The Journal of Economic Education

ISSN: 0022-0485 (Print) 2152-4068 (Online) Journal homepage: https://www.tandfonline.com/loi/vece20

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To cite this article: Daniel R. Marburger (2001) Absenteeism and Undergraduate Exam Performance, The Journal of Economic Education, 32:2, 99-109, DOI: 10.1080/00220480109595176

To link to this article: https://doi.org/10.1080/00220480109595176

Research in Economic Education

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PETER KENNEDY, Section Editor

Absenteeism and Undergraduate Exam Performance

Daniel R. Marburger

Abstract: The author investigates the relationship between students' absenteeism during a principles of microeconomics course and their subsequent performance on exams. Records were maintained regarding the specific class periods that each student missed during the semester. Records were also kept of the class meeting when the material corresponding to each multiple-choice test question was covered. A qualitative choice model reveals that students who missed class on a given date were significantly more likely to respond incorrectly to questions relating to material covered that day than students who were present.

Key words: absenteeism, attendance, exam, undergraduate

JEL codes: A0, A2

Lectures and classroom discussion represent the primary means of teaching economics to undergraduates.[1] However, Romer (1993) found a significant level of absenteeism during class meetings. Surveying three colleges/universities, he found that one-third of the class was absent during the typical class period. The hypothesis that class attendance is likely to be correlated with student learning has been investigated empirically in economic education literature. Not surprisingly, most studies have found an inverse relationship between absenteeism and course performance (Romer 1993; Park and Kerr 1990; Durden and Ellis 1995; Schmidt 1983).

In each of these studies, researchers employed a macro approach to examine the attendance/performance relationship. Specifically, each study regressed a

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measure of the students' overall performance for the course against their attendance, either over the entire semester or during a sample period. The fundamental limitation in each of these studies was the uncertain cause-and-effect between absenteeism and performance. Do students who miss a lot of class perform poorly on exams because they were not present when the material was covered? Or, alternatively, are students with high levels of absenteeism less committed to academics in general? Each study noted this problem and attempted to control for it by including the students' grade-point-averages (GPAs), scores on college entrance exams, or even the students' self-reported ratings of their interest in the course. Nonetheless, the cause and effect remains inferred rather than directly observed and measured.

In this study, I eliminated the problem by employing a micro approach. I maintained records of the specific class periods each student missed over the entire semester. In addition, I kept records of the class meetings when the material corresponding to each test question was covered. This allowed me to estimate a qualitative choice model in which the likelihood of responding incorrectly to a multiple-choice question was related to whether the student was absent during the corresponding class period. The evidence points to absenteeism during the relevant class meeting as a significant determinant of incorrect responses on a multiple-choice exam.

PRIOR LITERATURE

Romer (1993) examined attendance in undergraduate economics classes. He surveyed attendance at all undergraduate economics classes at three academic institutions during a sample week of class. One institution was a medium-sized private university, one was a large public institution, and the third was a small liberal arts college. All three were classified as highly competitive by *Barron's Profiles of American Colleges*. The study revealed that roughly one-third of the classes was absent during a typical class meeting. Absenteeism tended to be highest at the large public university and lowest at the small liberal arts college. Absenteeism was lower for courses with a significant mathematical component. Attendance also tended to be lower for core courses. Finally, the study revealed that attendance was higher when the perceived quality of instruction was greater.

Romer also investigated the relationship between student attendance and overall course performance. In one of his intermediate macroeconomics courses, he took attendance during six class meetings. Overall performance for the course was then regressed against a set of independent variables that included the students' record of attendance during the sample period. To control for the cause-and-effect problem of attendance versus motivation, he restricted his sample to only those students who had completed all of the problem sets assigned during the semester. He also included the students' GPAs as an explanatory variable. The evidence showed a positive correlation between attendance and course performance.

