# Aiding or Dissuading? The Effects of Exhausting Eligibility for Need-based Aid on Bachelor's Degree Attainment and Time to Completion

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ABSTRACT

Little is known about the effects of need-based financial aid disbursed late into college and how students respond when aid is lost. I exploit changes to federal Pell Grant eligibility rules that reduced the lifetime availability for grant aid from 9 to 6 full-time-equivalent years to examine these questions. Using data from the University System of Georgia and a matched difference-in-differences research design, I compare student outcomes before versus after the rule change for Pell recipients affected and unaffected by the new policy. Risk of aid exhaustion due to the policy change led students to increase their academic effort, as measured by term-over-term re-enrollment and term credits attempted and earned. It also accelerated time to completion but had no effect on degree attainment overall. These findings indicate that aid disbursement policies and lifetime aid limits can impact the cost-effectiveness of aid expenditures and the efficiency of college degree production.

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## 1. INTRODUCTION

For decades financial aid has been a widely utilized strategy to support access to higher education and postsecondary attainment. In the fifty years since the passage of the federal Higher Education Act of 1965, average aid per student has more than tripled in real dollars, from $3,800 (in 2017 dollars) to $14,500, largely due to the expansion of federal aid programs (Baum, Elliott, & Ma, 2014; Dynarski & Scott-Clayton, 2013). Despite this growth in spending, more than 60 percent of degree-seeking students who enter community college do not earn an associate's or bachelor's degree within six years of first enrolling, and nearly 40 percent of students who begin at four-year institutions do not graduate within six years.[1] The size of public aid expenditures, magnitude of dropout, and protracted time to graduation have motivated questions about whether financial aid is effectively helping students progress to graduation.

While prior studies find that generous and simple aid programs can increase college access and completion (Angrist, Autor, Hudson, & Pallais, 2016; Castleman & Long, 2016; Denning, Marx, & Turner, 2017; Dynarski, 2003; Goldrick-Rab, Kelchen, Harris, & Benson, 2016), little is known about how aid loss affects whether students graduate and how quickly they do so. Even less is known about whether lifetime eligibility limits alter the impact of aid on student persistence and completion. Understanding this is policy-relevant because millions of college students lose financial aid each year (Schudde & Scott-Clayton, 2016; Suggs, 2016), in part because the federal government and many states impose lifetime limits on the availability of aid receipt.[2]

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[1]Author's calculations using the U.S. Department of Education's National Center for Education Statistics 2004/2009 Beginning Postsecondary Students Survey.

[2] In addition to lifetime eligibility limits on federal Pell Grants, states including California, Florida, and New York cap the duration of state need-based aid that students are eligible to receive. For example, in California and New York, students are eligible to receive the Cal Grant and the New York Tuition Assistance Program, respectively, for up to four full-time-equivalent years.

Evidence on whether aid loss affects degree attainment is currently limited and inconclusive. Carruthers & Özek (2016) find that losing merit-based aid had no effect on degree completion at public colleges in Tennessee, while Schudde & Scott-Clayton (2016) find evidence that failure to meet academic renewal requirements for the need-based federal Pell Grant led some community college students to dropout sooner, but also may have increased the probability of transfer and completion for students who persisted. Both of these studies have also only examined the effects of aid loss early in college due to poor academic performance, which may not generalize to contexts in which aid is taken away later for non-academic reasons.

One challenge to studying the effects of aid exhaustion is that student enrollment decisions are endogenous and affect who is impacted by lifetime eligibility limits. Straightforward comparisons of students who do and do not exhaust aid can therefore lead to biased estimates of policy effects and may be one reason why previous research has not estimated the causal effects of aid exhaustion on long-term student outcomes. I shed light on this question by exploiting a plausibly exogenous reduction to the lifetime limit for Pell Grant eligibility and by accounting for selection into the group of students affected by the new lifetime Pell Grant limit. Specifically, using a matched difference-in-differences (DD) design, I examine recent changes to federal Pell Grant eligibility rules that reduced the lifetime cap on aid from 9 to 6 full-time-equivalent (FTE) years beginning in the 2012-13 school year. The new lifetime limit immediately and unexpectedly eliminated a subset of continuing students from receiving need-based aid and reduced award amounts for others. I estimate effects on the probability of term-over-term re-enrollment, bachelor's degree attainment, and time to completion for students at risk of exhausting their Pell Grant aid due to the policy change.

The key identifying assumption of my research design is the parallel trends assumption: in the absence of the new lifetime limit, the enrollment and completion trends for treated and

comparison students would have evolved similarly over time. I combine the DD research design with a matching procedure to address the fact that the parallel trends assumption is violated in the full sample. The matching procedure addresses this issue by identifying treated and comparison students who followed similar enrollment trajectories in their first four years of college. As a result, matching allows me to infer that average differences in outcomes between affected and unaffected students exposed versus not exposed to the policy change capture unbiased causal estimates of reducing the lifetime Pell limit from 9 to 6 FTE years.

To preview my results, I find that treated students on average lost one-half of their grant aid per term after the new lifetime limit took effect. Students responded by increasing their academic effort, as measured by term-over-term re-enrollment and term credits attempted and earned. The eligibility change increased the probability of term-over-term re-enrollment by 3.6-4 percentage points. I also find suggestive evidence that the rule change increased bachelor's degree completion within 8 years by 2-3 percentage points. Furthermore, for students with at least one year of Pell eligibility remaining when the new lifetime limit took effect, the policy change increased the probability of bachelor's degree completion before 6 FTE years by 10 percentage points. Importantly, I find no evidence that the new lifetime limit decreased the probability of degree completion overall. These findings indicate that setting limits on the availability of need-based aid can accelerate time to completion for inframarginal bachelor's degree completers.

I structure the remainder of the paper as follows. In Section 2, I review past research on the effects of financial aid on completion, discuss theoretical predictions of student responses to losing grant aid late into college, and provide details on the change to Pell Grant eligibility. I describe the details of my empirical analysis in Section 3. In Section 4, I present the main results

and the results of robustness checks to validate the findings. I conclude in Section 5 with a discussion of the findings and directions for future research.

## 2. BACKGROUND AND LITERATURE REVIEW

### *2.1 Hypothesized Student Responses to Need-Based Aid Exhaustion*

Competing hypotheses posit that need-based grant aid may help or hinder progress to degree completion. Because students may acclimate to receiving aid and be unaware of how much aid they have remaining, it may be difficult to forecast and contingency plan for abrupt changes in funding. Older students may also face stiffer credit constraints than their younger, financially dependent peers (who may be able to secure parental financial support), and they may run up against cumulative federal borrowing limits, potentially making it difficult to offset grant losses with additional student loans (Gichevu, Ionescu, & Simpson, 2012). These scenarios predict that losing eligibility for need-based aid could increase the probability of dropout late into college.

However, if students weigh the marginal costs and benefits to attendance when considering whether to re-enroll, decisions to persist may stabilize over time as investment in college accumulates and the remaining cost to completion declines. The effect of financial aid on attainment may therefore diminish as students progress in school. Furthermore, because grant aid offsets the full cost of attendance to students, offering aid late into college could even delay graduation for some students. Indeed, several studies find that students respond to the availability of grant aid by strategically adjusting their enrollment intensity (Cornwell, Lee, & Mustard, 2005; Marx & Turner, 2018; Richburg-Hayes et al., 2009; Scott-Clayton, 2011). It follows that when students face the risk of exhausting grant eligibility, they may allocate more time and effort to school to avoid or minimize the loss of aid.

