Better Outcomes Without Increased Costs? Effects of Georgia's University System Consolidations

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Abstract

Declining state appropriations for higher education have prompted consolidations within numerous public university systems. Using administrative data from the University System of Georgia, I investigate the effects of recent consolidations on educational quality and efficiency. Comparing cohorts matriculating after consolidations to similar cohorts at non-consolidated institutions reveals that consolidation increases retention rates and the fraction of students graduating on-time with four-year degrees. Spending data and conversations with USG administrators suggest that increased spending on academic support (advising), made possible by economies of scale in student services, are likely responsible for the gains.

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1 Introduction

For years, public higher education systems have responded to fiscal pressures with consolidations. In 1974, the University of Wisconsin system combined with the Wisconsin State Universities system to avoid program duplication and contain growing costs (University of Wisconsin 2016). In 1995, Minnesota restructured its public system of state colleges, community colleges, and technical colleges to improve efficiency (Healy 1996; Shecter 1996). Other states to consolidate their state university, state college, or community college systems include Kentucky (1997), Kansas (1965-2008), Alabama (2015), Louisiana (2015), Texas (2015), and Georgia (2013-2018) (Warren 2008; Ohman 2011; Diamond 2013; Reeve 2013; Hamilton 2013; Marcus 2013; Mytelka 2015). Most recently, in October 2017, University of Wisconsin officials announced a plan to merge all two-year campuses with four-year institutions, and the President of the Connecticut State Colleges and Universities System announced that the state's 12 community colleges will be consolidated into a single community college, a plan prompted by the state's dire financial situation (Savidge 2017; Megan 2017).

It is unsurprising that many state systems are implementing structural changes to improve efficiency since fiscal pressures have only intensified in recent years. Between 2003 and 2013, state appropriations declined dramatically with public research institutions receiving 28% less funding per student in 2013 than 2003 and public community colleges receiving 9% less. As of the 2016 fiscal year, state appropriations in all but five states were still below pre-recession levels (SHEEO 2016). In the midst of lower levels of state appropriations, all sectors of the higher education market have increased spending in real terms on education and related expenses. Public community colleges increased spending by 4.3%, and public research universities increased spending by 11.9%. Consequently, net tuition revenue has constituted an increased share of spending (Desrochers and Hurlburt 2016), and state policymakers have identified consolidations as one way to improve efficiency.

Consolidations are an attractive response to increases in spending due to potential economies of scale. A merged institution can operate with a single admissions or registrar office and con-

solidate libraries, health services, and athletics programs. Additionally, a merged institution can cut its administrative payroll by retaining fewer administrators to oversee larger institutions. For example, Connecticut policymakers predict that combining 12 existing community colleges will save the system $28 million, primarily through replacing 12 separate community college presidents, chief financial officers, and provosts with a single vice chancellor, a single provost, and a single chief financial officer (Megan 2017). However, potential savings are not limited to administrative spending. Instruction may also have economies of scale if institutions can consolidate program offerings, a goal of both the Minnesota mergers in the 1990s and the Georgia mergers in 2013 (Healy 1996; USG 2012).

Mergers will increase the productivity of institutions if there are overall cost savings that do not decrease quality or quality improvements that do not increase overall costs. However, the effect of mergers on productivity is theoretically ambiguous due to potential disruption effects of reorganization and uncertainty surrounding cost savings (Healy 1996; Wieder 2012; Woodhouse 2015). Administrators who oppose consolidations in Georgia and South Carolina have cited challenges in combining institutions with dissimilar missions (Board of Regents of the University System of Georgia 2013; Rivard 2013; Shain 2014; Rivard 2015), and students have worried about how mergers will affect their educational experiences (Rivard 2013; Rivard 2015). Little evidence exists to inform the debate since effects of college and university mergers have rarely been rigorously investigated.

In this paper, I examine five recent mergers within the University System of Georgia to provide the first quantitative evidence on the quality effects of consolidations in a public US higher education system. These mergers are typical of many public consolidations in that administrators have predicted fiscal savings through economies of scale and plan to redirect savings to spending that will increase student attainment. In fact, the USG Board of Regents has adopted increasing educational attainment as its first guiding principle for assessing potential consolidations (USG 2011a). USG combined eight institutions into four in 2013 and subsequent mergers followed in 2015, 2016, 2017, and 2018.

Using a differences-in-differences methodology, I compare student retention and gradua-

tion outcomes for cohorts enrolling just before and just after consolidation relative to cohorts at similar non-affected institutions in the USG. Rich administrative data allow me to observe student-level covariates such as demographics, financial aid receipt, and measures of pre-college preparation which allow me to account for cohort composition changes which could otherwise bias estimates of merger effects.

My evidence indicates that the USG consolidations increased retention of first-time undergraduate students.[1] The main estimates indicate that the mergers increased the probability that a student re-enrolled for a second year by 1.7 percentage points. Since 21% of students dropout after the first year, this represents an 8% decline in first-year dropout. I find no similar retention effects for partially treated cohorts (i.e. students who matriculated prior to consolidations but who were exposed to consolidations partway through their studies). Consolidations also increase the fraction of students pursuing a Bachelor's degree who graduate within four years by 4 percentage points. Since only 14% of Bachelor's degree students pre-consolidation finish on time, this corresponds to an 29% increase in on-time graduation.

I assess several potential mechanisms underlying these gains. The most obvious potential explanation is increased overall spending per student as prior work has established that increasing spending, especially on academic support, is an effective way for public institutions to increase postsecondary attainment (Deming and Walters 2017). My point estimates, while imprecise, suggest that the retention gains did not come at the cost of overall increased spending per student. Instead, consolidations allowed affected institutions to shift spending from student services to academic support in such a way that overall spending was unaffected. Discussions with USG administrators reveal that the increase in academic support spending is likely reflective of the hiring of additional advising staff.

Even if consolidations increase productivity by improving student outcomes without increasing costs, it is not clear that they are welfare improving for students. It is possible that consolidations lead to higher tuition and fees for students through institutions exercising market power or charging for improved quality. However, I find no evidence that consoli-

[1] First-time undergraduates are the population for which I was able to obtain microdata.

dated institutions increase prices by raising sticker prices or decreasing institutional grant aid. Taken as a whole, my results suggest that consolidations were beneficial for students and most likely reflect productivity improvements realized at the affected campuses.

To my knowledge, there is only one existing study assessing impacts of higher education mergers quantitatively. A 2014 working paper by Capuccinello and Bradley investigates the impacts of college mergers in the United Kingdom on dropout rates. They find that mergers early in their sample period reduced dropout risk while mergers later in the period increased risk. Since early mergers were voluntary and mergers in the later period resulted from government pressures to improve cost effectiveness, they conclude that involuntary mergers are the most likely to have adverse effects for students. By contrast, my results indicate that involuntary mergers in the U.S. can actually benefit students.

The question of how to most efficiently deploy state resources in financing higher education fits into a broader literature investigating the most efficient way to publicly provide goods and services. Previous work has investigated the quality and efficiency implications of K-12 school consolidations as well as whether there are economies of scale in providing police services (Finney 1997; Gordon and Knight 2008; DeLuca 2013; Beuchert et al. 2016). Generally, these studies have found no evidence of economies of scale, and when consolidations have occurred, they have not improved quality. For instance, Beuchert et al. (2016) document that for primary schools in Denmark, consolidation has adverse effects on student test scores. The success of USG consolidations is notable because the student impacts are unusually promising.

The rest of the paper proceeds as follows: Section 2 provides background on the recent consolidations in Georgia. Section 3 describes the data and empirical strategy. Section 4 presents results for student retention and graduation. Section 5 discusses what mechanisms can potentially account for the student retention effects, and Section 6 concludes.

2 University System of Georgia Consolidations

I investigate the impacts of consolidations within the University System of Georgia, Georgia's public system of state colleges and universities. The Georgia Board of Regents governs, controls, and manages the system which consists of 28 institutions of higher education, a marine research institute, and a central University Systems Office (USG 2017).[2] USG is the fifth largest state university system in the United States as measured by total enrollment with 321,551 students in fall 2016, exceeded only by the University System of Ohio, the California State University system, the State University of New York system, and the State University System of Florida.[3] USG primarily serves in-state students; 91% of first-time freshman are Georgia residents.

The political will to undertake mergers within the public university system gained significant momentum when Hank Huckaby became USG Chancellor in the summer of 2011. Only a few months into his position, Chancellor Huckaby issued a report to the Board of Regents in which he emphasized the need to study whether campus consolidations could lower costs so that savings could be reinvested in programs to improve educational attainment (Hawks 2015). In November 2011, the USG Board of Regents announced that six principles would be used to assess potential consolidations including whether consolidations could increase opportunities to raise educational attainment levels, improve accessibility and regional identities, generate economies of scale and scope, enhance regional economic development, streamline administrative services while maintaining service level and quality, and avoid duplication of access to programs while optimizing access to instruction (USG 2011). By January 2012, the Board of Regents approved merging eight colleges into four, and on January 8, 2013, the Board authorized the consolidated colleges to operate (USG 2013). Given the key role of leadership turnover in pushing for consolidation, and the speed with which the mergers

[2] USG is completely separate from the Technical College System of Georgia (TCSG) which oversees Georgia's 25 technical colleges, though some core courses can be transferred across institutions in the two systems.

