
HOW DO INSTRUCTOR'S ATTENDANCE POLICIES INFLUENCE STUDENT ACHIEVEMENT IN PRINCIPLES OF MICROECONOMICS?

Todd Broker, Murray State University
Martin Milkman, Murray State University
Victor Raj, Murray State University

ABSTRACT

This paper examines the question of how an instructor's attendance policy influences student performance in Principles of Microeconomics. This study asked students in several different microeconomics classes at a medium sized regional university what sort of attendance policy they were subject to: was there a grade incentive for coming to class (i.e. bonus points), was there a grade punishment for not coming to class (i.e. deduction of points, missed assignments, etc.), was there some combination of the previous two or was there simply no attendance policy. While there are a few papers showing a positive correlation between required attendance and course performance, this paper seeks to understand more about the impact from the type of attendance policy employed. Data is collected from a student survey and from the university's registrar. The main empirical evidence is gathered from a two-stage regression analysis with student absenteeism as the dependent variable in the first equation and a student's final grade (using a 4.0 scale) as the dependent variable in the second equation. We find that, everything else equal, students seem more motivated to come to class when they expect a positive reward and they are more likely to miss class if they expect a negative punishment. Also, student attendance is a small, but significant determinant of a student's course performance after controlling for other relevant factors.

INTRODUCTION

The relationship between attendance and performance is an important issue in any classroom setting, including economics courses. Several studies have shown how attendance can influence student performance in the economics classroom (Chen and Lin, 2008; Stanca, 2006). Several other studies have shown evidence of how attendance policies can affect student attendance (Romer, 1993; Durden and Ellis; 1995; Marburger, 2001 & 2006; Dobkin et al., 2009). But, relatively few studies have focused attention on the question of whether the type of attendance policy implementation influences attendance and measured performance in economics (Self, 2012). This is the question we are asking in this paper.

We see from our data (Figure 1) that student absenteeism varies among the different attendance implementations. This graph shows that on the surface (i.e. without controlling for anything) students seemed less likely to miss class when faced with a positively incentivized

attendance policy compared to any other approach. Furthermore, we see preliminary evidence of an inverse relationship between absences and student performance (Figure 2).

Figure 1: Average Absence Percentage by Policy Type

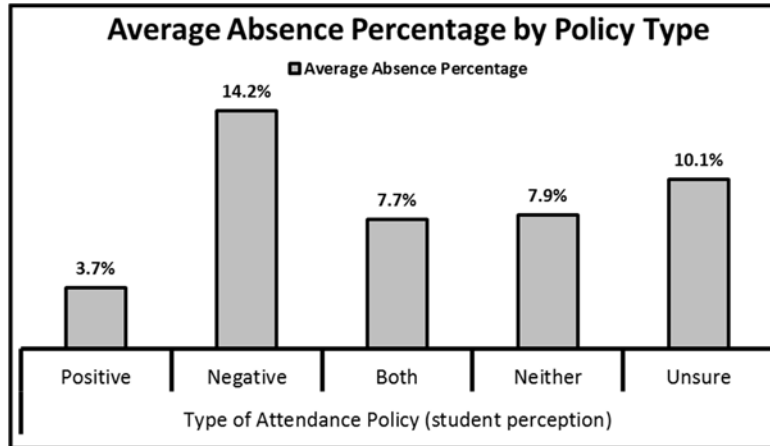
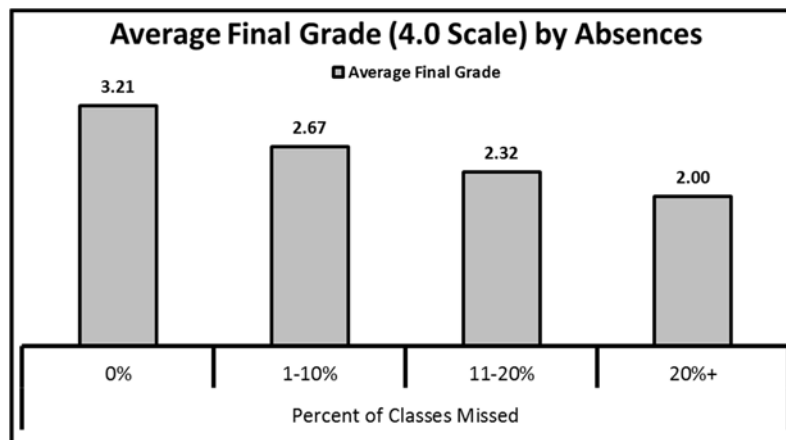


