

STUDY HABITS AND EXAMINATION PERFORMANCE IN AN ONLINE LEARNING MICROECONOMICS COURSE

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ABSTRACT

In light of the increased prevalence of online courses and web-based instruction offered in traditional courses, it is imperative to understand determinants of college students' academic achievement under the online instruction. Using a unique panel data collected from a university's e-learning server, this paper examines students' online study patterns and how study habits affect their learning outcomes. We find that many students enrolling in the sampled online microeconomics course finished viewing online course materials right before examinations, rather than spreading study time evenly over the semester. The estimation results also show that study habits are significantly correlated with students' examination performance.

INTRODUCTION

With the availability of new technologies, cyber classrooms are gaining ground in higher education. More and more universities are offering web-based instruction or completely online courses. Online courses provide a unique opportunity to scrutinize students' behavior, the associated academic results and the effectiveness of the technology being offered. Students' examination performance can be regarded as an education production function which highly correlates with students' efforts, instructors' efforts and some demographic characteristics of students. Among all educational inputs, study habit has been shown to be a good predictor of examination performance.

Study habits include frequency of studying sessions, review of material, rehearsal of learned material, self-testing and studying in a conducive environment (Credé & Kuncel, 2008). Good study habits, such as trying not to do too much studying at one time, reviewing notes before beginning an assignment and reviewing school work over the weekend help students learn better and improve their test scores. Many studies conducted in this line of research used self-reported study habits data and reached the conclusion that study habits are significantly correlated with students' grades (Borg, Mason & Shapiro, 1989; Okpala, Okpala & Ellis, 2000; Credé & Kuncel, 2008; Nonis & Hudson, 2010).

Instead of using self-reported study habits data, this paper utilizes a unique panel data set collected from a university's e-learning server and investigates the relationship between study habits and examination performance under the online mode. With the details of students' use of online materials and their examination performance, we are able to examine how study habits affect students' learning outcomes in an online microeconomics course. This paper adds a piece to the puzzle of learning students' study habits in online learning economics courses and makes

contribution to exploration of the relationship between online study habits and academic performance.

DATA DESCRIPTION

Data were collected from an online undergraduate intermediate microeconomics course for fall 2009 in a public university in Taiwan. There were 107 students in our sample. 12 instructor pre-recorded weekly lectures were available at the beginning of the semester on the website administered and maintained by the university's e-learning server.

The online class met in a classroom from 9:10 a.m. to 12:00 p.m. on Fridays five times during the sample semester for three examinations and two in-class project presentations. Other than that, students viewed pre-recorded lectures, read textbooks, solved assigned problem sets, studied past examination questions, and used Internet enhancements such as emails and discussion boards to aid their learning.

One feature of online courses is that students do not need to attend live lectures taught in traditional face-to-face ways. Instead, students may choose when and where to view online course materials, and may also view videos repeatedly. Students' viewing patterns here can be viewed as their study habits in online courses.

There were 12 instructor pre-recorded lectures for this course, and these pre-recorded materials were assigned to 12 specific weeks. We expect that good study habits such as reviewing online materials during the assigned week or finishing watching online recorded lectures before examination help students learn better.

We first explore students' online study habits by examining their course website usage patterns. As can be seen from the Figure 1, students visited the course website more frequently on Thursdays and Fridays. The average number of daily visits reaches the highest right before the first midterm during the entire period. Most students visited the course website in the evening, from 6 p.m. to 12:00 a.m.

For each lecture, all students' viewing patterns are further assigned to one of the following seven categories according to when they finish watching the online lecture for the first time.

