E-LEARNING RESEARCH

RESEARCH BRIEF
Number 2, December 2016

IS IT RISKIER TO TAKE A COURSE ONLINE?

Differences in successful course completion online versus face-to-face, after controlling for student self-selection

Claire Wladis, Borough of Manhattan Community College/City University of New York and the City University of New York Graduate Center

Alyse C. Hachey, Borough of Manhattan Community College/City University of New York

Katherine M. Conway, Borough of Manhattan Community College/City University of New York

Key Takeaways:

After controlling for the specific course taken and student characteristics, including environmental factors (e.g. work and family responsibilities) and non-cognitive factors (e.g. motivation, grit), there was no significant difference in successful course completion rates online versus face-to-face.

Institutions should be cautious in restricting access to online courses through restrictive enrollment or development policies, because this is likely to reduce access to college for non-traditional students (e.g. those with work or family responsibilities) without improving course or college outcomes.

On the other hand, students who do not currently elect to take online courses should not be forced to enroll online, as the results of this study can only be generalized to those students who currently choose to take courses online.

Past research on the impact of online courses on college persistence and degree completion is mixed, and past studies have been unable to control for more complex environmental and non-cognitive factors that likely influence both a student's likelihood of enrolling online and their probability of failing or dropout out of a course.

Several prior large-scale studies contend that online students are at higher risk of course or college dropout. Using multi-institution community college datasets from Washington and Virginia, Jaggars & Xu (2010) and Xu & Jaggars (2011a/b) report that online course-taking hinders college progression, with students who took a higher proportion of online courses found to be less likely to graduate or transfer to a senior college. Smith (2016), using multi-institution data from North Carolina, found similar results of a negative impact of online learning on course retention and grade outcomes in 4-year institutions.

In contrast, some studies found that students enrolled in online courses are at lower or equal risk of college dropout compared to students enrolled in face-to-face courses. Johnson & Mejia (2014) analyzed multi-institutional data from the California Community College system and found differences in course outcomes between online and face-to face courses, even after controlling for a selection of student characteristics typically available in

This research brief summarizes results presented in more detail in the following paper(s):
Wladis, C., Hachey, A. C. and Conway, K. M. Are online courses getting a bad rap? Differences in outcomes when controlling for complex student characteristics. *Manuscript submitted for publication.*

institutional data; however, contrary to prior research, they report that students who took some online courses were actually more likely than those who took only face-to-face courses to earn an associate's degree or to transfer to a four-year institution—thus, differences in course outcomes did not translate to differences in college outcomes. Shea & Bidjerano (2014) utilized a national dataset and controlled for student characteristics, including some more relevant environmental factors such as family size, and reasons for choosing that college (e.g. family, location). Like Johnson & Mejia, they found that students who had taken some of their early courses online actually completed degrees at significantly higher rates than completely face-to-face students; these results held even for those students who were less academically prepared. Wladis, Conway & Hachey (2016) assessed a sample from a large N.Y. university system while controlling for numerous factors, including a wide range of environmental and non-cognitive factors. Similar to previous findings, they report that students enrolled in online courses were less likely to re-enroll in college the subsequent semester. However, they also found that online course outcomes themselves had no direct effect on college persistence. Rather, it was other student characteristics that seemed to make students simultaneously both more likely to enroll online and to drop out of college.

Johnson & Mejia (2014) contend that student characteristics that are difficult to measure (e.g. academic motivation and ability, time management, or self-directed learning skills) or information which institutions do not have readily available (e.g. employment status and actual working hours) may simultaneously influence online course enrollment and student success. Almost all prior research on online course outcomes has excluded important non-cognitive and environmental factors due to limitations in the availability of data; for example, while many students cite family responsibility as a reason for enrolling in online courses, no prior studies aside from Wladis, Conway & Hachey (2016) have included information about the age and/or number of dependent children. Research has also shown that students often choose to take different types of course online versus face-to-face; however, some, but not all studies have controlled for the specific course taken. Thus, the mixed results in prior research regarding differential online versus face-to-face outcomes and related degree attainment is likely the result of a lack of comprehensive student- and course-level controls.