Figure 2: Average Final Grade by Absences



To investigate this preliminary evidence further, we used a two-stage regression approach. We first looked at whether using different types of attendance policies can have different effects on student absenteeism. Secondly, we looked at whether student attendance has any significant effect on student performance as measured by a student's overall course grade.

From here, the paper is divided into several parts. After this introduction, a brief review of the previous literature is presented. Then the data for this project is discussed and finally the results of the paper are offered with some modest conclusions.

REVIEW OF THE LITERATURE

The quantitative study of attendance and student performance in economics courses has a relatively short history, but also a relatively clear one: several studies have repeatedly found solid evidence that class attendance and performance share a strong, positive relationship.

Park and Kerr, in the spring of 1990, used a multinomial logit approach to study grades in different sections of a money and banking course. Using 97 observations and estimating only one equation, the authors find that absenteeism is far from the most important determinant, but does have a negative effect on grades in the class (Park and Kerr, 1990). This paper provides one of the first of several quantitative confirmations that student absenteeism negatively impacts student achievement in economics courses.

A second study by Romer looks at several intermediate macroeconomics classes. He first estimates an equation to measure absenteeism and then uses this equation to measure grades. He finds that generally, absenteeism negatively affects grades (Romer, 1993). Durden and Ellis also find that absenteeism significantly impacts student performance in principles of economics classes. They find a cumulative effect; “The evidence suggests that the effect is nonlinear, becoming important after a student has missed four classes during the semester” (Durden and Ellis, pg. 345, 1995).

Marburger, in 2001, allowed for a direct quantitative connection to be made between student attendance and learning. He “estimates 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” when that particular material was covered (Marburger, pg. 100, 2001). He finds that absenteeism is a significant determinant of incorrect responses on multiple questions in a Principles of Microeconomics class. Marburger then extends this work in 2006 by doing a second paper where he analyzes two semesters of students. For one set of students their attendance was taken in class but it never affected their grade. For the other set of students, attendance did affect their grades. Marburger finds that the policy significantly reduced absenteeism. Then, following the same method of his previous research, he once again finds that being absent is a significant determinant of incorrect responses on exams (Marburger, 2006). This line of work creates an important first step towards making the connection between what an economics instructor can do to improve student attendance, and thus student learning. Dobkin et al. looked at how enforcing a mandatory attendance policy on struggling students (determined by their midterm grade) for the second half of the course would affect attendance and performance. They find that student absenteeism falls significantly among the students exposed to the attendance policy. Also, among those same students, not only do they do better on their final exam in economics, but there is also not an adverse “crowding-out” effect, negatively harming their grades in other courses taken concurrently (Dobkin et al., 2009).

More recent research by Self, 2012, has investigated the impact of using different attendance policy strategies on student attendance. Her study focused on students in a Principles of Macroeconomics class. She found “strong support” that enforcing an attendance policy in class encourages students to come to class more often. She also found that students seemed more influenced to come to class if there was a negative punishment for missing class as opposed to positive reward for coming to class. This result is striking because it seems to contradict some of our main conclusions about the effect of positive versus negative incentives in attendance policy implantation. However, we believe our two studies can be reconciled in that the attendance policies she studied carried heavier punishments than the policies we studied, which could explain the difference in our results.

