TEACHING GRADUATE ECONOMICS: ONLINE VS. TRADITIONAL CLASSROOM INSTRUCTION

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Abstract

The use of online course offerings in college**,** including graduate business courses, has grown sharply in recent years (Eastman, Swift, Bocchi, Jordan and McCabe, 2003). Results of previous research comparing student performance in lecture versus online classes are mixed. This paper focuses specifically on student performance in MBA managerial economics classes, analyzing learning differences between those in online and traditional lecture classes. In addition to comparing overall performances, we tested further to determine if gender, ethnicity, and levels of achievement and aptitude are factors in explaining differences in performance between, as well as within, lecture and online classes. Our empirical results demonstrate that the grade difference between stronger and weaker students, as defined by aptitude and effort, is significantly larger for online students.

Key Words: MBA, managerial economics, online instruction, lecture instruction, student assessment

JEL Classification: A23

Introduction

Between 2003 and 2009, enrollment in online college classes increased at the national level by 19% per year (Allen and Seaman, 2010). Because much of the growth in online enrollment is due to new students who weren't previously enrolled in college classes, the growth in online courses has helped to fuel overall growth in the number of students in higher education courses. After conducting a survey of economics departments, Coats and Humphreys (2003) concluded that many of those enrolling in online economics courses are non-traditional students, such as working adults and those not seeking degrees. The growth in online enrollment during the same period of time was 16% at our school, a regional public university with just under 10,000 students and approximately one hundred MBA students. While the increase in students is welcome to educators and administrators, the fact that much of the gain is in online enrollment necessitates continuing research to compare the quality of online versus classroom lecture instruction.

Previous research is inconclusive with respect to student performance in online versus lecture classes. In most of the research to date, students' overall performance in online classes was compared to overall performance in lecture classes. Our concern with this method is that studying the overall outcome may hide the costs to certain segments of the student population. Some divisions of students may suffer with the widespread adoption of online courses. This paper expands the research to determine if gender, ethnicity, and levels of achievement and aptitude are factors in explaining differences in performance not only between lecture and online classes, but also within the different modes of instruction. In other words, even if there is little

overall difference between students taking online and traditional classes, one or more groups of students may suffer significantly if online courses replace traditional lecture ones.

For our research we chose students from a graduate level managerial economics course. All of the managerial economics courses are taught by the same professor using the same textbook. This is an applied microeconomics course, with one economics prerequisite, undergraduate principles of macroeconomics, and no calculus prerequisite. In keeping with the University's mission as a "student-centered" university, the professor emphasizes problem-solving, game theory, and written essays requiring students to apply economic concepts to their daily lives.

Literature Review

Most of the research comparing online and traditional economics classes has focused on undergraduate courses. Online undergraduate economics students tend to have certain characteristics. Brown and Liedholm (2002) found that those taking internet principles of microeconomics courses had higher ACT scores, more college experience, longer work schedules, and fewer reported study hours than traditional students. Shoemaker and Navarro (2000) determined that the online students in their introduction to macroeconomics courses were less likely to have taken previous economics courses and had higher GPAs than their traditional macroeconomics students. Keri (2003) noted that online economics students tend to be older, with the average age at 28.

The evidence on how undergraduate economics students perform and the pertinent factors affecting performance in internet versus traditional courses has been inconclusive. Navarro (2000) analyzed roughly 50 colleges which together had offered over 100 internet economics courses. He found that lack of student motivation and self-direction were major factors contributing to poor grades in online economics classes. Gabe Keri (2003) found that end-of-semester grades for online economics courses were positively correlated with years in college. Brown and Liedholm (2002) found that although women scored significantly lower than men in traditional microeconomics courses, there was no significant difference in how each performed in online courses. Overall, they found that traditional students scored higher than those taking the online courses, noting that the traditional students did significantly better on the more complex subject matter. They did not find a significant difference in scores on basic conceptual questions. In contrast, Shoemaker and Navarro (2000) found that internet principles of macroeconomics students scored significantly higher than traditional students. They also noted that gender, ethnicity, class level, and previous economics courses taken made no statistical difference in the outcomes.