[3] Authors calculations using fall 2016 enrollment data from the California State Unviersity System (`http://www.calstate.edu/as/stat_reports/2016-2017/f16_01.htm`), the State University of New York (`https://www.suny.edu/about/fast-facts/`), the State University System of Florida (`http://www.flbog.edu/resources/factbooks/factbooks.php`), the University System of Ohio (`https://www.ohiohighered.org/sites/ohiohighered.org/files/uploads/data/statistical-profiles/enrollment/headcount_institution_campus_07-16.pdf`), and the University System of Georgia (`http://www.info.usg.edu/`).

were approved, I consider the timing of the USG mergers plausibly unrelated to trends in Georgia's college-going population at the affected institutions.[4]

I study the impact of the first five mergers within the University System of Georgia (USG). The first wave of mergers took effect January 8, 2013 and consisted of the following four mergers: the merger of Augusta State University and Georgia Health Sciences to form Georgia Regents University, now called Augusta State University; the merger of Macon State College and Middle Georgia College to form Middle Georgia State College, now called Middle Georgia State University; the merger of Waycross College and South Georgia College to form South Georgia State College; and the merger of Gainesville State College and North Georgia College & State University to form the University of North Georgia (Board of Regents USG 2012; USG 2013).[5] The fifth merger of Kennesaw State University and Southern Polytechnic State University to form the new Kennesaw State University took effect about two years later on January 6, 2015 (USG 2015).

For each proposed merger, the Board of Regents created a consolidation committee consisting of members from each of the two merging institutions. While USG vice chancellors managed the overall process, members of the committee were involved in implementation decisions such as how admissions would operate the merged institution and what the new athletic teams would be called. Program offerings were streamlined, program-based accreditations were secured, faculty contracts were updated, tenure and processes and standards were consolidated, and program/curriculum differences were addressed (USG 2012a). To help inform consolidation decisions, USG also hired an outside consultant to analyze space utilization at the various campuses and make recommendations for how facilities could be used more efficiently (Hayes 2015). Presidents were appointed to lead the consolidated institutions. In all five cases, the appointed president had previously served as president of one

[4] There was another initiative called "Complete College Georgia" that began in 2012. This plan reformed remedial education across all USG institutions, encouraged institutions to implement policies to increase persistence, and created new articulation agreements for transfer students (USG 2011b). Because this intiative impacted all the control institutions, it is unlikely that this policy would drive differential persistence gains at consolidated institutions unless consolidated institutions had additional funds or greater freedom to implement these policies. I discuss this possibility in section 4. The articulation agreements do not apply to my sample of interest (first-time freshman), so these cannot drive persistence gains in this sample.

[5] Throughout the paper, I refer to institutions by the names they had during my time period of study (i.e. Middle Georgia State College rather than Middle Georgia State University and Georgia Regents University rather than Augusta State University).

of the combining institutions.[6]

3 Data and Empirical Strategy

The University System of Georgia generously provided administrative data covering all first-time undergraduate students matriculating between fall 2007 and fall 2015. The enrollment and degree completion information for these cohorts is current up to spring 2017.[7] The sample excludes any students who transferred into USG (approximately 30% of new undergraduate students in the USG system in any given year) and students who matriculated prior to fall 2007 but re-enrolled with freshman status in one of these years. I drop from my first-time undergraduate sample any students who were ever jointly enrolled in multiple institutions (0.5% of the sample) or jointly enrolled in high school and college (0.03% of the sample) so that I can assign each student a single freshman matriculation term and institution. The data include measures of pre-college academic performance (i.e. SAT scores and high school GPA), demographic characteristics (i.e. race, gender, age), information on financial aid awarded, and educational outcomes (i.e. degrees awarded).

Table 1 shows the characteristics of the first-time undergraduate sample. The first three columns of the table present statistics corresponding to the first-time undergraduate students enrolling at schools in the University of Georgia System unaffected by the 2013-2015 consolidations. Columns 4-6 present statistics for students enrolling at any institution to be consolidated between 2013 and 2015. Column 7 shows the p-value for a test of the null hypothesis that the mean is equivalent across the groups of consolidating and non-consolidating schools. The table shows that the first five mergers affected institutions that enrolled 22% of all students in the USG system between fall 2007 and fall 2015 (87,228 out of 399,211

[6] Dr. Bonita Jacobs, who became president of the University of North Georgia, was previously the president of North Georgia College & State University (USG 2018). Dr. John Black, who became the interim president of Macon State College in July 2012 was reappointed as the interim president of Middle Georgia State College when Macon and Middle Georgia College combined in January 2013 (USG 2012c). Dr. Virginia Carson, who was previously the president of Waycross College, became president of the merged school (Davis 2016a). Dr. Ricardo Azziz was selected to lead Georgia Regents University, after previously serving as president of Georgia Health Sciences University (SUNY2018). Dr. Daniel Papp, previously the president of Kennesaw State University, served as the president of the merged institution (Davis 2016b).

[7] Investigating outcomes for graduate students is beyond the scope of this paper, but graduate students, first-professional students, residents, and interns make up about 15% of the students enrolled in USG according to enrollment counts in USG's recent fall semester enrollment reports.

students).

Students matriculating at institutions affected by consolidations are similar to students at non-consolidated institutions along observable dimensions. Students are, on average, 19 when they begin school. There is a notable amount of racial diversity. At the non-consolidated institutions, half of the students are white, 33% are black, 7% are Hispanic, 7% are Asian, and 3% are two or more races/other. Students at the consolidated institutions are more likely to be white (67%) and less likely to be Asian (3%). Across the consolidated and non-consolidated institutions, about 50% of students have received a HOPE Scholarship, a merit based scholarship funded by lottery revenue awarded to Georgia residents with a high school GPA of at least 3.0. The scholarship covers 90% of tuition at public institutions in Georgia. The mean SAT scores of USG students correspond almost exactly to the 50th percentile of SAT takers nationally for both consolidated and non-consolidated institutions (College Board 2015).

3.1 Measuring Educational Outcomes

Early consolidation documents suggested that consolidations could improve retention and graduation rates by making within-system transfers more seamless for students and allowing institutions to pool resources to hire for specialized positions and to collaborate on strategic approaches to student needs (Board of Regents USG 2013). To investigate whether the goal of improving educational outcomes was realized, I assess whether the consolidations increased retention among cohorts enrolling at the consolidated institutions. Students who transfer to another USG institution are counted as enrollees in this analysis, but students who transfer to non-USG institution are not since I cannot observe outcomes for the latter group of students in my data.[8]

Assessing impacts on graduation rates is more difficult due to the recent time period of the consolidations. Within the USG, more than half of students completing an associate's degree take three years or more, and more than half of students completing a bachelor's

[8]My data are not linked to National Student Clearinghouse records which would make it possible to look at outcomes for students who transfer out of the University of Georgia system.

degree take five or more years. These USG average times for each degree are typical of two-year and four-year public institutions. Nationally, less than half of bachelor's degree recipients finish their degree in four years or fewer (NCES 2011). More than half of students completing degrees at public two-year college take three years or more (NCES 2017).

The first cohort of students who matriculated after the 2013 USG consolidations matriculated in fall 2013, so data covering spring 2016 are necessary to assess three-year graduation rates for associate's degree students. Because my USG data cover up to spring 2017, I am able to examine effects on 3-year graduation rates for Associate's degree students matriculating in fall 2013 and fall 2014. However, I am unable to assess effects on 5 or 6-year graduation rates for students initially pursuing a four-year degree since I lack data covering up to spring 2018 or spring 2019. For these students, I instead examine whether consolidations impact the fraction of students graduating on-time with a four-year degree for the fall 2013 cohort.

3.2 Empirical Strategy

To estimate the effect of consolidation on student outcomes, I implement a differences-in-differences estimation strategy where non-consolidated institutions in the USG serve as a counterfactual for how retention and graduation rates would have evolved in the absence of mergers. The retention and graduation results that follow come from estimating a student-level regression model using data from first-time freshmen matriculating between fall 2007 and fall 2015:

$$y_{sict} = \gamma M_{it} + \rho C_{it} + \delta_{ct} + \alpha_i + X_s'\beta + \varepsilon_{sict} \tag{1}$$

The model explores within-institution changes in the outcome y_{isct}; s indexes the student, i indexes the institution, c indexes the CIP code of the degree the student began pursuing at matriculation, and t indexes the fall matriculation year.

The key regressor of interest is M_{it}, an indicator that equals 1 if institution i is merged in year t, and C_{it} is an indicator that equals 1 for the partially treated pre-merge cohorts.

For the retention results which examine whether students are more likely to re-enroll for a second year of college, this indicator equals 1 for the fall 2012 cohorts at institutions merged in January 2013 and the fall 2014 cohorts for the institutions merging in January 2015. These cohorts were in their second semesters when the consolidations took effect. CIP code by matriculation year fixed effects (δ_{ct}) control for other factors impacting retention that vary over time but are common to all students pursuing a particular degree within the USG.[9] Because degree programs chosen by students may be endogenous, I also show estimate models omitting these fixed effects. However, it is useful to investigate whether there are within degree program changes in retention rates.

Following the approach of Gordon and Knight (2008), I include consolidated institution fixed effects (α_i) to control for unobservable characteristics of institutions that are constant over 2007-2015. I cannot include fixed effects at the level of pre-merged campuses/institutions because after consolidation, the institution of enrollment is reported only as one of the new combined institutions. I include a rich set of student-level covariates (X_s): student demographics (race indicators, gender indicator, age at matriculation), test scores and high school GPA, and receipt of financial aid indicators to increase precision and account for any shifts in characteristics of matriculation cohorts over time.[10] I cluster standard errors at the consolidated institution level which results in 30 clusters.[11] The key parameter of interest, γ, is the effect of matriculating at a post-consolidation institution on retention or graduation.

4 Student Retention and Graduation Results

Before reviewing the regression results, I present descriptive plots showing trends in one-year retention rates at consolidated and non-consolidated institutions. The top panel of Figure 1 plots the share of students from fall matriculation cohorts still enrolled three semesters

[9] Classification of Instructional Program (CIP) codes are 6 digit codes developed by the National Center for Education Statistics that designate a student's degree of study.