### *2.2 Prior Evidence on the Effects of Need-Based Aid on Educational Attainment*

More broadly, this study contributes to a growing body of research that suggests financial aid can increase college persistence and completion (Angrist et al. 2016; Castleman & Long, 2016; Denning et al., 2017; Goldrick-Rab et al., 2016). For example, Goldrick-Rab et al. (2016) find that students who were randomly offered an additional $3,500 in grant aid per year to attend public universities in Wisconsin increased their bachelor's degree completion within four years by almost 30 percent. Angrist et al. (2016) find that random assignment of scholarship offers in Nebraska increased persistence into year four by 13 percentage points for lottery winners. However, the authors also find that aid offers decreased bachelor's degree completion within four years, indicating that more generous need-based aid may delay time to completion for some students.

By examining the impacts of initial or cumulative aid amounts, most studies to date have estimated combined effects on the extensive and intensive margins of enrollment. Whether the duration that need-based aid is offered affects the probability of completing college and time to completion therefore remains an open question. Three studies of which I am aware do isolate the attainment impacts of grant aid disbursed late into college, although the findings across the studies are inconsistent. Garibaldi et al. (2012) exploit tuition discontinuities by family income at a private university in Italy to examine the relationship between college pricing and time to degree. Consistent with the prediction that tuition subsidies can delay graduation, they find that the probability of on-time graduation increased by 5 percentage points per 1,000-euro increase in tuition in students' last regular year of study. Denning (forthcoming) also leverages a discontinuous increase in federal Pell Grant aid when students become financially independent at age 24, but unlike Garibaldi et al. (2012), he finds that university seniors in Texas were 1.8 percentage points more likely to graduate in that year. Likewise, Barr (2019) finds that expansion of the GI bill increased degree completion among veterans and that at least one-half of the effect

is driven by persistence gains among inframarginal enrollees. However, Barr also finds little evidence of attainment effects among students who were eligible for the Post-9/11 GI Bill for only one or two years, which suggests that effects on persistence may fade over time and additional grant aid may not benefit students who are within two years of graduating.

### *2.3 Extending the Literature: Examining the Effects of Reducing Lifetime Pell Eligibility*

In this study, I examine how the risk of exhausting eligibility for federal Pell Grant aid affects school investment decisions and degree outcomes. As my review of the literature reveals, evidence on the degree impacts of receiving more generous grant aid late into college are mixed. It also remains unclear whether receiving more grant aid versus less grant aid have symmetrical effects on degree attainment and time to completion. The findings in this paper help to tease out the mixed evidence on whether the effects of need-based aid vary with time spent in college and how students who have already made considerable educational investments respond to losing tuition assistance.

To identify effects on student outcomes, I exploit changes to Pell Grant eligibility rules which took effect in the 2012-13 school year. The federal Pell Grant program is the single largest source of grant aid in the United States. To receive aid each year, students must submit the Free Application for Federal Student Aid (FAFSA) annually and qualify based on financial need. Approximately two in five undergraduates receive Pell Grants each year and award amounts ranged between $2,930 and $4,230 (in 2016 dollars) on average over the timeframe I study (Baum et al., 2017).[3]

In 2011, the Pell Grant program faced an $18 billion shortfall as a result of growing enrollments in college and previous program changes that made more students eligible for aid.

[3] More than one-quarter of undergraduates also take out subsidized and unsubsidized federal Stafford loans to pay for college; in 2011-12, students borrowed approximately $6,300 in federal student loans (Baum et al., 2017).

After infusing the program with $17 billion, Congress addressed the remaining funding gap by introducing four eligibility changes that applied to both incoming and continuing students:

1) Eliminating eligibility for students without a high school diploma or GED;
2) Eliminating eligibility for students who qualified for Pell Grant awards less than or equal to $555 per year;
3) Lowering the family income ceiling from $32,000 to $23,000 that automatically qualified students for maximum Pell awards; and
4) Reducing the lifetime eligibility duration from 9 to 6 FTE years.[4]

I examine effects on student outcomes caused by reducing the lifetime limit for Pell Grant aid. Estimates suggest that nearly 400,000 undergraduates were affected by the lifetime rule change alone and that students attending four-year institutions were impacted disproportionately.[5,6]

The U.S. Department of Education (ED) first announced these eligibility changes in January 2012, six months before they went into effect. However, ED did not contact students about the changes until April 2012, and the only students directly contacted (via e-mail) were those who had received more than 4.5 FTE years of Pell through spring 2012 (U.S. Department of Education, 2012). Also in April, ED provided institutions with a list of the students who were e-mailed. Beginning in July 2012, students could check their lifetime Pell use by logging into the National Student Loan Data System, and the federal aid processing system began flagging

[4] As I describe in more detail in section 3.1.1, the FTE provision means that lifetime Pell use is determined by both the number of years of aid received and by a student's enrollment intensity (i.e., full-time, part-time, etc.) in aid-receiving years.

[5] For example, the California State University System predicts that 4 percent of its total undergraduate population lost eligibility as a result of the new lifetime limit (Nelson, 2012). If this percentage is nationally representative, then 374,000 of the 9.35 million students enrolled in four-year degree programs are predicted to have been affected. I find that four percent of students in the USG dataset were also potentially affected by the new lifetime limit. However, the USG dataset excludes students who entered as transfer students, and as a result, the 400,000 estimate may be conservative.

[6] Additional evidence that the rule disproportionately affected students attending four-year institutions is evident from the patterns of persistence across college sectors. While nearly 40 percent of Pell Grant recipients take more than six years to earn a bachelor's degree (Wei & Horn, 2009), only 10 percent of Pell recipients who began at a community college remain enrolled in the two-year sector after five years (Cho, Jacobs, & Zhang, 2013). Most Pell recipients still enrolled in college after five years are therefore working towards bachelor's degrees at four-year institutions.

students in excess of 4.5 FTE years of Pell for school financial aid administrators. As a result of this communication strategy, students and institutions had only a few months to prepare for the eligibility changes when they first took effect in 2012-13. For example, a student contacted in April could have had their aid package impacted as early as July 1st (i.e., the beginning of the new aid year). In later years, more time afforded students greater opportunity to adjust their enrollment decisions to the more stringent lifetime limit.

## 3. EMPIRICAL ANALYSIS

### *3.1 Data*

The data in this study are from the University System of Georgia Enterprise Data Warehouse (USG), which maintains longitudinal student-level records for the twenty-eight public, four-year colleges and universities in the State of Georgia.[7] The dataset includes records on all 301,423 degree-seeking students who first attended a USG institution in the fall term between 2002 and 2008.

From this data I observe information on students at the time of application, including their demographics and college entrance examination scores, the financial information that students and their families supplied when completing the Free Application for Federal Student Aid (FAFSA), including the Expected Family Contribution (EFC) used to calculate how much federal Pell Grant aid students are eligible to receive, and all financial aid disbursements students actually received while enrolled in college. The dataset also includes complete records of enrollment, course-taking, and degrees received across the USG system through summer 2016, as well as records of transfer into USG from other postsecondary systems.

