IS THERE SUCH A THING AS A FREE TEXTBOOK?

Simon Medcalfe, Augusta State University

ABSTRACT

Students are being given greater choice over how they access textbook material for classes. This study examines the relationship between student choice and overall performance in an Introduction to Economics class. Simple averages suggest free online access to a textbook is associated with a grade one full letter lower than if that student had bought a traditional textbook. However, once we control for the endogeneity of student choice there is no significant difference in grade between those students who buy a traditional textbook and those that access the material in a different manner.

There is an increasing variety of ways in which students can access their textbooks. Many students still use the traditional textbook, but publishers have started to offer a number of other options. For example, students can access an e-text version. This is often a PDF version of the traditional textbooks that may include the opportunity to search the text and other options. The success of Apple products, most recently the ipad, has allowed publishers to offer ibook versions of their text for a variety of e-readers. Despite the increasing variety of textbook formats little research has been conducted into how these different formats affect student understanding. This paper provides initial observations on student achievement in economics when they are provided with a variety of choices about how they access the textbook material. The results suggest that there is no difference in student outcomes.

LITERATURE REVIEW

There has been much research into effective teaching of economics including the role of homework and assignments, peer effects, and technology. Further, there have been a number of studies examining the differential effect of online versus face-to-face teaching.

Frank (2002) described "The Economic Naturalist", a set of assignments used to teach introductory students how to speak economics. Students had to use an economic principle to explain some pattern of events or behavior that they had personally observed. Although no quantitative evidence was provided to show improved learning and understanding, anecdotal evidence suggested that students did become better speakers of economics with their classmates, families, and beyond the course.

Joerding (2010) found that students who received unique homework exercises did better on subsequent exams than students who received traditional paper assignments that were identical across students. The suggestion is that unique assignments encourage student to find

solutions to problems rather than just answers. Lee, Courtney, and Balassi (2010) however, found that students did no better, or worse, when using the Aplia online homework system compared to traditional paper assignments. It is not clear whether students were assigned unique questions in Aplia. One problem with these kinds of studies is that they compare one group of students who completed paper assignments with another group who completed Aplia assignments. This makes it difficult to know whether differences are due to the type of assignment or difference between one class and the other. Kennelly, Considine, and Flannery (2011) overcame this problem by using one set of students who completed some assignments on paper and some on Aplia. They found little evidence that the way a student completed an assignment has an effect on how they performed on the related exam question.

Parker (2010) using student performance data from 9 years of an undergraduate macroeconomics class found no evidence of free riding in effort of weaker students in collaborative assignments. Both students contributed to assignments in proportion to their abilities. He pointed out that this may be specific to his institutions and warns of extrapolating results to other institutions and courses. Munley, Garvey, and McConnell (2010) develop further the idea of peer effects by analyzing the effectiveness of peer tutoring. Peer tutoring programs typically utilize advanced undergraduates who have successfully completed the course to lead a small group of enrolled students through some problem solving sessions. The evidence from over 14,000 students was that an hour per week of peer tutoring increased the student's grade by 0.3 on a four point scale (e.g. from a B to a B+).

Technology has increasingly been advocated to enhance instruction but studies provide mixed results on its efficacy. Savage (2009) for example found no difference in student performance when one section of an Intermediate Macroeconomics course could access recordings of the lectures after the class via the internet. Savage suggested the lack of difference may be because the recording did not add anything new that was not already covered in class. Ghosh and Renna (2009) experimented with a Personal Response System that allowed students to anonymously answer questions and provided the instructor and student with real-time assessment of learning. In a survey, students overwhelmingly welcomed the technology for its ability to reinforce concepts and gauge their understanding. They were less certain that it improved their performance in class. Salemi (2009) reported that 85 percent of students in a Principles of Economics class thought "the use of clickers helped me to learn".

Studies of online versus face-to-face instruction have similarly returned mixed results. Coates, Humphreys, Kane and Vachris (2004) found that, after correcting for selection bias, online students performed significantly worse than face-to-face students on the Test of Understanding College Economics. However, online students did better than they would have in a face-to-face class. Brown and Leidholm (2002) found online students performed worse on examinations than face-to-face students. Medcalfe (2009) however, found no significant difference in grades of adult learners.