1. The student finished watching for the lecture during the examination week
2. The student finished watching the lecture after the assigned week but before the examination week
3. The student finished watching the lecture during the assigned week
4. The student finished watching the lecture before the assigned week
5. The student only watched part of the lecture (more than 50%)
6. The student only watched part of the lecture (less than 50%)
7. The student has never watched the lecture

Figure 2 presents the distribution of online viewing by lecture. For each lecture, on average, 11.83% of students did not watch online lectures even though they could easily view online materials at anytime and anywhere. Notably, the percentage of never watch online lectures is increasing as the semester goes on. Also, 28.50% of students viewed pre-recorded lectures during the examination week; 23.91% of students viewed pre-recorded lectures after the

**Figure 1: Frequency of Course Website Usage
(Daily Visits Per Student)**

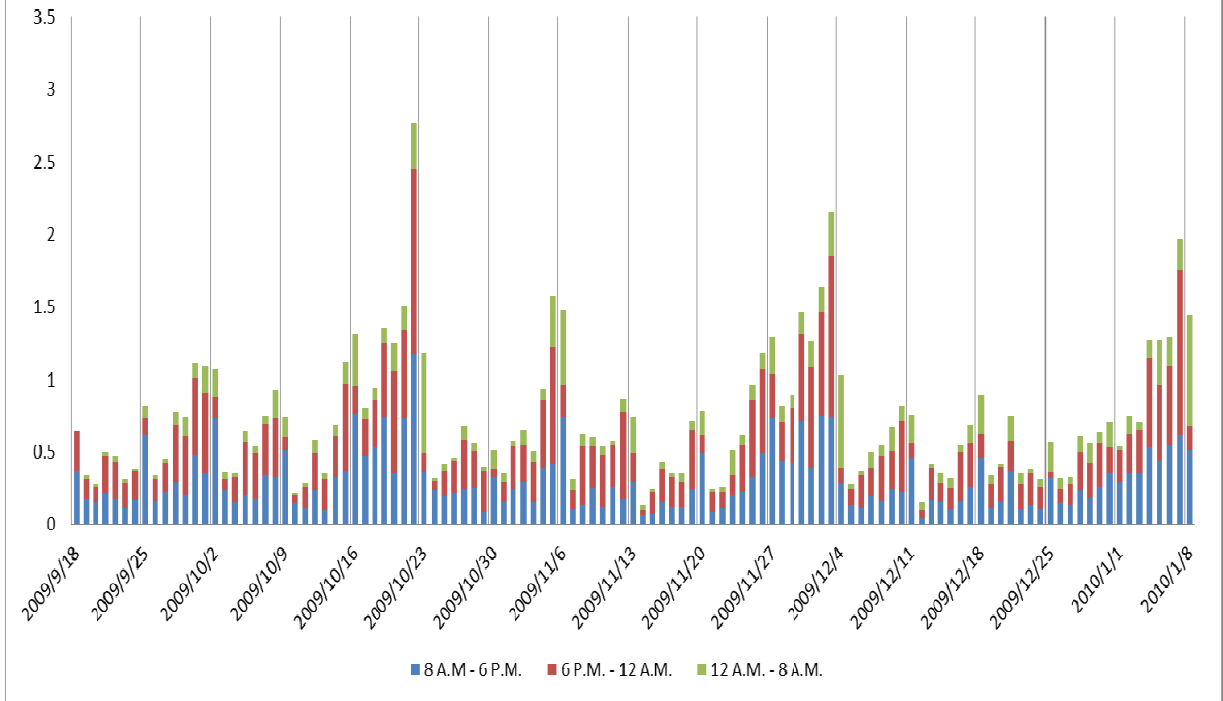
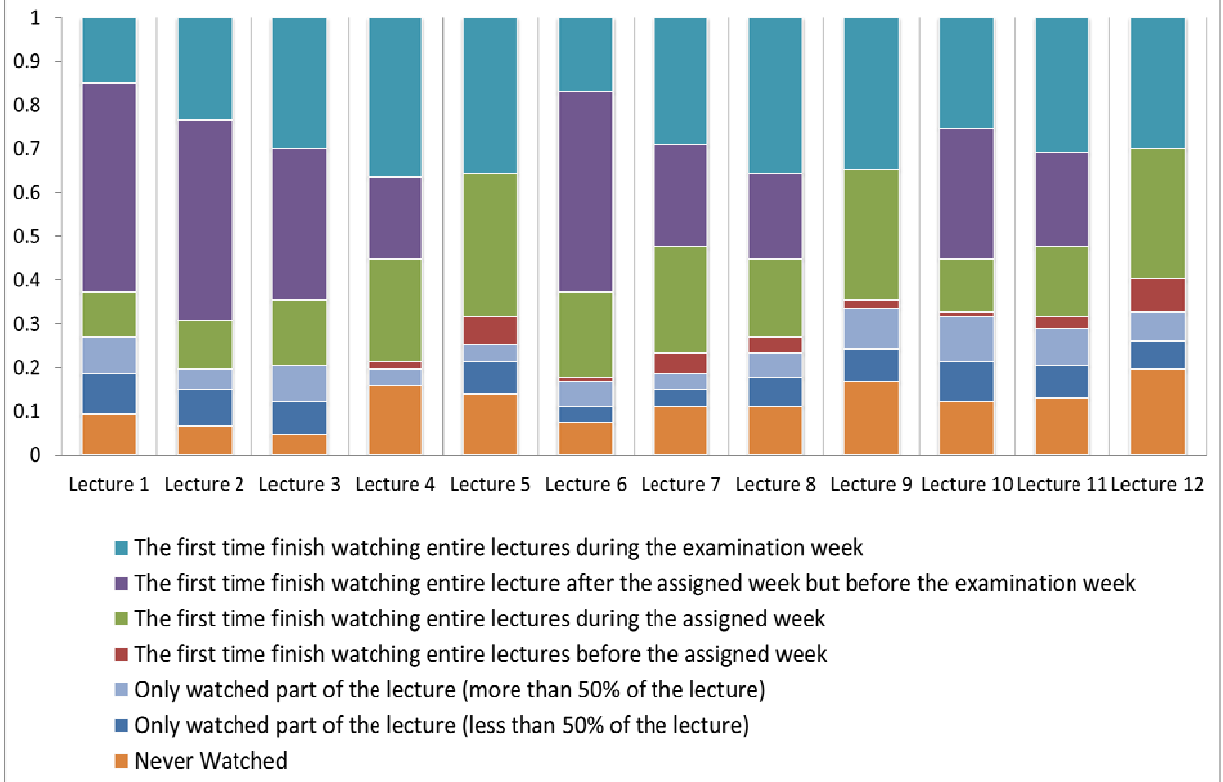