#### *3.1.1 Calculating Pell FTE Usage*

[7] Since 2013, the Board of Regents of the University System of Georgia has consolidated eighteen institutions into nine for cost-saving purposes. However, because the GDW data include institutional identifiers prior to consolidation, the dataset in practice covers student enrollments across thirty-seven unique campuses.

The dataset does not include a direct measure of cumulative Pell receipt, and because many students attend college less-than-full-time, it would be inaccurate to count every semester of Pell receipt as a full semester towards the lifetime eligibility limit. However, the dataset contains all the elements necessary to construct a measure of cumulative Pell receipt that accounts for each student's term-by-term enrollment intensity.

I used reported EFC and disbursed Pell Grant amounts over eight years to construct this measure for each student in the data using the following algorithm:

(1) $$Total\ Pell\ FTE\ Years_i = \sum_{t=1}^{8} \frac{Pell\ Received_{it}}{Max\ Pell\ Eligible_{it} \mid EFC_{it}, Cost_{st}}$$ , where

FTE years of Pell received for student $i$ in year $t$ is the amount of Pell aid received relative to the maximum amount the student was eligible to receive to subsidize the cost of full-time enrollment at college $s$. I relied on annual Pell award disbursement schedules published by the U.S. Department of Education (ED) to determine maximum eligible award amounts, which identify the grant amounts students qualify for as a function of their EFC and cost of attendance.[8]

In most years in this study, Pell recipients who enrolled full-time (defined as attempting 12 or more credits per term) over an entire school year received one FTE year of Pell. Recipients who enrolled less than full-time received less than one FTE year of Pell, with the specific amount determined by the student's EFC and enrollment intensity (i.e., whether the student enrolled three-quarters-time, half-time, or less-than-half-time in each term Pell aid was

[8] The USG dataset also does not include the cost of attendance charged to each student. However, this does not preclude using the disbursement schedules to identify eligible award amounts because the cost to attend USG institutions is sufficiently high that eligible award amounts in practice are based solely on EFC for the vast majority of students in the system. For example, in 2006-07, eligible award amounts were based solely on EFC once cost of attendance exceeded $4,049. In that year, the lowest cost of attendance across all USG institutions for in-state students living off-campus was $9,799 and the average cost of attendance exceeded $14,000. This pattern holds, with very few exceptions, for students across all school years, institutions, and living arrangements in this study.

disbursed).[9] An exception to these rules occurred in the 2009-10 and 2010-11 school years, when Pell recipients could qualify for a second award in the same year to subsidize the cost of summer attendance. In those two years, some students accumulated more than one FTE year of Pell during a single award year.[10] I include students who received two Pell Grants in one year in the analytic sample (26 percent of students did so). As a robustness check, I estimate results separately for students who did and did not receive two awards to examine if my main results conflate effects of the new lifetime limit with the availability of year-round Pell awards. I find no evidence that this is the case.

### *3.1.2 Defining Students Affected by the Lifetime Rule Change*

Under the new lifetime limit, students remain eligible for Pell Grants until they receive 6 FTE years of Pell. I define treated students more expansively than is set by the statutory limit – i.e., students who received 5 or more FTE years of Pell and enrolled on or after spring 2012 (i.e., one term before the new limit took effect) – for two reasons. First, students who have received between 5 and 6 FTE years of Pell aid at the start of an award year are eligible for proportionately smaller Pell Grant amounts under the new eligibility rule.[11] Including students who received 5 or more FTE years of Pell in the treated group therefore captures effects resulting from declines in aid generosity before full aid exhaustion. Furthermore, students with exactly 5 FTE years of Pell at the start of an award year aid did not experience aid losses but may have altered their enrollment behavior nonetheless. For example, students may have responded to the risk of aid exhaustion preemptively by either withdrawing or increasing their enrollment

[9] Less-than-half-time enrollment is defined as attempting fewer than 6 credits per term. Half-time enrollment is defined as attempting at least 6 but less than 9 credits per term. Three-quarters-time enrollment is defined as attempted at least 9 but less than 12 credits per term.

[10] Nationally, 1.2 million students (13 percent of all Pell Grant recipients) received supplemental awards in 2010-11, which increased the average grant per recipient by approximately $200, or 6 percent (Baum et al., 2017; Delisle & Miller, 2015).

[11] For example, a student with an EFC of $1,000 who received exactly 5 FTE years of Pell through 2011-12 would have been eligible for a Pell Grant of $4,600 in 2012-13, whereas a student with the same financial need who accumulated 5.5 FTE years of Pell would have been eligible for $2,300.

intensity. Including students with 5 or more FTE years of Pell in the treated group therefore allows for estimation of both direct and anticipatory policy effects.

### *3.2 Research Design*

The basic intuition of my empirical analysis is to compare outcomes for two groups of students – those who did and did not receive enough Pell aid to be affected by the 6 FTE year lifetime limit – in two time periods – before versus after the new lifetime limit took effect. A challenge to this difference-in-differences (DD) framework is that the enrollment patterns of treated and comparison students in the full sample are not stable over the pre- and post-policy periods, which violates the parallel trends assumption of the DD design.[12] I address this issue by using a matching procedure to construct a comparison group that mirrors the enrollment behavior of treated students during the first four years of college. Below, I describe the steps I followed to construct a matched comparison group that provides a reasonable counterfactual to the outcomes for treated students and I present evidence that the parallel trends assumption is plausible in the matched study sample. I then describe the statistical models I fit to estimate policy impacts and preview the robustness checks I conducted to validate the results.

#### *3.2.1 Matching Procedure to Construct the Analytic Sample*

To identify comparison students most similar to treated students, I conditioned the study sample on students who attended a USG college or university for five or more FTE years within eight years of initial entry (hereafter referred to as "5+ FTE" students). I then matched students who received 5 or more FTE years of Pell (hereafter referred to as "High-Pell" students) to observably-similar students who received less than 5 FTE years of Pell (hereafter referred to as

[12] I present evidence that the parallel trends assumption is violated in the full sample in Appendix A.

"Low-Pell" students).[13,14] Matching restricts the sample to High-Pell and Low-Pell students who followed similar enrollment trajectories through their first four years of college and accounts for other observable imbalances between the groups that are likely correlated with exposure to the new lifetime limit and with schooling behavior late into college.

I used the coarsened exact matching (CEM) procedure developed by Iacus, King, & Porro (2012) to construct the matched sample. This procedure allows the researcher to identify which characteristics to match on and specify how to coarsen the data for matching (if at all), and then exactly matches treated and non-treated observations using the coarsened data. CEM has several attractive properties over more traditional matching methods like propensity score matching (PSM). It obviates the search for a suitable matching algorithm to achieve ex-post balance and avoids creating uninformative matches that can produce more biased inferences than not matching at all (King, Nielsen, Coberley, & Pope, 2011).

