

Evaluating the impact of a web-based resource on student learning

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Introductory microeconomics module

- ▶ Key features of this module:
 - ▶ taken by over 400 first year undergraduate students
 - ▶ some but not all students are studying economics for the first time
 - ▶ introduces threshold concepts in economics.
- ▶ In 2009/10 we experimented with introducing a web-based resource (WBR) into this module.
- ▶ The MyEconLab resource is provided by the publisher to complement the course textbook. It provides the students with:
 - ▶ a wide range of practice questions – multiple choice + other formants incl. graphing tools
 - ▶ an individually tailored study plan
 - ▶ other supplementary materials - news blog, videos etc.

Web-based resource

- ▶ We used the WBR to assign **optional** practice and revision quizzes.
- ▶ 2 ways in which students could obtain access to the WBR:
 1. access code provided with a purchase of the course textbook
 2. additional access codes purchased by ABS.
- ▶ We hoped that introducing the WBR would enable the students to become more actively engaged in the learning process:
 - ▶ opportunities to check their understanding of the lecture material
 - ▶ rapid feedback.

The aim of this research was to investigate the impact the WBR had on student learning.

Previous literature

- ▶ Limited and inconsistent evidence on the impact technology has on student learning.
- ▶ The existing studies typically compare repetitions of the same module before and after a teaching innovation.
- ▶ 2 issues with the previous studies:
 1. when the module is repeated other factors may change
 2. no analysis of which students made use of optional supplementary materials.
- ▶ In contrast, we consider a single intake and first analyze which students used the WBR.
- ▶ Unlike previous studies, this allows us to control for self-selection bias.
 - ▶ Driffield et al. (2011) use the same methodology to examine the impact a placement year has on student performance.

Student usage of the WBR (in minutes)

Out of 446 students:

Sample	N	Mean	Std Dev	Min	Max
MyEconLab	254	131	205	1	1320
Book	213	131	214	1	1320
Free code	41	131	151	5	578

- ▶ 56% of students registered to use the WBR.
- ▶ On average each of these students spent just over 2 hours doing the assigned quizzes.

Exam performance by WBR usage

Exam:

50 MC questions (50%) and 4/6 short answer questions (50%)

Variable	N	Mean	Std Dev	Min	Max
<i>Non WBR</i>					
Exam (%)	192	47	16	16	82
MC (/50)	192	27	7	14	47
<i>WBR</i>					
Exam (%)	254	57	15	20	87
MC (/50)	254	31	7	12	47

- ▶ Students that registered for MyEconLab performed significantly better on both parts of the exam.
 - ▶ But, might this just be as a result of self-selection bias?

Descriptive statistics for the student characteristic variables

Variable	N	Mean
Age (years)	446	20.2
Male	446	0.60
Overseas	446	0.33
European	446	0.04
UCAS entry score	250	361
Economics	446	0.24
Econ UCAS score	102	94
Maths	446	0.34

Plus:

- ▶ degree programme
- ▶ previous education – Comprehensive, Grammar, Ind., College
- ▶ parent's occupation.

- ▶ **Our ultimate objective** is to explain student exam performance. This may depend upon:
 - ▶ student characteristics
 - ▶ **whether the student used the WBR.**
- ▶ However, simply estimating this model may **under or over estimate** the impact of the WBR. **WHY?**

*The typical student who chooses to use the WBR may have had a relatively high or low exam performance **REGARDLESS** of whether they decided to use the WBR.*

- ▶ Therefore, estimate a **treatment effects model** using a 2-step procedure:
 - ▶ Stage 1: estimate a model to determine which students decided to use the WBR.
 - ▶ Stage 2: explain student exam performance using the stage 1 results to control for the possibility of self-selection bias.

Results from stage 1: the probability a student pays to access the WBR (UCAS sample)

Variable	Marginal effect
Age	-0.117**
Comp	0.178***
Grammar	0.205*
N	250

- ▶ Older students are less likely to pay to use the WBR.
- ▶ Students with a Comprehensive or Grammar school education are more likely to pay to use the WBR.

Results from stage 2: explaining overall exam performance (UCAS sample)

Variable	Treatment-effects Coefficient
WBR	18.978***
UCAS entry score	0.034***
Economics	-1.032
Econ UCAS score	0.119***
Maths	4.444***
Male	5.371***
Overseas	4.960**
Constant	24.000***
N	250

- ▶ Paying to use the WBR had a positive and highly significant impact on student learning.

Exam performance by section (UCAS sample)

Variable	MC section	Section B
	Treatment effects Coefficient	Treatment effects Coefficient
WBR	6.466**	12.512***
UCAS entry score	0.013***	0.021***
Economics	-1.724	0.692
Econ UCAS score	0.066***	0.053*
Maths	1.941**	2.053**
Male	2.312***	3.059***
Overseas	1.827	3.133**
Constant	18.458***	5.542*
N	250	250

- ▶ The benefits a student gets from using the WBR is more apparent for the short answer type questions.

- ▶ **Free access codes:**
student characteristic data is less good at explaining the decision to access the WBR via either means.
 - ▶ However, the WBR variable remains positive and significant.
- ▶ **Full sample of 446 students:**
 - ▶ Overseas students are significantly less likely to pay to register for the WBR.
 - ▶ Students that pay to use the WBR also perform significantly better in this sample.

Conclusion

- ▶ Even after taking into account the possibility of self-selection bias, **using the WBR had a positive and highly significant impact on student learning**
 - ▶ + not just performance in the MC section of the exam
⇒ evidence practice MC quizzes facilitate deeper understanding.
- ▶ BS1163 was ideal for examining the impact of supplementary resources - theoretical nature of the material, repeated practice increases understanding of threshold concepts.
 - ▶ However, our findings should apply to many other economics and business modules + other disciplines.
- ▶ Evidence overseas students may be less willing/able to pay to use a WBR - information, learning style, higher fees?
- ▶ Postscript: in 2010/11 we also used MyEconLab for **assessed** quizzes ⇒ increased student engagement.