Figlio, Rush, and Yin (2010) did an experiment at a selective university where roughly 1400 students were randomly assigned to either online or live lecture sections of a large introductory microeconomics class. The only difference between the two modes was the delivery of the lectures. Some students viewed the lectures in person, while the online students viewed the videotaped lectures on the internet. They found that for all students, the average test score was higher for the live instruction students. More interestingly, they found that the test scores for Hispanic students, male students, low ability (low ACT), and low-achievers (based on prior GPA) were dramatically higher in the live instruction section.

Although scant research comparing learning in online and traditional formats has been done with graduate economics courses, more has been done for the broader category of graduate

business courses. Research in the learning differences between online and lecture courses for graduate business courses generally indicates that students earn lower scores in most online courses. Anstine and Skidmore (2005) reviewed MBA managerial economics and statistics courses, finding that average test scores from online and traditional courses were similar, but when they did an OLS regression, controlling for such factors as pretest scores, entrance exam scores, math background, GPA, gender, age, and reported study hours, online students scored significantly lower than did traditional students. When they did separate regressions for the two courses, however, the difference was significant only for the statistics class.

More recently, Hayes and Lu (2010) analyzed three MBA classes (finance, information systems, and operations management), online and traditional, using a common text, syllabus, and group of faculty teaching that course. Students scored lower in the on-line format than in the face-to-face. Specifically, the sample students scored significantly lower on the analytical problems in the online courses.

Does the amount of quantitative analysis impact student performance in an online course versus a traditional one? Brownstein, Brownstein, and Gerlowski (2008) analyzed two sections of a course in domestic and global business environment, a graduate business course that relied heavily on writing assignments to assess learning one online, one traditional. No significant differences in learning outcomes were measured between the online and the traditional sections.

In addition to online courses, some graduate business programs have introduced a hybrid format of 18-25 contact hours with other communication done via computers. Terry (2007) analyzed 356 MBA student results from macroeconomics, finance, and computer information systems classes and found that student grades, retention, and course evaluations were lower for online than traditional or hybrid classes. Although student performance on class assignments was equivalent across the different modes, online students scored 4% lower on the final exam than students in the other styles. GMAT and GPA scores and an undergraduate major in the discipline of the course had a positive and significant effect on final exam performance.

Gibson (2008) compared a relatively small set of student outcomes from three MBA human resource management classes, two online classes (24 students) and one weekend lecture-style class (12 students). All students worked full-time. Both modes had identical midterms and finals that were untimed, week-long, and turned in via the computer, plus research papers. The traditional students did slightly better on the final exams, papers, and the final grade.

Harmon and Lambrinos (2007) assessed the learning outcomes from a small hybrid graduate Principles of Economics class taught for those who had made a B- or lower in the two undergraduate economics courses. Eight MBA and five engineering students were in the class. Half the lectures were face-to-face and half recorded in PowerPoint and available electronically. Student answers to questions from the online portion were compared with those covered in the classroom. Students performed better on the questions coming from those chapters covered online. GPA and gender were not significant.

In an earlier study, Terry, Lewer, and Macy (2003) analyzed the results of 242 graduate students in just two courses, macroeconomics and financial economics, with about one third in traditional, one third in online and one third in hybrid classes. They found that the attrition rate in the traditional class setting (3.6%) was much lower than the online (13.8%) and hybrid (9.0%). They also found that overall student performance, faculty evaluation, and course evaluation were significantly lower for online classes. In accord with Harmon and Lambrinos (2007), the online students scored lower on the common final exam given to all classes. The

authors noted that the quality gap between online and other classes was narrowing over time andt that personal interaction and community seemed to be important contributors to successful academics.

Despite these mixed and inconclusive results, higher education administrators are moving forward with offering more online classes.

Methodology and Results

Student learning was measured by the final average grade in the course. Factors hypothesized to influence the final grade were: type of instruction, online or traditional lecture, ethnicity, gender, undergraduate GPA, graduate GPA, GMAT scores (total, quantitative, and verbal), and whether the student was an undergraduate business or nonbusiness major. Since most research has shown that men outperform women in economics (Anderson, Benjamin, and Fuss, 1994; Ballard and Johnson, 2005; Becker, 1997; Dynan and Rouse, 1997; Greene, 1997; Ziegert, 2000), we hypothesized that the final average for men would be higher than the final average for women. Based on the findings of Figlio, Rush, and Lin (2010), who found that Hispanic students performed better in lecture classes, and on our teaching experience, we hypothesized that scores of minority students would be lower than those of non-minority students. The three GMAT scores are indicators of students' overall, quantitative, and verbal aptitudes. Graduate GPA and undergraduate GPA measure how much effort a student has put into his or her studies. GPAs, GMAT scores, and having an undergraduate degree in business are expected to have a positive effect on performance.

