EFFECTS OF CURRENT AND PRIOR SKIPPED CLASSES ON CURRENT EXAM PERFORMANCE

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Abstract

Two hundred and three students in four introductory microeconomics classes (two sections in two semesters) participated in a study of the effect of skipped classes on exam performance and the impact of skipped classes in past exam periods on current exam performance. Results showed a negative and significant correlation—one additional class missed was found to lower test scores by approximately 1.92–2.54 points and reduce exam performance by approximately 3.5–6.4%. One additional class missed in the first and second exam periods was found to lower final exam scores by approximately 2.7 and 1.7 points, respectively, and reduce final exam performance by approximately 6.16% and 4.44%, respectively.

Key Words: Skipped classes; Exam performance

JEL Classification: A20; A22; C30

Introduction

The relationship between skipped classes and exam performance has been broadly investigated and discussed by education, psychology, and economics researchers (e.g., Anikeeff, 1954; Jenne, 1973; Schmidt, 1983; Jones, 1984; Brocato, 1989; Park and Kerr, 1990; Van Blerkom, 1992; Gunn, 1993; Romer, 1993; Day, 1994; Durden and Ellis, 1995; Douglas and Sulock, 1995; Devadoss and Foltz, 1996; Marburger, 2001, 2006; Rodgers, 2001; Rocca, 2003; Chung, 2004; Krohn and O'Connor, 2005; Cohn and Johnson, 2006; Stanca, 2006; Lin and Chen, 2006; Chen and Lin, 2008). Although researchers of this topic have adopted different methodologies and used different data sets, all have come to the same conclusion: exam performance is inversely and significantly correlated with skipped classes.

The relationship between skipped classes in the past exam period and current exam performance, however, has not been broadly investigated. This issue is important because knowledge is a cumulative process—concepts and models taught in earlier lectures may be used to understand later lectures. Therefore, students who miss earlier lectures may find it difficult to catch up on later lectures and may not do well on later exams, especially on a comprehensive final exam. For this reason, this study focuses on the impact of skipped classes on current exam performance in both the current and prior exam periods.

This paper is organized as follows. First, two hypotheses, a basic framework, and data measurement information are presented. Second, econometric models are built to investigate the issue and empirical results are reported. Finally, conclusions are offered.

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Hypotheses, Basic Framework, and Data Measurement

Hypotheses

Given the data available for this research, the following two testable (null and alternative) hypotheses were developed:

- *Hypothesis 1*
  - $H1_0$: Students' skipped classes in the current exam period will not affect their current exam performance.
  - $H1_a$: Students' skipped classes in the current exam period will affect their current exam performance.
- *Hypothesis 2*
  - $H2_0$: Students' skipped classes in the prior exam periods will not affect their current exam performance.
  - $H2_a$: Students' skipped classes in the prior exam periods will affect their current exam performance.

Basic Framework

An unobserved individual effect may be created by some individual unobserved heterogeneity variables, such as students' habits and motivations for attending classes,. Formally, the model for individual heterogeneity is illustrated below.

$$y_{it} = \beta_0 + X_{it}\beta + Z_i\gamma + \alpha_i + u_{it}, \tag{1}$$

where y_{it} is the dependent variable observed for individual *i* at time *t*, X_{it} is the time-variant regressor, Z_i is the time-invariant regressor, α_i is the unobserved individual effect (e.g., habits, motivation, or individual factors) , and u_{it} is the error term. The two main methods of dealing with the unobserved individual effect (α_i) are to make the random effects or fixed effects assumptions. The random effects assumption is that the unobserved individual effect is uncorrelated with the independent variables (i.e., assuming that α_i is independent of X_{it}, Z_i or $E(\alpha_i | X_{it}, Z_i) = 0$), while the fixed effects assumption is that the unobserved individual effect is correlated with the independent variables (i.e., assuming that α_i is not independent of X_{it}, Z_i or $E(\alpha_i | X_{it}, Z_i) \neq 0$). Adding dummy variables for each individual *i* is an alternative approach to removing the unobserved individual effect (α_i). Therefore, dummy variables, such as elective course, living background, math background, and gender, were added to the model to remove the unobserved individual effect.