Park and Kerr (1990) measured the determinants of student performance in a single instructor's money and banking course over a four-year period. They esti-

mated numerous logit equations to measure the probability of receiving a specific letter grade for the course as a function of several independent variables. The students' overall attendance during the semester was included among the explanatory variables. The evidence showed an inverse relationship between the students' course grades and their attendance. To control for the motivational aspects of performance, they controlled for the students' self-reported hours of study time devoted to the class and also their perceived value of the course.

Durden and Ellis (1995) also investigated the link between attendance and student learning. Their study included several principles of economics classes over three semesters. The dependent variable was the students' overall course grade averages. Each student's attendance record for the semester was self-reported through a questionnaire administered at the end of each semester. The results showed that low levels of absenteeism had no appreciable effect on student learning but that excessive absenteeism had a deleterious impact on course performance.

Finally, Schmidt (1983) performed a study on student time allocation. He relied on data gathered by Allen C. Kelley during his evaluation of his Teaching Information Processing System (TIPS). The TIPS study processed weekly multiple-choice responses that were optional and not a component of the students' grades. A production function was estimated in which the dependent variable was the students' percentage scores on final exam questions that related to the TIPS experiment. The independent variables included the students' self-reported study hours during the experiment. The evidence revealed a positive correlation between time spent in lectures and discussion sessions and exam performance.

THE MICRO APPROACH

Many of these studies acknowledged the problem of disentangling the impact of attendance on course performance from the motivational factors associated with high absenteeism. Although attempts were made to control for student motivation, the cause of the inverse relationship between class absences and course performance remained inferred rather than observed.

To measure more directly the impact of class absences on performance, I used a micro approach in a study conducted in a single section of principles of microeconomics during the 1999 fall semester.[2] The class met from 10:00 AM–10:50 AM on Mondays, Wednesdays, and Fridays. Three noncumulative 28-question multiple-choice exams were administered covering the entire course. Although the students were not given any sample test questions during class, they had access to a prior semester's exams on my web site. None of these questions appeared on any of their tests. Furthermore, although students received their corrected exams after each test, we did not go over any of the exam questions in class. All of the questions could have been answered correctly by a student who had never attended class but who had relied exclusively on the text to prepare for the exams.

Records were maintained of each student's attendance or absence at each class period. The attendance logs were sufficiently detailed that the specific class meetings that each student missed were recorded. In addition, for each multiple-choice

question, records were maintained as to the class meeting when the material pertaining to that question was covered. Consequently, if a student responded incorrectly to a specific exam question, the records revealed whether the student had been absent during the class period in which the relevant material was covered.

EMPIRICAL RESULTS

Trends in Absenteeism

The characteristics of the class are reported in Table 1. In contrast to Romer's findings, absenteeism for the class averaged only 18.5 percent for the semester.[3] Absenteeism for specific class meetings ranged from a low of 8.5 percent to a high of 44.1 percent. Thirty-eight nonexam class meetings made up the semester. The average student who completed the course missed 5.59, or 14.7 percent, of the class meetings.[4] The range for individual absences was from 0 to 29 class meetings.

Figure 1 shows absenteeism as a time series. The figure clearly indicates a higher level of absenteeism on Fridays, as well as a possible upward trend in

TABLE 1
Characteristics of Class Sample

Class characteristic		Absenteeism characteristics: Mean % of class absent		Absenteeism characteristics: Number of classes missed by individual students	
Number of students enrolled in the course through exam 1	60	Overall	18.5	Overall[1]	
		High	44.1	Total number of class meetings	38
		Low	8.5		
Number of students completing the course	56	Exam I	14.7	Mean	5.59
		High	25.4	High	29
		Low	8.5	Low	0
Mean grade point average	3.06	Exam II	19.1	Exam I	
		High	44.1	Number of class meetings	13
		Low	11.9		
Mean number of hours worked each week	17.4	Exam III	20.6	Mean	1.86
		High	33.9	High	10
		Low	14.3	Low	0
Mean number of credit hours that semester	15.5			Exam II	
				Number of class meetings	12
Percentage of business majors	80			Mean	2.54
				High	10
Percentage of sophomores	11.1			Low	0
Percentage of juniors	55.6			Exam III	
				Number of class meetings	13
Percentage of seniors	33.3			Mean	2.49
				High	13
				Low	0

[1]The overall absenteeism figures include only students who completed the course. The individual absenteeism figures per exam include all students in the course at the time the exam was given.

