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TEACHERS COLLEGE, COLUMBIA UNIVERSITY

## **Efficiency Gains in Community Colleges: Two Areas for Further Investigation**

Clive Belfield  
Queens College, City University of New York

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*Address correspondence to:*

Clive Belfield  
Associate Professor of Economics  
Queens College, City University of New York  
65-30 Kissena Boulevard  
Flushing, NY 11367  
Email: [clive.belfield@qc.cuny.edu](mailto:clive.belfield@qc.cuny.edu)

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## **Abstract**

The community college sector has come under increasing pressure to become more efficient, that is, to improve quality without spending more. The sector has responded, and over the past decade, per-student expenditures have fallen by one-tenth and enrollments have increased by over one-third. These changes have primarily affected the deployment of instructional personnel. I review two mechanisms by which deployment changes might affect efficiency—via an increase in contingent faculty (labor productivity) and an increase in class size—and one mechanism to address enrollment expansion—an increase in college size. Community colleges have relied heavily on these mechanisms over the last decade with the expectation that they would generate efficiency gains.

I find that for the first two mechanisms the evidence is far from conclusive that efficiency gains result. However, the case for increasing class size appears plausible based on general and related evidence. The evidence on college size is more robust but it too yields little hope for genuine efficiency gains. Given colleges' reliance on these mechanisms, and given the low likelihood of efficiency gains in other ways, further research on the first two mechanisms—increasing faculty productivity and class size—should be a priority.

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## 1. Introduction

There is increasing pressure on community colleges to be more efficient by both reducing costs and improving quality (Bailey, 2012; Sullivan, Mackie, Massy, & Shinha, 2012).<sup>1</sup> This pressure will only grow if community college tuition becomes subsidized to allow more students to enroll (as per President Obama’s State of the Union proposal of January 2015 [“Obama’s State of the Union,” 2015]).

Yet, research evidence to help community colleges become more efficient is limited (Agasisti & Belfield, 2014; Belfield, Crosta, & Jenkins, 2014). In light of recent postsecondary education policies, the quest for educational efficiency has been to “cut expenditures more than quality” (Jenkins & Belfield, 2014). Preferably, this quest should be flipped so as to “increase quality more than expenditures,” but doing so would require a substantial shift in the political landscape. In this discussion, I therefore take the absolute level of resources as given and consider how colleges might reallocate their existing resources to increase efficiency. The quest for efficiency gains is challenging, in part because efficiency can be defined in various ways. Ideally, efficiency should be defined as cost per award completion; for exposition here I use the simpler definition of cost per course completion.

I begin by describing patterns of resource allocation within the sector over the past decade; these patterns illustrate how colleges have responded to changes in funding. Looked at in terms of broad expenditure patterns, little appears to have changed. Yet, looked at using other metrics—enrollment and revenue sources—community colleges have changed dramatically. These changes lead me to examine a key input—faculty—and investigate how to increase its productivity (i.e., its ability to deliver high-quality education for a given amount of pay). Then, I look at a key part of the technology of college—class size—to investigate how this might be optimized. Finally, I consider some alternative ways to enhance efficiency across the sector (i.e., to produce more education without using more resources).

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<sup>1</sup> Often, this pressure comes from a (mistaken) belief that colleges are wasteful or inefficient. As summarized—but not accepted—by Barrow, Brock, and Rouse (2013, p. 4): “Many critics argue that much of the increased cost of postsecondary education is unnecessary and the result of institutions becoming ‘inefficient’ in the sense that they could provide ... the same quality education at a lower cost if they simply reorganized.”

This investigation is not a comprehensive review. It examines a few changes that I consider to have been overlooked relative to their importance for efficiency gains. I do not look at student input and how changes in this input might influence efficiency. Instead, I take student quality as given, a reflection of broader social and demographic factors. In addition, I apply a static approach—looking at efficiency at only one point in time. Other, more sophisticated approaches emphasize that completing college is a process, that students need to progress through a series of steps, and that they need instruction and guidance that helps them take all of these steps. While failure to complete reflects a student’s inability to progress through each of the necessary steps, improving one step will not yield efficiency gains unless subsequent steps are also improved (see the discussions in Jenkins & Belfield, 2014; Jenkins & Cho, 2013; Jenkins & Rodríguez, 2013).

## **2. Resource Patterns in Community College**

At the general level, revenue and expenditure patterns at community colleges can be described very simply (Desrochers & Kirshstein, 2014; Romano, 2012). Over the decade of the 2000s, total revenues per full-time enrollment (FTE) fell by approximately 10 percent. Accordingly, total expenditures per FTE fell. This change raises a series of questions: How did colleges re-structure their use of inputs in response? Did colleges simply become more efficient or did they make short-run changes that might impair their ability to operate efficiently over the long run? To answer these questions, one must look more closely at the full set of changes in revenues and expenditures.