[10] For this student-level regression, the student covariates X_s are based on the student's first semester of college enrollment. I observe all students in the first semester but only persisting students in later semesters. Making the covariates time dependent (i.e. basing financial aid receipt indicators on whether a student received financial aid semester by semester) would make the control variables outcome-dependent since students persisting have more semesters over which to qualify for aid.

[11] Because the number of clusters for most of the outcomes is quite small, I also provide alternative standard errors in section 4.1 based on a permutation test.

following matriculation (i.e. those that return for their sophomore year). The blue bars correspond to students whose first semester is at an institution that will not consolidate. The orange bars correspond to students whose first semester is at an institution that will consolidate in January 2013. Retention rates tend to be higher at institutions that will not consolidate. The retention rate of students who start at these institutions prior to 2013 is between 82 and 84% compared to between 73 and 75% for students starting at institutions that will consolidate. These plots also suggest that institutions were not targets for consolidation because they "spiraling downwards," though institutions selected for consolidations did have persistently lower retention rates than non-consolidated institutions.

For cohorts matriculating post-consolidation in fall 2013 or later, the gap in retention rates narrows. As shown in the bottom figure, the pre-consolidation gap in retention rates is 7 or 8 percentage points, but post-consolidation this gap narrows to only 5 percentage points. This narrowing is driven by improvements in retention rates at the consolidated institutions.

These plots lump all consolidated institutions into one group, and retention rates vary across consolidated institutions and degree programs, so changes in where students enroll over time or what degree program they choose could be still be driving the patterns. In addition, there could be differential changes in the characteristics of students enrolling in consolidated versus non-consolidated institutions over time. In the extreme, it could be that gains in retention rates are driven by students, who would have graduated regardless, switching to the consolidated schools from non-consolidated schools. To shed light on whether characteristics of matriculants are differentially changing at consolidated institutions, I regress measures of pre-college qualifications (high school GPA, SAT scores) on indicators for matriculating post-consolidation at a consolidated institution, matriculating at a will-be consolidated institution in a pre-consolidation year, matriculation term fixed effects, and institution fixed effects. The omitted category is the fully non-treated cohort immediately prior to consolidation (i.e. the fall 2011 cohort at institutions that will consolidate in January 2013). As shown in Table 2, I find little evidence that consolidated institutions enroll significantly more prepared students

after consolidation. The estimates rule out effects on SAT scores that correspond to a 10 SAT points increase (about 1/10 of a standard deviation). Nevertheless, my preferred persistence regressions will control for a rich set of observable student characteristics to account for even small shifts in the observable pre-college preparation of matriculants.[12]

4.1 Baseline Estimates

Table 3 displays the point estimates and standard errors from estimating equation (1) where the outcome of interest (y_{isct}) is an indicator that equals 1 if the student re-enrolls in a USG institution in the following year (fall semester). Column 1 reveals that students who matriculated after the institutions were consolidated were, on average, 2.3 percentage points more likely to re-enroll in the fall one year after their matriculation than students at comparable non-consolidated institutions. I find no evidence of effects for students who were partially treated due to matriculating one semester before the consolidation. In column 2, I add a rich set of controls for student covariates. In column 3, I switch from matriculation term fixed effects to matriculation term by CIP code fixed effects. The point estimate from column 2 indicates that consolidation increased on-year retention by 1.7 percentage points, and the estimate from column 3 indicates that consolidation increased one-year retention by 1.6 percentage points. Since 21% of students matriculating at consolidated institutions in the pre-consolidation period drop out before sophomore year, the estimates suggest that consolidations reduce dropout by 8%. These retention rate effects are similar in magnitude to effects of increasing financial aid by $1000 but smaller than increases in retention rates from successful college coaching programs. Singell Jr. (2004) estimates that a $1000 increase in grants and subsidized loans increases retention by 1.4 percentage points. Bettinger and Baker (2014) find that the InsideTrack, the most commonly used college coaching program in the U.S., increases one-year retention rates by 5.3 percentage points.[13]

[12] In section 5.1, I assess effects on institution-level spending and enrollments. I do not find a statistically significant change in the total number of full-time-equivalent students enrolled.

[13] These results are not obviously driven by students sorting into easier majors after consolidation. In results available upon request, I have directly tested whether consolidation affects the probability that a student chooses a STEM versus a non-STEM major and find no effect of consolidation.

Figure 2 shows the retention effects from my preferred specification graphically by cohort. The light blue regions of the event study plots show retention effects for partially treated cohorts while the orange regions show retention effects for fully-treated cohorts. There is no pre-trend which provides support for the parallel trends assumption. The plot shows there is no significant treatment effect for the partially treated 2012 cohort. Though consolidation does appear to boost retention rates for the three fully treated cohorts- fall 2013, fall 2014, and fall 2015, only one of the individual cohort effects is statistically significant at the 5% level.

Increases in retention rates indicate that greater numbers of students are on the path to earning a degree. However, it is not clear that these students will continue to persist and graduate. It is possible that the students induced to re-enroll who would have otherwise dropped out simply "delay" their drop-out. If this is the case, increases in retention may not impact graduation rates. To examine whether promising increases in retention rates translate into higher graduation rates, I look at effects on four-year graduation outcome for fall 2013 matriculants in Bachelor's degree programs and three-year graduation and transfer rates for fall 2013, fall 2014, and fall 2015 matriculants in Associate's degree programs. Specifically, I re-estimate equation (1) with indicators for these outcomes as the dependent variable.

The results in Table 4 indicate that consolidation actually decreased three-year graduation rates by 3 percentage points.[14] However, some or all of this decrease appears to be driven by students switching into a Bachelor's degree program rather than graduating with an Associate's.[15] Students transferring to a BA program may be a desirable outcome because Andrews et al. (2014) find that for college students in Texas, students who transfer from a two-year college to a four-year college have completion rates that are about the same as students who start in four-year institutions. In fact, they find that at non-flagship universities, transfers are even more likely to graduate than direct attendees. Because returns to a four-year degree are quite high, there is the potential for significant earnings gains from

[14] Event studies for these outcomes are shown in Figure 3.

[15] If I estimate effects on graduating with an Associate's within three years or transferring to a BA program, there is no significant effect of consolidation. The confidence interval rules out about a 5 percentage point change in either direction.

transferring. Using data from the North Carolina Community College system linked to unemployment insurance wage data, Liu et al. (2014) find that the return to transferring from a community college to a four-year program is positive, though earnings gains are largest for students who complete an Associate's degree before transferring. However, when comparing outcomes for students who complete an Associate's degree versus those who transfer without completing, outcomes are somewhat better for students who complete an Associate's degree rather than those who fail to complete but transfer. Whether these conclusions can be extrapolated to students in Georgia is unclear, but they suggest that the effects shown in Table 4 for students starting in Associate's programs may be offsetting.

The graduation results for students initially pursuing a Bachelor's degree are more clearly promising. The estimates from Table 4 indicate that consolidation increases the percent of students graduating in four-years by 4 percentage points. The magnitude of this effect is comparable to the on-time graduation effect of the most commonly used college coaching program InsideTrack (Bettinger and Baker 2014). Given that only 14% of students who enroll in a Bachelor's program pre-consolidation end up graduating with their degree within four years, this is a meaningful increase of about 29%. Interestingly, the magnitude of the on-time graduation effect (+4 percentage points) is larger than the effect on one-year retention (+1.7 percentage points). It must be that consolidation improves the probability of on-time graduation for students who would not have dropped out after their first year.

Given the recent time period of the consolidations, I am unable to look at effects on five or six year graduation rates. However, even in the unlikely case that these graduation effects represent only a decrease in time-to-degree rather than evidence that more students will eventually graduate, increased on-time graduation is still an economically meaningful outcome. Hayes (2010) estimates that a one-year delay in graduation from a public institution costs students between $45,000 and $144,000 due to additional tuition and fees and foregone earnings.

To test the robustness of the four-year graduation rate result, I perform a permutation placebo test in the spirit of Abadie, Diamond, and Hainmueller (2010). I assign four in-

stitutions of the twenty-five non-affected institutions to be "treated" in 2013. There are $\begin{pmatrix} 25 \\ 4 \end{pmatrix} = \left(\frac{25!}{4!21!}\right) = 12,650$ possible combinations. I then estimate equation 1 with an indicator for graduates within four-years as the dependent variable, using each of these possible placebo combinations. I plot the empirical cumulative density function of the placebo estimates from this procedure in light gray on Figure 4. The orange line shows the actual estimate.

Figure 4 reveals that the actual graduation effect estimates lie in the right tail of the placebo distribution; the actual estimates fall at the 95th percentile. Therefore, according to these alternative standard errors, the actual estimates are significant at the 5% level. This falsification test also shows that it is unlikely that four randomly chosen institutions would have graduation effects as large as those that I detect for the actually consolidated institutions due to idiosyncratic factors.