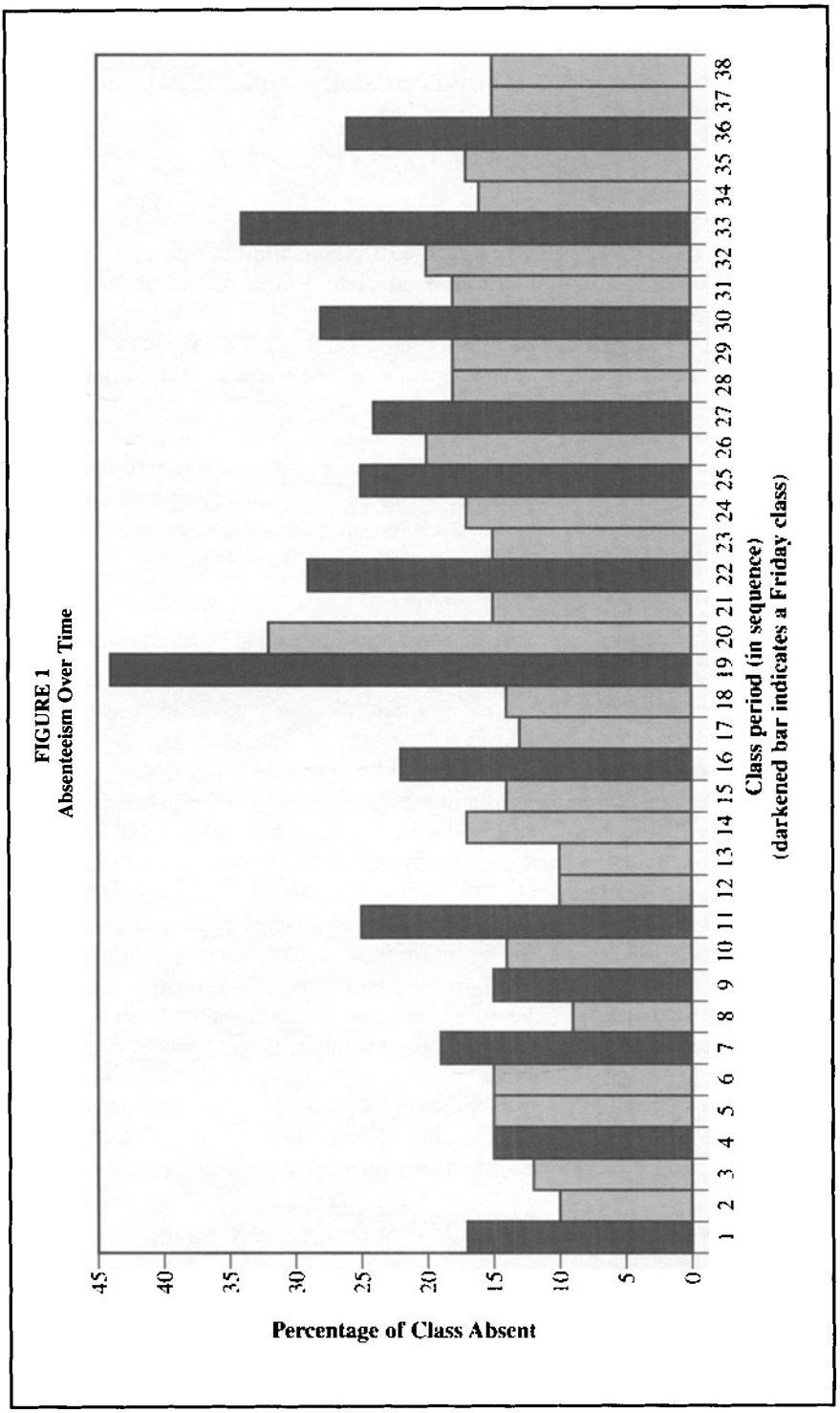
FIGURE 1
Absenteeism Over Time
Percentage of Class Absent
45
40
35
30
25
20
15
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Class period (in sequence)
(darkened bar indicates a Friday class)