During the 2000s, the decline in revenues for community colleges arose from a significant shift away from state funding and toward tuition revenue. Per FTE, revenue from state funding fell by \$1,700, and revenue from tuition rose by \$1,000 (with the loss of \$700 being the decline in overall revenues). In fact, state appropriations have not only declined as a share of total revenues, they have also declined in absolute terms: measured in constant dollars, state appropriations per FTE student were 25 percent lower in 2009 than in 1999 (Snyder & Dillow, 2012). In terms of federal funding, even as the federal

government has expanded its role in higher education, this expansion has taken the form of loans (not grants).<sup>2</sup>

One might expect this fall and shift in revenues to significantly change community college operations over the decade. If a firm's revenues fall, it will have to cut costs, and it is unlikely that it will cut costs across all activities (for example, it might reduce staff but be unable to sell its capital equipment). If a firm's revenues shift from one source to another, it should devote more resources toward the growing "customer base" and away from the declining customer base. A similar logic applies to colleges. Faced with a 10 percent decline in resources, colleges might change their input mix: for example, they might reduce staffing for auxiliary services (e.g., career guidance) more than for teaching faculty; or they might replace faculty with online delivery modes. It seems unlikely that the input mix needed for a college degree would be the same as for one that uses 10 percent less resources. Similarly, it also seems unlikely that an education funded from public subsidies would rely on the same input mix as one funded by students. In the latter case, colleges might devote more resources to services that "keep students happy" rather than to services that promote the public good.

This revenue change was accompanied by an enormous expansion in enrollments.<sup>3</sup> Over the period from 2000 to 2010, FTE enrollments at community colleges grew by over one-quarter (from 5.7 million to 7.2 million enrollees each fall semester [U.S. Department of Education, 2013]).<sup>4</sup> Thus, the scale of the community college system changed dramatically during this time period, even as the amount of resources also changed.

Looking at expenditure patterns, spending across the general categories appears to have changed little. When looking in more detail, however, community college resource use did change significantly over the decade in one important respect: labor input.

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<sup>2</sup> This shift reflects a longer trend. In 1980, state appropriations for public postsecondary institutions were 44 percent of total revenue; by 2009, these state appropriations were only 22 percent. Yet, looking across the decade at the entire postsecondary system, community colleges experienced the most severe fall in revenues. In their review, Kirshstein and Hurlburt (2013, p. 1) reported that "community colleges are ... the only public institutions where total operating revenues per student were lower than they were a decade earlier."

<sup>3</sup> Mathematically, the enrollment expansion was an important reason why spending per FTE fell. However, the change in spending per FTE could have been driven by lower funding and constant enrollments.

<sup>4</sup> Some of this increase was a temporary bump due to the Great Recession, but enrollment grew each year during the decade.

Specifically, three related changes in labor input can be identified. First, *the composition of all staff shifted toward part-time employees*. From 2000 to 2012 the full-time employment share fell from 59 percent to 54 percent. Second, *the composition of faculty staff shifted toward part-time faculty*. In 2000, 21 percent of staff were full-time faculty and 37 percent were part-time faculty; by 2012, the proportions had switched and shifted by 4 percentage points to 17 percent and 41 percent, respectively (Desrochers & Kirshstein, 2014, Figures 1 and 2; Knapp, Kelly-Reid, & Grinder, 2011; Snyder & Dillow, 2011). Third, *the ratio of all staff to students fell*. In 2000, community colleges employed 19.1 employees per 100 students; in 2012, the headcount figure was 17.5 employees per 100 students. Thus, the number of employees per student fell by 8 percent. All these changes were in response to the decline in resources/expansion in enrollment over the past decade.

Together, these first two changes combine to make the community college workforce substantially more contingent. With fewer full-time staff, students now have less access to personalized instruction or support from college personnel; with fewer full-faculty, students now have less access to individual college faculty members who are available during the regular working day. In addition, these part-time adjunct faculty have a weaker affiliation to the college than full-time faculty. The third change—reducing the staff–student ratio—likely means that the sizes of classes have increased. Larger class sizes may also reduce educational quality, even as they save on expenditures.

At issue is whether these staffing changes—within the context of expanding enrollments—have made colleges more efficient or have simply reduced educational quality to correspond with lower revenues. I consider these changes as three mechanisms: an increase in contingent faculty (labor productivity), an increase in college size (college scale), and an increase in class size (class scale).

### **3. Labor Productivity in Community Colleges**

Productivity refers to the amount of “output” produced by an input. Given their numbers, I focus on faculty as the input and for illustration I look at output in terms of courses successfully completed by students. I recognize that there are many possible



ways to measure output and others might be preferred (such as students completing their degree or students with high-paying jobs). Currently, data to measure productivity with these outputs are not available. However, I suspect that the measure of productivity used here is correlated with these other measures of output.

In general, there is little systematic inquiry into what determines faculty productivity (and almost none into the determinants of the productivity of other personnel in postsecondary institutions). It is therefore unclear what characteristics are associated with a productive faculty member (as opposed to a low-cost faculty member).

In particular, the productivity effects of contingent work in the postsecondary sector are not well understood. One issue is the relative productivity of part-time versus full-time personnel. Economic theory suggests that the work day involves “start-up costs”: workers are less productive in the first few hours of their shift than the last few hours, and so working a full day is more productive. (But there is also a possibility of “fatigue” such that the last few hours of a full-time work shift are less productive). More importantly, contingent workers are unlikely to have the same skillset as full-time workers: for example, fewer upper-level or small-group courses are taught by contingent faculty; and few adjuncts receive mentoring or professional development (Kezar, 2014; on faculty motivation, see Bailey, Jaggars, & Jenkins, 2015).

