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THE RELATIONSHIP BETWEEN ATTENDANCE AT UNIVERSITY LECTURES AND EXAMINATION PERFORMANCE[1]

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A variation on a linear regression model developed by Romer (1993) was used to estimate the relationship between lecture attendance and examination results for second and third year economics students at the National University of Ireland, Galway. While the results show that both lecture attendance and previous results are positively and significantly related to examination results for both classes, the variables are much more important in explaining the examination results of second year students than of third year students. Possible reasons for the variation between the second and third year classes are explored.

A number of studies of the relationship between lecture attendance and examination performance at economics courses have been undertaken in recent years. A positive and statistically significant relationship between attendance and performance has been noted in several studies, using different models and populations.[2]

Schmidt (1983) used a model which introduced linear structural relationships (LISREL), permitting an examination of a number of dependent and

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2 Similar findings have been reported from studies in other disciplines. A negative relationship between absence and grades for undergraduate psychology students was reported by Jones (1984). Similarly, research by Gunn (1993), examining the relationship between attendance and grades for first year psychology students, reported a positive, statistically significant relationship between the two variables. Hancock (1996) compared sections of a statistics course where attendance was mandatory with sections where it was not. Students in the mandatory attendance sections earned significantly higher scores than students registered for sections where attendance was voluntary. The performance gap between the two groups widened as the semester continued.

independent variables within an educational production function. In considering the various ways in which a student can spend his/her study time, he attempted to evaluate the effect of five variables: 'hours spent in lecture, discussion sessions, study outside of class, preparation for a midterm examination, and preparation for the final examination' (p.23). Of the five variables, hours spent in lecture were found to be the most productive, hours spent studying slightly less productive, and hours spent in discussion substantially less productive.

Brocato (1989) considered attendance at two courses over a five-year period. One of these (Principles of Macroeconomics) attracted mainly freshman and sophomore students while the other (Intermediate Economics) was comprised predominately of juniors and seniors. For both groups, absences and results were negatively correlated. Further, the correlation was stronger for students in the Principles course than in the Intermediate course. He noted, however, the danger of inferring a causal link between the variables since 'a good attendance/grade record could be proxying other variables such as emotional maturity, diligence and perseverance' (p.6). Given this caveat, he concluded that the 'results comfortably allow the inference that regular class attendance is a contributing factor in good grades with this factor being more important for younger students' (p.6).

Since in the American system, letter grades (such as A,B), which are discrete, rather than numbers are awarded for a course, Park and Kerr (1990) used a multinomial logit model to look at the same issue. They found the key determinants on a student's mark on a money and banking course to be an adjusted cumulative Grade Point Average (GPA) and the percentile rank on a college entrance examination. A student's attendance record and the student's opinion of the course were less important.

In 1993, David Romer published an article which ignited a lively debate in the United States about the relative merits of a mandatory attendance policy in third-level education. He investigated the extent of absenteeism at three prominent economics departments and developed a linear model to examine the relationship between lecture attendance and examination performance. In a study of his own Intermediate Macroeconomics class he found a positive statistically significant relationship between attendance and examination performance. On the basis of these results, he recommended that institutions should experiment with the reinstatement of the mandatory lecture attendance policy, both in principle and in practice.

When lecture attendance was the only independent variable in his model, he was able to account for 31% of the variation in examinations performance. Equation (1) shows Romer's regression result for his full class of 195 students.

$$P = 1.25 + 2.19A \qquad (1)$$
$$(0.27)\quad (0.35) \qquad R^2 = 0.31$$

where P represents performance as measured by the examination results. Scores were converted to a 4-point grading scale where 3.84 and above represents an A, 3.5 to 3.83 an A-, etc. The fraction of lectures attended is represented by the letter A in the equation. Standard errors are in parentheses. In another regression, Romer added GPA (the accumulated average of the student's marks for all classes taken during his/her college career) as a second independent variable as a proxy for ability. This was also measured on a 4-point scale. Equation (2) shows Romer's regression results using two variables for his class of 195 students.

