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Students' Performance in Economics: Does the Norm Hold Across Cultural and Institutional Settings?

Richard S. Tav

In a recent review of research on economic education, Becker, Highsmith, Kennedy, and Walstad (1991) found that the quantity of research on economic education at the college and university level had declined during the past decade despite expanded opportunities for publishing and an increased number of people listing economic education as an area of specialization. One reason suggested for this decline was the review by Siegfried and Fels (1979), which, combined with other studies during the 1980s, may have inadvertently led researchers to believe that further research would not yield significant insights. Siegfried and Fels (1979) found a general consensus regarding most of the widely hypothesized student's and instructor's effects on performance in economics. A student's general (especially verbal) aptitude is the most important determinant of learning. Socioeconomic background, prior economic courses, mathematics preparation, class size, textbooks, and study effort did not seem to matter very much.

Although the growth in published research on economic education has slowed, much progress has been made in the last decade. In a more recent survey, Siegfried and Walstad (1990) found that study effort, age of student, and a good match between student's learning style and instructor's teaching style all have positive

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influences on student's performance, whereas attitude toward the course, a prior economics course in high school, and having a graduate student as instructor remain insignificant. Male students were found to perform better when stock models of economic knowledge were used but not when flow models were used. In addition, men were found to perform better on multiple-choice examinations, but women did substantially better on essay examinations.

With a few exceptions, mainly from the United Kingdom, most studies in economic education have been conducted in the United States. My purpose in this study was to analyze some of these conclusions in the context of a different culture and institutional setting. In particular, the effects of a student's gender, effort, race, prior exposure to lower-level courses, and aptitude were studied together with instructor effects, such as having tutors who were graduate teaching assistants, foreigners, and lecturers.

I estimated an ordinal probit model of students' examination grades using data from the School of Accountancy and Business at the Nanyang Technological University (NTU) in Singapore. All first-year students in the school were required to take an economics course that was administered jointly for both accountancy and business students in the academic year 1991-92. The course was taught in a lecture-tutorial system. Students attended a one-hour lecture per week, where most of the course content was taught, and another hour of tutorial each week in which they had to answer tutorial questions and were also expected to clarify any doubts they might have about the material.

A major concern in such a system is to assure students and parents that students will not be handicapped or have an unfair advantage because of different teaching styles or different abilities of the tutors. That is, a student's grade on the examination should reflect mainly his or her ability rather than differences in the tutors. Uniformity across tutorial classes was maintained by several controls. First, all students attended the same lecture. Because of the large size of the class (over 1,300 students), students were divided into four groups for lectures, and the topics were divided and taught by three lecturers. Each lecture was repeated to all groups by the same lecturer responsible for the particular topic. Second, all tutorial and examination questions were assigned by the lecturer responsible for the particular topic, and all tutors were given the same set of suggested solutions. Third, at the end of the course, all students took a common three-hour essay examination. Fourth, to ensure consistency in grading, the same lecturer graded each question or subquestion for every student; no double grading was done. Fifth, the student's identity and tutorial group were not known to the grader. Only the student's matriculation number appeared on the exam script. The lecturers had no knowledge of any student's matriculation number and were prohibited by university policy from asking any student for his or her matriculation number. Last, students' grades were determined solely by their relative performance on the common examination, and no credits were given for class participation. The grades, however, were not normalized to create equal instructor or tutorial averages.

The above six controls diminished the influence of the tutor on the students' grades because the main role of the tutor was to serve as the tutorial leader. In contrast, tutors in the United States have direct impacts on students' grades

through the grading of their own students' exams and quizzes and through the assignment of marks for class participation. Therefore, the expected influences of the tutor found in most studies done in the United States (Lampher and McConnell 1970; Watts and Lynch 1989; Bosshardt and Watts 1990) may not be found in this study.

Beside differences in institutional setting, this database is unique because very little research has been done on economic education in an Asian society. Although Singapore inherited its education system from the British, its population is mainly Asian, and the culture is much more traditional and conservative than most Western democracies. The teacher-student relationship tends to be a one-way flow that may produce different student versus instructor effects on learning. Relatively higher weights are accorded to pure hard work in the reward system, implying that a student's effort and prior knowledge may be more important. Furthermore, because sexual stereotypes and biases are still quite prevalent, the conclusion on gender's role found in most Western studies may have to be qualified.

THE MODEL

An ordinal probit model was used to estimate students performance on an economics examination. This methodology was selected instead of the widely used ordinary least square regression because the dependent variable in this analysis was grades, which are discrete and ordinal in scale. Most previous studies used a cardinal and continuous dependent variable such as scores on standardized multiple-choice examinations. In Singapore, students' abilities are measured solely on the basis of their performance on examinations. No standardized instruments such as the Test of Understanding in College Economics (TUCE) are administered. Thus, in this analysis, the student's grade was selected as the sole measure of the student's learning and ability.