In theory, productivity should correspond to pay for the individual worker: if workers are less productive they should receive lower pay, including benefits (Hirsch, 2005). However, there are significant costs and challenges in monitoring college personnel to ensure that their pay does equate to their productivity.<sup>5</sup> For example, colleges make hiring decisions for contingent faculty that are not based on best practices (Kezar & Gehrke, 2014). Also, colleges rely in part on salary scales that may not correspond to productivity or readily reflect productivity changes.

A second issue is the college-wide cost of having large proportions of contingent workers. Several elements are important. First, there are fixed costs to the college for each worker employed, regardless of how many hours that worker puts in. These costs

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<sup>5</sup> To monitor the quality of adjunct faculty, for example, it may be necessary to observe their teaching in the classroom setting. This is time-consuming and has to be performed separately for each worker. Alternatively, colleges may use post-course evaluations to monitor quality. The validity of these post-course evaluations for pay-setting purposes is not well-established, nor is the protocol for interpreting them.

include record-keeping administrative costs, recruitment/firing costs, general managerial costs, and monitoring costs. These fixed costs become more important, the fewer hours each worker puts in. However, these fixed costs may be lower with contingent staff if the college does not have to pay benefits. Second, there are managerial costs to the college from communications deficits (e.g., failing to inform all staff of changes in policy) or from output continuity (e.g., when staff do not work together because they are not on the same shifts). There are also managerial costs if tasks are displaced to other staff (especially if those staff lack the requisite training or skills). Contingent staff are often isolated from college management and governance and rarely undertake managerial or supervisory tasks; even when contingent faculty are more efficient in the classroom, therefore, these other tasks have now been displaced to other staff. Thus, overall productivity may be reduced even if instructor productivity within the classroom remains constant. Third, contingent faculty may not have sufficient incentive to make decisions that are in the long-term interest of the college. For example, contingent faculty may be more lenient with students if they have a weak stake in the college's reputation; they may be unable to adapt their pedagogies to meet the needs of different student groups (Bailey et al., 2015).

There is some evidence on the instructional effect of adjunct faculty. Several studies have found that having more adjunct faculty reduces student completion and transfer rates in pooled samples of two- and four-year institutions (Eagan & Jaeger, 2009; Ehrenberg & Zhang, 2005; Jacoby, 2006).<sup>6</sup> However, looking specifically at community colleges, Stange (2011) found no relation between bachelor's degree attainment and the proportion of faculty who were full-time. Overall, the reduction in direct educational quality from increasing the numbers of contingent faculty appears to be modest.

Of course, this modest adverse instructional effect is only half of the calculus. To determine efficiency, one would need to know if there are any cost savings. That is, one would need to know the difference in the total compensation for adjunct and non-adjunct

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<sup>6</sup> Two studies have found positive effects of non-tenured faculty for occupational fields and introductory courses at four-year colleges (see respectively Bettinger & Long, 2010; Figlio, Shapiro, & Soter, 2013).

faculty and the additional college-wide costs of having a higher proportion of contingent faculty.<sup>7</sup> I am not aware of any studies that have examined either of these issues.

Investigation into faculty productivity within community colleges would therefore seem to be a priority. This investigation should first focus on the college-wide cost repercussions from having large proportions of contingent faculty.<sup>8</sup> The difference in college-wide costs when more instructors are adjuncts is potentially observable. By contrast, if the literature on K-12 teacher quality is a guide, it may be difficult to more precisely identify differences in instructional productivity. Despite vast attention, and the identification of teacher value added metrics that are stable and meaningful constructs, the teacher quality research has yielded little guidance on which observable attributes are associated with teacher quality (Chetty, Friedman, & Rockoff, 2014). Thus, even if one discovers that some teachers/instructors are much better than others, one does not know how to find these teachers/instructors *ex ante*. If the cost consequences of more contingent faculty were known, moreover, these estimates could help place boundaries around the necessary differences in instructional productivity.

#### 4. College-Level Economies of Scale

One technology component that might significantly influence efficiency is college size. If colleges are too small or too large, average cost per student (or per graduate) will be higher than the efficient level. In light of large expansions in enrollments, an important efficiency consideration is whether this expansion should come from opening new colleges or from growth in existing ones.

In theory, there are many reasons why average costs might fall as college enrollment (or college output) increases. These economies of scale might include: technical economies from using large-scale capital more intensively (e.g., enrollment

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<sup>7</sup> There are also likely to be dynamic effects. When contingent faculty are found to be more efficient, it is still necessary to devise policies that would efficiently substitute away from full-time faculty. If faculty newly perceive that their positions are insecure, they are likely to demand wage gains to compensate for this insecurity. If contingent faculty newly perceive that they have no prospect of full-time employment, they too are likely to demand wage compensations.