After restricting to 5+ FTE students, I matched High-Pell students to Low-Pell students using the following baseline characteristics: entry cohort (not coarsened), sex, race (White, Black, or Other), an indicator of whether the student enrolled continuously or stopped out in the first four years of college, number of years to attain 5 FTE status (not coarsened), quartile of cumulative credits attempted at the start of students' fifth FTE year (not coarsened), EFC in the fifth FTE year ($0-$1,300, $1,300-$2,600, $2,600-$5,200, > $5,200), and an indicator of whether

[13] Before restricting the data to 5+ FTE students, I also conditioned the sample on students who: 1) are high school graduates, 2) qualified for Pell awards above the minimum amounts, and 3) never left and later transferred back into a USG institution. The first two restrictions eliminate students potentially affected by other changes to Pell Grant eligibility introduced at the same time as the new lifetime limit. I impose the third restriction because it is possible that transfer students received Pell awards during enrollment spells I do not observe in the data. Eighteen percent of first-time, degree-seeking students left the USG system and subsequently returned as a transfer student. By excluding those students, I observe Pell receipt over eight years as near-completely as possible in the study sample.

[14] I use a modified version of equation (1) to calculate FTE status for all students, where I ignore students' EFC-eligibility status and determine FTE status solely by enrollment intensity. For example, a student who attempted 12 credits during fall 2010 and 6 credits during spring 2011 would be assigned an FTE of 0.75 for that year (i.e., 0.5 for full-time enrollment in the fall and 0.25 for part-time enrollment in the spring). An attractive feature of this approach is that Pell FTE years and FTE years are derived from a consistent set of rules.

each student enrolled on or after spring 2012.[15] In Section 4.5, I examine the sensitivity of the results to alternative matching decisions. I estimate effects on matched samples that include both fewer and more covariates in the CEM procedure and I estimate effects using PSM instead of CEM. The results indicate that after matching on the enrollment trajectory measures described above, including additional covariates in the match leads to larger effect estimates. PSM also returns slightly larger effect estimates, which suggests that my main matching procedure generates conservative effect estimates of the new lifetime limit on degree attainment and time to completion.

Of the 46,766 5+ FTE students in the data, 16,588 students are included in the main matched analysis sample (of which 8,656 are High-Pell students affected by the lifetime rule change and 7,932 are Low-Pell students in the comparison group). Eighty-eight percent of High-Pell students and 21.5 percent of Low-Pell students are included in the matched sample. In Table 1, I report summary statistics for High-Pell and Low-Pell students. Columns 1-4 present statistics in the full, unmatched sample and columns 5-8 present statistics in the matched analytic sample. High-Pell and Low-Pell students are different on several observable dimensions in the full sample. Compared to Low-Pell students, High-Pell students are more likely to be female and Black, have much greater financial need (according to their EFCs) at entry and in year 5, and entered college with lower average SAT scores.

As expected, treated and comparison students in the matched sample exhibit similar mean characteristics on the variables used in the matching procedure. For example, 62 percent of both groups are female and 25 percent are White. However, both groups are also similar on non-matched measures of academic performance. The mean difference in SAT achievement between groups in the matched sample is 22 points, which represents a 77 percent reduction in bias

[15] The upper bounds of the bottom three attempted credit quartiles are: 126, 136, and 146 credits.

relative to the unmatched sample. Students in both groups also completed the same number of credits and earned the same grades on average at the start of their fifth FTE year.

The key difference that distinguishes High-Pell from Low-Pell students in the matched sample is the number of years of Pell that students received. On average, High-Pell students received 5.6 years of Pell within eight years of entering college compared to 3.2 years for Low-Pell students. Because I matched students on EFC in their fifth FTE year to ensure that treated and comparison students had similar financial need profiles around the time that aid limits might influence their schooling decisions, there are two major reasons why Low-Pell students in the matched sample received less than 5 FTE years of Pell. First, 21 percent of Low-Pell students failed to file the FAFSA at the start of college, whereas only 1 percent of High-Pell students did not submit the FAFSA in their first year. Second, many Low-Pell students who applied for aid were not initially eligible for a Pell Grant. The average EFC at entry among Low-Pell students was $6,642 (in 2016 dollars), which exceeds the maximum value for Pell receipt. As a result, High-Pell students routinely received Pell aid and were potentially affected when Congress introduced the new lifetime limit, while Low-Pell students did not receive Pell aid as consistently and were not affected when the rule change took effect.[16]

*3.2.4 Testing for Violations of the Parallel Trends Assumption*

I examine evidence for violations of the parallel trends assumption in the matched sample in Figures 1 and 2. In Figure 1, I plot enrollment rates in the first four years of college separately by treatment and enrollment status relative to the policy change. In Panel A, the solid lines show re-enrollment rates for students who were exposed to the new lifetime limit and the dashed lines

[16] A potential concern is that students who receive Pell aid intermittently may be fundamentally different from students who receive Pell aid routinely, and thus serve as a poor comparison group. To examine this, I also restricted to students who received three or more years of Pell before matching High-to Low-Pell students. As shown in Appendix Table B4, I find no evidence that conditioning the sample on more consistent Pell recipients yields substantively different results from the main matched sample, although the estimates on degree completion are slightly attenuated and less precise in the more restricted sample.

show the same for students who were not exposed. High-Pell and Low-Pell students are denoted by white and black circles, respectively. The enrollment trends reveal that High-Pell and Low-Pell students in each period made nearly identical enrollment decisions in the first four years of college. Furthermore, the estimated re-enrollment differences in Panel B are near-zero in nearly every term through the first four years of college, and none of the estimates are statistically significant at the 5 percent level.

In Figure 2, I plot rates of bachelor's degree completion before 6 FTE years for High-Pell (dashed line) and Low-Pell (solid line) students by the year that students attained 5 FTE status. The completion rate decreases across most years for both groups because, as shown in Appendix Table B1, students who attained 5 FTE status in the earliest years performed stronger academically compared to students who attained 5 FTE status in the later years. However, because I matched students using entry cohort and time to 5 FTE attainment, High-Pell and Low-Pell students are similar on observable measures of academic performance in each year. The trends in Panel A of Figure 2 therefore show that treated and comparison students followed similar attainment trajectories prior to 2012; once again, none of the difference-in-difference estimates in Panel B are statistically significant in the years before the new lifetime limit took effect. Taken together, the results in Figures 1 and 2 suggest that the parallel trends assumption is plausible in the matched sample.

To test this assumption further, I also examined whether the relative composition of High- and Low-Pell students in the matched sample were stable in pre-policy and post-policy periods. Table 2 reports baseline characteristics in the exposed and unexposed periods for High-Pell and Low-Pell students in columns 1-2 and 4-5, respectively. In columns 3 and 6, I present estimates of within-group compositional changes between the two exposure periods. Column 7 shows whether the compositional changes differed for High-Pell and Low-Pell students. The

results in column 3 indicate that High-Pell students exposed to the new lifetime limit entered college with more financial resources (based on EFC) than High-Pell students not exposed to the policy change. They were also more academically disadvantaged. However, those differences and all others reported in Table 2 are also observed in the Low-Pell group. I therefore find no evidence of differential selection between treated and comparison students in the matched sample. The results in Table 2 reinforce that the enrollment and completion trends for Low-Pell students appear to provide a reasonable counterfactual to the outcome trends for High-Pell students in the matched sample.

### *3.2.5 Estimation Models*

To estimate effects of the new lifetime Pell limit on students' term-by-term enrollment decisions, I use a matched student-by-term dataset and a DD framework, where the first difference is whether or not a student received 5 FTE years of Pell and the second difference is whether or not a student was exposed to the new lifetime limit (defined as enrolled on or after spring 2012). In this research design, I attribute the deviation from trend between High-Pell and Low-Pell students following 4.5 FTE years as the causal effect on enrollment. I restrict the dataset to four terms following students' 4.5 FTE attainment because, as discussed above, communication about the new lifetime limit was targeted to students who had received at least 4.5 FTE years of Pell at the start of new financial aid award years.