4.2 Who is more likely to persist?

A natural next step is characterize the students who are most likely to persist due to consolidations. Does consolidation improve retention for students with the weakest pre-college qualifications or those who are most prepared to succeed in college? To investigate this question, I estimate effects by predicted retention quartiles and predicted on-time graduation quartiles. I use the repeated sample (RSS) estimator proposed by Abadie, Chingos, and West (2018) which is asymptotically unbiased for this endogeneous stratification.[16] The results shown in Table 5 indicate that consolidation effects are largest for students in the top quartile of the predicted retention and predicted on-time graduation distributions, though the point estimates are positive for students from all quartiles. These results are, hence, con-

[16] If I were to regress an indicator for persists to the second-year on the student covariates using my full sample of student-level observations and then use the coefficients to predict persistence, the predicted persistence estimates from this procedure would be biased upward for individuals with low predicted outcomes and biased downward for individuals with high predicted outcomes (Abadie et al. 2018). The bias stems from a mechanical correlation between predicted persistence and actual persistence. Instead, I use the repeated sample (RSS) estimator proposed by Abadie, Chingos, and West (2018), which is asymptotically unbiased. This estimator splits the untreated sample into two groups: the prediction group and the estimation group. The prediction group is used to estimate the model of persistence, and the estimation group is used along with the treated group to estimate treatment effects. Ferwerda (2014) provides the Stata ado package that computes the repeated split-sample estimator of Abadie, Chingos, and West (2018).

sistent with effects being driven by students with the strongest pre-college qualifications.[17]

If I estimate retention effects separately for each merger, the impacts are large and statistically significant for three of the five mergers (see Appendix Table A.2). The magnitude of all the estimates is between a 0 percentage point increase and 3 percentage point increase in one-year retention. A formal test of equivalence of all five coefficients rejects with p-value less than 0.01. The evidence suggests that all not all the mergers were similarly effective in increasing retention rates. Interestingly, the two mergers that had no effect on retention rates were those that combined two state colleges (the merger of Middle Georgia College and Macon College and the merger of Waycross College and South Georgia College). The other mergers combined universities with a state college or another university.

5 Unpacking the Effects of College Mergers

The increase in retention and four-year graduation rates for students pursuing Bachelor's degrees raises the question: what can explain these gains? Since the gains are not driven by students initially pursuing Associate's degrees, an increased number of students transferring from Associate's to Bachelor's programs at consolidated institutions cannot be responsible for the gains. In addition, since the effects are detectable even when controlling for matriculation term by CIP code fixed effects, students differentially choosing degree programs with higher retention and graduation rates cannot explain the entire effect. Did the affected institutions increase overall spending to increase retention rates? In the analysis that follows, I assess whether consolidated institutions invested more in instruction, student services, or academic support to increase educational quality.

5.1 Did productivity improve?

To investigate how consolidations affected education costs, I use spending data provided

[17] To complement this endogeneous stratification analysis, Appendix Table A.1 presents results where consolidation retention effects are estimated separately by gender, race, above vs. below median SAT scores, and the type of degree first pursued. The most notable difference in treatment effects is that retention effects are driven by students initially pursuing Bachelor's degrees and certificates rather than Associate's degrees.

by USG's Office of Fiscal Affairs - Accounting & Reporting. These data are aggregate institution-year level spending broken out by function (instruction, public service, research, academic support, student services, plant operations and maintenance, institutional support, or scholarships and fellowships, and total operating expenses). The data correspond to the 2009-2010 through 2014-2015 school year. I combine these spending figures with data on the number of full-time equivalent students as reported in USG's summer, fall, and spring semester enrollment reports to convert total spending amounts into average spending per full-time equivalent (FTE) student per academic term.[18,19] Finally, I convert nominal spending amounts to real amounts using the Higher Education Price Index (Commonwealth Institute 2015).

Again following the approach of Gordon and Knight (2008), the unit of observation is a post-merge institution with variables aggregated up to this level in pre-merger years. In particular, I combine separate institutions that will eventually merge by summing their expenditures.[20] The intuition behind aggregating pre-consolidation spending in this way is that if each institution/campus continues to operate as before (i.e. no personnel changes are made, and spending levels are unchanged at each institution/campus), then there will be no change in the aggregated spending measure before and after consolidation. This data structure also allows me to include fixed effects for ultimately merged institutions to account for level differences in spending across institutions.

My differences-in-differences specifications take the following form:

$$y_{ict} = \beta_1 P_{it} + \beta_2 M_{it} + \gamma_{ct} + \alpha_i + \varepsilon_{ict} \tag{2}$$

where i indexes the institution, c indexes the institution's institutional category (research university, regional university, state university, or state college), and t indexes the academic

[18] The National Center for Education Statistics Integrated Postsecondary Data System (IPEDS) is an alternative source of spending data. However, the spending data I received from the Office of Fiscal Affairs is likely more accurate than that in the IPEDS since external auditors verify USG financial records after information to IPEDS is submitted. Sometimes changes are made which are retroactively updated in the IPEDS.

[19] The semester enrollment documents report FTE equivalent students in each term (summer, fall, spring). I add up FTE enrollment across the three terms and divide total spending by this number. Thus, the resulting figure corresponds to average spending for a full-time equivalent student in one term.

[20] I am unable to investigate spending at the level of once separate institutions because after the merger, spending amounts are reported only at the level of the combined institution.

year. The indicator P_{it} equals one for any school year during which an institution merged partway through the year. For the four January 2013 mergers, P_{it} equals 1 for the 2012-2013 school year, and for the Kennesaw State merger in January 2015, it equals 1 for the 2014-2015 school year. The indicator M_{it} equals 1 for any year in which an institution was merged during the entire school year (i.e. 2013-2014 and 2014-2015 for the four January 2013 mergers). My preferred specification allows for separate trends in educational spending by institution category with institution category by year fixed effects (γ_{tc}), though the results are robust to including only year fixed effects. Institution fixed effects (α_i) control for unobserved factors influencing spending that are constant over the panel for each institution. The dependent variable is the natural log of spending per full-time equivalent student for instruction, academic support, student services, or total spending over an academic term. I look specifically at instruction, academic support, and student services in addition to total operating expenditures because these are the categories most likely to be affected by mergers for the reasons described in the introduction.[21]

A stated goal of the USG mergers was to avoid duplication of academic programs, which could lead to economies of scale in instruction, and to streamline administrative services, which could affect both academic support and student services spending depending on what type of administrative services are optimized (Board of Regents USG 2012). For instance, reducing the number of deans would save on academic support while maintaining fewer admissions offices would save on student services. However, not all merger induced changes would necessarily decrease spending in these two categories. Merger documents point out that achieving efficiencies from several de-centralized locations will present operational challenges, perhaps requiring greater efforts from administrative staff. Moreover, documents mention that the mergers present the opportunity to hire specialized higher education enterprise professionals (Board of Regents USG 2012). While potentially beneficial to students,

[21] Instructional spending includes expenditures for all activities that are part of the institution's instructional programs including credit and non-credit courses, distance learning, and technical instruction. Compensation for instructional staff and faculty, including department chairpersons, are included in this category. Academic support encompasses support services for instruction, research, and public service. It includes expenditures on libraries, computing support, non-instructional administrators, and some course and curriculum development. Student services covers financial aid, administration, admissions, the registrar's office, student activities, athletics programs, counseling, and student health services.

hiring for these positions would increase administrative payroll expenses.

Table 6 displays the $\hat{\beta}$s from equation 2 along with the pre-consolidation mean of the dependent variables. Consolidated institutions within the USG spent $7,654 per FTE student per term, on average, prior to consolidation. About 32% went towards instructional expenses while another 7% and 5% went to academic support and student services, respectively. In general, the consolidation impact results are too noisy to pin down how enrollments or spending per FTE student per term changed with the consolidations. The point estimates for enrollment effects are negative (columns 1-2), but none is statistically significant. Columns 3-4 indicate that there is no statistically significant evidence of a change in instructional expenditures due to consolidation. The point estimate from the indicator for a fully post-merge year in column 4 suggests that spending in this category decreases by 5% relative to comparable non-consolidated institutions in the USG system, but the 95% confidence interval includes effects ranging from -15% to +4%. However, the result for spending on administration and academic support is statistically significant. The point estimate from column 6 suggests that consolidations increased spending in this category by 47% ($e^{0.386}-1 = 0.47$). The effect is, very imprecisely estimated, and the 95% confidence interval cannot rule out effects ranging from +12% to +93%. Columns 7-8 show estimates for student support; the 95% confidence interval is again quite wide (-28% to -7%) but does exclude an effect of zero. The point estimate indicates that spending in this category decreases by 18% ($e^{-0.199} - 1 = -0.18$). The last two columns show estimated impacts on total operating expenditures which includes categories not included in the previous columns such as building operation and maintenance expenses, public service, and research. The 95% confidence interval includes zero and ranges from -5% to +11%. Figure 5 documents that the effects are not driven by a pre-trend.

Though my estimates are imprecise, they are consistent with what USG planned for merger savings - to keep overall spending unchanged by taking advantage of economies of scale in some areas to increase spending in others. The results are suggestive that USG saved on student services in order to invest more in academic support. This increased spending on

academic support is a potential source of the persistence gains. Deming and Walters (2017) show that when state budget shocks lead to large decreases in core academic spending, academic support is particularly responsive, and student persistence suffers. USG appears to have used consolidations to boost academic support spending and consequently, student persistence. These more recent findings are somewhat at odds with Webber and Ehrenberg (2010) who use panel data models and estimate that student services spending has a larger effect on graduation rates than academic support spending.

To better understand what institution-level changes may have driven these gains in student attainment, I also spoke with several USG administrators closely involved in consolidation implementation. Two key themes emerged from these discussions. First, administrators highlighted the disruptive effect of the mergers. Whereas changing institution-level policies usually takes several years and requires extensive discussion with faculty on several committees, consolidation allowed these campuses to reorganize and revamp policies quickly. Consolidation may have made it possible to implement more dramatic advising and instructional changes that would have been impossible without consolidations. Second, consolidations allowed campuses to eliminate duplicate student services and academic affairs positions. These cost savings were used to hire additional advisors and academic affairs professionals. For example, Augusta University hired 6 new full-time advisors and appointed a professional director of academic advising. Similarly, Kennesaw State University added eight new professional staff academic advisor positions to increase their number of advisors to 53.[22] In fact, new advising systems were implemented at all the consolidated institutions. Though several non-consolidated institutions also reformed advising over this period, consolidated institutions were able to implement new systems quickly and with an increased number of employees.