<sup>8</sup> Analyses of contingent faculty will require college or department-level data, as well as information on work responsibilities. Ideally, evidence over a longer horizon should be used to see whether reliance on contingent faculty has led to declines in educational quality over time.

management systems and building space); purchasing economies from buying in bulk; administrative personnel and overheads savings, as these expenditures are spread over more departments and classes; marketing economies; and specialization and division of labor (as workers become more proficient at their specific tasks).

However, there are also many reasons why average costs might rise with enrollment or output. Larger colleges may suffer from *poor staff or student communication*: on the staff side, it is difficult to maintain an effective flow of information between departments and central administration; on the student side, it may be difficult to convey information to students on what requirements are needed to graduate. Larger colleges may also be unable to respond speedily to changes in market conditions (e.g., by closing or opening courses or programs). Also, *coordination problems* may affect larger colleges with many departments and divisions; these colleges may not be able to combine or manage divisions with differing structures, program offerings, or technological requirements. Presidents, deans, and provosts will have to delegate tasks to department heads, who will then need to be managed. When institutions become larger, there is a possibility of *x-inefficiency* in that the goals of the college become unclear and so personnel are not clearly directed toward meeting those goals. For example, a college with large numbers of both terminal award programs and transfer students may be conflicted in its ultimate goal. Finally, larger institutions may suffer from *low worker motivation*; if each worker has (or perceives to have) a negligible overall impact on output, that worker may not put in maximum effort. Typically, these diseconomies are discussed in the context of workers at a firm. However, these diseconomies—regarding communication, coordination, x-inefficiency, and motivation—might easily apply to students as well.

Overall, there is no obvious theoretical presumption that larger colleges will have lower average costs or that changing college size will reduce cost per unit of output. Yet, it seems more plausible that the personnel changes to community colleges would tend to create diseconomies of scale. Ultimately, it is an empirical question whether colleges are currently too large or small.

Most of the research on economies of scale has looked at four-year institutions or pooled all public institutions together. In general, these studies do find some evidence of

economies of scale (i.e., that colleges are probably too small; Laband & Lentz, 2004) Yet, these pooled findings are unlikely to be valid for community colleges: the model specifications typically include variables measuring research expenditures and graduate student enrollments and do not consider certificates as outputs. Few recent studies are available, and none address the substantial changes in the community college sector in the last decade.

There is no clear evidence that colleges are sub-optimal in size. Belfield (2012) found only a modest association between cost per award and community college size. Clotfelter, Ladd, Muschkin, and Vigdor (2013) looked at community colleges in North Carolina and found that only a few colleges can be identified as high- or low-performing, with most being statistically indistinguishable, and that performance levels appear to be uncorrelated, even with basic college characteristics such as size or expenditure. Thus, it is not clear that colleges should either expand or contract in size.<sup>9</sup>

## **5. Class-Level Economies of Scale**

Class size is an important component of the technology of education, and clearly some of the increase in staff–student ratios will translate into larger instructional classes. Class size is a tradeoff between a higher quality of instruction and lower average cost. As class size increases, average cost per student will almost certainly fall and the quality of instruction will most likely fall; at issue are the relative sizes of these changes. When class size is set optimally, any increase in class size would yield cost savings, which would be correspondingly offset by lower quality instruction. The net result would be zero efficiency gain. However, identifying the optimal class size is difficult.

The evidence and debate on class size reduction in K-12 schooling is vast (Finn & Achilles, 2005). By contrast, there is very little inquiry into the optimal class size in postsecondary education. Bound, Lovenheim, and Turner (2010) estimated that

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<sup>9</sup> Perhaps it is understandable that colleges exhibit constant economies of scale. Higher education instruction is a labor-intensive service with tasks that are cognitively challenging and interactive. These types of tasks cannot easily be routinized and made more efficient by reducing the amount of labor time allocated to them or by doing more of them. Thus, the technology of higher education is such that it is very hard to generate proportionately more human capital by increasing output (or by substituting machines for labor).

increasing the student–faculty ratio by 1 percentage point would decrease community college degree completion rates by 0.5 percentage points. Approximately, this study suggests that class sizes are close to optimal: it implies that costs would have fallen by 1–2 percent and output would have fallen by 1–2 percent. But the student–faculty ratio is only a proxy for class size (because teaching loads vary), and this study does not directly report marginal costs. As with college size, it is an empirical question as to whether class sizes are currently too large or too small.