Descriptive statistics for the variables used in our analysis of online and in-class instruction are given in Table 1. The mean and standard deviation were calculated for the combined sample, and then for the sample separated into lecture and online classes. A t-test for differences in the means between the lecture and online classes was performed, and the p-value, or significance level, for the difference in means is reported in the last column.

The final average score in the online classes, 81.24, was slightly higher than that in lecture classes, 79.64, but the difference was not significant. The undergraduate GPA, total GMAT score, and verbal GMAT score were all slightly higher for the online students, but the difference was not significant. The graduate GPA was significantly lower at the 0.07 level for the online students. The online students had quantitative GMAT scores that were lower than the lecture classes, but the difference was not significant.

Table 2 contains summary statistics for the final grade average by gender for the combined sample and for both types of instruction separately. Although both men's and women's scores were higher in the online course than in the lecture, the difference was not significant. The difference in the means between women and men in the lecture classes was significant at the .004 level. In the online classes, the mean score of the men, 85.5, was significantly higher than the mean score for women, 79.4, at the .01 level. In the combined sample of lecture and online classes, the men's average score, 83.8, was significantly higher than the women's average score of 77.8. These results support previous research showing that men outperform women in economics, especially in micro courses, in both online and lecture classes.

Table 1
Descriptive Statistics by Course and Type of Instruction

	All Classes	Traditional Lecture	Online	Difference between means p-value
Final Average	80.30 (8.44)	79.64 (8.86)	81.24 (7.82)	0.38
Undergraduate GPA	3.17 (0.43)	3.16 (0.46)	3.18 (0.39)	0.77
Graduate GPA	3.29 (0.44)	3.36 (0.39)	3.18 (0.50)	0.07
Total GMAT	463.33 (76.51)	463.82 (64.70)	464.10 (91.79)	0.95
Verbal GMAT	26.87 (6.51)	26.60 (6.27)	27.24 (6.91)	0.65
Quantitative GMAT	26.71 (6.51)	27.06 (5.92)	26.22 (8.25)	0.60
Number of Observations	90	53	37	

Values in parentheses are standard deviations.

Table 2
Final Averages by Gender and Type of Instruction

	All Classes	Traditional Lecture	Online	Differences between means p-value
Women	77.8 (8.85) n=53	76.3 (9.28) n=27	79.4 (8.26) n=26	0.25
Men	83.8 (6.45) n=37 p=.000354	83.1 (7.01) n=26 p=.004	85.5 (4.94) n=11 p=.01	0.20

Values in parentheses are standard deviations.

Table 3
Final Averages by Ethnicity and Type of Instruction

	All	Lecture	Online	p-value
Minority	79.3 (6.1) n=14	77.7 (7) n=9	81.2 (2.4) n=5	0.10
Non-minority	80.5 (8.8) n=76 p=.54	80 (9.2) n=44 p=.39	81.3 (8.4) n=32 p=.55	0.53

Values in parentheses are standard deviations.

Comparing scores by students' ethnicity, Table 3, both groups performed better in the online classes than in the lecture classes. Minority students' average score in the online classes, 81.2, was significantly higher at the 0.10 level than the average score in the lecture classes of 77.7. There was no significant difference for non-minority students between the lecture and online classes. In both the lecture and online classes, the non-minority students scored better than the minority students, but the difference was not significant in either case.

Table 4
Averages by Level of Achievement and Type of Instruction

	All	Lecture	Online	p-value
Low Achievers	76 (8.7) n=30	75.2 (9.5) n=15	76.7 (8) n=15	0.637
High Achievers	83.6 (8.2) n=36 p=0.0006	82.4 (9.1) n=25 p=0.024	86.2 (5) n=11 p=0.001	0.121

Values in parentheses are standard deviations.