Few studies have actually looked at textbook choice. One notable exception is Pyne (2007) who examined the (instructors) choice of textbook. He found some evidence that the choice of introductory microeconomics textbook did affect student outcomes in subsequent economics courses (intermediate microeconomics and money and banking). However, there has been no research examining student choice of textbook access and outcomes.

THE UNIVERSITY AND THE COURSE

Augusta State University (ASU) is a member of the University System of Georgia (USG). It currently offers more than 50 programs of study leading to bachelor, masters and educational specialist degrees. In fall 2009, there were 7,061 students enrolled at the institution (6,718 in spring 2010). In fiscal year 2009, 608 bachelor's degrees were conferred. The freshman retention rate in 2007/2008 (the latest year data is available) was 69% within the institution and 73% within the USG. The six year baccalaureate degree graduation rate for the 2003 cohort was 21% within ASU and 28% in the USG.

Introduction to Economics is a course aimed at non-business majors offered twice a year (once in the fall and once in the spring semester). The core curriculum of all bachelor degrees at ASU requires 12 credit hours in social sciences. Students are required to take an American history and American government class and must choose one of four courses: Introduction to Economics, Cultural Anthropology, Introduction to General Psychology, or Introduction to Sociology (along with one other course). A broad range of majors are represented in a typical Introduction to Economics class including, but not limited to: engineering, nursing, sociology, history, English and education. Sixty five percent of the students were freshmen or sophomores in fall 2009, and 76% were in spring 2010. Sixty nine students gave permission for their data to be used in this study (35 in the fall and 34 in the spring semester). Students were assessed using a combination of exams and homework, as well a paper and a presentation.

The assigned textbook in the course was *Principles of Economics* by Timothy Taylor available from textbookmedia.com. The website provided the following choices for accessing the textbook:

1. Sponsored Online Book: Free access to the online book. Includes StudyBreak Ads (advertising placed in natural subject breaks). NOTE: No printing. Study Guide not included. Price: $0.00.
2. Online Book (ad-free): Ad-Free version of online book. NOTE: No printing. Study Guide not included. Price: $9.95.
3. Digital Bundle: PDF Chapters + Online Book: BEST VALUE: Printable version of ad-free online textbook. 710 pages. Includes downloadable PDF chapters for easy self-printing. Price: $19.95.
4. Hybrid Bundle: Paperback + Online Sponsored Book: Provides students with print and online versions of the textbook for convenience and easy access. Includes an affordable

print version of the book (with no ads). This black & white paperback is shipped directly to you (allow 5-7 business days). Savings compared to traditional Economics textbooks: $100+. Use the Sponsored Book version while waiting for paperback delivery. Price: $29.95.

RESULTS

Students in the fall 2009 semester were not given any guidance or instruction about which mode of accessing the textbook should be used. However, students who bought the traditional textbook (Hybrid Bundle) earned a course grade about 10 percentage points higher than those who accessed the free online text. Students in the spring 2010 semester were informed of this difference in grade to allow then to make the most well informed choice. Despite this advice, more students (14) chose to access the textbook free online rather than buy a traditional copy (11). Moreover, the students that bought the traditional textbook earned a grade 3 percentage points higher than those that used the free textbook. Summary statistics of this data are presented in table 1.

Table 1: Summary Statistics

	Fall 2009			Spring 2010		
	Number	Mean Grade	S.D.	Number	Mean Grade	S.D.
Free	13	72.0	9.6	14	70.0	9.0
Ad-free	2	69.1	3.1	1	82.8	n/a
Digital bundle	2	76.0	20.4	2	88.3	5.2
Traditional	13	82.2	8.6	11	73.2	7.5
None	5	71.5	9.2	6	65.1	9.2

Obviously, other factors can contribute to a course grade besides accessing the textbook. The following section uses regression analysis to better understand how accessing the textbook affects course grades. Other information about the students was collected either from a survey (appendix A) or directly from university records (GPA). The OLS regression results are presented in column 1 of Table 2. The coefficient on the free variable suggests that those students who chose the free access earned a grade for the course about 5 percentage points lower than those students who used a traditional textbook. The only other significant variable of interest is the GPA. A one point increase in GPA (say from 2.5 to 3.5) is associated with a higher grade in the course of about 8 percentage points.