I implement this framework by fitting the following statistical model to the dataset:

(2) $$Y_{icjt} = \beta_1 Treat_i * Post2011_t + \beta_2 Treat_i + \beta_3 Post2011_t + \phi\, X_i + \omega_{cj} + \eta_t + \varepsilon_{icjt}.$$

In equation (2), $Y_{icjt}$ is a measure of term-over-term re-enrollment, term credits attempted or earned, or term GPA for student $i$ in term $t$ and entry cohort $c$ at college $j$. $Treat_i$ is an indicator for students who received five or more FTE years of Pell. $Post2011_t$ is an indicator for terms on or after spring 2012. The coefficient on the interaction term ($\beta_1$) is the parameter of

interest. To increase precision of the estimates and to reduce bias, I include a vector of student-level covariates ($X_i$) that were either coarsened or not used in the matching procedure. This vector is comprised of the following controls: indicators for race/ethnicity (Black, Hispanic, Asian, Other, and Missing), indicators for U.S. citizenship status and Georgia residency status, an indicator of whether each student initially pursued a bachelor's degree at entry, and an indicator of whether each student was assigned to remedial coursework at entry, as well as continuous measures of age at entry, SAT math and verbal scores (imputed where missing), and Expected Family Contribution at entry (imputed where missing).[17] The model also includes entry cohort-by-institution ($\omega_{cj}$) and term ($\eta_t$) fixed effects. In all estimates, I report standard errors that account for the potential clustering of schooling behavior within USG campuses.[18]

Because degree attainment is a singular event for most students, I cannot estimate effects on bachelor's degree completion using the same matched student-by-term dataset. I therefore fit a modified version of equation (2) to a matched student-level dataset that excludes the term ($\eta_t$) fixed effects. I estimate effects on bachelor's degree attainment overall and within specific time intervals (i.e, before 6 FTE years and within 8 years of entry) using this statistical model.

### *3.2.6 Robustness Checks*

I conducted several checks to validate the robustness of the estimated enrollment effects. Because the new lifetime limit was introduced during a dynamic period in the aftermath of the Great Recession, in some versions of equation (2) I also control for a vector of institution-by-term covariates that account for contextual changes that occurred around the same time. This vector includes the number of undergraduate degree-seeking students, inflation-adjusted in-state

[17] Missing SAT scores and EFC at entry are predicted using the full set of non-missing baseline characteristics. In all results, I present estimates from multiple imputation regressions that account for uncertainty in the imputed values for students with missing data.
[18] I cluster standard errors by the 37 unique campuses prior to USG consolidation activities.

tuition and fees and instructional expenditures per FTE student, and the unemployment rate within the commuting zone of each institution. I also include the interactions of these covariates with the treatment indicator to allow these factors to differentially impact the schooling decisions of treated and comparison students. Comparing the point estimates from versions of equation (2) that do and do not include this vector sheds light on the extent to which any changes in student outcomes I observe are explained by the volatility of institutional and labor market conditions around the time the new limit took effect.

To validate the robustness of the estimated degree effects, I estimate versions of equation (2) that do and do not include the vector of individual-level controls and entry cohort-by-institution fixed effects**.** I also estimate effects by EFC zero status to examine whether the results are driven by changes to the family income restriction instead of the lifetime limit reduction that were introduced concurrently. Likewise, I examine whether the results can be attributed to two other changes to financial aid policy which took effect in 2011-12: 1) elimination of the summer Pell Grant provision, which in 2009-10 and 2010-11 allowed eligible students to receive more than one Pell Grant in an award year, and 2) changes to eligibility requirements for Georgia's merit-based HOPE Scholarship, which reduced award amounts for some students who were already enrolled in college.[19]

## RESULTS

### *4.1 Graphical Evidence*

Comparing the re-enrollment and degree attainment trends of High-Pell and Low-Pell students suggests the lifetime rule change caused High-Pell students to increase their effort and graduate more quickly. Evidence of a degree acceleration effect is seen in Figure 2. Both groups

[19] In 2010-11, approximately one-third of USG students received HOPE Scholarships. On average, award amounts the following year declined by $300 per semester for students who no longer qualified for full HOPE scholarships (Suggs, 2016).

of students followed similar attainment trajectories prior to 2012, and High-Pell students only became more likely to graduate before 6 FTE years one year following the policy change. To illustrate the acceleration effect on enrollment, I plot re-enrollment rates by treatment status and enrollment status relative to the policy change in Figure 3. Figure 3 is formatted like Figure 1, except that I now show re-enrollment rates as a function of students' FTE enrollment status instead of term since entry. Before enrolling for 5 FTE years, High-Pell students re-enrolled at slightly higher rates than Low-Pell students in both the exposed and unexposed periods. After enrolling for 5 FTE years, High-Pell students were less likely to re-enroll than Low-Pell students in the unexposed period, whereas High-Pell students in the exposed group were *more likely* to re-enroll than Low-Pell students.

### *4.2 First-Stage Effects of the Rule Change on Financial Aid Receipt*

Table 3 reports estimated effects of the rule change on financial aid receipt. In columns 1 and 2, I report results from versions of equation (2) that exclude and include instituion-by-term controls, respectively. The point estimates in column 2 are larger than those in column 1, which suggests that the loss of Pell aid among High-Pell students is not driven by dynamic institutional and labor market conditions over the period of interest. After the rule change, High-Pell students received $706 less Pell aid per term on average, which represents a 54 percent reduction in Pell aid. As discussed in Section 3.2.2, some treated students remained eligible for full or reduced awards before exhausting their eligibility for Pell Grant aid.[20] This, plus measurement error in calculating lifetime Pell receipt, explains why the point estimates in Panel A are less than the corresponding baseline means. The results in panels B and C indicate that students did not replace lost Pell Grant dollars with other sources of grant aid or federal loans.[21]

[20] Forty-eight percent of treated students in the matched sample entered a new aid award year having received exactly 5 FTE years of Pell and were therefore eligible for full Pell awards that year.
[21] This in part reflects the fact that Georgia does not offer state need-based aid to students.

### *4.3 Effects on Re-enrollment, Term Credits, and GPA*

In Table 4, I report results on short-term academic outcomes to examine whether risk of aid exhaustion altered students' enrollment behavior. Consistent with the evidence in Figure 3, the coefficient in panel A of column 1 indicates that term-over-term re-enrollment increased by 4 percentage points (4.7 percent) for High-Pell students because of the new lifetime limit. The estimates in panels B and C indicate the new lifetime limit also increased the number of credits treated students attempted and earned per term by 0.5-0.6 credits. In columns 3-4, the credit estimates in the enrollment-conditioned sample are roughly one-third the magnitude and not significant at the 5 percent level. Neither do I find evidence in Panel D that the risk of losing aid affected the grades students earned. This suggests that the lifetime limit increased the probability of re-enrollment but had little-to-no impact on enrollment intensity or academic performance on the intensive margin.

Similar to the results in Table 3, the estimated effects on short-term academic outcomes are robust to the inclusion of institution-by-term covariates, again suggesting that changing contextual factors around the time of the rule change do not explain the observed impacts on enrollment behavior. Furthermore, as shown in Appendix Table B2, the estimated effects are also robust to restricting the sample to students who graduated. This provides one piece of evidence that effects of the lifetime limit are concentrated among inframarginal graduates.