Either way, the past evidence seems overwhelmingly in support of the idea that students need to come to class to improve their learning of economics. Although there are some past studies that attempt to connect instructor enforced attendance policies with student attendance and subsequently performance, very few compare different types of attendance policies directly. We hope this study is another step in that direction.

DATA

This paper took advantage of a natural experiment in the Principles of Microeconomics sections at a comprehensive, medium-sized, public university in the south. Most of our data is self-reported from a voluntary survey with some supporting data provided by the Registrar.

In the spring of 2011, there were six sections of Principles of Microeconomics being taught by five different instructors ¹. Two of these sections used no official attendance policy, two other sections used attendance policies that effectively punished student's that didn't attend (through missing in-class quizzes and homework assignments) and the other two sections used an attendance policy that effectively benefited the students' final grade if they had perfect attendance (1.5 percentage points were added to their final overall percentage grade for perfect attendance).²

During that semester, 189 students enrolled in all six sections combined. The students were offered a voluntary survey near the end of the semester³. The average attendance rate on the dates the survey was offered was nearly 85%. This meant about 160 students were given the opportunity to take the voluntary survey. Of this group, about 93% took the survey, which gave us a sample size of 148 respondents (which amounted to an overall response rate of about 78% = 148/189). Part of the difference in these numbers is due to the fact that of the 189 registered students at the beginning of the semester, some of them dropped or withdrew during the course of the semester. In addition to information about each student's extracurricular life from the survey, we received most of the academic information for each student from the registrar. Tables 1-3 offer short explanations and then descriptive statistics of the variables used in our empirical work.

Table 1. List of Independent Variables Dependent Variable = Absenteeism (1st Equation)	
Variable	Description
GPA	The students' cumulative grade point average ⁴ .
Commute Time to Campus	The average number of minutes it takes for the student to get to campus from their residence.
Hours of Work	The average number of hours the student worked at a job in a given week during the semester.
Time Spent with Student Organizations	The average number of hours the student participated in activities of a student organization in a given week during the semester.
Tuition Payment Structure	A dummy variable equal to 1 if the student indicated that they paid at least part of their tuition with their own money or money they would have to pay back (student loan).
First or Last Class of Day	A dummy variable equal to 1 if the student indicated that their Principles of Microeconomics class was either their first or last class on the days it met.

Positive Attendance Policy	A dummy variable equal to 1 if the student indicated that they thought their class attendance policy included positive benefits for coming to class.
Negative Attendance Policy	A dummy variable equal to 1 if the student indicated that they thought their class attendance policy included negative consequences for missing class.
Neither Positive or Negative Attendance Policy	A dummy variable equal to 1 if the student indicated that they thought their class attendance policy included neither positive nor negative effects for attending or not attending class.

**Table 2. List of Independent Variables
Dependent Variable = Final Course Grade
(2nd Equation)**

Variable	Description
GPA	The student's cumulative grade point average ⁵ .
Credit Hours	The number of college credit hours the student had earned.
Interest Level in Economics	The student's rating, on a 5-point scale, of how interested they were in economics (5 highest).
Predicted Percent of Total Absences	Predicted absenteeism rate of the student missed; predicted dependent variable from first equation (transformed).

Table 3. Descriptive Statistics of All Variables

Variable	All Students	
	Mean	S.D.
Student Rate of Absenteeism in Economics (transformed: square root) ⁶	2.18	1.64
GPA	2.93	0.64
Commute Time to Campus	14.17	20.44
Hours of Work	13.46	13.80
Tuition Payment Structure (pct. affirmative)	0.45	.50
Time Spent with Student Organizations	6.56	9.55
Interest Level in Economics	2.95	1.10
First or Last Class of Day (pct. affirmative)	0.78	0.41
Credit Hours	75.88	35.51
Student Final Course Grade (4.0 scale)	2.69	0.99
Predicted Student Rate of Absenteeism in Economics ⁷	1.83	0.92
Positive Attendance Policy (pct. affirmative) ⁸	0.59	0.49
Negative Attendance Policy (pct. affirmative)	0.39	0.49
Neither Positive or Negative Attendance Policy (pct. affirmative)	0.20	0.40
Number of Students	148	

METHODS

This paper sought to understand the empirical relationship between different types of attendance policies employed in an economic classroom and their effect on absenteeism, while controlling for other relevant factors. The second goal was to understand the empirical relationship between a students' absenteeism and their performance in the course, while controlling for each student's personal effort, intelligence, attitude, etc.