Letter grades were used in this analysis because of possible changes in the raw scores if the board of examiners, appointed by the university president, should decide to normalize the overall curve. To grade the examination, lecturers assigned a number score for each question or subquestion. These scores were later tallied and entered into the computer by the coordinator, who was the principal lecturer and chief administrator for the course. University policy dictates that a student should receive a grade of A if he or she obtained 75 percent or higher on an examination and grades of B, C, or D if he or she obtained at least 65, 55, or 50 percent, respectively. Scores below 50 percent would result in an F grade, or failure in the course. If the overall distribution is deemed unacceptable by the board of examiners, then normalizing may be done. The number scores would have to be adjusted to conform to the university's grading scheme and the revised distribution. The relative ranking of students, however, was maintained in the adjustment. Because the original number grades were not available, letter grades may be a better measure.

A student's grade is assumed to be a function of his or her intellectual ability, academic background, personal factors, and instructional input. The prevalent education production function used in economic education research can be adapted

for this analysis to address several of these concerns; specifically, I estimated the function

$$\text{GRADES} = f(\text{MALE}, \text{AGE}, \text{ACC}, \text{CHIN}, \text{A-ECON}, \text{A-AGGRE}, \text{FRGN}, \text{GTA}, \text{LECT}) \quad (1)$$

in an ordinal probit model, using the maximum likelihood technique that yields estimates with the desired properties.

One of the most widely studied personal factors affecting a student's learning and ability is gender. Siegfried (1979) posited that female students grow up in a cultural environment in which girls are not supposed to like business and thus have a disadvantage in economics courses. Compared with the Western countries in previous studies, Singapore has a more traditional and conservative attitude toward gender roles. Therefore, the bias toward the male student may be even more significant in this analysis. Furthermore, Siegfried and Strand (1977) and Siegfried (1979) suggested that young females are more likely than males to possess a dependent learning style and might be penalized in a large lecture format that does not accommodate dependence. Because all courses in NTU are taught in mass lectures without much interaction or feedback, this hypothesis was pertinent to our study. The dummy variable, MALE, was thus expected to be positive and significant.

On the other hand, Lumsden and Scott (1987) found that female students perform better on essay exams and Ferber, Birnbaum, and Green (1983) found no significant gender difference on essay tests. Because students in the sample took an essay exam, the earlier hypothesis that males perform better had to be qualified.

The effects of the different institutional and cultural factors on the role of gender were confounded by the different political environment in Singapore. Because the average male student in the sample was two to three years older than the average female student because of the compulsory military draft in Singapore, the MALE variable was likely to be correlated with AGE. The coefficient of AGE was expected to be positive and significant because the maturity of students has been widely found to be positively correlated with performance (Siegfried and Fels 1979; Siegfried and Walstad 1990).

Another dummy variable, ACC, was included to capture any systematic differences between accountancy students and business students. One motivation for including this variable in the specification was the common belief held by many faculty members at NTU, acquired mainly through observations, that accounting students tend to be more motivated and better prepared for tutorials. If this hypothesis is true, then the estimated coefficient should be positive and significant. One may also argue that accounting students would perform better because they learn some economics in accounting. In addition to the common courses in business statistics, principles of law, and principles of economics, accounting students take financial accounting I, cost and management accounting, business communications, organizational behavior, and management science, whereas business students take accounting, business finance, management, information technology, and marketing. It is not apparent from these courses that accounting students were taught more economics.

One area that has received relatively little attention in the literature is racial and ethnic influences. The Chinese form the majority and are the dominant group economically in Singapore. In addition, they are proportionately overrepresented in the local institutions of higher learning. Much of this academic success has been attributed to greater emphasis on education by Chinese parents. If this hypothesis is true, then the dummy variable CHIN would have a positive and significant coefficient. Another ethnic influence may be the linguistic capacity of students that would affect their performance on an essay-type examination. This influence, however, was not expected to be significant because no major ethnic group in Singapore—the Chinese, Malays, or Indians—has a noticeable advantage in English, which is the language of instruction in all schools in Singapore.

In the surveys by Siegfried and Fels (1979) and by Siegfried and Walstad (1990), a prior economics course in high school was found to have no significant effect on a student's performance in economics at college. This issue was recently reexamined by Myatt and Waddell (1990) and Lumsden and Scott (1987), who found a positive correlation. Interestingly, the latter studies were both from non-American colleges, suggesting that the earlier conclusion may have to be qualified. One possible reason may be that the content of the high school economics courses in these countries differs from that taught in American colleges. High school economics courses in the United Kingdom and other British Commonwealth nations are more akin to the principles courses in most American colleges.