### *4.4 Effects on Bachelor's Degree Attainment and Time to Completion*

In Table 5, I present estimated effects of the new lifetime limit on the probability of degree completion and time to degree. I present estimates with and without the inclusion of student-level controls in even- and odd-numbered columns, respectively. In columns 1 and 2, the coefficients on the interaction term are near-zero, which indicates that losing aid did not affect

the overall likelihood of completion before students exhausted their Pell eligibility. However, this null effect is not surprising because more than 80 percent of High-Pell students in the matched sample had already received more than 5 FTE years of Pell at the start of the 2011-12 school year. Most treated students therefore had very little time to graduate before exhausting their eligibility for Pell aid.

Nevertheless, the new lifetime limit could still have induced many High-Pell students to graduate more quickly, albeit after the point of aid exhaustion. The results in columns 3-8 of Table 5 provide suggestive evidence that this was the case. The coefficients in columns 3 and 4 are suggestive of a 2-2.5 percentage point (3 percent) increase in bachelor's degree attainment within 8 years, and the coefficients on degree completion in years 6-8 after entry are 3-3.6 percentage points (7 percent).[22] In columns 7 and 8, I report effects on bachelor's degree attainment overall. The coefficients are one-third the size of the effects on completion in years 6-8 and not distinguishable from zero. I therefore find little evidence that the rule change increased the probability of degree completion overall.

The trends in Figure 2 also suggest that pooled analyses conceal dynamic effects on completion before the new lifetime limit benchmark of 6 FTE years. In Table 6, I report effects by year of 5 FTE attainment to examine if students with more time to react to the new lifetime limit were more likely to graduate within 6 FTE years. High-Pell students who attained 5 FTE status before or in the first year of the new policy were no more likely to graduate before 6 FTE years. However, students who had more than one year to react to the new policy before reaching the new lifetime limit were much more likely to graduate within this timeframe. The effect

[22] I report on degree outcomes within 8 years given that this is the longest I observe students across all entry cohorts. However, I also report on BA attainment ever, which captures degree completion through spring 2016. This outcome therefore captures degree attainment over a longer timeframe, but the time horizon varies across cohorts. For the earliest entrance cohort (fall 2002), the BA ever outcome captures degree attainment through 14 years following entry. For the last cohort (fall 2008), this outcome captures degree attainment through 8 years.

estimate for this group of students is 9.6 percentage points, and I reject that the effects by year of 5 FTE attainment are time invariant (the p-value on an F-test of equal effects is 0.016). By contrast, I find no evidence of dynamic effects on bachelor's degree attainment within 8 years or overall.[23] Taken together, the results in Tables 5 and 6 indicate that High-Pell students with and without advance warning of the new lifetime limit reacted to the policy change consistently (i.e., by accelerating time to completion), although only High-Pell students who maintained more than one year of aid eligibility when the new rule took effect were more likely to graduate before 6 FTE years.

Results of the robustness checks in Table 7 also suggest the acceleration effects are driven by the change in lifetime Pell eligibility rather than concurrent changes to other financial aid eligibility rules. In Panel A of Table 7, I disaggregate the degree effect estimates for students with and without zero EFCs at the start of their fifth FTE year to examine whether the acceleration effects are driven by the new family income restriction that automatically qualifies students for maximum Pell Grant awards, which took effect along with the new lifetime limit. In Panel B, I report effects for students separately by merit-based aid receipt status to examine whether the acceleration effects can be attributed to changes to Georgia's merit-based HOPE Scholarship. In Panel C, I report effects separately for students who did and did not receive two Pell awards in the same year to I investigate if the results are explained by changes to the availability of year-round Pell aid. If the effects are driven in part by changes to the family income restriction, then effects should be larger for zero-EFC students who qualified for

[23] Although the coefficient on overall degree attainment for students who attained 5 FTE status after 2012-13 is non-trivial (0.028), this appears to be overestimated since most students in this group are members of the 2008 entry cohort and I only observe degree completion through 8 years for this group. The point estimates on overall attainment are closer to zero for students I observe over a longer time horizon. It is therefore likely that the estimate for the post 2012-13 group would attenuate if I were able to track the 2008 entry cohort over a longer period.

maximum awards. Likewise, effects should be larger for merit award recipients and for students who received two Pell awards in one year if those concurrent policy changes explain the results.

The results in Panel A show that the acceleration effects are concentrated among students with EFCs greater than zero who did not qualify for maximum award amounts.[24] This suggests that while need-based aid dissuades some wealthier Pell recipients from graduating sooner, it is not a deterrent to graduating earlier for very low-income recipients, perhaps because students with the greatest financial need have more constraints on their time and less flexibility to increase their enrollment intensity. In Panels B and C, the magnitudes of the point estimates are also suggestive of larger effects for non-HOPE and non-dual-Pell recipients, respectively. Taken together, the effects on time to degree do not appear to be driven by concurrent changes to either the federal Pell Grant or to Georgia's merit-based aid program.

### *4.5 Stability of Effect Estimates to Alternative Matching Procedures*

Another possible concern is that the results may be sensitive to the choice of covariates used in matching or to the choice of matching procedure itself. In Table 8, I therefore report degree effects from alternative matched samples constructed after using fewer and more covariates in the CEM matching solution. Column 1 reports the main results for purposes of comparison. Columns 2-4 report estimates when I use fewer baseline characteristics to match High- to Low-Pell students. In column 5, I add cumulative credits earned and cumulative GPA at the start of the fifth FTE year to full set of characteristics I used to construct the main matched

[24] In Appendix Table B3, I report analogous estimates by EFC status after dropping students whose EFC status may have been affected by the change to the family income restriction. The results are substantively identical to those in Table 7, which reinforces that the family income restriction is not driving the main results, nor the variation in effects by zero-EFC status.

sample. In column 6, I estimate effects after using PSM instead of CEM to match High-Pell to Low-Pell students.[25]

The magnitude of the estimates in columns 2-5 increase when I add more covariates to the matching solution. This implies that my main results likely provide conservative estimates of the effect of reducing lifetime Pell eligibility on time to completion if matching does not fully account for differential selection on unobservables. The estimates in column 6 are also larger when I use PSM instead of CEM for matching, which indicates the main results are also robust to the choice of procedure used to construct the matched sample.

## 5. CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The findings in this study reveal that students are responsive to lifetime eligibility limits for need-based aid. Students at risk of exhausting their eligibility for Pell Grant aid due to the new lifetime limit re-enrolled at higher rates and graduated more quickly. Assuming that 400,000 students were initially affected by the reduction in lifetime eligibility from 9 to 6 FTE years, the effects I estimate imply that 12,000 students graduated more quickly in response.[26]

These results are consistent with the theory that student enrollment decisions solidify with increased investment in college, and as a result, the effect of grant aid on attainment declines over time. The findings also indicate that decisions over how to allocate financial aid are consequential. Lifetime limits and other disbursement policies can be designed to accelerate time to completion and increase the cost-effectiveness of financial aid expenditures.

