experience in Athens Graduate School of Economics and Business Science (ASEBS) during the academic year 1974 - 75. The purpose of this paper is to explore the relation between the students' performance in Econometrics and their High School, University Entrance Examination and first three years University performance. The effect which the optional subject of Mathematical Statistics, the class work and the sex of the students had on their Econometrics performance is investigated using dummy variables. Covariance analysis is employed to examine whether these latter factors made any difference on the students' performance in Econometrics when their marks in related subjects, taken in their first three years in the School, were used as explanatory variables. Finally the relation between Econometrics and related subjects, High School, University Entrance Examination and the Degree results of some students who graduated in June 1975 is investigated using correlation analysis.

I. The Background

It is not possible, in a short paper, to outline either the Greek Secondary Education and the University Entrance Examinations system or to give an account of how Econometrics came to be taught as a compulsory subject to all Final - year Economics students in ASEBS. Suffice here to say that all High school graduates wishing to enter any University have to sit an Entrance examination

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in August of the year they intend to start their University studies. The results of this Examination determine whether the candidate will enter University. Usually only between a quarter and one fifth of all candidates are successful. The students who are the subject of this paper entered ASEBS in October 1971. As University studies in Greece last, normally, for four years the students who had successfully gone through the first three years of their studies had reached their Final year in 1974 - 75. All students followed a scheme of study introduced in the School in 1970. The scheme included compulsory Economics courses in all four years, Mathematics courses in the First and Second year and Statistics courses in the Second and Third Year. Econometrics was compulsory in the Final year. Some of the students have also taken Mathematical Statistics as an optional subject in their Third year. As not all Final - year students attend lectures, our investigation refers only to those who attended at least 50 % of them and sat the June 1975 examination in Econometrics.

II. Description of the Course

In designing the Econometrics course to be given to the Final-year Economics students in ASEBS in the academic year 1974 - 75 it was decided to use Linear Algebra in the exposition of Econometric Theory. Given the courses the students have taken in their first three years in the School it was thought that a revision of what they have done in Linear Algebra in their First and Second Year - Mathematics courses supplemented by special topics like : Quadratic forms, Characteristic roots, Trace, Elements of Differential Calculus in Matrix form etc. was necessary. The revision of the general part of Linear Algebra was based on Hadley (1961), while the special topics were selected from the material given in Chapters on Linear Algebra in Econometrics textbooks as, for example, in Goldberger (1964), Theil (1971) and Johnston (1972). The topics covered in Econometrics corresponded to the main parts of Chapters 5, 6, 7 and 8 of Johnston (1972) with some supplementary material. The total number of hours taught was 48 in lectures and 24 in classes. The Class work was exercises given to students one week before they were to be discussed. Only a quarter of the students have handed in 3 or more of the 12 sets of exercises which were prepared for them. Out of the 60 - 70 students, who have attended over 50 % of the lectures, 58 sat the June 1975 examination. Of those 9 were eliminated because they were not students who entered the School after passing successfully the August 1971 University Entrance Examination. The marking Scheme in individual subjects in the School is in integer numbers. Those who receive marks of 4 or below fail the examination. The «pass» marks are 5, 6. The «Upper Second» marks 7, 8 and the «First Class» marks 9, 10. The June 1975 examination results in Econometrics were as follows :

Table 1. The June 1975 Econometrics Results.

Marks	Men	Women	Men+Women	%
9 - 10	7	—	7	14.3
7 - 8	10	3	13	26.5
5 - 6	14	6	20	40.8
< 5	5	4	9	18.4
Total	36	13	49	100.0

III. The Determinants of the Perfomance in Econometrics

The individual marks of the students covered by table 1 were taken as the indicator of the students' performance in Econometrics and hence were our dependent variable (ECM = y_s). As explanatory variables we have tried the students' average marks in the High School Certificate (HSC), their average marks in the University Entrance Examination (UEX) as well as their marks in Economics, Statistics and Mathematics courses taught in the School in their First, Second and Third Year. We have found that of the two Statistics courses taught in the Second and Third Year only the marks of the Third - year course (ST3 = = x_{s_1}) were significantly correlated with the marks in Econometrics. Of the three Economics courses taught in the First, Second and Third year only the First - year course marks (EC1 = x_{s_2}) gave statistically significant results. Both Mathematics courses taught in the First and Second Year were significantly correlated with Econometrics but the marks of the Second - year course (MA2) were more correlated with the latter than the marks of the First - year course. In table 2 we give the correlation coefficient matrix of all these variables :

Table 2. Correlation Coefficient Matrix of the Marks of Students in ECM, HSC, UEX, MA2, ST3 ansd EC1.

	ECM	ASC	UEX	MA2	ST3
HSC	0.093				
UEX	0.154	0.439			
MA2	0.469	0.370	0.308		
ST3	0.518	0.389	0.403	0.486	
EC1	0.493	0.328	0.474	0.639	0.304

Table 2 shows that at the 5 % level all the results are statistically significant except those referring to the correlation between Econometrics on the one hand and (separately) High School Certificate and University Entrance Examination performance. Of the three courses taught in the School the one which

is more closely correlated with Econometrics is the Third - year course in Statistics. As that course covers Correlation and Regression Analysis this is, of course, natural.