5.2 Did mergers increase prices for students?

Quality improvements will not necessarily improve student welfare if they are accompanied by

[22]Complete College Georgia, Kennesaw State University, Campus Plan Updates 2016. http://www.completegeorgia.org/sites/default/files/Campus_Plans/2016/Kennesaw_State_University_2016_Update.pdf

price increases. Price increases are of particular concern since mergers consolidate market power. To test whether USG institutions take advantage of market power by increasing tuition prices, I first look at sticker prices using the following regression:

$$y_{scd\tau} = \phi M_{i\tau} + \delta_{cd\tau} + \varepsilon_{icd\tau} \tag{3}$$

where s denotes an institution, c denotes its institutional category, d denotes the duration of the degree program (2-year or 4-year), and τ denotes the academic term. The dependent variable $y_{icd\tau}$ is the natural log of the per-credit tuition price.[23] $M_{i\tau}$ equals 1 in all post-merge terms for institution i. I estimate the model separately for in-state and out-of-state students.[24] In the event study specification, I replace $M_{i\tau}$ with leads and lags.

The event studies for in-state and out-of-state students in Figure 6 indicate that the USG does not take advantage of increased market power by raising tuition prices at consolidated institutions. There is no obvious pre-trend in tuition rates, and the point estimates from the pre/post specification are quite close to zero. The 95% confidence intervals are not able to rule out modest increases in sticker prices (as large as 7.8% for in-state students and 5.6% for out-of-state students).

Though increasing sticker prices is one way to increase prices, another is to adjust financial aid awards. USG data do not record exact prices students paid by semester. However, I can use financial aid data to investigate whether students are less likely to receive institutional grants after consolidations. It is unlikely institutional aid will function as a significant margin of adjustment since only 3.1% of in-state students and 8.3% of out-of-state students receive institutional grant aid at the affected institutions prior to consolidation. Neverthe-

[23] If the institutions that will consolidate have different per credit tuition rates in a pre-consolidation term for a given degree-level (two-year or four-year), I use a student enrollment weighted average to construct a per-credit tuition rate at the institution-degree level. Three institutions have only a flat tuition rate for students towards the end of the analysis period (Georgia Institute of Technology, University of Georgia, and Georgia College and State University). I omit these institution-term observations from the analysis in the results presented. However, the results are also robust to dividing the flat rate by 15 credits to obtain a per-credit rate that corresponds to a full-time student and using this per-credit rate in the analysis. I also drop Middle Georgia State College in fall 2016 and later since in July 2015, the Board of Regents elevated Middle State Georgia to a state university and thus its institutional category is not constant over time.

[24] I drop any observations corresponding to an academic term and degree level for which there are no enrolled students. For example, there are no in-state students in a 4-year degree program at Abraham Baldwin Agricultural College in fall 2008, so there is no per-credit rate for 4-year degree students at Abraham Baldwin in fall 2008 included in the in-state regression. Because there are some programs enrolling only in-state students, the sample sizes differ between the in-state and out-of-state regressions.

less, I re-estimate equation 3 using student-term level financial aid data collapsed to the institutional-degree level where the dependent variable is the fraction of students receiving any institutional aid. As shown in Figure 7, I find that consolidated institutions do not experience any statistically significant changes in the fraction of students receiving institutional aid. The point estimates are actually positive, and the 95% confidence intervals rules out decreases in the percent receiving institutional aid greater than 2.4 percentage points for in-state students and 5.5 percentage points for out of state students.[25]

6 Conclusion

This paper informs the debate surrounding public higher education consolidations by examining five recent mergers with the University System of Georgia. These mergers affect over 10,000 first-time undergraduate students per year who matriculate at the consolidated campuses. The short-term impacts are promising. The differences-in-differences estimates indicate that consolidation increases one-year retention rates by 1.7 percentage points and four-year graduation rates for Bachelor's degree seeking students by 4 percentage points. Students pursuing Associate's degrees are less likely to graduate within three years but more likely to transfer to a four-year program. The gains for Bachelor's students do not come at the cost of statistically significant increases in total spending. Meanwhile, there is no robust evidence that consolidations cause institutions to raise prices for students, though the estimation is too noisy to rule out modest price increases or decreases. Taken as a whole, the evidence suggests that consolidations were quality improving and benefited students.

How did USG achieve these gains in student attainment? Though the mechanisms analysis is only broadly suggestive, the most likely driver is increased spending on academic support made possible by cuts in student services spending. My data lack sufficient detail to identify exactly what components of academic support spending increased, but USG administrators at consolidated institutions report hiring new advising personnel. USG administrators also

[25] In results not shown here, I have also looked at whether the amount of institutional aid for the group receiving aid changes with consolidation. The point estimates are positive, but the confidence intervals are too wide for meaningful inference.

mention the disruptive role of mergers in making it possible to change institutional policies. Better understanding the sources of productivity gains is critical as other governing boards consider whether consolidations could be similarly successful in their public college systems. Nevertheless, the USG experience suggests that consolidations are a promising policy option that merits further consideration.

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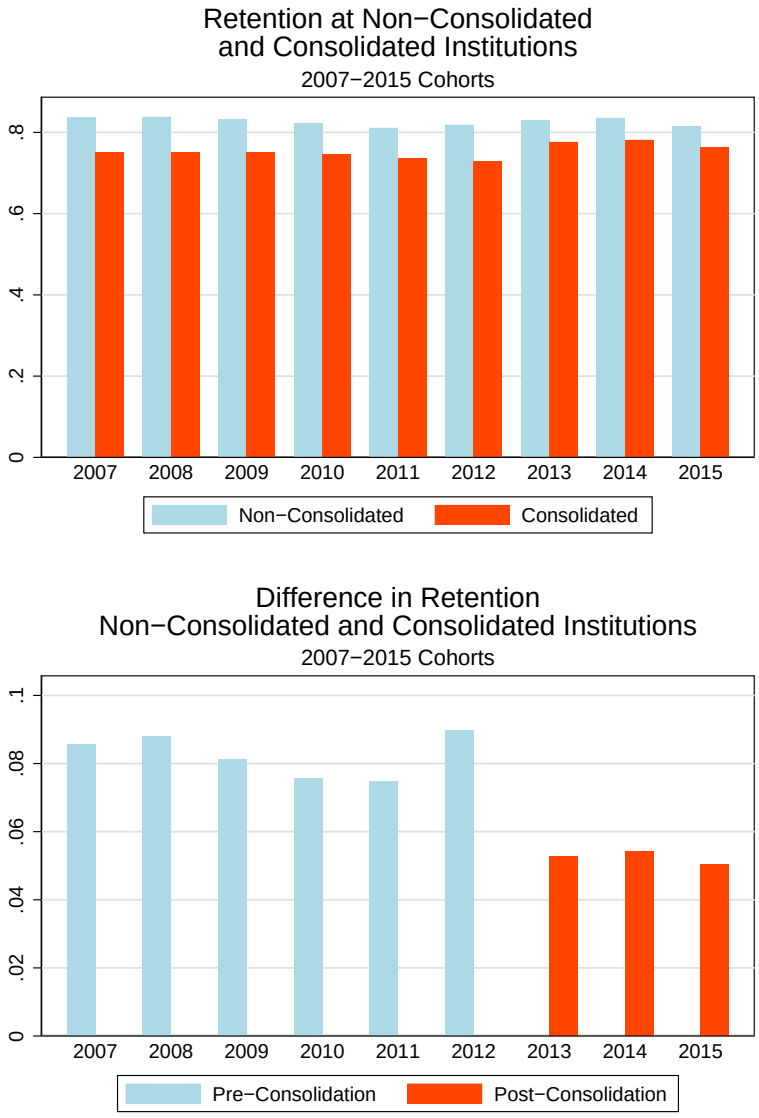
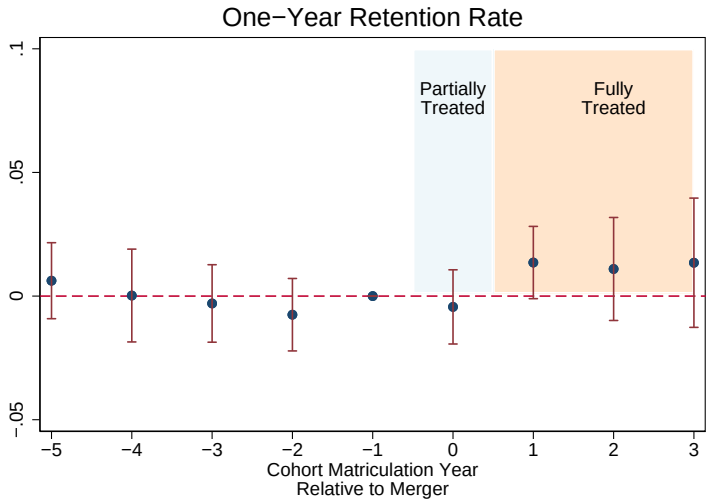
Figure 1: Student Retention Rates by Cohort