[25] For this procedure, I used the same covariates as in the main CEM matching solution to estimate the probability of being a High-Pell student separately for those who were exposed and not exposed to the policy change. I then matched High-Pell to Low-Pell students with the same exposure status and similar predicted probability of High-Pell status (i.e., within +/- 0.05 percentage points).

[26] Fifty-one percent of 5 Pell FTE students not enrolled post-2011 graduated in years 6-8 versus 54 percent of treated students enrolled post-2011. As a result, 12,000 students [(400,000*0.54)-(400,000*.51)] are estimated to have graduated more quickly. See footnote 7 for how the estimated number of affected students is derived.

A natural question is whether the findings would persist if aid eligibility limits were more binding and consequently affected more students. I believe the results in this study should be extrapolated cautiously because their generalizability is unclear. On the one hand, Congress restricted Pell Grant eligibility to 6 FTE years based on fiscal necessity, not because that limit was known to benefit students. It is therefore possible that more stringent lifetime limits could produce acceleration effects of similar magnitude for more students. However, students impacted by the current Pell lifetime limit are also distinct with respect to their commitment to degree completion and their consistency of applying for and receiving financial aid over time. At some point, excessively stringent aid limits would certainly introduce costs (i.e., increased dropout) that outweigh the benefits realized from the current lifetime limit. The tipping point at which aid limits begin to do more harm than good remains a question left for further research, and it deserves special attention because many state need-based aid programs impose more stringent lifetime caps than the federal Pell Grant.

A related question is whether reallocating grant aid along the path to completion would produce greater benefit than simply eliminating disbursements after 6 FTE years. My findings indicate that eliminating grant eligibility after 6 FTE years can accelerate time to completion but does not affect the probability of degree completion overall. As a result, simply eliminating aid late into college does not address the challenge of increasing college completion rates. However, several recent studies show that offering more generous need-based aid to students in the first two years of college can increase the probability of degree completion (Angrist et al., 2016; Castleman & Long, 2016; Goldrick-Rab et al., 2016). Increasing both the levels and efficiency of degree production may therefore require frontloading tuition subsidies and increasing spending on need-based aid.

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## FIGURES AND TABLES

Figure 1. Re-enrollment rates in years 1-4 of college in the matched analytic sample, by treatment and enrollment status relative to the policy change

A. Enrollment by term

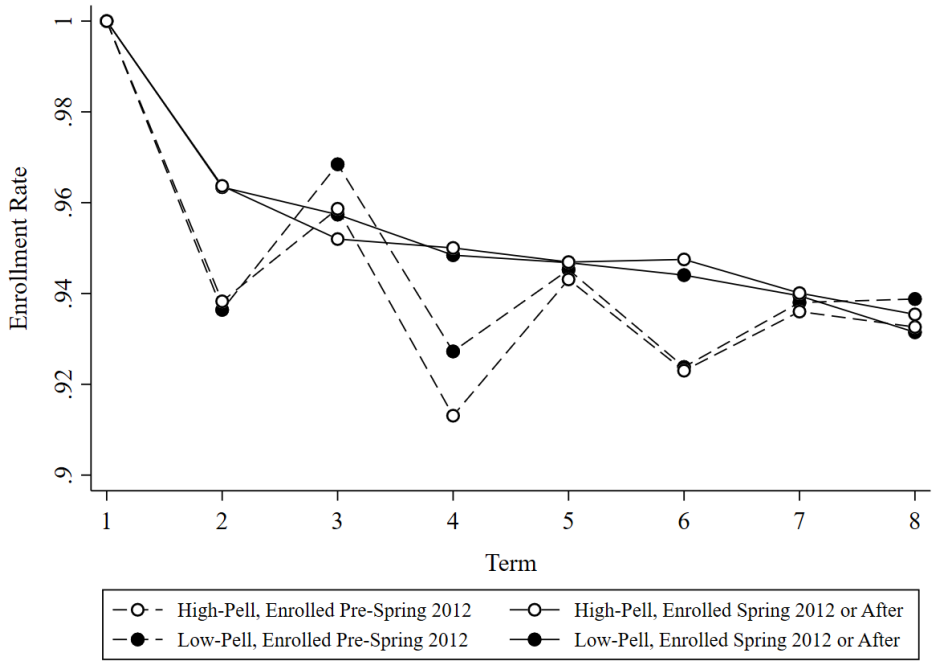
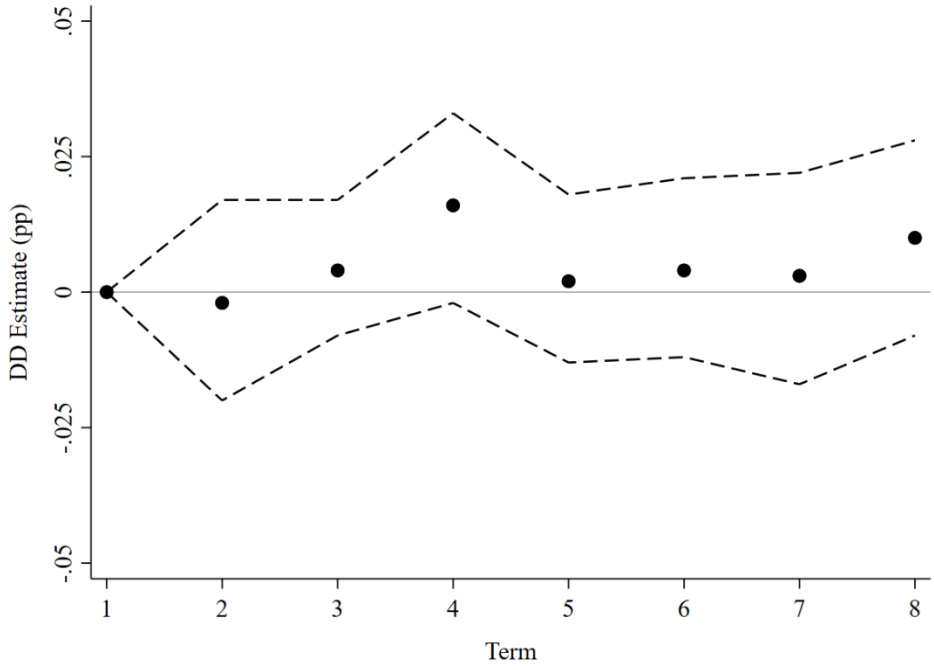



Figure 1, Continued.