Consequently, a basic framework for a student's exam performance is as follows:

Exam Performance = *f* (*Student's quality*, *Working hours per week*, *Total credits taken in a semester*, *Frequency of studying for the exam*, *Skipped classes*, *Student's living background*, *Student's math background*, *Elective course*, *Gender*).

Data Measurement

To conduct this experiment, four factors need to be held constant. They are:

(1) *Teacher's instructional style and teaching materials*. Since there were two sections in each semester, a teacher's instructional style and teaching materials was held constant. Therefore, only one teacher was chosen in order to ensure the same instructional style and teaching materials.
(2) *Incentive to attend class*. In order to identify the effect of the student's skipped classes on exam performance, students were given complete freedom to make their own choice. Hence, there were no mandatory attendance policies, no attendance bonus, and no quizzes. Both mandatory attendance policies and quizzes serve to enforce students' class attendance while an attendance bonus encourages students to attend class. In addition, punishment due to mandatory attendance policies and a bonus may serve to change students' original grades, leading to bias.
(3) *Quality of classroom*. The same classroom was used with two different sections each semester so that the instructor might maintain the same instructional style. The classroom had high-tech equipment, including a computer, an over-head projector, and a chalkboard.
(4) *Same exams for two sections*. The same exams (including midterm exams and final exam) were created for two different sections each semester for consistency.

Students in introductory microeconomics classes in spring 2007 and spring 2009 were the participants in this case study. Each class met twice a week (Tuesdays and Thursdays). One section began at 10:00am while the other section began at 2:30pm. These were good attendance times for students, not too early or too late, and not during lunch time. Note that no additional weekly review/tutorial classes were provided by graduate students for this course on this branch campus. Daily attendance was taken, but there was no penalty for skipping class.

There were two midterm exams and one final exam. The final exam was cumulative (i.e., comprehensive). Each exam was one-third of the final grade. About 80% of the lectures were from textbooks, with the remainder from the instructor's own examples and exercises. Each exam included problems and essay questions taken word-for-word from the lectures, examples, and exercises in class. If students missed the day on which these examples and exercises were provided, they often found it harder to answer questions bearing on those examples on the exam because they could not easily find the information in textbooks. Students also were given a weekly base study guide with answers to help them study. Thus, 50–60% of the questions came from study guides (all questions in the study guides were developed from lectures and some harder questions were discussed in class) and the rest were from lecture notes and/or the textbook.

The following variables were used in this study:

1. *Skipped class record*. Daily attendance for each exam period was taken, such that each student had an absence record. There were nine classes (excluding the exam day) between exam periods.
2. *Three exam scores*. Each student's three exam scores were recorded. The scores were on a 100-point-scale.
3. *Student quality*. Many researchers use GPA or SAT score to proxy student quality. Each measures different dimensions. The GPA, regardless of a student's major, is a measure of a student's motivation and scholarly ability. The SAT score, on the other hand, is a measure of a student's innate ability. Measurement of innate ability and motivation as well as scholarly ability is necessary. For that reason, student quality (*QUA*) is defined as

$SAT \times GPA$. Students' SAT scores were provided by the admissions office, while students' GPAs were obtained by the registrar's office.

4. *Total credits taken in the semester*. Each student's total credits taken in the semester were provided by the registrar's office.
5. *Gender*. Set to 1 for male students and 0 for female students.

