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The impact of online learning on students' course outcomes: Evidence from a large community and technical college system

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ABSTRACT

Using a large administrative dataset from a statewide system including 34 community and technical colleges, the authors employed an instrumental variable technique to estimate the impact of online versus face-to-face course delivery on student course performance. The travel distance between each student's home and college campus served as an instrument for the likelihood of enrolling in an online section of a given course. In addition, college-by-course fixed effects controlled for within- and between-course selection bias. Analyses yield robust negative estimates for online learning in terms of both course persistence and course grade, contradicting the notion that there is no significant difference between online and face-to-face student outcomes—at least within the community college setting. Accordingly, both two-year and four-year colleges may wish to focus on evaluating and improving the quality of online coursework before engaging in further expansions of online learning.

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1. Introduction

For two decades, state financing of higher education has been on the decline (Kane, Orszag, & Gunter, 2003). Public postsecondary institutions have responded by raising tuition, increasing class sizes, cutting programs, and otherwise seeking to reduce costs and improve efficiency. At the same time, colleges have sharply increased their distance education offerings through online coursework—though often with an intent to improve access and convenience for students rather than to reduce costs. In the wake of the recent recession, policy leaders in several states, assuming that online courses must be more cost-effective than face-to-face courses, have championed further expansions in online learning (e.g., Chen, 2012; Fain & Rivard, 2013; Texas Higher Education Coordinating Board, 2011). The notion that online courses are more cost-effective than traditional, face-to-face courses is predicated on two assumptions: first, that online course sections are consistently less expensive; and second, that they yield fairly comparable student outcomes.

Although it may seem self-evident that online courses are consistently cheaper than face-to-face courses, there is surprisingly little evidence on online and face-to-face course costs. Most research on the topic is dated (e.g., Hawkes & Cambre, 2000; Jewett, 2000; Jung, 2003; Levine & Sun, 2002; Rogers, 2001; Virginia Community College System, 2001; Whalen & Wright, 1999), and the conclusions drawn from relevant studies are mixed. Rumble (2003) discussed the complexities involved in making generalizations about costs across different types of courses and institutions and concluded that there can be no clear-cut answer as to whether online courses are

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indeed cheaper. Schiffman (2005) noted that development costs for online courses varied across institutions from $10,000 to $60,000 per course. Based on interviews with presidents, provosts, and other senior academic leaders at more than 25 higher education institutions,[1] Bacow, Bowen, Guthrie, Lack, and Long (2012) reported that most institutions provided distance education to better serve student needs rather than to save on costs. In fact, many interviewees believed that online courses were at least as expensive as traditional courses, not only due to their substantial start-up costs (e.g., investments in technology, course design, and instructor training) but also due to recurring costs (e.g., those resulting from increased coordination demands and technical support). Moreover, studies of online course costs have not taken into account the quality or effectiveness of the courses examined, and it is possible that online courses with high completion rates and strong learning outcomes require substantial investments to design and teach.

The second assumption underlying the cost-effectiveness argument—that online courses produce student outcomes comparable to those produced by face-to-face courses—is also based on relatively weak evidence. Although dozens of studies have compared student performance between online and face-to-face courses, most have been descriptive studies, with no controls for student self-selection. Moreover, the majority have focused on populations (e.g., K-12 students) or contexts (e.g., hour-long educational modules) that are not relevant to the typical online college course. Only a few random-assignment or quasi-experimental studies have focused on semester-length college courses (Caldwell, 2006; Cavus & Ibrahim, 2007; Coates, Humphreys, Kane, & Vachris, 2004; Figlio, Rush, & Lin, 2010; LaRose, Gregg, & Eastin, 1998; Mentzer, Cryan, & Teclehaimanot, 2007; Odell, Abbitt, Amos, & Davis, 1999; Peterson & Bond, 2004; Schoenfeld-Tacher, McConnell, & Graham, 2001). Results of these studies are mixed, leading many college leaders to conclude that online learning at least "does no harm." However, two considerations limit the usefulness of this conclusion.

First, nearly all previous studies have focused on learning outcomes among students who completed the course, and thus have disregarded the potential impact of online delivery on course withdrawal. Ignoring course withdrawal may be reasonable within the context of selective four-year institutions, which typically have low course withdrawal rates. In the community college context, however, descriptive studies have typically reported course withdrawal rates in the 20–30% range, with higher withdrawal rates for online courses (Beatty-Guenter, 2002; Carr, 2000; Chambers, 2002; Moore, Bartkovich, Fetzner, & Ison, 2003). Course persistence and completion is a particularly important issue in community colleges, where most students are low-income, many are working or have dependents, and few can readily afford the time or money required to retake a course they did not successfully complete the first time (Adelman, 2005; Bailey & Morest, 2006; Planty et al., 2009). Thus, studies that focus solely on course completers are minimally helpful to community college administrators contemplating the potential costs and benefits of expanding online course offerings.

Second, it is unclear whether the sets of courses examined in previous research represent the larger body of online courses available in the postsecondary setting, and particularly in the community college setting. Each study in the literature tends to focus on one or two specific courses, which in some cases are selected because they are thought to represent high-quality examples of online coursework. Moreover, each course included in the rigorous research cited above was conducted within a selective college or university (Jaggars & Bailey, 2010)—institutions that are not representative of the less-selective or open-access colleges that make up the bulk of the nation's postsecondary sector. Qualitative research conducted in the community college setting has revealed that most online instructors simply convert their face-to-face instructional materials to printed handouts and text-heavy slide presentations, with few of the interactive technologies that may effectively engage students in online learning (Cox, 2006; Edgecombe, Barragan, & Rucks-Ahidiana, 2013). Although no parallel studies have been conducted in the four-year sector, these findings raise the question of how high-quality the "typical" or "average" online college course may be.

In order to understand student performance in the typical online course within a given sector, it would be most useful to compare a large and representative set of online courses against a similar set of face-to-face courses. Thus far, only one study has done so: Using a dataset including hundreds of course sections from 23 colleges in Virginia's community college system, Xu and Jaggars (2011) found that students fared significantly worse in online courses in terms of both course persistence and end-of-course grades. However, the study was limited to entry-level English and math courses in community colleges in one state, raising the question of whether the results apply to other academic subjects and other state contexts. Moreover, although Xu and Jaggars controlled for a wide array of student, course, and institutional characteristics using multilevel propensity score matching, they could not control for unobserved influences on students' course selection, such as employment status, actual working hours, educational motivation, and academic capacity. Thus, the results could have remained subject to selection bias. Indeed, using an endogenous switching model, Coates et al. (2004) found that online students tended to have "higher levels of unobservable ability that improves their performance under both types of instruction" (p. 543). Thus, failure to account for unobservables underlying student self-selection may underestimate any negative impacts of the online format on student course performance.

This paper builds on Xu and Jaggars' (2011) study of Virginia community colleges by focusing on a different region of the country and using an instrumental variable (IV) technique to control for unobserved confounding

[1] The institutions included public and private research universities, four-year colleges, and community colleges.

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