Table 2: Regression results.		
	OLS	IV
Intercept	55.43***	59.85***
	(5.61)	(3.33)
None	-3.56	-6.29
	(1.08)	(0.64)
Free	-5.07**	-9.79
	(2.00)	(0.54)
Adfree	-6.51	-8.89
	(1.29)	(0.92)
Digital bundle	5.21	3.41
	(0.86	(0.39)
Freshman	-3.58	-3.45
	(0.97)	(1.16)
Sophomore	-0.20	0.91
	(0.06)	(0.18)
Junior	-1.78	-0.98
	(0.41)	(0.22)
GPA	8.20***	7.27*
	(3.04)	(1.84)
R-squared	0.41	0.38
N	69	69
note: absolute robust t statistics in parentheses.		

One problem with the OLS regression however, is that the choice of access is endogenous. The traditional econometric way to deal with this endogeneity is to use an instrument variable that is correlated with the textbook choice but not with the grade. One variable that was identified was the number of laptops the student had access to. The correlation between laptops and free was 0.26 and between laptop and grade was 0.16. Using laptop as an instrument variable (IV) for free access results in the IV regression results in column 3 of Table 2. Although the coefficient on the free variable is similar in magnitude to the difference in average scores for the fall 2009 semester, it is not significantly different from zero. Again, the only significant variable of interest is GPA, where a one point increase in GPA is associated with a 7 percentage point increase in grade.

DISCUSSION

Before investigating the relationship between textbook access and student outcomes, there was no preconceived idea about the relationship. Some factors suggest that students may do better with a traditional textbook and others that they would do worse. A traditional textbook, for example, may be a physical reminder of the need to study. An electronic version is hidden in the midst of their computer and the internet. A student may turn on their computer with the intention

of pulling up the e-text, but gets distracted by Facebook, YouTube, email and any number of other distractions. However, today's generation of students has grown up in an electronic age. They may be more familiar with, and used to, accessing information electronically. Additionally, they may be used to reading computer screens for hours on end.

Other issues that this study raises include the extra choices available to students. First, once upon a time, textbooks could only be accessed by buying a book. Now they can be downloaded online, to digital devices such as iPads and eReaders. However, previous research has shown that too much choice may be bad (Iyengar and Lepper, 2000). Given too much choice of jams in grocery stores shoppers did not buy any. Similarly, too much choice over accessing textbooks may paralyze the student and they do not buy any. In this study, 16% of students did not access the textbook at all. Whether this is higher than normal is not ascertainable from the current data. Second, students have difference learning styles so a free online textbook may be appropriate for some students but not others. However, students may make poor choices because they do not understand their learning styles. If this was true, then we would expect to see freshman and sophomores making lower grades than juniors and seniors who have had time to understand how best they study. This hypothesis is not supported by the results in Table 2 where there is no significant difference between the grades earned by freshmen and other classmen. Also 25% of freshman chose the free access as did 25% of seniors. However, 54% of sophomores did choose the free text compared to 44% of juniors. Finally, students will consider ability to pay when making their textbook choice. However, whether they or their parents bought their textbooks had no effect on their choice.

CONCLUSION

Although this study used a non-traditional publisher of textbooks, the mainline publishers are also offering students a variety of ways to access the required textbook including eTexts, eBooks, and iPad aps. This increased choice over access to textbooks raises the need to know how student choices affect their performance in classes. The results of this study suggest that how students access their textbook does not affect their grade in the course. Overall, this study most closely reflects the findings of Lee, Courtney, and Balassi (2010) and Kennelly, Considine, and Flannery (2011) in that today's student is able to complete homework, or read textbooks, online without affecting their performance in class.