Methods

This research used an initial sample frame (called the *IR dataset*) of all students enrolled in the City University of New York (CUNY) for all courses in which at least one section was offered either partially or fully online in fall 2014 (including students who took face-to-face sections of these courses). Students were emailed a link to an online survey; the subset of students who responded to the survey is identified as the *survey dataset*. The survey utilized scales which measure several different affective and "life" factors: motivation; course enjoyment/engagement; academic integration; self-directed learning skills; time management skills; preference for autonomy; and grit (i.e. perseverance/passion for long-term goals). To control for course diversity, both the *IR* and *survey datasets* were further reduced to include only those students who took courses for which both fully online and either hybrid or face-to-face course sections were available. The resulting *IR dataset* had a sample size of 92,270 and the *survey dataset* had a size of 3,549. Matched samples were then generated for each data set, with sample sizes of 25,198 for the resulting *matched IR dataset* and 1,060 for

the resulting *matched survey dataset*. S*uccessful course completion* was measured as a grade of "C –" or higher (because it is the typical standard to receive major or transfer credit). Course medium was dichotomized to not-fully online (hybrid or face-to-face) or fully online (80% or more content online), based on Sloan Consortium definitions (Allen & Seaman, 2010). Xu & Jaggars (2011a/b) report that students who take hybrid courses (33-80% online content) share similar characteristics with students who take face-to-face courses and that their outcomes are similar; preliminary tests with this data confirmed this pattern. Using several different statistical modeling approaches, this study analyzed the relationship between online enrollment and course outcomes while attempting to control for both student characteristics and the exact course taken online versus face-to-face.

Results and Discussion

The results of this study found that on average, online students were at no higher risk of dropping, failing, or earning a "D" grade in a course than comparable students who took the same course face-to-face. This stands in contrast to accounts of higher dropout/lower grade in online courses reported in prior large-scale, multi-institution studies (i.e. Jaggars & Xu, 2010; Johnson & Mejia, 2014; Smith, 2016; Xu & Jaggars, 2011a/b; Xu & Jaggars, 2013). One possible explanation for this lack of confirmation of previous work is that none of the prior studies controlled for a wide array of environmental and non-cognitive factors. In this study, the results of the IR dataset analyses, after controlling for course, showed a weak but still significant difference, with online students less likely to successfully complete the course (as has been previously reported). However, the actual size of the difference found in this study was smaller than that found in other studies.

This difference between online and face-to-face course outcomes found in the IR dataset totally disappears in the survey dataset where a wide array of environmental and non-cognitive factors (e.g. parental status/age of children, motivation, time management skills, etc.) were used to conduct matching. These factors were not included in past large-scale studies, which may explain the contrasting results reported between this study and past research. In this study, we found that in the matched IR dataset (where most environmental and non-cognitive variables were not available during the matching procedure) taking a fully online course did correlate with a small but significantly lower probability of successful course completion. However, in the matched survey dataset (where a wide array of environmental and non-cognitive variables were included in the matching procedure), there was no significant difference in outcomes by course medium in any model. Further, in most of the analyses, the direction of the relationship was reversed, with students in fully online courses more likely (although not significantly so) to successfully complete the course.

Figures 1-4 depict the odds ratios with error bars representing the 95% confidence interval, for each model run on each dataset. Odds ratios greater than one show that students were more likely to successfully complete an online than a face-to-face courses, whereas odds ratios less than one show that students were less likely to successfully complete the course online. Odds ratios equal to one show no difference in rates of successful course completion between mediums. Figures 1 and 2, which depict the IR dataset where environmental and non-cognitive variables could not be controlled, show the patterns described

above: with no controls, online students have higher rates of successful course completion, but after controlling for specific course taken, this relationship reverses, and even after matching a small but significant negative effect of online enrollment can be observed on course outcomes (Figure 2). In Figures 3-4, which depict the survey dataset where environmental and non-cognitive variables are included, we see a similar pattern in the unmatched data as we saw in the IR dataset, but after matching on all variables, including environmental and non-cognitive variables, we see that the odds ratios are greater than but indistinguishable from one.

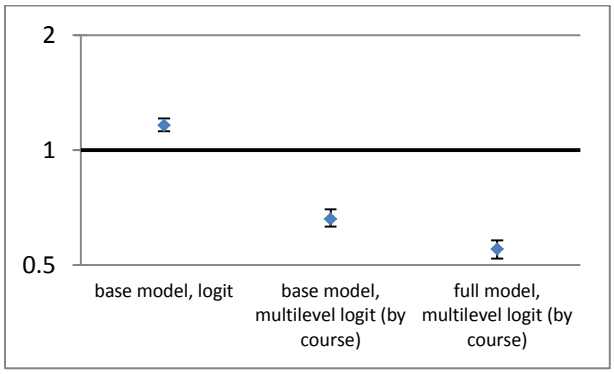

Figure 1. Models with various levels of student- and course-level controls on the IR unmatched dataset.