$$P = -0.67 + 1.52A + 0.78GPA \qquad (2)$$
$$(0.32)\quad (0.32)\quad (0.12) \qquad R^2 = 0.47$$

To our knowledge, Romer's linear regression model has not been tested in Ireland. In fact, we were unable to locate any research on attendance or absenteeism at Irish universities. Although we felt and continue to believe that student behaviour is more complex than can be captured in a simple linear model, we thought that it would be interesting to adapt Romer's model and to test it in the Irish context. At the very least, this exercise would help us to examine systematically one aspect of student behaviour. At best, it could point to interesting areas for future research. Hence, the study described in this paper was designed to investigate the lecture attendance patterns of second and third year economics students at the National University of Ireland, Galway (NUI, Galway). Romer's model is adapted to look at the relationship between lecture attendance and examination performance.

METHOD

According to the general regulations in the annual college calendar at NUI, Galway, lecture attendance is mandatory. In practice, attendance is not recorded consistently by any lecturer on the staff of the economics department and is not considered by lecturers when assessing a student's performance. Therefore, for practical purposes, attendance at lectures is voluntary.

Since systematic attendance records are not kept, for the purpose of this study, attendance was taken periodically throughout the second semester (Hilary term, 1995), which was ten weeks long, beginning in late January and continuing until the end of March. The first three weeks were not included because attendance is traditionally low following semester examinations which are administered in January. Attendance was not taken during rag week, since many lectures are cancelled during that week of student festivities and lecturers who soldier on, do so to

a very small audience. If possible, afternoon classes were chosen in preference to morning classes. In short, the times chosen were 'student friendly.'[3] Therefore, the average attendance recorded overestimates the true average.

In general, attendance was taken only once on any given day. We wanted each observation to record a unique decision to either attend or to be absent. Students were not informed of the schedule of attendance collection, but we did explain why we were recording attendance. We were concerned that students might think that the records were being used for the purpose of assessment and alter their behaviour. We did not see any evidence that their attendance behaviour changed as a result of the project. Lecturers were never shown the attendance records of individual students which might have biased their marks.

Graduate students from the economics department helped gather the information on attendance. Classes were adjourned a few minutes early and each lecture hall exit was blocked by a data collector who wrote down the name of each student before s/he left the lecture hall. The names were then compared with the registration roster for each course. Over the duration of the semester, we tracked both the aggregate attendance at lectures and the attendance pattern of each student.

Third year students are required to take two courses, Economic Theory and European Economy, during the second semester. They also choose two optional courses from a selection of seven courses. Attendance was taken at two lectures for each required and optional course. This means that we have eight possible observations for each student.

Second year students are required to take two courses in the second semester. Attendance was taken three times for each course. Therefore, we had six opportunities to see if they were attending classes.[4]

One hundred and thirty-one third year students were registered for the second semester, excluding those who registered for 'examination only.' Ten of these students were dropped from analyses because they did not complete their second semester examinations. For second year, 82 students were included in the analyses.

3 We made this decision from the outset because our main objective was to see the influence of attendance on marks. Therefore, we chose times when students were likely to attend, rather than times when they were not.

4 We decided to check attendance at six lectures (as opposed to eight) for two reasons. First, we wanted to disrupt as few lectures as possible. Also, weekly tutorials are provided for second year students. Attendance is voluntary and is recorded at each tutorial. Therefore, we had attendance records to show whether the patterns were broadly the same. As expected, they were. There is a reasonably high correlation (0.74) between attendance at tutorials and attendance at lectures. Also, students for both types of classes are more likely to attend after Rag Week than before. Although we have fewer observations, we are fairly confident that they accurately reflect attendance behaviour.