The next step was to try combinations of the three variables in two's. From the pairs the one which gave the best fit was that of ST3 and EC1 i.e. the model :

$$y_s = a_0 + a_1 x_{s_1} + a_2 x_{s_2} + u_s \qquad (1)$$

Using the 49 observations of our sample the estimated equation (1) («t» values are given below the coefficient estimates) is :

$$y_s = \underset{(1.54)}{-2.391} + \underset{(3.36)}{0.617}\, x_{s1} + \underset{(3.06)}{0.681}\, x_{s_2} \qquad \bar{R}^2 = 0.366 \qquad E = 14.86$$

This result shows that the performance in the Econometrics Finals examination depended almost equally on the 1st year Economics and 3rd year Statistics marks. The negative intercept is due to the differences in the distributions of the marks received by the students in ECM, ST3 and EC1. As the students who are the subject of our investigation have all passed the latter two subjects, their marks in them are all greater than or equal to 5. For comparability purposes we have taken the corresponding subset of the students of table 1 and worked out the distribution of their marks in Econometrics. In table 3 we give the three distributions.

Table 3. Distributions of Marks greater or equal to 5 in ECM, ST3 and EC1

	% of Marks in		
Marks	ECM	ST3	EC1
9 - 10	17.5	16.3	6.1
8 - 7	32.5	49.0	20.4
6 - 5	50.0	34.7	73.5

The only other pair which yielded statistically significant results was ST3 and MA2 ($\bar{R}^2 = 0{,}301$). When ST3, EC1 and MA2 were tried together the coefficient estimate of MA2 was not statistically significant.

Apart from the performance of the students in subjects related to Econometrics taken in the previous years in the School we have also looked into the question whether the following factors had any effect on their performance in Econometrics :

(a) Class work. For this we have defined the following dummy variable :

$$d_{s1} = \begin{cases} 1 \text{ if the student has done at least 25 \% of the class work} \\ 0 \text{ otherwise} \end{cases}$$

(b) The Sex of the student. The dummy variable for this was :

$$d_{s2} = \begin{cases} 1 \text{ for males} \\ 0 \text{ for females} \end{cases}$$

(c) The optional subject of Mathematical Statistics taken by some students. For this the dummy variable used was :

$$d_{s3} = \begin{cases} 1 \text{ if the student has taken Mathematical Statistics} \\ 0 \text{ otherwise} \end{cases}$$

We have tried these dummy variables one at a time. Only d_{s1} gave statistically significant results ($\bar{R}^2 = 0.176$). We have, then tried combinations of them and the one which yielded significant results was :

$$y_s = \beta_0 + \beta_1 d_{s1} + \beta_2 d_{s2} + v_s \qquad (2)$$

The estimated equation (2) was :

$$\underset{}{y_s} = \underset{(7.28)}{4.349} + \underset{(3.58)}{2.204 d_{s1}} + \underset{(2.05)}{1.326 d_{s2}}$$

This result shows that Class work contributed 2.204 marks to the mark obtained by a student in the Econometrics Finals examination. Moreover a male student had an advantage of 1.326 marks over a female one.

Using covariance analysis we have found that neither intercepts nor slopes of equation (1) differed between (i) males and females (ii) between those who have done class work and those who haven't and (iii) among those who have done and those who haven't done class work differentiated by sex.

IV. The Degree Results

Out of the 36 students who were successful in the Econometrics Finals examination only 17 managed to graduate in June 1975 (the others had to sit the subjects they did not pass in later examination periods).

The degree mark is obtained by averaging 29 marks received in all four years in the School. We have calculated a correlation coefficient matrix between the Degree mark (DEG) of the 17 students and their marks in : Econometrics, subjects related to Econometrics used in equation (1), High School Certificate and University Entrance Examination. The matrix is given in the following table.

A comparison between table 4 and table 2 shows that there are differences in the correlations of ECM, MA2, ST3 and EC1. In table 4 only the correlation of ECM and EC1 is statistically significant at the 5 % level.

Table 4 shows that almost all marks in subjects taken in the first three years as well as the marks in Econometrics are correlated with the Degree mark. The

Table 4. Correlation Coefficient Matrix among DEG, ECM, HSC, UEX, MA2, ST3 and EC1

	DEG	ECM	HSC	UEX	MA2	ST3
ECM	0.493					
HSC	0.394	— 0.217				
UEX	0.428	0.035	0.255			
MA2	0.666	0.332	0.350	0.200		
ST3	0.462	0.207	0.242	0.336	0.294	
EC1	0.771	0.459	0.164	0.487	0.552	0.024

correlations of the marks in the first two years in the School with the Degree mark are higher than the correlations with the marks received in subjects taught in the third (ST3) and fourth (ECM) year. This may be due to the fact that many students start working part - time or even full - time in their last two years in the School.

Finally table 4 shows that there is no statistically significant correlation among DEG, HSC and UEX. Given the size of this sub - sample and its unrepresentativeness of the Greek or, even, the School's student population (the majority of students do not receive their degree in the first Finals examination period), the results of table 4 point to the need of a broadly based research on the relation between High School, University Entrance Examination and the Degree results both in ASEBS and in other Greek Universities.

CONCLUSION

This paper has shown that the students' performance in the Econometrics Final examination in ASEBS does, to some extent, depend on their previous years' performance in examinations on subjects belonging to the constituent disciplines of Econometrics (see Frisch, 1933). Class work and the sex of the students, used together, made a difference but they were not statistically significant when used in conjunction with the students' marks in Economics and Statistics as explanatory variables of their marks in Econometrics. The other results of the paper point to the need of further research on the relation between pre — University, intermediate University examinations and Degree results.

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