absenteeism over the semester. To test the significance of these factors, I estimated the following equation:

$$\underset{}{\text{PCTABSENT}_j} = \underset{(4.62)}{0.112} - \underset{(-.066)}{0.001}\textit{WEDNESDAY}_j + \underset{(4.06)}{0.090}\textit{FRIDAY}_j \qquad (1)$$
$$- \underset{(-1.17)}{0.024}\textit{HOMEWORK}_j + \underset{(3.26)}{0.0026}\textit{TIME}_j,$$

where PCTABSENT_j is the percentage of class absent during class meeting j; $\textit{WEDNESDAY}_j$ is a dummy variable equal to 1 if class meeting j was on a Wednesday; $\textit{FRIDAY}_j$ is a dummy variable equal to 1 if class meeting j was on a Friday; $\textit{HOMEWORK}_j$ is a dummy variable equal to 1 if a homework assignment was due on class meeting j; and $\textit{TIME}_j$ is a time trend variable to indicate the sequence of class meetings. The t statistics are shown in parentheses below the corresponding coefficients.

The data show that the percentage of the class that was absent did not significantly differ between Mondays and Wednesdays but increased by an average of 9 percent on Fridays. In addition, absenteeism gradually increased as the semester progressed. Absenteeism did not appear to be affected by scheduling a homework due date.[5]

Absenteeism and Exam Performance

The micro approach allows a test of the hypothesis that an incorrect response was related to the student's absence during the relevant class meeting. I estimated a probit equation in which the dependent variable, *RESPONSE*, was coded with a 1 for an incorrect response to the question and a 0 for a correct response. To examine the impact of class absences, I coded the variable *ABSENT* as a 1 if the student had not attended class during the period the material relevant to that question was covered and a 0 if the student had attended class that day.

Previous empirical studies used continuous variables associated with individual students (such as GPA) to control for other factors that might influence exam performance. Because my intent in this study was to identify the "pure" attendance effect rather than to measure the impact of various other factors, each student was assigned a dummy variable. By assigning student-specific dummy variables, all other external factors associated with each student's exam performance (i.e., ability/motivation/study habits) could be controlled. Similarly, to control for the relative difficulty and/or ambiguity of individual test questions, I assigned dummy variables to each question. Consequently, the model took the form:

$$\textit{RESPONSE}_i = \beta_0 + \beta_1\textit{ABSENT}_i + \sum_{j=1}^{n}\beta_2\textit{STUDENT}_{ij} = \sum_{k=1}^{m}\beta_3\textit{QUESTION}_{ik} + \varepsilon_i,$$

where $\textit{RESPONSE}_i$ is an unobservable latent variable that is assumed to be normally distributed; $\textit{ABSENT}_i$ is a dummy variable equal to 1 if the ith student was absent during the corresponding class period; $\textit{STUDENT}_{ij}$ is a dummy variable

equal to 1 if the *i*th student takes the identity of *j*; $QUESTION_{ik}$ is a dummy variable equal to 1 if the *i*th student was answering question *k*, and ε_i is the normally distributed error form for the *i*th student.

Separate equations were estimated for each of the three exams. The results of the estimations are shown in Table 2.[6] As expected, *ABSENT* is positive and significant for every exam. A positive and significant coefficient means that students who were absent during a given class period were significantly more likely to miss test questions pertaining to the material covered that day than students who were present.[7] Overall, absenteeism increased the probability that the average student would respond incorrectly to the average exam question by 14.6 percent on the first test, 14.4 percent on the second exam, and 7.5 percent on the third exam.