Figure 2: Distribution of Online Viewing Patterns



assigned week but before the examination week; only 20.17% of students viewed pre-recorded lectures during the assigned week.

PANEL DATA ANALYSIS

The major research question is that whether or not online lecture viewing patterns or study habits affects students' learning outcomes. Specifically, we link students' viewing patterns to their examination performance. For each examination question, we know the corresponding lecture and students' viewing behavior of that particular lecture. This enables us to employ panel data method to take into account students' time invariant heterogeneity like motivation, and estimate the effects of online viewing patterns on examination performance.

A linear model describing the relationship between a student's examination performance and various online viewing pattern variables is shown below.

$$y_{ij} = \eta r_{ij} + \alpha_i + \gamma_j + \varepsilon_{ij}, \quad i = 1, 2, \dots, I, j = 1, 2, 3, \dots, J \quad (1)$$

I denotes total number of students and J denotes total number of examination questions. y_{ij} corresponds to student i 's observed examination performance on question j . r_{ij} refers to online learning pattern variables. η represents the correlation between online viewing patterns and grades, the major interest of this paper. α_i represents student i 's time-invariant individual effect, γ_j represents question j 's specific effect, and ε_{ij} is a random disturbance term.

There were three examinations in the sample semester. Total number of questions was 52, and total number of students was 107. Table 1 shows the estimation results of least square models for the pooled data, fixed and random effects models. The dependent variable is the percentage of correctness for each examination question. The viewing pattern variables described above are the main independent variables. Examination question and student dummy variables were used as covariates to better control for question and individual heterogeneity.