To test the effect of student effort on the student's performance, we divided the students based on graduate GPA into three categories, approximately equal in number: low achievers, those in the lowest one-third of the sample with a graduate GPA below 3.1, medium achievers with GPAs in the middle one-third of the sample from 3.1 to 3.49, and high achievers in the top slightly more than one-third of the sample with a graduate GPA of 3.5 or more. The average score for the low achievers was 1.5 points higher in the online class compared to the lecture classes, but the difference was not significant. See Table 4. The high achievers averaged 86.2 in the online classes and 82.4 in the lecture classes, but the difference was not significant. The largest and most significant differences occurred when achievement levels were compared across the lecture and online classes. In the lecture classes, the high achievers averaged 7.2 points higher than the low achievers, significant at the .024 level. The difference between the two

groups was larger in the online classes where the high achievers averaged 9.5 points higher than the low achievers. This difference was significant at the .001 level.

Table 5
Averages by Aptitude and Type of Instruction

	All	Lecture	Online	p-value
Low Aptitude	75.9 (8.7) n=29	76.1 (8.6) n=18	75.7 (9.4) n=11	0.723
High Aptitude	84.7 (8.1) n= 32 p=.0009	83.9 (9.6) n=18 p=.01	85.7 (6.1) n=14 p=.007	0.63

Values in parentheses are standard deviations.

To determine the effect of aptitude, the students were divided into three levels, based on the total GMAT score in the entire sample. The 29 students with a GMAT score of 420 or less were in the low aptitude group, while those with a GMAT of 421 to 479 were in the medium aptitude group. The thirty-two students with scores of 480 and above were classified as high aptitude. See Table 5. Although the low aptitude group's average score was slightly lower in the online classes, there were no significant differences between their scores and those of the high aptitude group in the lecture and online classes. Within the lecture classes, however, high aptitude students averaged 7.8 points higher than low aptitude students, significant at the 0.01 level. In the online classes the difference in the averages was larger, 10 points higher for the high aptitude students and significant at the 0.007 level. Again the difference between the stronger students and the weaker students, as measured by aptitude and by effort, was significantly larger in the online classes.

In general, regardless of the type of instruction, men, non-minorities, high achievers, and high aptitude students performed better than women, minorities, low achievers, and low aptitude students. With respect to gender, ethnicity, and level of achievement, the online classes averaged slightly higher, but the difference was significant only in the case of the minority students. In the case of aptitude level, the low aptitude students scored slightly lower in the online classes. Within the types of instruction, however, there were significant differences based on gender, achievement and aptitude level. For both achievement and aptitude levels, the difference in the scores was larger in the online classes compared to the lecture classes.

The empirical model used in ordinary least squares estimation is:

GRADE = f(G_GPA, U_GPA, GEN, OL, MAJ, T_GMAT, V_GMAT, Q_GMAT, MIN)

The variables are defined as:

GRADE Student's final grade average for the course
G_GPA Student's overall graduate school grade point average

U_GPA	Student's overall undergraduate grade point average
GEN	Dummy variable equal to1 if student is male.
OL	Dummy variable for type of instruction equal to1 if the class is online.
MAJ	Dummy variable equal to 1 if student is a business major.
T_GMAT	Student's total GMAT score.
Q_GMAT	Student's quantitative GMAT score
V_GMAT	Student's verbal GMAT score
MIN	Dummy variable equal to 1 if student is not a minority

The results of the original regression of all of the variables on the final grade appear in Table 6.

Table 6
Regression Results for All Variables

	Coefficient	p-value	VIF
Constant	34.46	0.003	
MIN	- 3.25	0.112	1.19
GEN	4.06	0.011	1.23
O-L	3.80	0.011	1.09
T_GMAT	0.03	0.005	1.31
U_GPA	1.68	0.34	1.16
G_GPA	7.75	0.00	1.40
MAJ	0.92	0.63	1.04

R^2 = 44.8% n=90

Since the three forms of GMAT scores are highly correlated, we used only the total GMAT score to avoid multicollinearity. The variables representing major, undergraduate GPA, and all three forms of the GMAT score were not significant. The undergraduate GPA did not indicate a significant positive effect on the overall course grade. This is not completely unexpected as many students become more serious with their studies when they are in graduate school. In support of the literature cited above, the gender coefficient was positive and significant (1%) showing that being male has a positive four point impact on the total course grade. Taking the course online also has a positive and significant (1%) effect of almost four points on the total course grade, *ceteris paribus*. This is likely due students self-selecting the online course. Many online students are business professionals who do not have the time or flexibility for the regular lecture classes. These students generally are better prepared and score higher in a managerial economics, business decisions-style class. Having an undergraduate degree in business did not prove to have a positive impact on the expected course grade. This is perhaps due to the business prerequisites courses that non-business majors are required to complete before entering the MBA program. Our study did not find a statistically significant effect of minority status on the final grade.