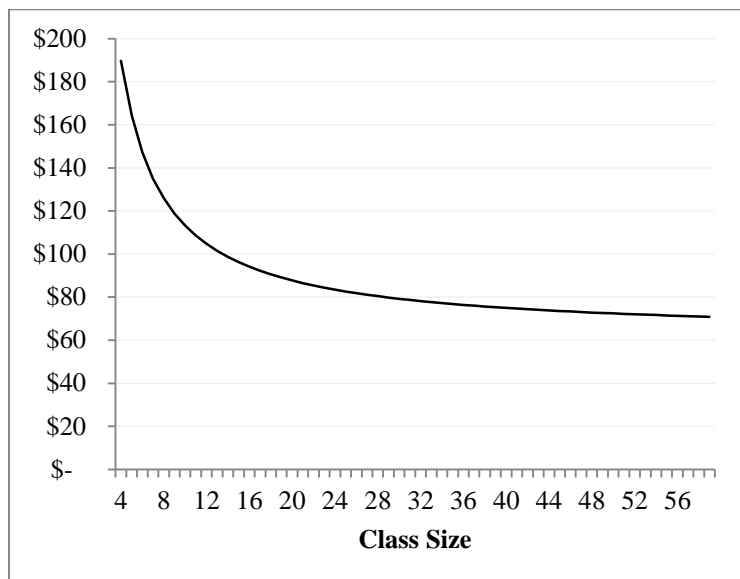
To illustrate the potential tradeoff in changing class size, I perform three empirical exercises. First, I simulate how average cost changes as class size increases. I adapt Integrated Postsecondary Education Data System data on cost per FTE (Desrochers & Hurlburt, 2014, Figure 5). I assume that per course there are fixed costs per course and variable costs per student.<sup>10</sup> Although these assumptions are approximations, they are likely to underestimate the cost savings from increasing class size: senior (higher-paid) faculty typically teach smaller, upper-level courses, and larger courses are likely to have some economies of scale in instruction.

Figure 1 shows how average cost per student falls as class size increases (based on the assumptions about the split between fixed and variable costs). As fixed instructional costs are distributed over more students, the average cost falls sharply from five to 20 students. After a class size of 25 students, average cost flattens out. Increasing class size reduces average cost: from five students to 10 students, average costs fall 31 percent; from 10 to 15 students by 15 percent; from 15 to 20 students by 19 percent; and from 20 to 25 students by 6 percent. Going from small to moderately sized classrooms yields significant cost savings per student.

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<sup>10</sup> The fixed costs per course are estimated at 80 percent of instructional personnel and 20 percent of operations and maintenance costs. The variable costs per student are estimated at 20 percent of instructional personnel, 80 percent of operations and maintenance costs, and 100 percent of administrative resources, student support, and other student services.

**Figure 1**  
**Average Cost per Student**

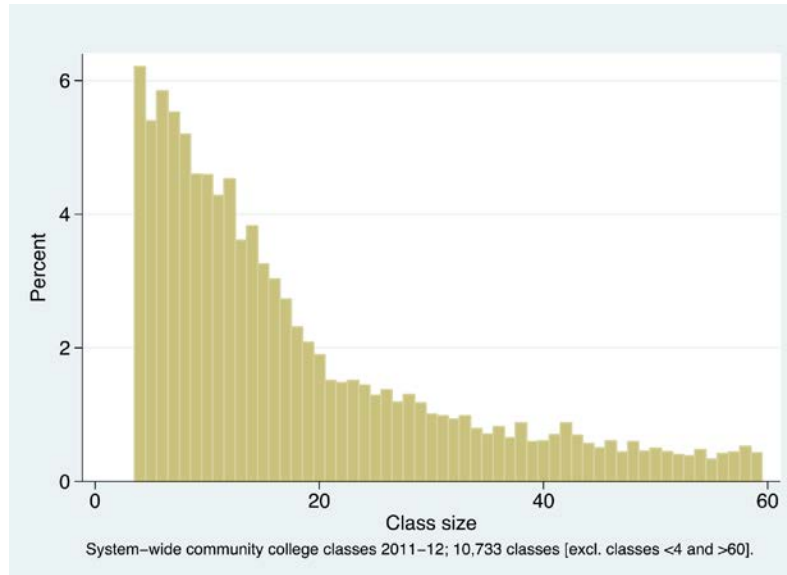


Next, I show that class sizes in community colleges are quite small. Obtaining data on class size is difficult. It is often not accurate to assume that staff–student ratios correspond to class sizes (staff vary significantly in their teaching loads). For illustration, I use data from a statewide community college system for all classes delivered in 2011 and 2012.<sup>11</sup> I estimate the median class size at approximately 15 students. Figure 2 shows that most community college courses are very small, with few courses having class sizes beyond 25 students. Given the small sizes of these classes, the shape of the average cost curve becomes relevant. That is, a reform that increased class sizes from five students to 10 students would affect many community college classes and would yield significant reductions in costs per class.

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<sup>11</sup> Our primary focus is on the typical community college course. I exclude all classes with less than three or more than 60 students. Very small classes may be independent study or coding errors (e.g., from cross-listing). Very large classes may be duplicate section class codes. These exclusions likely offset each other.