In addition to these five variables, six more variables were self-reported by students. A questionnaire was developed at the end of the semester. Five minutes before the final exam began the questionnaire was handed to each student. Since no question was confidential, all students were required to write down their names so that these self-reported data could be matched with the non-self-reported data. Before the questionnaires were distributed to students, they were told that this survey was for a research project and definitely would not affect their final grades. These six variables are:

6. *Total working hours per week*. Students were asked to write down total working hours per week.
7. *Living with young children.* Students were asked whether or not they lived with children less than 10 years old. Set yes as 1 and no as 0.
8. *Elective or required*. Students were asked whether this course was elective or required. Set 1 as elective and 0 as required.
9. *Have taken college algebra.* Students were asked whether or not they had finished a college-level algebra class elsewhere. Set yes as 1 and no as 0.
10. *Have taken college calculus.* Students were asked whether or not they had finished a college-level calculus class elsewhere. Set yes as 1 and no as 0.
11. *Frequency of studying for exams.* Students were asked three questions: (1) how often did you study for Exam I? (2) How often did you study for Exam II? (3) How often did you study for the final exam (Exam III)?[2] There were five choices for these questions. *1* = I study only 1 day before the test; *2* = I study only 2-3 days before the test; *3* = I study only 4-5 days before the test; *4* = I study one week before the test; *5* = I study regularly right after the class.

Table 1 reports means and standard deviations for the variables used in this study. It should be noted that the grades for each exam were original grades without curves. The effective number of total students in this study was 203. Eleven students who dropped out of the class during the semester were excluded because they did not answer the questionnaire on the final exam day and did not complete all three exams.

[2] Students were not asked to write down the number of hours devoted to studying for the exam, because they might not precisely remember how many hours they had studied for the exam, but it might be easier for them to recall how often they had studied for the exam.

Table 1: Mean and Standard Deviation of Variables

Variables	Mean	Standard Deviation
Scores for exam I (EXA_1)	67.12069	16.55299
Log value of scores for exam I ($\ln(EXA_1)$)	4.17208	0.27354
Scores for exam II (EXA_2)	77.51478	15.17480
Log values of scores for exam II ($\ln(EXA_2)$)	4.32790	0.22413
Scores for exam III (EXA_3)	50.87685	14.4312
Log values of scores for exam III ($\ln(EXA_3)$)	3.88504	0.31074
SAT scores (*SAT*)	1006.5025	139.00044
GPA	2.47828	0.595699
Total working hours per week (*WHR*)	29.18227	13.03352
Log value of total working hours per week ($\ln(WHR)$)	3.04852	1.15153
Total credits taken in the semester (*CRD*)	12.73891	3.37519
Log value of total credits taken in the semester ($\ln(CRD)$)	2.496597	0.34296
Frequency of studying for first exam (STD_1)	2.91626	1.120414
Log value of frequency of studying for first exam ($\ln(STD_1)$)	0.98333	0.44248
Frequency of studying for second exam (STD_2)	3.19212	1.15507
Log value of frequency of studying for second exam ($\ln(STD_2)$)	1.07826	0.43774
Frequency of studying for third exam (STD_3)	2.92118	1.22422
Log value of frequency of studying for third exam ($\ln(STD_3)$)	0.96795	0.48335
Number of absenteeism in the first exam period (ABS_1)	0.88177	1.24908
Number of absenteeism in the second exam period (ABS_2)	1.50246	1.87578
Number of absenteeism in the third (final) exam period (ABS_3)	1.37931	1.97483
Dummy variable: having young kids to live with (*KID*)	0.27586	0.44805
Dummy variable: have taken college algebra (*ALG*)	0.57143	0.496095
Dummy variable: have taken college calculus (*CAL*)	0.310345	0.46378
Dummy variable: male students (*MAL*)	0.51724	0.50094
Dummy variable: elective course (*ELE*)	0.157635	0.365300

Econometric Models and Empirical Results

Econometric Models

The effect of skipped classes on a student's exam performance is investigated for Exams I, II, and III, including whether skipped classes in the last exam period had an impact on current exam performance. Exam performance is modeled as two types of functions. These two econometric models are:

Model 1:

$$EXA_i = a_0 + a_1 QUA + a_2 WHR + a_3 CRD + a_4 STD_i + a_5 ABS_i + a_6 KID$$

$$+ a_7 ALG + a_8 CAL + a_9 MAL + a_{10} ELE + \varepsilon_1 \quad (2)$$

Model 2:

$$\ln EXA_i = b_0 + b_1 \ln QUA + b_2 \ln WHR + b_3 \ln CRD + b_4 \ln STD_i$$
$$+ b_5 ABS_i + b_6 KID + b_7 ALG + b_8 CAL + b_9 MAL + b_{10} ELE + \varepsilon_2, \quad (3)$$

where i = 1, 2, 3; EXA_i = scores of Exam i; QUA = student quality (i.e., SAT × GPA); WHR = total working hours per week; CRD = total credits taken in the semester; STD_i = frequency of studying for Exam i; ABS_i = total number of absence during the period of Exam i; KID = having young kids to live with; ALG = have taken college algebra class; CAL = have taken college calculus class; MAL = male students; ELE = elective course; and ε_1, ε_2 = stochastic disturbance with a mean 0 and a variance σ^2.

Empirical Results

<u>Exam I</u>

The results for Exam I are reported in Table 2. The null hypothesis that students' skipped classes in the current exam period do not affect their current exam performance was rejected. Skipped classes in the first exam period have a negative and significant (at 5%) effect on the first exam score in both models. Thus, missing class negatively affected a student's achievement. The point estimate indicates that each additional missed class lowers the first test scores by approximately 1.92 points on average, or by approximately 3.523%.

In addition, student quality exerted a positive and significant (at 1%) effect on first exam performance in both models. Frequency of studying for the first exam also exerted a positive and significant (at 1%) effect on first exam performance. Obviously, out-of-classroom effort is an important factor in determining a student's exam performance, an effect that could be partially attributed to the format of the exam. The exam involved essays & problems, rather than multiple-choice questions, in an attempt to avoid the "*opportunist*" problem. Selection of this format meant that students had to devote sufficient time and effort to studying for the exam. Students who thought that they were smart and thus did not need to study often (only one or two days before the exam) were less likely to perform well on an essay & problem-based exam. For example, if a multiple-choice-based exam with five choices in each question were offered, the student who had not studied and chose the same answer for all questions could receive twenty credits (i.e., the probability of getting the correct answer is 20%). On the other hand, under the essay & problem-based exam, a student who did not study at all would likely receive zero credit. The difference between these two bases is twenty credits. Nevertheless, some students may not precisely recall how often they studied for the first exam during the first exam period, so their response may be based on their exam grades.

The coefficient on the male dummy was positive and significant at the 10% level in both models, indicating that gender had a statistically significant effect on first exam performance. This result is consistent with those in the education literature, such as Helpern (1996) and Hedge and Nowell (1995)—males score higher on average than females on tests of mathematics ability. Since economics involves mathematical skills, male students may do better in economics than female students, *ceteris paribus*. Similarly, having finished a calculus class had a positive and significant effect on exam performance at the 10% level in both models, suggesting that understanding calculus benefits the learning of economics. The significance of the calculus dummy variable may also reflect a student's choice of major and the degree to which they are more motivated and/or have higher innate ability. Alternatively, students who have completed a calculus course may have a higher class standing than those who have not taken this course. Therefore, more experienced students may perform better than those of lower class standing.

Working hours per week exerted a negative and significant (at 10%) on the first exam in Model 1, while the effect was not statistically significant in Model 2. This implies that the more time these students work, the less time they have for study and hence they may perform worse on exams. It should be noted that the literature typically reports that the relationship between hours worked per week and grades is nonlinear so that the logs (i.e., Model 2) are appropriate. However, the empirical evidence here showed that the effect was significant in Model 1 rather than in Model 2. A possible reason could be that the extreme values (i.e., students working 40 hours or more per week) accounted for the significant estimated coefficient in Model 1. Finally, the coefficients for both total credit hours taken in the semester and living with young kids were not statistically significant at the 10% level.