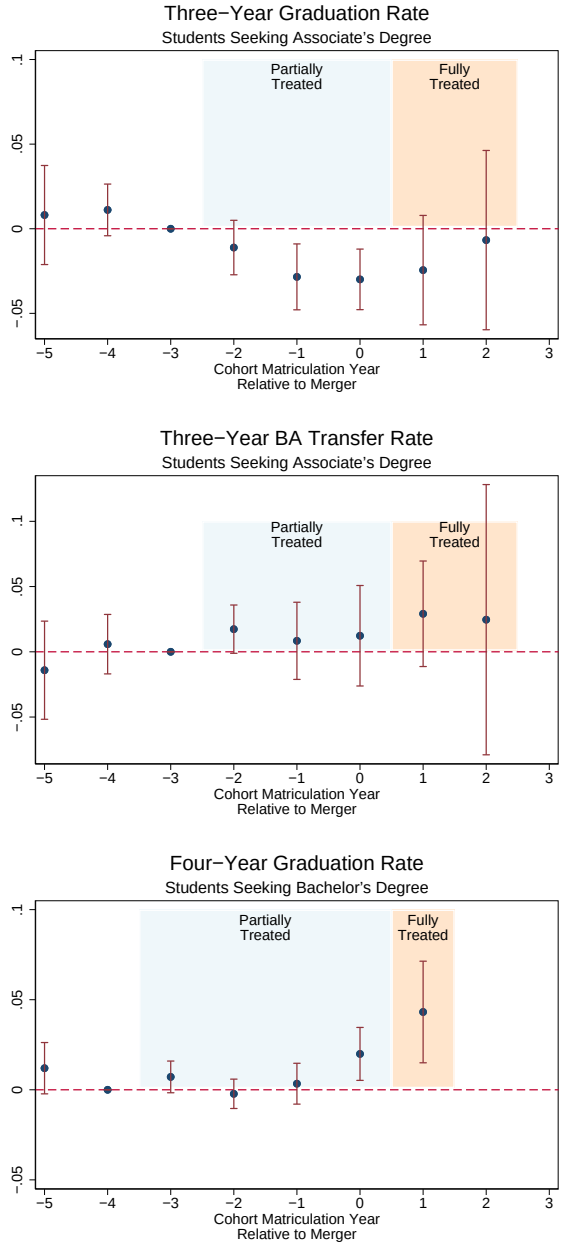
Sources: USG Student Information Administrative Data Files
Notes: The top bar chart plots the one-year retention rate for students at consolidated and non-consolidated institutions for cohorts of students matriculating in fall 2007 to fall 2015. The bottom bar chart shows the difference in one-year retention rates for cohorts at the consolidated institutions and those at the non-consolidated institutions before and after consolidations. I drop data corresponding to students who matriculate at Kennesaw State University, South Polytechnic State University, Georgia State University, and Perimeter College because these institutions will consolidate by August 2016 but were not part of the initial January 2013 consolidations.

Figure 2: Event Study for Effects of Consolidations on Retention



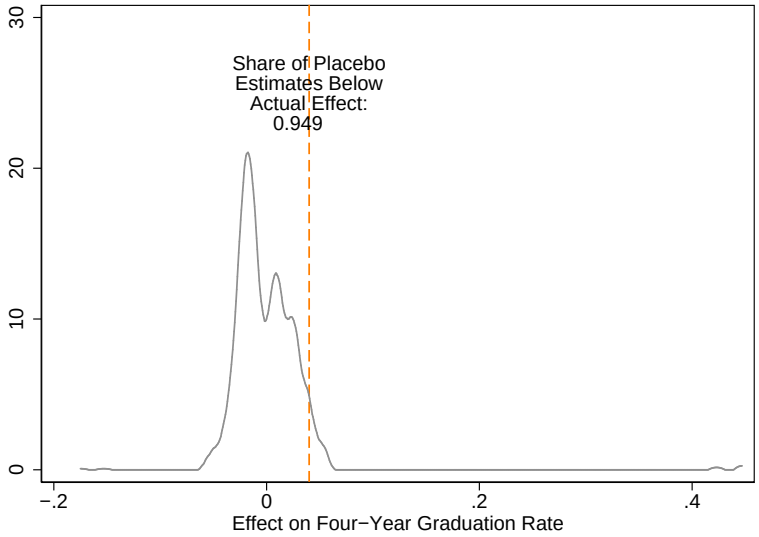
Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files
Notes: The above figure plots coefficients and 95% confidence intervals from a regression where the post-merge indicator in equation (1) is replaced with cohort indicators. The light blue shaded region corresponds to cohorts that were partially treated, and the orange region corresponds to cohorts that were fully treated. The omitted cohort is the first fully non-treated cohort for each outcome. Standard errors are clustered at the consolidated institution level. Student covariates are based on the student's first semester of enrollment and consist of gender and race indicators, age at matriculation, SAT math and verbal scores, high school GPA, indicator for Georgia residence, indicator for filling out the FAFSA, indicators for received Hope Scholarship, Hope Grant, Zell Scholarship, an athletic scholarship, any federal or state loans, any institutional loans, any external loans, work study, institution grants, federal or state grants, and any external grants.

Figure 3: Event Study for Effects of Consolidations on Transfer and Graduation



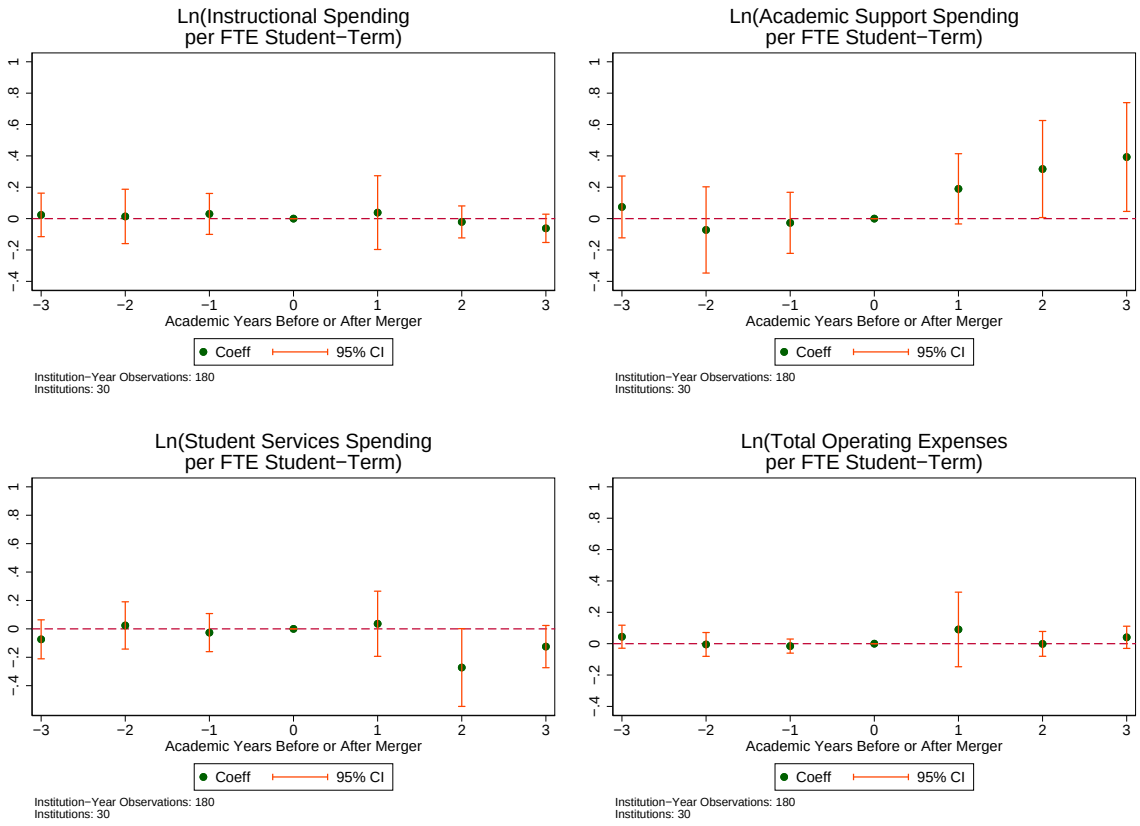
Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files
Notes: The above figure plots coefficients and 95% confidence intervals from a regression where the post-merge indicator in equation (1) is replaced with cohort indicators. The light blue shaded region corresponds to cohorts that were partially treated, and the orange region corresponds to cohorts that were fully treated. The omitted cohort is the first fully non-treated cohort for each outcome. Standard errors are clustered at the consolidated institution level. Student covariates are based on the student's first semester of enrollment and consist of gender and race indicators, age at matriculation, SAT math and verbal scores, high school GPA, indicator for Georgia residence, indicator for filling out the FAFSA, indicators for received Hope Scholarship, Hope Grant, Zell Scholarship, an athletic scholarship, any federal or state loans, any institutional loans, any external loans, work study, institution grants, federal or state grants, and any external grants.

Figure 4: Placebo Permutation Test



Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files
Notes: I assign four institutions out of the 25 non-affected institutions to be "treated" and estimate the four-year graduation rate regression (equation 1). I repeat this process for all $\begin{pmatrix} 25 \\ 4 \end{pmatrix} = \frac{25!}{4!21!} = 12,650$ combinations. Then I plot the the density function for these estimates in gray. The orange dotted line shows where the actual estimate from Table 4 falls in the placebo distribution. I report the share of the 12,650 placebo estimates that fell below the actual estimated treatment effect.