Including the variables for ethnicity, gender, method of instruction, and graduate GPA, we ran the regression three more times, using each of the GMAT scores individually to avoid

multicollinearity.[1] Q_GMAT, the quantitative GMAT score was not significant, but T_GMAT and V_GMAT were both significant. The results using the total and verbal GMAT scores are presented in tables 7 and 8.

Table 7
Regression Results with T_GMAT

	Coefficient	p-value	VIF
Constant	38.60	0.00	
MIN	- 3.13	0.13	1.18
GEN	3.61	0.012	1.15
O-L	3.80	0.011	1.08
T_GMAT	0.03	0.003	1.28
G_GPA	8.19	0.000	1.31

R^2 = 43.5% n=90

Table 8
Regression Results with V_GMAT

	Coefficient	p-value	VIF
Constant	42.52	0.000	
MIN	-2.92	0.159	1.16
GEN	3.56	0.021	1.17
O-L	3.65	0.015	1.09
V_GMAT	0.34	0.005	1.23
G_GPA	8.53	0.000	1.27

R^2= 43.1%

The quantitative GMAT score was not significant (at 10%) for any of the three sample groups. This is likely due to our teaching pedagogy that focuses on strategy and business decisions rather than more quantitative models. Schroder (1993) illustrates the benefits of this approach for learning and retention. If we applied a more quantitatively rigorous, model-solving approach to the course, it is likely that the quantitative GMAT score would become a more important determinant of expected outcome and course grade.

The variable indicating achievement level, G_GPA, had a large impact of between 8.19 and 8.53 points on the final average for each point of G_GPA, *ceteris paribus*. G_GPA had the highest significance level of any of the variables in the regressions in tables 7 and 8. The variables measuring aptitude, the total and verbal GMAT scores, had positive coefficients and were also highly significant. These regression results underscore the importance of aptitude and achievement level on student performance.

[1] We tried other empirical specifications of the model, but the principal results did not vary.

Summary and Conclusion

Our research revealed men, high achievers, and high aptitude students had higher average scores than women, low achievers, and low aptitude students in the combined sample. Although non-minority students' scores were slightly higher, the difference was not significant. With respect to the different methods of instruction, minority students and high achievers had significantly higher scores in the online classes. Nevertheless, when the differences in performance with respect to gender, ethnicity, aptitude and achievement levels were compared within a single mode of instruction, we found in both lecture and online classes that men, non-minorities, high achievers, and high aptitude students had higher averages.

The differences in the average scores between high and low achievers and between high and low aptitude students were highly significant. In addition, the difference was significantly larger, 9.5 points, between the high and low achievers in the online classes. The difference between high and low aptitude students was also significantly larger, 10 points, in the online classes. Our regression results also found positive and significant relationships between grade and aptitude, ability, effort and being male, *ceteris paribus*.

For achievement and aptitude levels, we found that the difference between the lower and higher groups is much larger in the online classes, perhaps implying that this method of instruction widens the gap between the two groups. If this is the case, less selective schools with more low achievers may need to evaluate the effectiveness of online classes considering the possibility that they may further widen the gap between the low and high achievers.

Citing research claiming that student performance in online courses is equal or better in quality than in lecture courses, academic administrators have embraced online learning as a cost-saver equivalent, especially with the decrease in state funding. Although further testing on the impact of ethnicity, aptitude, and achievement levels should be conducted in other courses and at other universities before definite conclusions are drawn, our research in graduate level managerial economics suggests that the benefits of online education are not shared equally among all students. If this proves to be the case in other courses and at other institutions, then the substitution of online for lecture classes may not be justified, particularly at universities with less selective admissions requirements.

References

Anderson, G., D. Benjamin and M. Fuss. 1994. "The Determinants of Success in University Introductory Economics Courses." *Journal of Economic Education, 25*(2): 99-119.