Table 2: Estimates of EXA_1 and $\ln(EXA_1)$

Explanatory Variables	Exam I Model 1 Explained Variable: EXA_1	Exam I Model 2 Explained Variable: $\ln(EXA_1)$
Constant	37.717*** (5.74)	1.3469*** (3.25)
QUA	0.008379*** (7.55)	
$\ln(QUA)$		0.34468*** (7.15)
WHR	-0.14168* (-1.80)	
$\ln(WHR)$		-0.01268 (-0.88)
CRD	-0.1687 (-0.52)	
$\ln(CRD)$		-0.01037 (-0.20)
STD_1	3.5218*** (4.09)	
$\ln(STD_1)$		0.14244*** (3.84)
ABS_1	-1.9168** (-2.46)	-0.03523*** (-2.69)
KID	0.294 (0.13)	0.01268 (0.33)
ALG	0.334 (0.16)	0.01033 (0.30)
CAL	3.330* (1.65)	0.06387* (1.71)
MAL	3.697* (1.90)	0.05553* (1.69)
ELE	1.673 (0.66)	0.02269 (0.53)
R^2	0.415	0.379
$\bar{R}^2$	0.384	0.347
F-Statistics	13.60	11.73
Sample size	203	203

(t-value) *** denotes statistical significance of the t-statistic at the 0.01 level; * denotes statistical significance of the t-statistic at the 0.10 level.

Exam II

The results for Equations (2) and (3) for Exam II are presented in Table 3. The null hypotheses that students' skipped classes in the prior and current exam periods do not affect their current exam performance were rejected. Skipped classes in the first exam period exerted a negative and significant (5% in Model 1; 10% in Model 2)) effect on second exam performance. Skipped classes in the second exam period also exerted a negative and significant (1%) effect on second exam performance in both models. The coefficient of skipped classes in the second exam period indicated that one additional class missed could lower the second test scores by approximately 2.1 points and reduce exam performance by approximately 3.33%. Although the second exam was not cumulative, skipped classes in the first exam period still have a statistically significant effect on second exam performance. This implies that concepts and models taught in earlier lectures are useful in understanding later lectures. Students who missed some lectures in the first exam period may miss important concepts used in the second exam. For example, we might expect a student who skipped supply/demand material to perform more poorly on market efficiency and structure questions in a future exam.

Student quality and student's frequency of studying for the second exam still exert a positive and significant (1%) effect on second exam performance in both models. Working hours per week exert a negative and significant (5% and 10%, respectively) effect on second exam performance in both models (except Column 4). Having finished a calculus class had a positive and significant (5%) effect on second exam performance in both models, implying that students who understand calculus have an easier time learning economics. The coefficients on the male and elective dummy variables, however, did not exert a significant effect on second exam performance in either models.

The second exam materials include market efficiency and the theory of consumer choice (e.g., marginal utility and indifference curves). The chapter on consumer choice theory is more abstract and mathematical. Therefore, students who understand calculus likely do better than students who do not understand calculus. Moreover, this chapter may be more difficult than the other chapters. Hence, students who frequently missed class during the second exam period found it difficult to study and did not do well on exams.

Exam III

The results for Equations (2) and (3) for Exam III are reported in Table 4. Again, the null hypotheses that students' skipped classes in the prior and current exam periods do not affect their current exam performance were rejected. Skipped classes during the third exam period had a negative and significant (1%) effect on third exam performance in both models. The coefficient for skipped classes in the third exam period implies that one additional class missed lowers the third test score by approximately 2.54 points on average and reduces exam performance by approximately 6.44%. Moreover, skipped classes in the previous exam periods (Exam I and II periods) also had negative and significant (1%) effects on final exam performance in both models. The coefficient for skipped classes in the first exam period indicates that one additional class missed in that period reduces the third test score by approximately 2.7 points on average and final exam performance by approximately 6.16%. The coefficient for skipped classes during the second exam period implies that one additional class missed in that period reduces the third test score by approximately 1.73 points on average and final exam performance by approximately 4.44%. Obviously, when the final exam is cumulative, previous skipped classes in the first and second exam periods significantly affect final exam performance. This implies that concepts and models covered in earlier lectures are also used on later exams. Students who missed class in earlier exam periods have difficulty performing well on the final exam.