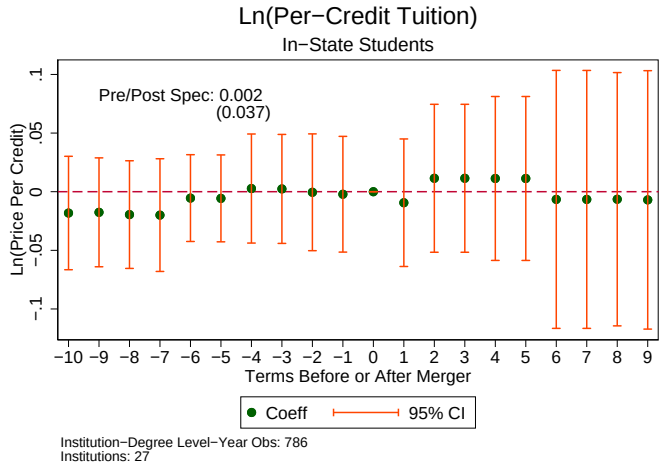
Figure 5: Event Studies for Institutional Spending

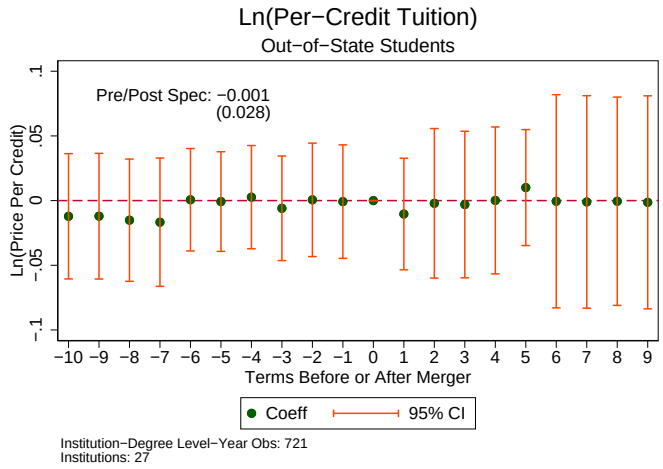


Sources: USG's Office of Fiscal Affairs- Accounting & Reporting: Spending by Function Report; USG Semester Enrollment Reports

Notes: These event studies plot the coefficients and 95% confidence intervals for lead and lag indicators in a log spending regression that includes consolidated institution fixed effects and year by institution category fixed effects. The omitted category is one year before the academic year in which the institution was merged. The first year after the merger is the year in which the institutions merged partway through the academic year. All spending amounts are Higher Education Price Index (HEPI) adjusted. Standard errors are clustered at the consolidated institution level.

Figure 6: Event Studies for Tuition Sticker Prices

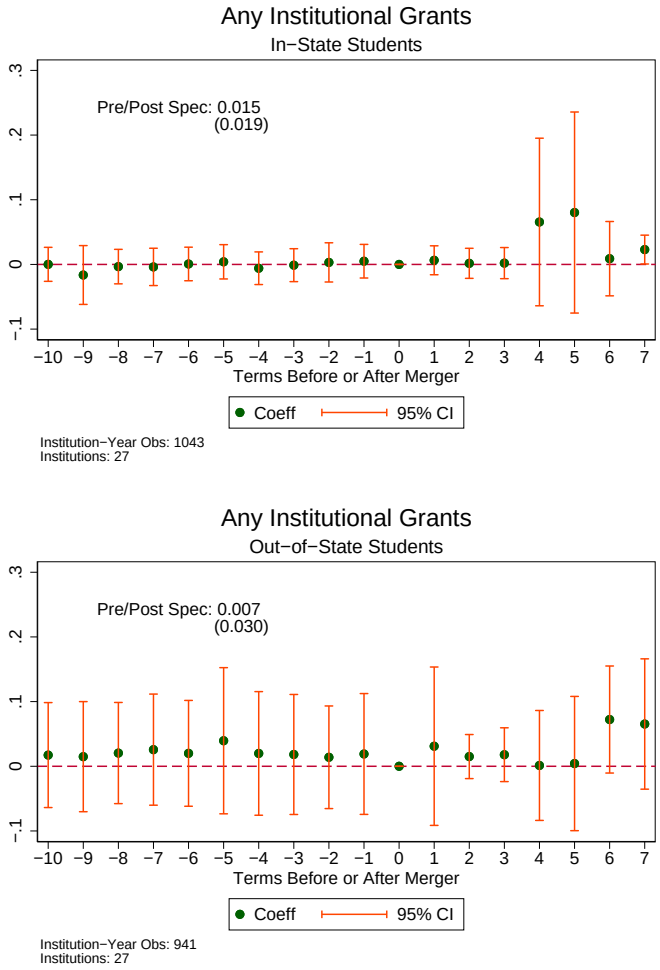




Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files; USG Archived Undergraduate Tuition and Fees Tables

Notes: These event studies plot the coefficients and 95% confidence intervals for lead and lag indicators in an institution-degree level regression of the natural log of the per-credit tuition price on an indicator for post-consolidation, consolidated institution fixed effects, and academic term by institution category fixed effects. The omitted category is the term before the institution was merged. Standard errors are clustered at the consolidated institution level. All amounts are consumer price index (CPI) adjusted. I drop Middle Georgia State College in fall 2016 and later since in July 2015, the Board of Regents elevated Middle State Georgia to a state university and thus its institutional category is not constant over time. Three institutions have only a flat tuition rate for students towards the end of the analysis period (Georgia Institute of Technology, University of Georgia, and Georgia College and State University). I also omit these institution-term observations.

Figure 7: Event Studies for Institutional Grants



Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files; USG Archived Undergraduate Tuition and Fees Tables

Notes: These event studies plot the coefficients and 95% confidence intervals for lead and lag indicators in a institution-degree level regression as described in the text. The omitted category is the term before the institution was merged. Standard errors are clustered at the consolidated institution level. I drop Middle Georgia State College in fall 2016 and later since in July 2015, the Board of Regents elevated Middle State Georgia to a state university and thus its institutional category is not constant over time.

Table 1: Characteristics of First-Time Undergraduates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Non-Consolidated			Consolidated			P-value
	Mean	Std Dev	Obs	Mean	Std Dev	Obs	
Male	0.44		311,893	0.47		87,228	[0.315]
Age at Matriculation	18.8	3.8	311,893	18.7	3.1	87,228	[0.672]
Race: Black	0.33		311,893	0.20		87,228	[0.136]
Race: Hispanic	0.07		311,893	0.07		87,228	[0.921]
Race: Asian	0.07		311,893	0.03		87,228	[0.083]
Race: White	0.50		311,893	0.67		87,228	[0.030]
Ever Fed/State Grant Recipient	0.54		311,893	0.51		87,228	[0.660]
Ever HOPE Scholarship Recipient	0.47		311,893	0.55		87,228	[0.347]
High School GPA	3.13	0.58	298,355	3.07	0.51	82,092	[0.662]
SAT Math	526	109	213,592	506	83	60,690	[0.498]
SAT Verbal	523	100	213,591	507	82	60,688	[0.541]
			Joint	F-Stat	0.902	P-Value	[0.550]

Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files
Notes: The sample consists of first-time undergraduate students matriculating between fall 2007 and fall 2015, excluding students who were ever jointly enrolled in multiple institutions or jointly enrolled in high school and college. Standard errors are clustered at the consolidated institution level to generate p-values for significant differences. There are fewer observations for the last three covariates because these covariates are missing for some students.

Table 2: Effect of Consolidations on Characteristics of Matriculants

	(1)	(2)	(3)	(4)	(5)	(6)
	High School GPA		SAT Math		SAT Verbal	
Overall USG Mean	3.216	3.216	521.6	521.6	519.2	519.2
Overall USG Std. Deviation	0.536	0.536	104.2	104.2	96.9	96.9
Fully Treated Cohorts						
Matriculated Post-Consolidation	0.029	0.006	5.4*	3.5	5.9*	3.9
	(0.021)	(0.023)	(3.1)	(4.0)	(3.4)	(4.5)
Pre-Consolidation Matriculants						
Matriculated 1 Semester Before						
Matriculated 3 Semesters Before	0.000	0.001	0.1	0.5	0.4	1.6
	(0.008)	(0.008)	(1.9)	(1.4)	(1.5)	(1.2)
Matriculated 5 Semesters Before	0.007	0.004	4.1*	4.0***	3.7*	4.3***
	(0.015)	(0.013)	(2.3)	(1.3)	(1.8)	(1.3)
Matriculated 7 Semesters Before	0.004	-0.001	0.5	0.4	0.5	-0.5
	(0.016)	(0.015)	(2.3)	(1.7)	(2.9)	(2.3)
Matriculated 9 Semesters Before	0.008	0.004	2.2	1.6	3.3	2.0
	(0.022)	(0.026)	(4.0)	(3.3)	(4.4)	(3.8)
Matriculated 11 Semesters Before	0.011	0.004	2.7	1.2	2.8	1.7
	(0.021)	(0.024)	(4.6)	(3.6)	(5.2)	(4.6)
Matriculated 13 Semesters Before	0.036**	0.018	-1.8	-3.1	-0.5	-2.7
	(0.016)	(0.019)	(4.5)	(3.6)	(5.5)	(4.2)
Matriculated 15 Semesters Before	0.035*	0.014	-5.1	-6.9**	-2.3	-4.5
	(0.019)	(0.018)	(5.4)	(4.0)	(6.0)	(5.4)
Matriculated 17 Semesters Before	0.015	-0.007	-1.8	-5.6	-0.1	-2.7
	(0.021)	(0.024)	(6.6)	(5.7)	(7.3)	(7.0)
Matriculation Term FE	Yes	No	Yes	No	Yes	No
Matriculation Term x CIP Code FE	No	Yes	No	Yes	No	Yes
Student Observations	270,850	270,850	270,850	270,850	270,850	270,850
Clusters	30	30	30	30	30	30

Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files
Notes: The omitted group is the group of students who matriculated in fall 2012 (i.e. the semester immediately prior to consolidations). Standard errors are clustered at the consolidated institution level. All specifications include consolidated institution fixed effects.
* p<0.10, **p<0.05, *** p<0.01.