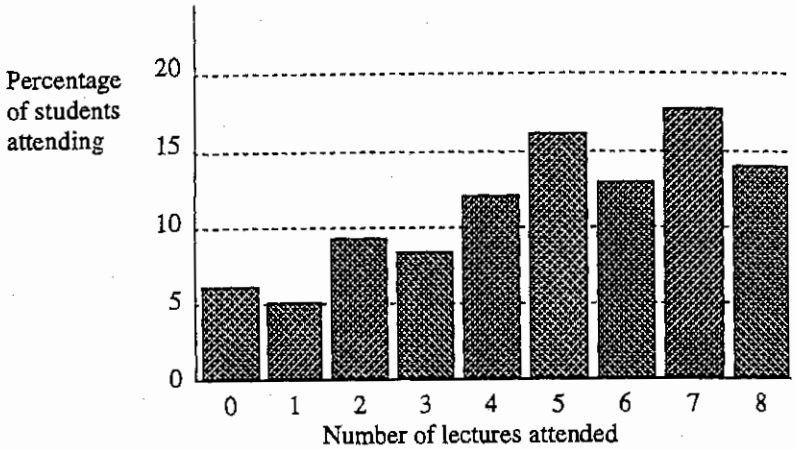
RESULTS

Third Year Students

Variation in attendance among third year students is shown in Figure 1. While many students seldom attended classes, others were almost always there. About 20% seldom attended, 36% attended intermittently, and 44% attended regularly. About 40% of students attended half of their classes or less.

FIGURE 1

PERCENTAGES OF THIRD YEAR STUDENTS ATTENDING VARYING NUMBERS OF LECTURES (N=121)



The independent variables used for the third year regression analysis are 'Fraction of Lectures Attended' and 'Second Year Results.' The attendance coefficient is the number of lectures attended divided by 8, that is 0/8, 1/8... If a student attended all lectures, the fraction is 8/8 or one. 'Second Year Results' are expressed in percentages. The dependent variable is the second semester results for third year students, the semester when attendance data were collected. It is also expressed as a percentage.

Summary statistics for the dependent and independent variables are presented in Table 1. Regression data are presented in Table 2.[5]

5 All the models presented in this paper have been checked using the Goldfeld-Quandt test and the Spearman rank correlation test to confirm that there is not heteroscedasticity. The results have been corrected for measurement error using a method suggested by Durbin and recorded by Johnston (1991).

TABLE 1

MEANS AND STANDARD DEVIATIONS FOR INDEPENDENT AND DEPENDENT VARIABLES, THIRD YEAR STUDENTS (N=121)

	Mean	SD
Fraction of Lectures Attended	0.61	0.30
Second Year Results	52.71	7.98
Third Year, Second Semester Results	57.15	5.81

Column (1) of Table 2 shows the regression results using 'Third Year Results' as the dependent variable and the 'Fraction of Lectures Attended' as the only independent variable.

TABLE 2

REGRESSION DATA FOR ATTENDANCE AND PERFORMANCE, THIRD YEAR STUDENTS (N=121)

	(1)	(2)
Constant	52.28	34.93
	(45.97)	(12.39)
Fraction of Lectures Attended	8.00	4.10
	(4.73)	(2.59)
Second Year Results		0.37
		(6.50)
R^2	0.15	0.38

T-statistics are in parentheses

The size of the attendance coefficient is 8. This can be interpreted as meaning that if a third year student attends all of his/her lectures, s/he will earn approximately 8 percentage points more than a student who does not attend. That would be enough to move a student from third class honours to second class honours or from second class honours to first class honours. The magnitude of this coefficient is quite small in comparison to that obtained by Romer.