Similarly, high school students in Singapore take the Cambridge General Certificate of Examination Advanced Level (GCE 'A' level) Economics course study, which is more comparable to the principles of economics courses taken by most college students in the United States. The first-year economics course taught at NTU is also pitched at a higher level than most principles-level courses in the United States. For instance, Pindyck and Rubinfeld (1989) and Maddala and Miller (1989) are examples of textbooks recommended for the microeconomics half of the course, and Brown (1988) and Dornbusch and Fisher (1990) are recommended for macroeconomics. Hence, the 'A' level economics course can be viewed as a prerequisite course to a higher level course. In this regard, the linkage between A-ECON, which indicates whether a student has taken the 'A' level economics paper, and a student's performance was expected to be positive and significant.

A-AGGRE, which has a maximum possible score of 76, was the grade point of the student's GCE 'A' level examinations. It was used to capture the aptitude and intellectual ability of the students. A-AGGRE was used in this analysis instead of the student's first-year grade point at NTU because it provides more information for policymakers. Admission into local universities is based solely upon this aggregate—a prevalent criterion among colleges in the British Commonwealth system (Lumsden and Scott 1987). Therefore, it was hoped that the estimated coefficient would be positive and significant.

Graduate students have been used increasingly to teach lower-level courses in many colleges and universities around the world. This practice has been well established, and Singapore is no exception. The effect on the students' performance of having a graduate student as instructor has been widely examined in the United

States and the United Kingdom and was found to be insignificant (Siegfried and Fels 1979; Siegfried and Walstad 1990). Coupled with the institutional controls, the dummy variable GTA was not expected to be significant.

The effect of foreign faculty on the performance of students has received relatively little attention. Watts and Lynch (1989) studied the effect of foreign (English as a second language) teaching assistants and found that students of foreign teaching assistants performed significantly less well. Because teaching assistants were found to be comparable to faculty members in most studies, the difference in effectiveness could then be attributed to a foreign/local teacher dichotomy. Because there was no foreign teaching assistant in our data, the dummy variable FRGN in this study referred to foreign faculty members. If language, and not differences in cultural or educational background, is the main barrier for foreign instructors, then FRGN should be insignificant, because the foreign faculty members in the sample were all from North America and classes were conducted in English. On the other hand, if familiarity with local culture, economy, and environment is important, then FRGN should be negative, assuming that the institutional controls did not dominate this weakness.

The prominent role played by the lecturers led one to speculate on the possible existence of biases for students who are tutored by lecturers. Recall that lecturers are responsible for imparting the core of the materials during lectures, preparing tutorial questions and suggested solutions for all tutors, and setting and grading examinations. In this respect, lecturers may be better prepared than other tutors and have private information regarding the examination that could be extracted by their students. Although every effort has been taken by lecturers to be consistent and fair, occasional lapses may occur that would then be detected by a positive and significant coefficient on the dummy variable LECT, which indicates if the tutor is also a lecturer.

DISCUSSION OF DATA

Primary data on the student's matriculation number, exam grade, gender, age, race, 'A' level aggregate points, and whether he or she had taken the 'A' level economics paper were provided by the registrar's office. Secondary data on the student's matriculation number, tutorial group, and tutor were provided by the School of Accountancy and Business. The sample consisted of 1,314 first-year students in the School of Accountancy and Business at the Nanyang Technological University in Singapore who had taken the economics paper in the main examination for the academic year 1991–92. A small number of students who had not taken the economics paper during the main examination were excluded from the sample even though they took the supplementary examination. This was done to ensure that consistency was maintained in comparing their grades.

About half (50.9 percent) of the students were registered in the accountancy program; 35.31 percent were male, 97.72 percent were Chinese, and 71.39 percent had taken 'A' level economics (Table 1). The mean age of the students was 19.33, with a standard deviation of 3.63. With a mean grade point of 63.28, this cohort was one of the best in the country, second only to the School of Medicine at

TABLE 1
Summary Statistics of Sample, 1991-92

Dependent variable		Explanatory variable		
Grades	Distribution (%)	Regressors	Means	SD
A	12.71	MALE	0.3531	0.4781
B	29.45	AGE	19.333	3.6288
C	28.84	ACC	0.5099	0.5001
D	22.53	A-ECON	0.7138	0.4521
F	6.47	A-AGGRE	63.279	13.853
		CHIN	0.9772	0.1494
		FRGN	0.1781	0.3827
		GTA	0.1735	0.3788
		LECT	0.2877	0.4528

the National University of Singapore. These students were divided into 54 tutorial groups of approximately 25 students per group and were assigned to 14 tutors.