Table 3: Estimates of EXA_2 and $\ln(EXA_2)$

Explanatory Variables	Exam II			
	Model 1		Model 2	
	Explained Variable: EXA_2		Explained Variable: $\ln(EXA_2)$	
	(1)	(2)	(3)	(4)
Constant	49.586*** (7.95)	53.187*** (8.77)	2.0365*** (5.90)	2.2164*** (6.67)
QUA	0.007392*** (7.18)	0.0069617*** (7.00)		
$\ln(QUA)$			0.2742*** (6.84)	0.25417*** (6.58)
WHR	-0.15844** (-2.16)	-0.12364* (-1.75)		
$\ln(WHR)$			-0.01919* (-1.65)	-0.01386 (-1.21)
CRD	0.2146 (0.71)	0.2752 (0.95)		
$\ln(CRD)$			0.02457 (0.57)	0.03696 (0.89)
STD_2	2.7900*** (3.61)	2.2526*** (2.98)		
$\ln(STD_2)$			0.11291*** (3.66)	0.08666*** (2.88)
ABS_1	-1.4454** (-1.99)		-0.02079* (-1.89)	
ABS_2		-2.0998*** (-4.48)		-0.033314*** (-4.69)
KID	0.739 (0.35)	0.246 (0.12)	0.0062 (0.19)	-0.00062 (-0.02)
ALG	-0.399 (-0.21)	-0.516 (-0.29)	0.00102 (0.04)	-0.00167 (-0.06)
CAL	4.748** (2.34)	4.455** (2.28)	0.0723** (2.33)	0.06542** (2.20)
MAL	0.059 (0.03)	-0.473 (-0.27)	-0.00156 (-0.06)	-0.00789 (-0.30)
ELE	-0.873 (-0.37)	-0.938 (-0.41)	-0.01227 (-0.34)	-0.01366 (-0.40)
R^2	0.396	0.441	0.354	0.409
$\bar{R}^2$	0.364	0.412	0.320	0.378
F-Statistics	12.57	15.18	10.50	13.30
Sample Size	203	203	203	203

(*t*-value) *** denotes statistical significance of the *t*-statistic at the 0.01 level; ** denotes statistical significance of the *t*-statistic at the 0.05 level; * denotes statistical significance of the *t*-statistic at the 0.10 level.