The first three columns only include one major independent variable, "Watched the lecture". It is defined as 0 if the student had never watched or did not finish viewing online lecture; otherwise, it is coded as 1. We find a positive association between students' viewing of online lectures and their grades. The result shows that students who chose to access online course materials do better than those chose not to access online materials. The sign and magnitude of "watching lecture" effect here are comparable to the attendance effects in the literature (Stanca, 2006; Lin & Chen, 2006).

The fourth, fifth, and sixth columns show the results of detailed online viewing patterns on examination performance. "Finish watching lectures before the assigned week", is combined into "Finish watching lectures during the assigned week" in this part of estimation. Also, "Only watched part of the lecture" includes "Only watched part of the lecture (more than 50% of the lecture)" and "Only watched part of the lecture (less than 50% of the lecture)". The reference group here is "Never watched the lecture". All the viewing pattern variables except "Only watched part of the lecture" are found positively correlated to students' examination performance. Our results support the argument that study habits are significantly correlated with students' academic performance. In the fixed effects model, the magnitude of "Finish watching entire lecture during the examination week" is the greatest among all viewing pattern variables. This

Table 1: Factors Affecting Students' Examination Performance

Dependent Variable (% of Correctness)	OLS	Fixed Effects	Random Effects	OLS	Fixed Effects	Random Effects
Watched the lecture	0.0461*** (0.0165)	0.0555*** (0.0211)	0.0538*** (0.0184)			
Only watched part of the lecture				0.0210 (0.0203)	0.0341 (0.0238)	0.0317 (0.0211)
The first time finish watching entire lectures during the assigned week				0.0935*** (0.0180)	0.0410* (0.0236)	0.0519** (0.0215)
The first time finish watching entire lecture after the assigned week but before the examination week				0.0504*** (0.0188)	0.0694*** (0.0237)	0.0671*** (0.0208)
The first time finish watching entire lectures during the examination week				0.0162 (0.0134)	0.0772*** (0.0160)	0.0658*** (0.0153)
Constant	0.668*** (0.0452)	0.659*** (0.0437)	0.661*** (0.0380)	0.663*** (0.0451)	0.654*** (0.0439)	0.655*** (0.0379)
Hausman Test Statistics			0.09			20.99
R-squared	0.233	0.352	.	0.238	0.353	.
Number of Observations	5,564	5,564	5,564	5,564	5,564	5,564

Note: The exam question dummies are included in all models, and student dummies are only included in the fixed effects models. "***" is at 0.01, "**" is at 0.05 and "*" is at 0.1 Type I error levels. White (1980) robust standard errors are in parentheses. All Hausman test statistics are not significant from zero.

implies that students that wait until the last minute to cram for examinations using online resources do pay off in our sample. This result is in line with that in Chen and Lin's 2012 paper (Chen & Lin, 2012).

CONCLUSION

As the computer technology advances, learning economics in higher education has become more digitalized. Availability of online courses has given students an alternative choice to learn economics. This paper utilizes online usage data collected by a university e-learning

server and explores the effects of study habits on students' examination performance in an online learning microeconomics course.

We find that many students spend their study efforts during the examination period, i.e. they wait until the last week to cram for examinations. The results demonstrate that study habits in terms of online viewing patterns are significantly correlated with students' examination performance. Students with study habits such as finishing watching online lectures during the assigned week, finishing watching online lectures after the assigned week but before examination date or finishing watching online lectures during the examination week perform better than those never watched online lectures and those viewed only partial online materials. However, for this online course, crammers' examination performance is not statistically different that of those learning and reviewing online materials before examination week. It may imply that, in the short run, last minute exam preparation does pay off. This explains why many students choose to wait until the last minute to cram for exams.

ACKNOWLEDGMENT

We are grateful to Pedro de Araujo, Chinn-ping Fan, and seminar participants at the 2011 AEA National Conference on Teaching Economics and 2012 TEA Annual Meeting for their thoughtful comments and suggestions. Financial support provided by Taiwan's National Science Council through grant NSC100-2410-H-004-067-MY2 and National Chengchi University is gratefully acknowledged. All errors are our own.

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