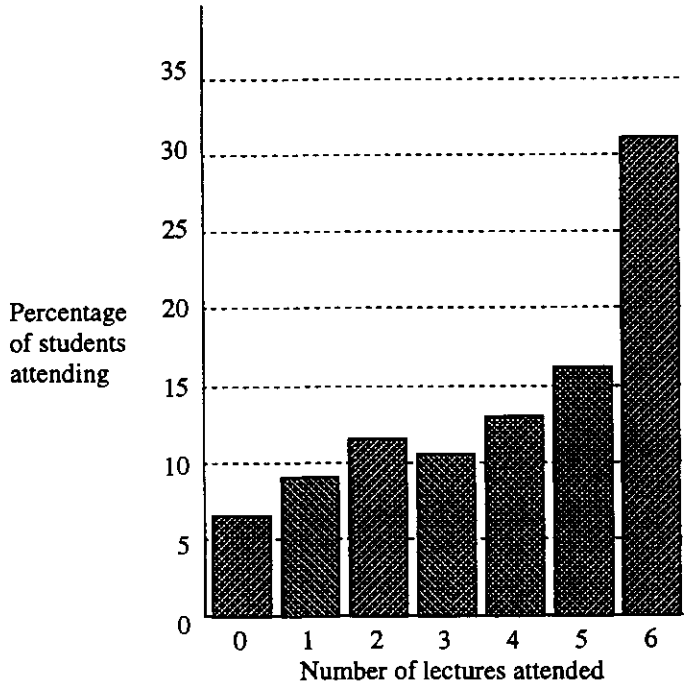
The second column of Table 2 shows the regression results when second year marks are included as a proxy for ability. The coefficient for attendance is about half the size that it was in the first regression. The correlation between attendance and second year marks is 0.39, which is significant at the 1% level. This suggests that the explanatory variables are collinear; they are moving together in a systematic way. This means that the coefficient for lecture attendance is underestimated; some part of the effect of attendance is included in the previous marks variable.

Second Year Students

Attendance data for second year students are similar to those for third year students. Thirty-one per cent of the class was present each time that attendance was taken. Another 17% attended five times out of six. However, this is balanced by 39% of students who attended half of the lectures or less (Figure 2).

FIGURE 2

PERCENTAGES OF SECOND YEAR STUDENTS ATTENDING VARYING NUMBERS OF LECTURES (N=82)



The independent variables for the second year regression are 'Fraction of Lectures Attended' and 'First Year Results.' The attendance coefficient is the number of lectures attended dividing by 6, that is 0/6, 1/6... The dependent variable is the second semester results for second year students. Results for independent and dependent variables are expressed as percentages. Table 3 presents the summary statistics.

TABLE 3

MEANS AND STANDARD DEVIATIONS FOR INDEPENDENT AND DEPENDENT VARIABLES, SECOND YEAR STUDENTS (N=82)

	Mean	SD
Fraction of Lectures Attended	0.65	0.33
First Year Results	57.32	9.27
Second Year, Second Semester Results	54.05	16.25

The first column of Table 4 suggests that if a second year student attends all of his/her classes, marks will improve by about 25%. This would take a student from a pass to an upper second-class honours award. When attendance is the only independent variable in the regression, it accounts for 27% of the variation in students' examination results. This is closer to Romer's result of 31%.

Column 2 shows the regression data in which first year results have been added as an independent variable. The coefficient for attendance is smaller and the coefficient for first year results is almost one. Therefore, if a student did not attend any lectures, we would expect his/her results to be slightly more than 13 points below his/her first year results. Attendance and previous marks account for 55% of the variation in students' marks.

TABLE 4

REGRESSION DATA FOR ATTENDANCE AND PERFORMANCE, SECOND YEAR STUDENTS (N=82)

	(1)	(2)
Constant	37.97	-13.27
	(10.89)	(-1.72)
Fraction of Lectures Attended	24.88	19.39
	(5.14)	(4.97)
First Year Results		0.96
		(7.10)
R^2	0.27	0.55

T-statistics are in parentheses.

A Comparison of Second and Third Year Students

Additional insights can be gained by comparing the results for second and third year students. We used a dummy variable approach to compare the regressions for the two groups. The sample of second and third year students was combined to give a total sample size of 203 observations. The following regressions were then estimated.

$$R_i = C_1 + C_2D_i + B_1A_i + B_2(D_iAi) + u_i \quad (3)$$

$$R_i = C_1 + C_2D_i + B_1A_i + B_2(D_iA_i) + B_3PR_i + B_3(D_iPR_i) + u_i \quad (4)$$

where R_i, A_i, and PR_i are examination results, fraction of lectures attended, and previous examination results. $D_i = 1$ for third year observations and $D_i = 0$ for second year observations.