Of the 54 groups, 10 were tutored by four first-year graduate students. Three of the four graduate students were pursuing their master of business degree by research and had earned their bachelor's degree in economics. The fourth graduate student was doing his doctorate by research and had a first degree in engineering and a master's degree in economics. No training in teaching skills was provided to the graduate students. All new faculty members were required to attend a half-day micro-teaching seminar organized by the Center of Educational Development. Eleven groups were tutored by four faculty members recruited from North America. Sixteen of the 54 groups were tutored by the three lecturers in the course.

RESULTS AND IMPLICATIONS

In general, the effects related to the instructor were found to be insignificant, whereas students' influences were found to be significant (Table 2). A student's performance was determined by his or her personal and academic background and not by differences arising from instructors. Thus, some empirical support existed that the institutional controls were successful in achieving the university's objective of providing a "level playing field" for students to compete in.

The finding that the performance of students of foreign faculty members was comparable to that of students of local faculty members should be encouraging to NTU's administration. Because of the rapid expansion of the school, a large number of foreign staff has been recruited over the past few years, and this recruitment is continuing. This is especially true for the business faculty, where expatriates are fast becoming the majority. This result provides some support for the supposition that language ability, and not culture, of a foreign instructor is the main determinant of students' performance. From the findings in this and previous studies, the university administration should not be worried about the race or nationality of recruits but whether the potential faculty member can communicate in English effectively.

TABLE 2
Estimation Results

Variable	Coefficient	SE	t ratio
Constant**	-0.11433	0.30832	-0.371
MALE**	0.16350	0.06573	2.488
AGE**	0.03453	0.01010	3.415
ACC**	0.58967	0.06488	9.089
CHIN*	0.28776	0.17064	1.686
A-ECON**	0.36512	0.06915	5.280
A-AGGRE	0.00283	0.00021	1.370
FRGN	0.02023	0.07559	0.268
GTA	-0.26552	0.08500	-0.312
LECT	0.02922	0.00692	0.422
MU1**	1.04098	0.05386	19.328
MU2**	1.86139	0.05997	31.038
MU3**	2.86748	0.06849	41.868

Number of observations = 1,314

Log likelihood = -1874.1

Restricted log likelihood = -1962.7

Chi square ($df = 8$) = 177.10

Significance level = 0.3217E-13

Note: Dependent variable: Examination grades: A = 4, B = 3, C = 2, D = 1, F = 0.

*Denotes significance at the 90% confidence level. **Denotes significance at the 95% confidence level.

Although it was anticipated that GTA would be insignificant, the result was nevertheless reassuring. In some aspects, though, this outcome was slightly counterintuitive. Because all graduate students in the sample were in their first year and most of the faculty had more than a year of teaching experience, GTA also captured the effect of teaching experience that had been found to be significant in other studies (Siegfried and Fels 1979). In addition, graduate students were not required to attend a micro-teaching seminar but faculty members were. This result thus provided a weak case against making the seminar compulsory for faculty.

Male students in the sample were found to perform better than their female counterparts. This finding is consistent with most studies that measure the level of understanding. Although I hypothesized that the essay examination used in the study would be favorable to the female students, the large lecture format and the cultural biases and stereotypes apparently had a stronger impact on the students' performance. Therefore, the conclusion that female students performed better or no worse than male students on essay examinations did not appear to hold across cultural or institutional settings.

As anticipated, older students were found to perform significantly better. In addition, since both AGE and MALE were statistically significant, their correlation did not pose a significant problem in this analysis.

Chinese students were found to perform better than their Malay and Indian counterparts. This competitive edge may have resulted, in part, from the economic and ethnic dominance of the Chinese in Singapore and the strong emphasis placed on education by Chinese parents. The Singapore government has recognized the

difference and has taken steps to improve the position of the minorities by helping to set up grassroots organizations like Mendaki and Sinda for these ethnic groups, with educational improvement as one of the major objectives.

Siegfried and Fels (1979) pointed out that most studies on students' effort found no impact of study time on performance. Although study time is a straightforward way to measure effort, it may not be a good indicator. A student who puts in long hours of unproductive time may not be as well prepared for classes as another student who spends much less but more productive time. From an instructor's viewpoint, being prepared for classes is a much clearer indication of a student's effort than a student's self-reported study time. The positive and significant coefficient estimated for the dummy variable ACC indicates that being well prepared for classes contributes significantly toward good performance in an examination.