To obtain a better grasp of the effect of absenteeism on exam performance, I estimated the mean performance on each test if 100 percent attendance had prevailed throughout the semester. If the mean exam-specific values for the independent variables are plugged into the equation, the fitted value is a *z* score that can be transformed to indicate the mean percentage of incorrect responses for that test. The transformed *z* score will, of course, be equal to the actual percentage of incorrect responses on the exam. If all students were present for each class meeting, then the mean number of absences would be zero. Consequently, by subtracting the *ABSENT* coefficient times the mean number of absences during the exam period from the fitted *z* score, the transformed vector can be manipulated to determine the percentage of incorrect responses if every student had attended each class session.[8]

The mean percentage of correct responses on the first exam was 65.7 percent. Had each student attended every class period, the mean would have risen to 68.1 percent. Had 100 percent attendance prevailed for the second exam, the mean

TABLE 2
Absenteeism and Exam Performance

	Exam I	Exam II	Exam III
Number of students taking exam	57	52	53
Mean % of incorrect responses	34.3	30.6	27.4
Mean % of class absent[1]	15.2	18.3	17.1
Variable		*Coefficient*	
CONSTANT	–.023	–1.508	–2.77
	(–.077)	(–4.00)*	(–5.22)*
ABSENT	.423	.471	.275
	(3.71)*	(4.18)*	(2.25)**
N	1,596	1,456	1,484
Log likelihood	–772.3	–622.6	–600.58
McFadden R^2	.300	.306	.311

t statistics are in parentheses.
*Significant at .01 Type I error level; **Significant at .05 Type I error level.
[1]Class absences may differ from figures reported in Table 1 because not all students enrolled took the exam.

score would have risen from 69.4 percent to 72.2 percent. Without any absenteeism, the third exam score would have risen from a mean of 72.6 percent to 74.1 percent. Overall, absenteeism reduced the mean score by 2.3 percent.

The results of this study are relevant to issues raised by Becker (1982). If absenteeism is tolerated or accommodated in the final grade distribution, then the cost of skipping class is lowered. If tolerance of absenteeism hinders the college's ability to screen accurately its students, then the result could be less learning overall and particularly among the more able students.

Student Responses Toward Absenteeism

At the end of the semester, the students were asked to fill out an anonymous survey. The purpose of the survey was to elicit their attitudes toward absenteeism and also to understand how the students' study habits change in response to their own absenteeism. A copy of the survey along with the overall responses appears in the appendix.

In addition to the overall responses reported in the appendix, the sample was broken down into two groups: those with low absenteeism (six or fewer absences) and those with high absenteeism (more than six absences). Eighty-one percent of those who had missed at least one class meeting indicated that they had gotten another student's notes either all or most of the time. The percentage was 89 percent for students with low absenteeism, whereas only 66 percent of those with high absenteeism regularly availed themselves of another student's notes when they missed class. This difference is significant at the .10 Type I error level. Students did not appear to use the text when they missed class. Less than 30 percent of students with low absenteeism relied on the book when they missed class (i.e., indicated they read the text all or most of the time), and only 27 percent of those with high absenteeism reported using the book in response to class absences.

The reliance on class notes rather than on the textbook apparently reflects a strategic attempt by students to identify the "most important" concepts covered in the text. All of the material pertaining to the test questions was covered both in the text and during lectures. Consequently, by obtaining another student's notes, they could identify the content most likely to appear on an exam. Of course, the limitation of relying on another student's notes rather than on the text is that their comprehension of the missed material is only as good as the quality of the notes.