We utilized OLS regression techniques to estimate our parameters in the first equation. This seemed consistent with the prior literature (Dobkin et al., 2009) and with our own thoughts about the nature of individual student absenteeism, which served as our dependent variable.⁹

It was a critical concern for us in deciding how to structure the independent variables of interest (e.g. the types of attendance policies). We first considered assigning each student a dummy variable indicating what type of policy they were exposed to, based on the instructor's syllabus¹⁰. This however would have given us a dataset that was essentially aggregated at the class level. Since we only had six total classes, we essentially would have only had six unique data points to estimate our parameters¹¹. Thus, we decided to use the self-reported data from the student surveys at the individual level. This would mean we would be assessing what each student's perception of their attendance policy was, as opposed to what it actually was according to the syllabus.

This, of course, created the possibility that the students could have misinterpreted the attendance policy in their class (Our data indicates that 67% of students in our study correctly reported their classes' attendance policy according to the syllabus). However, this seemed reasonable for our purposes given that we were empirically studying student responses to attendance policies, which would inherently be considering student perception. It could be true that it doesn't really matter what any actual attendance policy is, but rather the important factor could be in effectively communicating the policy to students so that they understand. Using the "student perception" approach in this study actually may be a better way to investigate this effect.

To measure each student's perception of their class attendance policy, they were asked what they thought the attendance policy was in their class. They had the option of responding that it provided a positive benefit, a negative consequence, both positive and negative effects, neither a positive nor a negative effect or they could have indicated that they didn't know what the attendance policy was. This information was used to construct our attendance policy dummy variable in the first equation where the dependent variable was absenteeism.

Given the fact that grades are reported to the university as discrete variables (A, B, C, D, E), OLS would not be sufficient to estimate student performance in our second equation. Therefore, to estimate the major determinants of a student's course grade we employed an ordered logit function where our dependent variable followed the 4.0 scale (A = 4, B = 3, C = 2, D = 1, E = 0).

Table 4.
OLS Regression Statistics: Dependent Variable = Absenteeism
(1st Equation)¹⁴

Multiple R	0.612		
R Square	0.374		
Adjusted R Square	0.334		
Standard Error	1.337		
Observations	148		
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i> ¹⁵
Intercept	4.384	0.655	6.695**
GPA	-0.907	0.175	-5.167**
Commute Time to Campus	0.004	0.006	0.771
Hours of Work	0.014	0.009	1.511
Time Spent with Student Organizations	0.039	0.013	3.018**
Tuition Payment Structure	-0.657	0.247	-2.663**
First or Last Class of Day	0.699	0.280	2.497**
Positive Attendance Policy	-0.948	0.308	-3.078**
Negative Attendance Policy	0.763	0.252	3.029**
Neither Attendance Policy	-0.204	0.372	-0.548

RESULTS

This paper attempts to study the effects of various attendance policies empirically. The 1st equation of results, where the dependent variable was absenteeism, showed that our overall model performance was significant (as measured by the F-Statistic and R^2) and most of the other outcomes seemed generally consistent with previous research (see Table 4). Consistent with nearly all prior literature, a student's GPA¹² was significant and negatively correlated to absenteeism, meaning that students with higher overall GPA's were more likely to attend class. As already observed in previous studies, a student's GPA is probably a proxy not just for their intelligence, but also for a level of effort as well¹³.