Anstine, J. and M. Skidmore. 2005. "A Small Sample Study of Traditional and Online Courses with Sample Selection Adjustment." *Journal of Economic Education, 36*(2): 107-128.

Allen, I. Elaine and J. Seaman. 2010. *Class Differences: Online Education in the United States, 2010*. Babson College: Babson Survey Research Group.

Ballard, C. and M. Johnson. 2005. "Gender, Expectations, and Grades in Introductory Microeconomics at a US University." *Feminist Economics, 11*(1): 95-122.

Becker, W. 1997. "Teaching Economics to Undergraduates. *Journal of Economic Literature, 35*(3): 1347-1373.

Bennett, Doris S., Gene L. Padgham, Cynthia S. McCarty and M. Shawn Carter. 2007. "Teaching Principles of Economics: Internet vs. Traditional Classroom Instruction."

Journal of Economics and Economic Education Research, 8(1).

Brown, B. and C. Liedholm. 2002. "Can Web Courses Replace the Classroom in Principles of Microeconomics?" *American Economic Review, 92*(2): 444-448.

Brownstein, Barry, Deborah Brownstein and Daniel A. Gerlowski. 2008. "Web-Based vs. Face-To-Face MBA Classes: A Comparative Assessment Study." *Journal of College Teaching & Learning,* 5(11): 41-48.

Coates, Dennis and Brad Humphreys. 2003. "An Inventory of Learning at a Distance in Economics." *Social Science Computer Review,* 21(2): 196-207.

Dynan, K. and C. Rouse. 1997. "The Underrepresentation of Women in Economics: a Study of Undergraduate Economics Students." *Journal of Economic Education, 28*(4): 350-68.

Eastman, J.K., C.O. Swift, J. Bocchi, R. Jordan and J. McCabe. 2003. "The Challenges and Benefits of Teaching MBA Courses Online: Lessons from the Georgia WEBMBA™." *AMA Winter Educators Conference Proceedings*, 14: 153-154.

Figlio, David N., Mark Rush and Lu Yin. 2010. "Is it Live or Is It Internet? Experimental Estimates of the Effects of Online Instruction on Student Learning." National Bureau of Economic Research Working Paper 16089, June.

Gibson, Jane Whitney. 2008. "Comparison of Student Outcomes and Student Satisfaction in Three MBA Human Resource Management Classes Based on Traditional vs. Online Learning." *Journal of College Teaching & Learning,* 5(8): 1-10.

Greene, B. 1997. "Verbal Abilities, Gender, and the Introductory Economics Course: a New Look at an Old Assumption. *Journal of Economic Education*, *28*(1): 13-30.

Harmon, Oskar R. and James Lambrinos. 2007. "Student Performance in Traditional vs. Online Format: Evidence from an MBA Level Introductory Economics Class." University of Connecticut Department of Economics Working Paper Series, 2007-03.

Hayes, Linda and June Lu. 2010. "Assessing Online Student Performance in an MBA Program within AACSB Assurance of Learning Guidelines." *International Journal of Education Research,* January.

Keri, G. 2003. "Relationships of Web-Based Economics Students' Learning Styles, Grades and Class Levels." *National Social Science Journal, 21*(1): 34-41.

McCarty, C., G. Padgham and D. Bennett. 2006. "Determinants of Student Achievement in Principles of Economics." *Journal for Economics Educators*, *6*(2).

Navarro, P. 2000. "Economics in the Cyberclassroom." *Journal of Economic Perspectives, 14*(2), 119-132.

Schroeder, Charles C. 1993. "New Students--New learning Styles." *Changes,* 25(5): 21-26.

Shoemaker, J. and P. Navarro. 2000. "Policy Issues in the Teaching of Economics in Cyberspace: Research Design, Course Design, and Research Results." *Contemporary Economic Policy, 18*(3): 359-366.

Terry, Neil. 2007. "Assessing Instruction Modes for Master of Business Administration (MBA) Courses." *Journal of Education for Business, 82(4).*

Terry, Neil, Joshua Lewer and Anne Macy. 2003. "The Efficacy of Alternative Instruction Modes in Economics." *Journal of Economics and Economic Education Review,* 4(1):23-34.

Ziegert, A. 2000. "The Role of Personality Temperament and Student Learning in Principles of Economics: Further Evidence." *Journal of Economic Education, 31*(4): 307-322.