The students were also asked what the maximum acceptable number of class absences during a semester ought to be. Significant differences in attitudes existed between students with high and low absenteeism. Seventy-nine percent of the respondents with low absenteeism defined the maximum acceptable number of absences as six or fewer. Only 26 percent of those with high absenteeism indicated that six or fewer absences were an acceptable maximum. Perhaps most telling is a comparison between the student's self-reported absenteeism and the number of absences he or she deemed to be acceptable. One hundred percent of students with low absenteeism indicated that their own record of absenteeism

was equal to or lower than the maximum acceptable number. For those with high absenteeism, 73 percent of the respondents indicated that their own absenteeism was at or below the maximum acceptable level. Overall, 92 percent of the respondents defined their own propensity to miss class to be acceptable.

CONCLUSION

The evidence from this study provides an assessment of the pure relationship between absenteeism and student learning. The findings suggest that the mean exam score was significantly affected by absenteeism. Of course, the precise measurement of the impact of absenteeism on student learning is institution specific. This study took place in a medium-sized state-supported regional university in a relatively small classroom setting. Other differentials may be observed in alternative teaching environments. Moreover, the differentials reported in this study are also likely to be instructor specific. In general, we would expect that the more effective the instructor, the greater the value added from attending class. This may be inferred from Romer's findings that attendance was higher in classes in which the perceived quality of instruction (i.e., the perceived value added) was high. Consequently, less effective instructors may experience high absenteeism, yet the differential may be small.

One should also note that the differentials reported here are likely to be biased on the low side. The model does not measure any spillover effects from absenteeism. Many lectures build upon material covered in the previous class meeting(s). Although a student may be present during a given class period, the value added may be low relative to other students if the individual had been absent during the previous class meeting.

APPENDIX
Absenteeism Survey Results

1. Place an "X" to indicate the approximate number of class meetings you missed in this class. (Don't include exam dates you missed.)

Number of absences	Total responses
0	6
1–2	16
3–6	11
7–9	9
10–13	6
14–18	2
19–25	1
Over 25	0

2. Whenever I miss this class, I make sure I get someone else's notes.

	Total responses
Always	21
Most of the time	13
Some of the time	4
Never	4

3. Whenever I miss this class, I make sure to read the chapter.

	Total responses
Always	5
Most of the time	7
Some of the time	15
Never	15

4. What should the maximum acceptable number of absences in a semester be?

Number of absences	Total responses
0	0
1–2	8
3–6	22
7–9	11
10–13	2
14–18	0
19–25	1
Over 25	4

NOTES

1. Siegfried, Saunders, Stinar, and Zhang (1996) surveyed 180 introductory economics classes and found that the courses were taught primarily as lecture courses, with the largest component of students' grades determined by multiple-choice exams.
2. An earlier version of the study was conducted during a summer session with a smaller enrollment. The results were similar to those reported in this study.
3. Attendance was taken by circulating a class roster for the students to sign. They were told the purpose of the sign-up sheet was to further this study and that the attendance sheets would not be incorporated into their grades.
4. The university has a seldom-enforced class attendance policy for freshmen and sophomore classes. The policy defines the maximum acceptable number of class absences as no more than twice the number of lectures that would normally be scheduled during a week. Students who exceed this maximum may receive a failing grade by the instructor. Thus, students with more than six class absences could receive a failing grade for excessive absenteeism according to university policy. Of the 56 students who completed this course, 18, or 32 percent, exhibited excessive absenteeism.
5. Students were required to turn homework in by the due date to receive any credit. However, another student could turn in their assignment for them. Alternatively, students were encouraged to fax or e-mail their homework to me if they could not attend class on the due date.
6. The dummy variable coefficients for individual students and exam questions are not reported, but are available from the author on request.
7. To see if any differences existed between students with high and low levels of absenteeism, I created a dummy variable in which students with excessive absenteeism by university standards (seven absences or more) were assigned a value of 1. The dummy variable was interacted with *ABSENT*. The dummy coefficient was not significant in any of the estimations.
8. Of course, this calculation is valid only if the students are identical. Nonetheless, it provides an approximation of the overall impact of absenteeism on exam performances.

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