In addition, we see that students that spend more time (weekly hours) in campus organizational activities are significantly more likely to miss class. Interestingly, if a student indicated that that they were paying for tuition themselves, either through direct payments or indirectly through loans, they were significantly more likely to attend class. Not surprisingly, if a student indicated that their microeconomics class was their first or last class of the day for them personally, they were significantly more likely to miss class.

In terms of policy analysis, we see that both "positive" and "negative" attendance policies were significant predictors of absenteeism. However, only the positive attendance policy variable showed a negative relationship to absenteeism. In other words, students who thought there was a positive incentive for coming to class were more likely to go to their microeconomics class,

everything else equal. But those students that thought that there was a negative punishment for missing class were significantly more likely to miss class.

This outcome could be a result of the “positive” attendance policy offering an exogenous reward (i.e. bonus points) for coming to class while our sample of “negative” attendance policies mainly offered an endogenous punishment (i.e. missed quizzes/homework grades).

The results from the 2nd equation, where the dependent variable was a student’s final course grade, returned a significant model (see Table 5). Our main variable of interest, student absenteeism, showed a significant negative relationship to a student’s final performance in their Principles of Microeconomics class. This means that, even after controlling for student maturity (Credit Hours), student interest (Interest Level in Economics) and intelligence & effort, (GPA) students who came to class more often were significantly more likely to perform better (i.e. get a higher grade).

However, the coefficient on our variable of interest, absenteeism, was relatively small as were its marginal effects. This may mean that student absenteeism, though significant, may not have a meaningful impact on student performance until relatively large numbers of absences are accumulated (see Table 6)¹⁶. However, this result does not negate the fact that missing more class does generally harm a student’s overall grade, everything else equal.

Table 5.
Logit Regression Statistics:
Dependent Variable = Final Course Grade
(2nd Equation)

Number of observations	148		
Log likelihood function	-144.136		
Restricted log likelihood	-201.314		
Chi squared	114.356		
Degrees of freedom	3		
Prob [ChiSq > value] =	0.0000000		
	<i>Coefficients</i>	<i>Standard Error</i>	<i>B / St.Er.</i> ¹⁷
GPA	2.120	0.190	11.133**
Credit Hours	0.009	0.005	1.901
Interest Level in Economics	0.268	0.141	1.906
Predicted Student Rate of Absenteeism in Economics	-0.194	0.050	-3.896**

Table 6.
Summary of Marginal Effects for Ordered Probability Model (logit)

	<i>Y = 00</i> <i>(Grade = E)</i>	<i>Y = 01</i> <i>(Grade = D)</i>	<i>Y = 02</i> <i>(Grade = C)</i>	<i>Y = 03</i> <i>(Grade = B)</i>	<i>Y = 04</i> <i>(Grade = A)</i>
<i>GPA</i>	-0.0022	-0.0715	-0.3895	0.2543	0.2089
<i>Credit Hours</i>	0.0000	-0.0003	-0.0016	0.0010	0.0009
<i>Interest Level in Economics</i>	-0.0003	-0.0090	-0.0493	0.0322	0.0264
<i>Predicted Student Rate of Absenteeism in Economics</i>	0.0002	0.0066	0.0357	-0.0233	-0.0192

As expected, a student's overall GPA was significant and positively related to their final grade in economics. This suggests that students who have performed well in their other classes during college are likely to also perform well in their Principles of Microeconomics class, everything else equal.

Also, students with higher class standing (i.e. more college credit) and those that were more interested in economics were more likely to go to class as indicated with positive coefficients. But these effects were only marginally significant at the 90% level.

CONCLUSIONS

We set out to study empirically if student attendance was a significant contributor to student performance in Principles of Microeconomics classes. We also wanted to know if using an attendance policy in the classroom would help encourage attendance, and if so, what type of attendance policy seemed to have the largest impact in reducing student absenteeism.