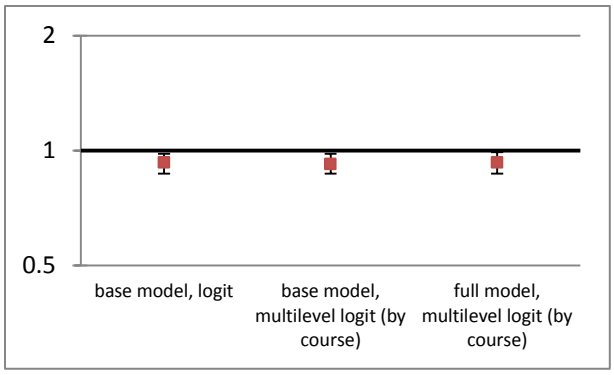

Figure 2. Models with various levels of student- and course-level controls on the IR matched dataset.

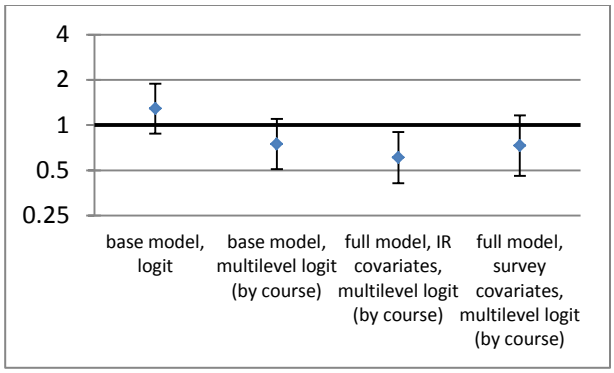

Figure 3. Models with various levels of student- and course-level controls on the survey unmatched dataset.

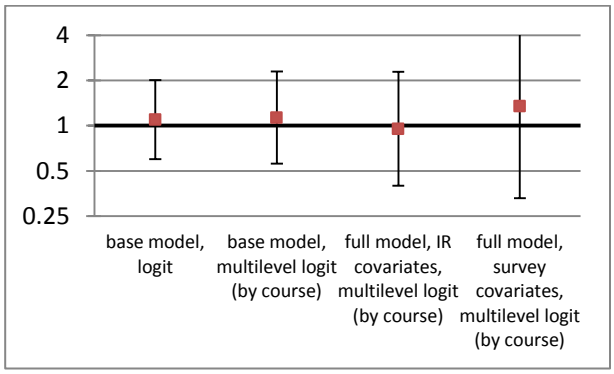

Figure 4. Models with various levels of student- and course-level controls on the survey matched dataset.

This study confirms the findings of Shea & Bidjerano (2014), who also included some environmental and non-cognitive factors and found that students who took online courses early in their academic careers were significantly more likely to attain a community college degree. Findings from this study, combined with Shea & Bidjerano (2014), strongly suggest that including relevant environmental and non-cognitive factors that are not routinely collected by college institutional research departments can make a very substantial difference in the conclusions that can be drawn from analyses of online versus face-to-face course outcomes, and further, on conclusions about the potential impact of online course enrollment on college outcomes.

Implications

Results of this study indicate that, despite prior concerns about lower retention in online versus face-to-face courses, institutions should be cautious about restricting access to online sections through enrollment or course development policies, as this may restrict student access to courses without improving course outcomes or college persistence. Thus policies that attempt to screen students, that limit online enrollment to certain student groups (e.g. GPA requirements), that limit the number of courses that students can take online, that restrict which courses can be offered online, or that limit the number of online courses that faculty can teach, may reduce options for students without improving outcomes.

However, we also note that practitioners and policymakers should take care when attempting to generalize these results to all groups of students, as it is possible that the relationship between online course enrollment and subsequent course outcomes may differ for different types of students. This study only considered population-average effects for students currently enrolled in online courses and therefore, the patterns observed cannot necessarily be applied to specific sub-groups (such as community college students, or ethnic minority students in less diverse samples) or to students who are currently not enrolled in online courses and who are very dissimilar from those students who currently enroll in online courses. Thus, while this study suggests that enrolling in online courses did not result in negative outcomes for students who currently choose to enroll in online courses and their comparable face-to-face peers, it cannot be inferred from this research that requiring all students to take online courses would have no negative effects. Colleges and policy-makers should be cautious about forcing students to take courses online (e.g. by requiring online course enrollment, or by providing insufficient face-to-face sections of courses to meet student demand) when those students are unlikely to elect to enroll in an online course voluntarily.