**Figure 2**  
**Class Size Distribution**



To complete the analysis, I need to look at evidence on the association between class size and outcomes such as instructional quality. As noted above, Bound et al. (2010) found a clear negative association: larger classes are of lower quality. But the key issue is whether the tradeoff between cost and quality is correctly estimated—in other words, whether outcomes fall by 6 percent (the fall in costs) when class size increases from 20 to 25 students. To illustrate, Figure 3 shows average grade patterns for classes across a statewide community college system. Regardless of how grade patterns are depicted, the lines are very flat: as class size increases, student grades do not change. This is suggestive evidence that larger classes do not lead to significant deteriorations in quality.<sup>12</sup> Other studies have also shown that the class size instructional quality penalty is relatively low. Using student evaluations at four-year colleges, Bedard and Kuhn (2007) estimated that evaluation scores fell from 4.19 to 3.94 as class size increased from 10 to 30 students. This association equates to a 6 percent deterioration in quality for a 30 percent fall in average costs.<sup>13</sup>

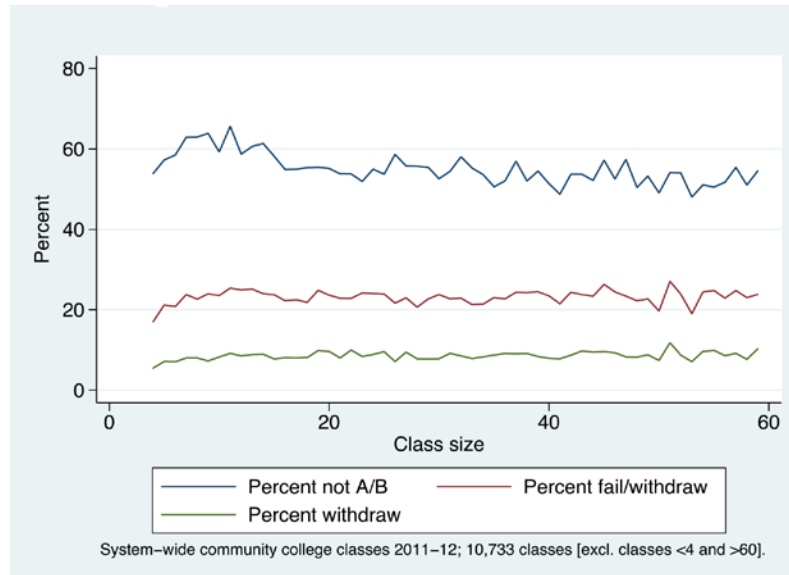
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<sup>12</sup> The evidence is only illustrative: instructors may grade on a curve or give grades that are not accurate indicators of learning.

<sup>13</sup> Bandiera, Larcinese, and Rasul (2010) did not find that larger classes disproportionately affected lower-ability students. Also, there is evidence that student evaluations become more accurate as class size increases (Benton & Cashin, 2012; Spooen, Brockx, & Mortelmans, 2013).



**Figure 3**  
**Class Size and Student Performance**



The above analysis is far from a complete evaluation of the economic consequences of increasing class size.<sup>14</sup> The penalty of larger classes may be measured too narrowly (e.g., if it actually reduces enrollment in subsequent courses or if its impacts are felt in the labor market). The opportunity to reallocate resources as class size changes may be overstated. Also, I have assumed that pedagogies will remain the same (i.e., that larger lecture classes will not be replaced by online classes).<sup>15</sup>

Nevertheless, given the current distribution of class sizes, the convex average cost curve, and the weak association between learning outcomes and class size, further investigation into the optimal class size appears warranted.

<sup>14</sup> I do not distinguish between class size alterations by cutting the number of sections of each course, by reducing the number of courses, or by expanding enrollments.

<sup>15</sup> Most evidence shows adverse effects from online instruction (Bell & Federman, 2013; Xu & Jaggars, 2013), and no study has rigorously calculated costs (Bowen, 2012, p. 29).

## 6. Conclusions

The quest for efficiency gains is persistent. But it typically yields very little that might guide policymakers or help colleges improve performance. There are many reasons for this.

First, if recent history is a guide, there is unlikely to be any additional resource to implement potentially wide-ranging efficiency-generating reforms in the nation's community colleges. If colleges want to change practices, they will have to reallocate resources. This is a significant obstacle: to get more students to graduate not only requires more resources at the start (Tinto, 2012), but it also requires more resources as these students progress further through college (Belfield, Crosta, & Jenkins, 2014). New reforms create financial burdens later on.

Second, it is unlikely that efficiency gains will be easily measurable with the metrics currently available. Efficiency is not clearly identifiable, and measures of efficiency are not consistent across colleges and time.<sup>16</sup> Although there are some high-performing colleges each year, these are not typically the same colleges year after year, such that “high-performing” can be deemed a stable construct. Even as average cost per graduate fell over the last decade, there was substantial variation across colleges: those with big efficiency gains in one period were not the same as those with big efficiency gains in other periods. Even modest improvements in efficiency over time appear to be spread across the sector rather than concentrated in a subset of consistently high-performing colleges.

Third, one of the main drivers of efficiency—student quality—is unlikely to be within the control of the community college. In the context of declining student preparedness, and all the additional resources required to remediate that unpreparedness, it may be unrealistic to expect significant improvements in the efficiency of college inputs.<sup>17</sup>

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<sup>16</sup> Output and costs per degree are not stable across colleges. Over the period 1989–2008, four-year growth rates at academic community colleges ranged between –9 percent and +12 percent; vocational colleges exhibited even greater volatility in four-year output growth (Belfield, 2012).