Anecdotally we believed there was some extra motivation for students when they believed they could "earn" bonus points for their final grade in economics simply by coming to class. Despite recognition of possible empirical deficiencies, our results seem to suggest that students may in fact be more motivated to attend class when they think there is some sort of tangible reward for attending (i.e. bonus points). This seems striking when you consider that the bonus points that were offered in this experiment were really inconsequential (most teachers round their grades at the margins anyway).

Our result that positive attendance rewards may be a better motivator to reduce student absenteeism may not completely contradict previous studies that found that a negative punishment was a stronger motivating factor in deterring absenteeism. The punishment in those studies was seemingly quite severe: 5 points deducted from the students' overall points earned for every week of class missed not to mention missed quiz and homework grades (Self, 2012). By contrast, the negative attendance policy we studied only factored in missed quiz and homework grades with no explicit grade punishment. It could be possible that any reward or punishment that is tangibly explicit and large could be effective in encouraging class attendance.

ENDNOTES

1. Using five different instructors may cause unobserved heterogeneity in teaching styles / grading procedures that may bias our results. We attempted to control for these potential unobserved effects by controlling for the student interest level in the course. This variable showed statistically different values between courses/instructors suggesting that it might be serving as a proxy for some unobserved differences between the instructors. Furthermore, we do not believe that varying grading procedures have unduly influenced our sample since none of the different class averages (final grades) were statistically different from the overall sample average.
2. These classes were not random, per se, in the sense that students were allowed to self-select which classes they wanted to be in and the individual instructors were all free to select their own attendance policies at will. However, it would have been difficult for students to know which classes would offer which type of attendance policy before selecting one of these sections. For this reason, we do not feel that the data suffers unduly from self-selection bias.
3. The date the survey was offered in each section was coordinated with each instructor so as not to be inadvertently right before or after an exam, which may have biased our data collection inadvertently.
4. This is the student's cumulative GPA at the end of the semester they were taking their Principles of Microeconomics course. This isn't perfect, but it was the only cumulative data we were able to obtain from the Registrar.
5. Ibid.
6. In our final model we used to estimate our parameters, we transformed our dependent variable, student rate of absenteeism, by taking the square root. We did this to correct for skewness in the variable which allowed us to meet the OLS normality assumptions in our 1st equation. We ran the model both ways (with and without the transformed dependent variable) and recorded no significant differences in the results. The statistics in this table represent the variable after it was transformed.
7. The dependent variable in the 1st equation was transformed by taking the square root to correct for skewness in the data. Thus, our predicted values for absenteeism represented square roots. The numbers in this table were squared before being used in the 2nd equation, which is what the values in this table represent.
8. The attendance policy variables (self-reported by the students) add up to more than 100% because students were allowed to answer that they thought their policy had BOTH positive and negative incentives, which was represented in our equations as an affirmative response to both the "positive" and "negative" dummy variable.
9. The absenteeism variable used in our analysis was the self-reported number of absences each student reported missing on the survey divided by the number of classes that section met during the semester. To ensure accuracy, this was cross checked and found to be highly correlated to attendance data collected by individual instructors. The correlation coefficient between the two datasets was 0.90.
10. We used this approach and did our empirical work using basically the same techniques and came to similar, but somewhat different results. Being exposed to a positive attendance policy still significantly encouraged attendance and attendance was a minor, but still significant, predictor and class performance. One difference in this approach was that the sign on the coefficient for the negative attendance policy was negative, like on the positive attendance policy dummy variable, indicating that it too reduced absenteeism. This sign was reversed when we used individual level data as opposed to class aggregated data.
11. Thanks to Caleb Stroup of Vanderbilt University for his helpful comments in this area.
12. The GPA was the cumulative GPA for the student after the semester was over.
13. Park and Kerr, pg. 105, 1990.
14. This first OLS regression model returned a significant F statistic of 9.175.
15. *statistically significant at the 95% level
**statistically significant at the 99% level
16. As suggested by Durden and Ellis, pg. 345, 1995.
17. *statistically significant at the 95% level
**statistically significant at the 99% level

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