TABLE 5

REGRESSION DATA FOR ATTENDANCE AND PERFORMANCE FOR SECOND AND THIRD YEAR STUDENTS (N=203)

	(1)	(2)
Constant	38.02	-13.24
Dummy (1)	14.30	48.13
	(4.51)	(6.62)
Fraction of Lectures Attended	24.80	19.25
Dummy (2)	-16.85	-15.39
	(-3.72)	(-4.02)
Previous Results		0.96
Dummy (3)		-0.58
		(-4.23)

T-statistics are in parentheses.
Dummy (1) is the differential intercept coefficient.
Dummy (2) and Dummy (3) are differential slope coefficients.

Column (1) in Table 5 shows the regression results when the 'Fraction of Lectures Attended' is the only independent variable. In column (2), 'Previous Results' is added as a second independent variable. The results of the two regressions show that both the differential intercept and differential slope coefficients are statistically significant, strongly indicating that the regression results differ for second year and third year students.

CONCLUSION

Because the number of observations for each class differs, the results for second and third year students are not directly comparable. However, we were surprised that second year students appeared to attend more regularly than third year students. Degree results are comprised of either the average of the results for the second and third year, or of the results of the third year, depending on which is higher. Therefore, while the second year results may count, the third year results must count. Though it seems that the incentives to attend are stronger in the third year than they are in the second year, student behaviour did not appear to reflect the difference in incentives.

The absentee rate is high. With the sampling bias in favour of attendance, we assume that the absentee rate is somewhere in excess of 40% which is even higher than at the American third-level institutions examined by Romer (1993). His general conclusion was that 'on a typical day at the typical elite American University, roughly one-third of the students in economics courses are not attending classes' (p.168). Absenteeism was highest (almost 40%) at the public university which had the largest average class size.

Results on attendance are significant in our study. However, for third-year students, it accounts for 15% of the variance in examination performance while for Romer, it accounted for 31%. The smaller R^2 may be a consequence of differences between the studies. Romer's attendance data were compared directly with the results from the course that he taught. The attendance data used in our study crosses all of the students' subjects and is compared with the students' cumulative mark for the entire semester. Attendance in this instance may not be as strong a predictor of results because the comparison is not as direct as in Romer's study.

When attendance is combined with second year results, the two variables account for 38% of the variance in examination results. In Romer's study, the two variables accounted for 45% of variance, and the magnitude of both independent variables was proportionately larger.

When we compare our results for second and third year students, we find that the magnitude of the coefficients for both attendance and previous results is far greater for the former than for the latter. That is, attendance and previous results are more important variables in predicting second year results than third year results. Our findings support Brocato's (1989) results which indicated that '...regular attendance may be more important in grade determination for younger college students' (p.2). How can we explain the differences between the two groups of students?

Part of the answer probably relates to differences in the curriculum of second and third year economics courses. Second year students must take two courses per semester. Third year students take two compulsory courses and can choose between two of seven optional courses. Because all of the staff members in the semester considered in this study had taught the optional courses previously, third year students had information about the level of technical difficulty, the marking habits of the lecturer, and his/her propensity to change either the course content, the semester paper, or both. In short, third year students had information and the ability to make decisions based on it. Also, third year students write an extended essay and can generally choose the topic. Together, the options and extended essay account for 60% of the third year student's marks. A student can choose options and a research topic which complement his/her interests and abilities.

Further, because third year students can make more strategic decisions, their previous marks, based on classes which they could not choose, become less predictive of their performance in their third year. On the other hand, all of the first year courses are compulsory and second year courses build fairly directly on the material covered in the first year. Under these circumstances, previous results for second year students are likely to predict subsequent results fairly well.

A further point may be made in attempting to explain differences in the role of attendance for second and third year students. Second year students in the 1994/1995 academic year were lectured by three members of staff, two of whom were new to the department. This further reduced the limited number of variables under the control of second year students, who did not have a series of previous papers, prepared by the lecturer who was teaching the course, to use for revision. Furthermore, notes from previous years were not useful since the syllabus, particularly for Macroeconomics, has been significantly altered. In this situation, lecture attendance was probably more important and contributed more prominently to results. Thus, additional variables, under the control of students, may diminish the importance of previous results and attendance in explaining examination performance. Obviously, these inferences are highly speculative and require more research.

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