In addition, these results also cannot be extended to other types of online courses such as MOOCs; self-directed learning modules provided by publishers or other organizations; or online courses taught by off-site instructors not affiliated with the institution. In this study, both online and face-to-face courses were developed and taught by university faculty, with grading and class interaction expected to be comparable to that found in face-to-face course sections. Online sections were expected to take the same amount of both student and faculty time as face-to-face sections of the same course, and class sizes were roughly comparable across mediums. Thus, these results may not be generalizable to other types of online courses, or other contexts in which online and face-to-face courses are taught by different types of instructors or in which the courses are not intended to be comparable (e.g. online courses where less instructor interaction is provided).

This research also has strong implications for future research by revealing the importance of controlling for variables that are not present in standard institutional research datasets when investigating the relationship between online course-taking and later course and college outcomes. When matching on and controlling for a wider variety of variables that capture student environmental and non-cognitive factors, results in this study revealed no difference in online-versus-face-to-face outcomes and they were less sensitive to the effects of hidden bias. Therefore, this study strongly suggests that any future research in this area should take these additional factors into account if inferences based on observational student data are to be considered valid.

Acknowledgments

This research was supported by a grant from the National Science Foundation (Grant No. 1431649).

References

Allen, I. E., & Seaman, J. (2010). *Class differences: Online education in the United States, 2010.* (No. ED529952). Sloan Consortium. Retrieved from http://sloanconsortium.org/publications/survey/class_differences

Jaggars, S. S. (2011). *Online learning: Does it help low-income and underprepared students?* (CCRC Working Paper No. 26). Community College Research Center, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/media/k2/attachments/online-learning-help-students.pdf

Jaggars, S. S. (2013). *Choosing Between Online and Face-to-Face Courses: Community College Student Voices.* (CCRC Working Paper No. 58). Community College Research Center, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/publications/online-demand-student-voices.html

Jaggars, S. S., & Xu, D. (2010). *Online learning in the Virginia community college system.* Community College Research Center, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/media/k2/attachments/online-learning-virginia.pdf

Johnson, H., & Mejia, M. C. (2014). *Online Learning and Student Outcomes in California's Community Colleges*. San Francisco, CA: Public Policy Institute of California.

Mantel, N., & Haenszel, W. (1959). Statistical aspects of the analysis of data from retrospective studies of disease. *Journal of the National Cancer Institute, 22*(4), 719-748.

Rosenbaum, P. R. (2002). *Observational studies*. New York: Springer.

Rubin, D. B. (2001). Using Propensity Scores to Help Design Observational Studies: Application to the Tobacco Litigation. *Health Services & Outcomes Research Methodology, 2*(1), 169-188.

Shea, P., & Bidjerano, T. (2014). Does online learning impede degree completion? A national study of community college students. *Computers & Education, 75*, 103-111.

Smith, N.D. (2016). Examining the effects of college courses on student outcomes using a joint nearest neighbor matching procedure on a state-wide university system. North Carolina State University. Retrieved from https://aefpweb.org/sites/default/files/webform/41/NicholeDSmith_ExaminingOnline.pdf

Wladis, C.W., Conway, K.M. & Hachey, A.C. (2016). Assessing readiness for online education – Research models for identifying students at risk. *Online Learning Journal, 20*(3).

Xu, D., & Jaggars, S. S. (2011a). The effectiveness of distance education across Virginia's community colleges: Evidence from introductory college-level math and English courses. *Educational Evaluation and Policy Analysis, 33*(3), 360-377. doi:10.3102/0162373711413814

Xu, D., & Jaggars, S. S. (2011b). *Online and hybrid course enrollment and performance in Washington state community and technical colleges.* (CCRC Working Paper No. 31) Community College Research Center, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/media/k2/attachments/online-hybrid-performance-washington.pdf

Xu, D., & Jaggars, S. S. (2013). *Adaptability to online learning: Differences across types of students and academic subject areas.* (CCRC Working Paper No. 54) Community College Research Center, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/media/k2/attachments/adaptability-to-online-learning.pdf