Table 4: Estimates of EXA_3 and $\ln(EXA_3)$

Explanatory Variables	Exam III (Final Exam)					
	Model 1			Model 2		
	Explained Variable: EXA_3			Explained Variable: $\ln(EXA_3)$		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	30.698*** (5.76)	32.102*** (5.96)	33.844*** (6.69)	1.238*** (3.28)	1.5828*** (3.65)	1.5523*** (3.93)
QUA	0.00572*** (6.28)	0.00551*** (6.00)	0.005502*** (6.41)			
$\ln(QUA)$				0.30722*** (6.09)	0.28785*** (5.72)	0.2913*** (6.34)
WHR	-0.1898*** (-2.94)	-0.18521*** (-2.85)	-0.18317*** (-3.03)			
$\ln(WHR)$				-0.04032*** (-2.70)	-0.03785** (-2.54)	-0.03484** (-2.56)
CRD	-0.0719 (-0.27)	-0.0954 (-0.35)	-0.0283 (-0.11)			
$\ln(CRD)$				-0.01365 (-0.25)	-0.00695 (-0.13)	0.01504 (0.30)
STD_3	3.6374*** (5.43)	3.5472*** (5.23)	2.9104*** (4.49)			
$\ln(STD_3)$				0.22423*** (6.19)	0.21033*** (5.76)	0.16709*** (4.89)
ABS_1	-2.6969*** (-4.17)			-0.06157*** (-4.45)		
ABS_2		-1.7325*** (-4.00)			-0.04439*** (-4.81)	
ABS_3			-2.5408*** (-6.63)			-0.06445*** (-8.00)
KID	-0.587 (-0.32)	-1.097 (-0.59)	-1.061 (-0.61)	-0.01909 (-0.48)	-0.03056 (-0.77)	-0.02937 (-0.81)
ALG	0.098 (0.06)	0.712 (0.43)	0.828 (0.53)	0.00194 (0.05)	0.01632 (0.46)	0.02118 (0.65)
CAL	3.234* (1.80)	3.119* (1.73)	3.375** (2.00)	0.0696* (1.79)	0.06392* (1.65)	0.0674* (1.90)
MAL	2.408 (1.52)	1.761 (1.11)	1.447 (0.97)	0.03023 (0.88)	0.01521 (0.45)	0.00706 (0.23)
ELE	0.781 (0.38)	0.755 (0.36)	1.586 (0.81)	-0.00774 (-0.17)	-0.00847 (-0.19)	0.01254 (0.31)
R^2	0.482	0.479	0.540	0.476	0.484	0.566
$\bar{R}^2$	0.455	0.451	0.516	0.448	0.457	0.544
F-Statistics	17.88	17.63	22.57	17.42	17.99	25.08
Sample Size	203	203	203	203	203	203

(*t*-value) *** denotes statistical significance of the *t*-statistic at the 0.01 level; ** denotes statistical significance of the *t*-statistic at the 0.05 level; * denotes statistical significance of the *t*-statistic at the 0.10 level.

In addition, taking a closer look at the *t*-values for ABS_1, ABS_2, and ABS_3, shows that the *t*-value for ABS_3 is much larger in absolute value than the *t*-values for ABS_1 and ABS_2. The larger *t*-statistic for ABS_3,given the size of the estimated coefficient, is due to a relatively smaller estimated standard error. That is, the fit is better than for ABS_1 and ABS_2.

Furthermore, student quality still has a positive and significant (1%) effect on final exam performance. Amount of time spent studying for the third exam exerts a positive and significant (1%) effect on final exam performance in both models. Working hours per week has a negative and significant (1% and 5%) effect on final exam performance in both models. Although total credits taken during the semester and living with young kids exerted negative effects on final exam performance in both models, these effects are not statistically significant. In addition, student's math background (calculus) had a positive and significant (5% and 10%) effects on final exam performance, while algebra did not exert a statistically significant effect, although the effect is positive. Finally, the coefficients on the male and elective course dummy variables are not significant.

Conclusions

In the case study described in this paper, two hundred and three students in four introductory microeconomics classes (two sections in two semesters) participated in a study of the effect of skipped classes in current and previous exam periods on current exam performance Since knowledge is cumulative—concepts and models taught in earlier lectures may be used in later lectures and exams—students who missed earlier lectures appear to have difficulty catching up on later lectures and do not perform as well on later exams, especially on a comprehensive final exam.

The data for exam performance in this study were taken from students' responses to essay & problem questions. The advantage of essay & problem questions is that students' explanations and calculation process must be read in order to ascertain their understanding of the materials and award points. Thus, essay and problem questions may more precisely reflect a student's exam performance. Skipped classes and exam performance are negatively and significantly correlated, in the absence of guessing, as in Browne *et al*. (1991), who found significant positive effects of attending lectures on essay tests. These results imply that performance on problems and essays are directly related to attendance at lectures.

Finally, the point estimates showed that one additional class missed reduced test scores by approximately 1.92–2.54 points on average and reduced exam performance by approximately 3.5–6.46%. Absenteeism in past exam periods (Exams I and II) also had negative and significant effects on final exam performance: one additional class missed in the first and second exam periods lowered final exam scores by approximately 2.7 and 1.7 points respectively, and final exam performance by approximately 6.16% and 4.44%, respectively.

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