However, caution should be attached to this statement. First, the sample size is relatively small at 69 students. It would be hard to extrapolate these results to other students, courses, or institutions. Larger studies, over a number of courses and universities should be conducted to confirm the robustness of these findings. Second, other independent variables may be included that are correlated with success in economics courses. Previous studies have included math skills (Pyne, 2007), student characteristics, such as race, gender, age (Coates et al., 2004), and standardized test scores and/or some measure of high school performance (Brown and Liedholm,

2002; Munley et al., 2010). Third, there was no random selection of students. In fact few previous studies use a random selection of students. One notable exception is Savage (2009) where students were randomly assigned to comparison (lecture recording and posting on the internet) and tests groups. While other studies, as well as this one attempt to correct for selection bias more randomized studies would be useful. Failing that, attempts should be made to find a better instrument variable to appropriate the choice of access.

REFERENCES

Brown, B. W., and C. E. Liedholm. (2002). Can web courses replace the classroom in principles of microeconomics? *American Economic Review 92*(2), 444–448.

Coates, D., B.R. Humphreys, J. Kane, and M. A. Vachris. (2004). No significant distance between face-to-face and online instruction: Evidence from principles of economics. *Economics of Education Review*, *23*(5), 533-546.

Frank, R. H. (2002). The economic naturalist: Teaching introductory students how to speak economics. *American Economic Review 92*(2), 459–462.

Ghosh, S., and F. Renna. (2009). Using electronic response systems in economics classes. *Journal of Economic Education 40*(4), 354-365.

Iyengar, S. S. and M.R. Lepper. (2000). When choice is demotivating: Can one desire too much of a good thing? *Journal of Personality and Social Psychology, 79*(6), 995-1006.

Joerding, W. (2010). Teaching and learning with individually unique exercises. *Journal of Economic Education 41*(2), 125-135.

Kennelly, B., J. Considine, and D. Flannery. (2011). Online assignments in economics: A test of their effectiveness. *Journal of Economic Education, 42*(2), 136-146.

Lee, W., R. H. Courtney, and S. J. Balassi. (2010). Do online homework tools improve student results in principles of microeconomics courses? *American Economic Review*, *100*(2), 283–86.

Medcalfe, S. (2009). Student performance in online and face-to-face microeconomics: Evidence from adult learners. *Journal of Adult and Continuing Education, 15*(1), 37-54.

Munley, V. G., E. Garvey, and M. J. McConnell. 2010. The effectiveness of peer tutoring on student achievement at the university level. *American Economic Review*, 100(2): 277–82.

Parker, J. (2010). An empirical examination of the roles of ability and gender in collaborative homework assignments. *Journal of Economic Education 41*(1), 15-30.

Pyne, D. (2007). Does the choice of introductory microeconomics textbook matter? *Journal of Economic Education 38*(3), 279-296.

Salemi, M. (2009). Clickenomics: using a classroom response system to increase student engagement in a large-enrollment principles of economics course. *Journal of Economic Education 40*(4), 385-404.

Savage, S. (2009). The effect of information technology on economic education. *Journal of Economic Education 40*(4), 337-353.

Taylor, T. (2008). *Principles of Economics*. Textbook Media.

APPENDIX A

ECON 1810 Textbook Survey

You are not required to answer any of these questions and your participation is completely voluntary. If you do not wish to participate please leave the survey blank. Thank You.

ID number:__927_____

1. Please circle the letter below indicating below how you accessed the Textbook Principles of Economics by Timothy Taylor:

a. Free access to the online book which includes "study break ads". This option does not allow printing.
b. An ad-free version of the online book which again does not allow printing (cost $9.95).
c. A printable ad free online textbook with downloadable PDF chapters (cost $19.95).
d. A "traditional" black and white textbook is mailed to the students (cost $29.95).
e. Did not access the textbook at all.

2. Please indicate the number of computing devices you have access to.
_____Desktop computer
_____Laptop computer
_____Netbook computer

3. What is your current academic standing?
_____Freshman
_____Sophomore
_____Junior
_____Senior

4. Who buys your textbooks?
_____I buy my own textbooks
_____My parents buy my textbooks
_____Other (please specify)