Grade-point averages are sometimes interpreted as measures of a student's aptitude or intelligence. Contrary to most previous findings, our study showed that A-AGGRE had no significant impact on the students' performance. One possible explanation for this anomaly is the difference in test instruments used. Standardized instruments, such as the TUCE, used in most studies in North America, may reward general ability as well as knowledge of economics because the test is not set specifically by the instructors to test materials that are taught in the class but is set by external examiners to test the students' general understanding of economics. The examination administered to the students in this sample, however, was set by the lecturers to test how well the students had learned the materials taught in lectures or discussed in tutorials, and just being smart would not significantly help a student to perform well. Alternatively, it could be argued that the students in the sample were highly homogeneous and of high quality, which reduced the ability of A-AGGRE to capture enough of the variance in the students' general academic abilities.

On the other hand, students who had taken an introductory course in economics during preuniversity studies performed significantly better than those who did not. Together with the insignificance of A-AGGRE, this result suggests that the admissions office should perhaps give some consideration to the subjects taken by the applicants in preuniversity and not base admission solely on grade points. In the United Kingdom, for example, it is widely known that only a weak correlation exists between the students' 'A' level results and their successes in higher education and that British universities specify the 'A' level specialization required for admission to different fields (Burn 1985; Mitter 1985; Kalten 1992).

It should be noted that the above analysis is based on estimates shown in Table 2. Regressors with t ratios greater than 1.96 and 1.645 are considered to be statistically significant at the 95 percent and 90 percent confidence levels, respectively. A positive sign on the coefficient indicates that an increase in the value of the regressor will increase the probability of getting an A and reduce the probability of failing the course. A negative coefficient, on the other hand, will have the reverse effect. This interpretation is consistent with those in a standard regression model. The marginal effects of the regressors on the probabilities of getting an intermediate grade (B, C, or D), however, are ambiguous. Greene (1993) provides

TABLE 3
Marginal Effects of Changes in Regressors

Regressors	Prob(A)	Prob(B)	Prob(C)	Prob(D)	Prob(F)
ACC	0.10530	0.11859	-0.02387	-0.13239	-0.06763
A-ECON	0.05906	0.07771	-0.00747	-0.08311	-0.04619
MALE	0.03007	0.03326	-0.00829	-0.03752	-0.01752
CHIN	0.04285	0.06281	-0.00086	-0.06517	-0.03963
AGE	0.00616	0.00715	-0.00151	-0.00795	-0.00385

a simple method of computing these effects that will greatly assist in the interpretation of the estimated coefficients.

Table 3 reports the calculated effects of those regressors that were found to be statistically significant. Note that the sum of the marginal effects is zero. This is a consequence of the requirement that the probabilities sum to one. Since most of the significant regressors, except AGE, are dummy variables, the changes in probabilities are the differences in the probabilities when these variables assume their two values (0 and 1), with other variables held at their sample means. The marginal effects of a one-year increase in AGE above the mean are also reported in Table 3. Coincidentally, an increase in any of the significant independent variables increases the probability of obtaining a grade of A or B but reduces the probability of getting a C or lower.

CONCLUSION

In this study, I reexamined several widely studied hypotheses concerning economic education under a different institutional and cultural setting and found that some earlier conclusions did not hold. Student's preuniversity grade point average and having foreign faculty, graduate teaching assistant, or lecturer as a tutor were not significant in determining performance. On the other hand, prior economics courses, gender, age, ethnic background, and being well prepared for classes significantly affected performance.

Three of these findings deserve to be highlighted. First, taking the 'A' level economics course of study in high school improved the student's performance in the first-year economics course of study in college. This result is consistent with those found in the United Kingdom and Canada but not in the United States. Second, male students performed better than their female counterparts, even in an essay examination; a finding that differs from the norm in the United States and the United Kingdom. Third, contrary to all previous studies, overall ability or intelligence, measured by A-AGGRE, was insignificant.

This study also provides some evidence for and against current admissions and recruitment policies. First, recruitment of foreign faculty should continue with little concern for the applicant's nationality or race but with due consideration for ability to communicate in English. Second, the admissions policy should give some weight to appropriate courses taken by the student in preuniversity instead of admitting solely on the basis of overall grade points.

Caution, however, should be exercised in interpreting the results. This study is nevertheless for a single cohort of students. Further studies should be conducted using data from different years and also from the National University of Singapore, which is the only other college in the country. In addition, standardized instruments such as the Test of Understanding in College Economics should be included for better comparison with studies from other countries. Pre- and posttest scores should also be collected to measure the flow of knowledge.

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