<sup>17</sup> As noted by Bettinger, Boatman, and Long (2013, p. 95) much of the need for remediation is “closely tied to the student’s high school curriculum.” As well, Bound et al. (2010) calculated that more than two thirds of the decline in community college completion rates for males over prior decades is attributable to their weaker initial math skills. Simulations have found that serving more students who are unprepared to succeed in college—and thus will need lots of support to enter and progress through programs—is

Given these challenges, the approach undertaken in this paper is to look at two areas where colleges appear to be making changes but where evidence is sparse—faculty productivity and class size. (A third mechanism for boosting efficiency—increasing college size—appears to have little support based on the evidence.)

For faculty productivity, I emphasize that lower instructional quality is not the only consequence of a more contingent faculty: the displaced college-wide costs are potentially as important and could be measured. Indeed, this investigation might serve as a foundation for research on the productivity of other personnel, for whom even basic questions remain unexplored.<sup>18</sup>

For class size, I note that smaller classes—although higher in quality—are likely to be significantly more expensive. At first glance, the trend toward larger classes may in fact be efficiency-enhancing, particularly in community colleges where class sizes do appear to be quite small. However, the exercise here is only illustrative and should prompt a more comprehensive and rigorous investigation. For example, it is not known whether larger classes have a longer term effect (e.g., on award completion or earnings) or what it would cost to increase class sizes when facilities and space are fixed.

Given the interest in increasing faculty productivity and class size as a means to increase efficiency, and given the low likelihood of efficiency gains in other ways, further research on these two mechanisms should be a priority.

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substantially more costly than serving “college-ready” students (Belfield et al., 2013). The latter progress through college more quickly and complete their program.

<sup>18</sup> These questions include the displacement effect of managerial tasks to full-time faculty, the productivity of non-instructional faculty, and the economic value of professional development.

## References

- Agasisti, T., & Belfield, C. (2014). *Efficiency in the community college sector: Stochastic frontier analysis* (CCRC Working Paper No. 69). New York, NY: Columbia University, Teachers College, Community College Research Center.
- Bailey, T. (2012). Can community colleges achieve ambitious graduation goals? In A. P. Kelly & M. Schneider (Eds.), *Getting to graduation: The completion agenda in higher education* (pp. 73–101). Baltimore, MD: Johns Hopkins University Press.
- Bailey, T., Jaggars, S. S., & Jenkins, D. (2015). *Redesigning America's community colleges: A clearer path to student success*. Cambridge, MA: Harvard University Press.
- Bandiera, O., Larcinese, V. & Rasul, I. (2010). Heterogeneous class size effects: New evidence from a panel of university students. *The Economic Journal*, 120, 1365–1398. doi: 10.1111/j.1468-0297.2010.02364.x
- Barrow, L., Brock, T., & Rouse, C. E. (2013). Postsecondary education in the United States: Introducing the issue. *Future of Children*, 23(1), 3–16.
- Bedard, K., & Kuhn, P. (2007). Where class size really matters: Class size and student ratings of instructor effectiveness. *Economics of Education Review*, 27(3), 253–265.
- Belfield, C. R. (2012). *Measuring efficiency in the community college sector* (CCRC Working Paper No. 43). New York, NY: Columbia University, Teachers College, Community College Research Center.
- Belfield, C., Crosta, P., & Jenkins, D. (2014). Can community colleges afford to improve completion? Measuring the cost and efficiency consequences of reform. *Educational Evaluation and Policy Analysis*, 36(3), 327–345. doi: 10.3102/0162373713517293
- Bell, B. S., & J. E. Federman. (2013). E-learning in postsecondary education. *Future of Children*, 23(1), 165–186.
- Benton, S. L., & Cashin, W. E. (2012). *Student ratings of teaching: A summary of research and literature* (IDEA Paper No. 50). Manhattan, KS: IDEA.
- Bettinger, E. P., Boatman, A. & Long, B. T. (2013). Student supports: Developmental education and other academic programs. *Future of Children*, 23(1), 93–115.
- Bettinger, E., & Long, B. T. (2010). Does cheaper mean better? The impact of using adjunct instructors on student outcomes. *Review of Economics and Statistics*, 92(3), 598–613.