Table 3: Cohort Diff-in-Diff Estimates: Effect of Consolidation on One-Year Retention

	(1)	(2)	(3)
Pre-Consolidation Mean	0.788	0.788	0.788
Matriculated Post-Consolidation	0.023**	0.017***	0.016***
	(0.009)	(0.006)	(0.006)
Partially Exposed to	-0.003	0.002	0.005
Consolidation	(0.007)	(0.006)	(0.006)
Matriculation Term FE	Yes	Yes	No
Mat. Term x CIP Code FE	No	No	Yes
Student Covariates	No	Yes	Yes
Student Observations	270,850	270,850	270,850
Clusters	30	30	30

Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files
Notes: Each column corresponds to a separate regression. Each regression includes consolidated institution fixed effects in addition to the time fixed effects listed for that column. Standard errors are clustered at the consolidated institution level. Student covariates are based on the student's first semester of enrollment and consist of gender and race indicators, age at matriculation, SAT math and verbal scores, high school GPA, indicator for Georgia residence, indicator for filling out the FAFSA, indicators for received Hope Scholarship, Hope Grant, Zell Scholarship, any federal or state loans, any external loans, work study, federal or state grants, and any external grants.
* $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 4: Cohort Diff-in-Diff Estimates: Effect of Consolidation on Graduation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Graduates within Three Years (Associate's)			Transfers to Four-Year Program Within Three Years (Associate's)			Graduates within Four Years (Bachelor's)		
Pre-Consolidation Mean	0.100	0.100	0.100	0.115	0.115	0.115	0.139	0.139	0.139
Matriculated Post-Consolidation	-0.031*	-0.028*	-0.031*	0.015	0.018	0.024	0.041**	0.038*	0.039***
	(0.015)	(0.015)	(0.016)	(0.028)	(0.026)	(0.034)	(0.017)	(0.018)	(0.014)
Partially Exposed to Consolidation	-0.024***	-0.025***	-0.029***	0.003	0.003	0.002	-0.003	0.008	0.003
	(0.006)	(0.006)	(0.005)	(0.014)	(0.014)	(0.015)	(0.011)	(0.013)	(0.010)
Matriculation Term FE	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Matriculation Term x CIP Code FE	No	No	Yes	No	No	Yes	No	No	Yes
Student Covariates	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Student Observations	59,865	59,865	59,865	59,865	59,865	59,865	159,195	159,195	159,195
Clusters	21	21	21	21	21	21	24	24	24

Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files

Notes: Each column corresponds to a separate regression. Each regression includes consolidated institution fixed effects in addition to the time fixed effects listed for that column. Standard errors are clustered at the consolidated institution level. Student covariates are based on the student's first semester of enrollment and consist of gender and race indicators, age at matriculation, SAT math and verbal scores, high school GPA, indicator for Georgia residence, indicator for filling out the FAFSA, indicators for received Hope Scholarship, Hope Grant, Zell Scholarship, any federal or state loans, any external loans, work study, federal or state grants, and any external grants. The number of clusters is not constant across the columns because not all institutions offer both Associate's and Bachelor's degrees.

* $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 5: Endogenous Stratification Repeated Split-Sample Estimates

	(1) Persists to Second Year	(2) Graduates in 4 Years
Post-Consolidation x Bin 1	0.018**	0.008
	(0.009)	(0.015)
Post-Consolidation x Bin 2	0.006	0.014
	(0.009)	(0.022)
Post-Consolidation x Bin 3	0.011	0.038
	(0.008)	(0.030)
Post-Consolidation x Bin 4	0.043***	0.080***
	(0.007)	(0.025)
Student Observations	399,121	261,589

Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files
Notes: Estimates are computed using the repeated-split-sample estimator of Abadie, Chingos, and West (2018) with 100 repeated split sample repetitions and 100 bootstrap repetitions for the standard errors. The covariates used to predict persistence are based on the student's first semester of enrollment and consist of gender and race indicators, age at matriculation, SAT math and verbal scores, high school GPA, and an indicator for Georgia residence. Specifications also include consolidated institution fixed effects and matriculation term by institutional category fixed effects.
* $p<0.10$, **$p<0.05$, *** $p<0.01$.

Table 6: University Spending per FTE Student Before/After Consolidation of USG Institutions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ln(FTE-Terms)		ln(Instruction)		ln(Acad Support)		ln(Student Services)		ln(Total)	
Pre-Consolidation Mean	10.076	10.076	7.794	7.794	6.271	6.271	5.981	5.981	8.943	8.943
Merged Part of Year	-0.026	-0.050	0.064	0.078	-0.210	-0.172	0.204	0.232	0.046	0.068
	(0.147)	(0.143)	(0.108)	(0.133)	(0.233)	(0.211)	(0.130)	(0.145)	(0.119)	(0.134)
Merged Entire Year	-0.069	-0.103	-0.062	-0.055	0.387***	0.386***	-0.209***	-0.199***	0.022	0.026
	(0.088)	(0.070)	(0.046)	(0.047)	(0.127)	(0.133)	(0.053)	(0.064)	(0.035)	(0.039)
Year FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Year x Inst. Category FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	180	180	180	180	180	180	180	180	180	180
Number Institutions	30	30	30	30	30	30	30	30	30	30

Sources: Spending by function for fiscal years 2010-2015 was provided by USG's Office of Fiscal Affairs- Accounting & Reporting. FTE Enrollments come from USG Semester Enrollment Reports.

Notes: All spending amounts are Higher Education Price Index adjusted. Each column is a separate regression of the natural log of spending per FTE student per academic term on an indicator for a partially treated year and fully treated year, consolidated institution fixed effects, and the indicated academic year fixed effects. Standard errors are clustered at the consolidated institution level. The pre-consolidation mean is the mean in natural log points among the institutions that will consolidate over the years prior to consolidation (fiscal years 2010-2012).

* $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Appendix Tables

Table A.1: Retention Effect Heterogeneity

	(1)	(2)	(3)	(5)
	Mean	One-Year Retention		
Panel A: Gender				
Matriculated Post-Consolidation x Female	0.808	0.043***	0.017***	0.013**
		(0.007)	(0.006)	(0.006)
Matriculated Post-Consolidation x Male	0.767	0.000	0.019**	0.019**
		(0.010)	(0.008)	(0.007)
Panel B: Race				
Matriculated Post-Consolidation x White	0.799	0.029***	0.012*	0.010
		(0.008)	(0.006)	(0.006)
Matriculated Post-Consolidation x Black	0.744	-0.004	0.009	0.007
		(0.028)	(0.020)	(0.018)
Matriculated Post-Consolidation x Hispanic	0.795	0.031**	0.037**	0.037**
		(0.015)	(0.014)	(0.014)
Matriculated Post-Consolidation x Asian	0.853	0.127***	0.078***	0.074***
		(0.021)	(0.023)	(0.023)
Matriculated Post-Consolidation x Other	0.811	-0.017	0.013	0.012
		(0.026)	(0.021)	(0.019)
Panel C: SAT Scores				
Matriculated Post-Consolidation x Above Median SAT	0.831	0.057***	0.020***	0.018***
		(0.017)	(0.007)	(0.006)
Matriculated Post-Consolidation x Below Median SAT	0.748	-0.004	0.016**	0.015**
		(0.011)	(0.007)	(0.007)
Panel D: Degree Pursued				
Matriculated Post-Consolidation x Certificate	0.664	0.128*	0.153***	
		(0.064)	(0.041)	
Matriculated Post-Consolidation x Associate's	0.725	-0.006	0.009	
		(0.010)	(0.011)	
Matriculated Post-Consolidation x Bachelor's	0.823	0.037**	0.021***	
		(0.015)	(0.007)	
Matriculation Term FE		Yes	No	No
Matriculation Term x CIP Code FE		No	No	Yes
Student Covariates		No	Yes	Yes
Student Observations		270,850	270,850	270,850
Clusters		30	30	30

Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files
Notes: The mean is the pre-consolidation mean. Standard errors are clustered at the consolidated institution level. Student covariates are based on the student's first semester of enrollment and consist of gender and race indicators, age at matriculation, SAT math and verbal scores, high school GPA, indicator for Georgia residence, indicator for filling out the FAFSA, indicators for received Hope Scholarship, Hope Grant, Zell Scholarship, any federal or state loans, any external loans, work study, federal or state grants, and any external grants. All specifications include consolidated institution fixed effects.
* p<0.10, **p<0.05, *** p<0.01.

Table A.2: One-Year Retention Effects Separately by Institution

	(1)	(2)	(3)	(4)
Fully Treated Cohorts				
Post-Consolidation x Middle Georgia	0.712	0.012**	0.001	0.000
		(0.005)	(0.005)	(0.007)
Post-Consolidation x South Georgia	0.731	0.001	0.000	-0.007
		(0.005)	(0.004)	(0.007)
Post-Consolidation x Univ. North Georgia	0.769	0.026***	0.024***	0.019***
		(0.005)	(0.005)	(0.006)
Post-Consolidation x Georgia Regents	0.741	0.072***	0.037***	0.028***
		(0.005)	(0.005)	(0.004)
Post-Consolidation x Kennesaw State	0.838	0.008	0.011**	0.014**
		(0.005)	(0.005)	(0.006)
Matriculation Term FE		Yes	Yes	No
Matriculation Term x CIP Code FE		No	No	Yes
Student Covariates		No	Yes	Yes
Student Observations		270,850	270,850	270,850
Clusters		30	30	30

Sources: USG Student Information, HOPE, Financial Aid, and FAFSA Administrative Data Files
Notes: The dependent variable is an indicator for persists to the fourth semester. Column 1 displays the pre-consolidation mean. Standard errors are clustered at the consolidated institution level. The regression table omits the coefficients for the partially treated cohorts by matriculating institution interactions. Student covariates are based on the student's first semester of enrollment and consist of gender and race indicators, age at matriculation, SAT math and verbal scores, high school GPA, indicator for Georgia residence, indicator for filling out the FAFSA, indicators for received Hope Scholarship, Hope Grant, Zell Scholarship, any federal or state loans, any external loans, work study, federal or state grants, and any external grants. All specifications include consolidated institution fixed effects.
* p<0.10, **p<0.05, *** p<0.01.