- Bound, J., Lovenheim, M. F., & Turner, S. (2010). Why have college completion rates declined? An analysis of changing student preparation and collegiate resources. *American Economic Journal: Applied Economics*, 2, 129–157.
- Bowen, W. G. (2012). *The 'cost disease' in higher education: Is technology the answer?* Retrieved from ITHAKA website at:  
<http://ithaka.org/sites/default/files/files/ITHAKA-TheCostDiseaseinHigherEducation.pdf>
- Chetty, R., Friedman, J. N., & Rockoff, J. E. (2014). Measuring the impacts of Teachers II: Teacher value added and student outcomes in adulthood. *American Economic Review*, 104(9), 2633–2679.
- Clotfelter, C. T., Ladd, H. F., Muschkin, C. G., & Vigdor, J. L. (2013). Success in community college: Do institutional differences matter? *Research in Higher Education*, 54(7), 805–824. doi: 10.1007/s11162-013-9295-6.
- Desrochers, D. M., & Hurlburt, S. (2014). *Trends in college spending: 2001–2011* (A Delta Data Update). Washington, DC: American Institutes for Research.
- Desrochers, D. M., & Kirshstein, R. J. (2014). *Labor intensive or labor expensive? Changing staffing and compensation patterns in higher education* (Issue Brief). Washington, DC: American Institutes for Research.
- Eagan, K. Jr., & Jaeger, A. J. (2009). Effects of exposure to part-time faculty on community college transfer. *Research in Higher Education*, 50(2), 168–188.
- Ehrenberg, R. G., & Zhang, L. (2005). Do tenured and tenure-track faculty matter? *Journal of Human Resources*, 49(3), 647–59.
- Figlio, D. N., Schapiro, M.O., & Soter, K. B. (2013). *Are tenure track professors better teachers?* (NBER Working Paper No. 19406). Cambridge, MA: National Bureau of Economic Research.
- Finn, J. D., Gerber S. B. & Boyd-Zaharias, J. (2005). Small classes in the early grades, academic achievement, and graduating from high school. *Journal of Educational Psychology*, 97(2), 214–223.
- Hirsch, B. T. (2005). Why do part-time workers earn less? The role of worker and job skills. *Industrial and Labor Relations Review*, 58(4), 525–51.
- Jacoby, D. (2006). Effects of part-time faculty employment on community college graduation rates. *Journal of Higher Education*, 77(6), 1081–1103.
- Jenkins, D., & Belfield, C. R. (2014). Can community colleges continue to do more with less? *Change: The Magazine of Higher Learning*, 46(3), 6–13.

- Jenkins, D. (2011). *Redesigning community colleges for completion: Lessons from research on high-performance organizations* (CCRC Working Paper No. 24, Assessment of Evidence Series). New York, NY: Columbia University, Teachers College, Community College Research Center.
- Jenkins, D., & Cho, S.-W. (2013). Get with the program...and finish it: Building guided pathways to accelerate student completion. *New Directions for Community Colleges*, 2013(164), 27–35.
- Jenkins, D., & Rodríguez, O. (2013). Access and success with less: Improving productivity in broad-access postsecondary institutions. *Future of Children*, 23(1), 187–213.
- Kezar, A. (2014). Changing faculty workforce models. Retrieved from TIAA-CREFF website: <https://www.tiaa-creffinstitute.org/public/pdf/changing-faculty-workforce-models.pdf>
- Kezar, A., & Gehrke, G. (2014). Why are we hiring so many non-tenure-track faculty? *Liberal Education*, 100(1).
- Kirshstein, R. J., & Hurlburt, S. (2013). *Revenues: Where does the money come from?* Retrieved from Delta Cost Project website: [www.deltacostproject.org/sites/default/files/products/Revenue\\_Trends\\_Productio\\_n.pdf](http://www.deltacostproject.org/sites/default/files/products/Revenue_Trends_Productio_n.pdf)
- Knapp, L. G., Kelly-Reid, J. E., & Grinder, S. A. (2011). *Employees in postsecondary institutions, fall 2010, and salaries of full-time instructional staff* (NCES 2012-276). Washington, DC: U.S. Department of Education, National Center for Education Statistics, Institute of Education Sciences.
- Laband, D., & Lentz, B. (2004). Do costs differ between for-profit and not-for-profit producers of higher education? *Research in Higher Education*, 45(4), 429–441. doi: 10.1023/B:RIHE.0000027394.33115.71
- Obama's State of the Union 2015 transcript (full text) and video. (2015, January 20). *New York Times*. Retrieved from <http://www.nytimes.com/2015/01/21/us/politics/obamas-state-of-the-union-2015-address.html>
- Romano, R. M. (2012). Looking behind community college budgets for future policy considerations. *Community College Review*, 40(2), 165–189.
- Snyder, T. D., & Dillow, S. A. (2011). *Digest of education statistics 2010* (NCES 2011-015). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics.

- Snyder, T. D., & Dillow, S. A. (2012). *Digest of education statistics 2011* (NCES 2012-001). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics.
- Spooren, P., Brockx, B., & Mortelmans, D. (2013). On the validity of student evaluation of teaching: The state of the art. *Review of Educational Research*, 83(4), 598–642.
- Stange, K. (2011). Ability sorting and the importance of college quality to student achievement: Evidence from community colleges. *Education Finance and Policy*, 7(1), 74–105.
- Sullivan, T. A., Mackie, C., Massy, W. F., & Sinha, E. (Eds.). *Improving measurement of productivity in higher education: Panel on measuring higher education productivity: Conceptual framework and data needs*. Washington, DC: The National Academies Press.
- Tinto, V. (2012). *Completing college: Rethinking institutional action*. Chicago, IL: University of Chicago Press.
- U.S. Department of Education. (2013). Digest of Education Statistics, Table 306.20. Retrieved from [http://nces.ed.gov/programs/digest/d13/tables/dt13\\_306.20.asp](http://nces.ed.gov/programs/digest/d13/tables/dt13_306.20.asp)
- Xu, D., & Jaggars, S. S. (2013). The impact of online learning on students' course outcomes: Evidence from a large community and technical college system. *Economics of Education Review*, 37(0), 46–57.