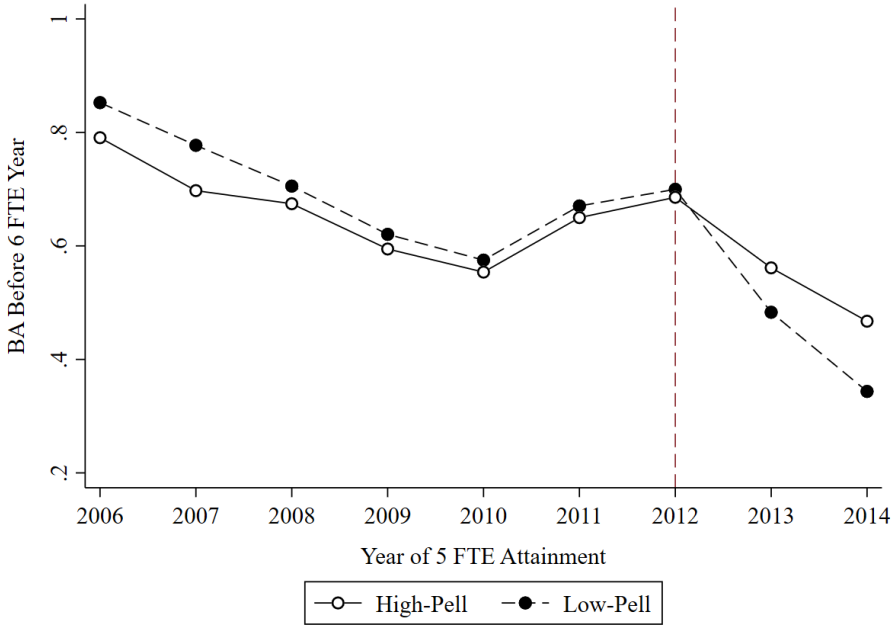
B. Difference-in-differences estimate



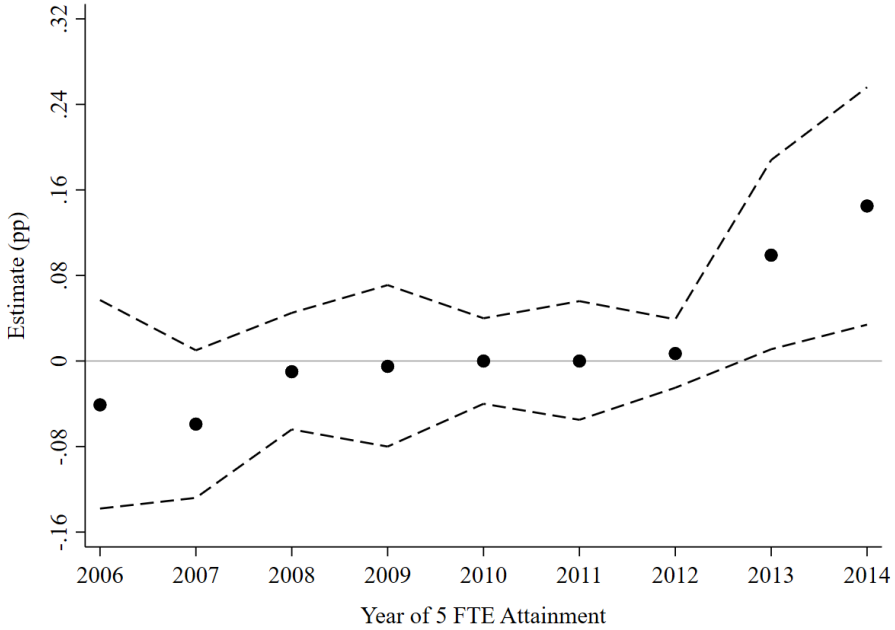

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. Within this group, treated (High-Pell) students who received 5 or more FTE years of Pell are matched to observably-similar (Low-Pell) students who received less than 5 FTE years of Pell. Summer terms are excluded. In Panel B, each point denotes the average enrollment rate difference of High-Pell versus Low-Pell students in the pre-policy versus post-policy period. The dotted lines represent 95 percent confidence intervals around each estimate.
Source: University System of Georgia administrative records.

Figure 2. Bachelor's degree completion rates before attainment of 6 FTE status, by treatment status and year of 5 FTE attainment

A. Completion by year of 5 FTE attainment



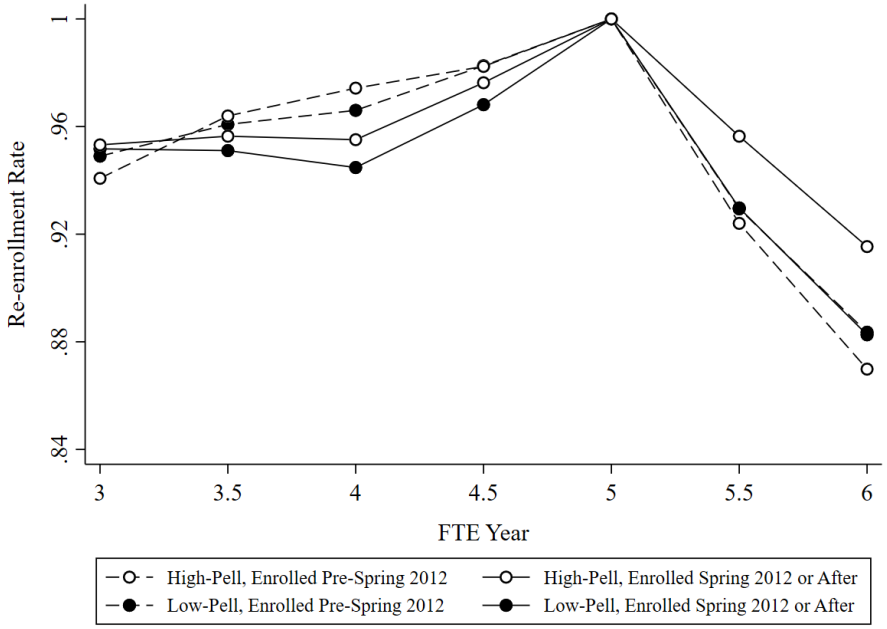

B. Estimated Difference



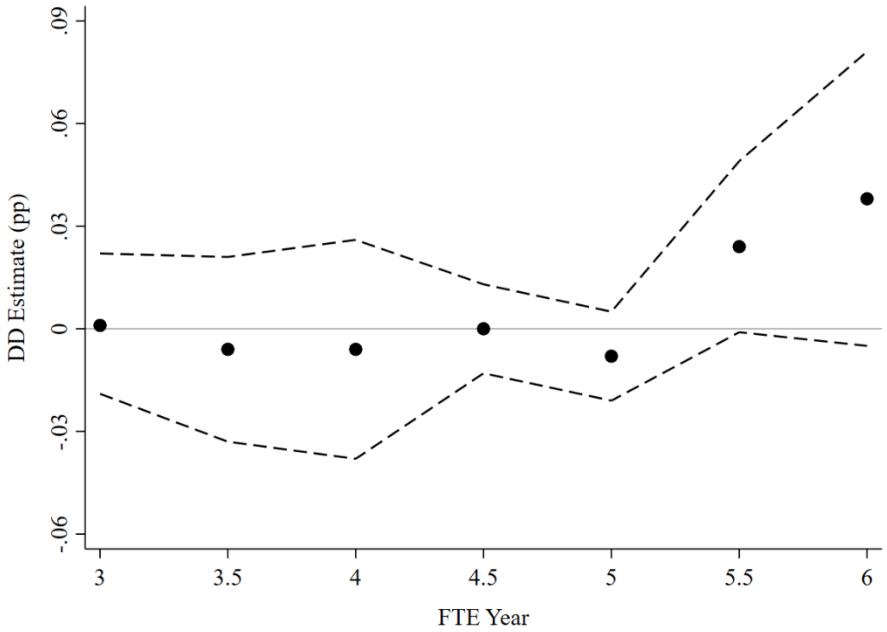

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. Within this group, treated (High-Pell) students who received 5 or more FTE years of Pell are matched to observably-similar (Low-Pell) students who received less than 5 FTE years of Pell. The reference line in Panel A denotes the first year in which the new lifetime Pell limit took effect. In Panel B, each point denotes the completion rate difference between High-Pell and Low-Pell students by year of 5 FTE attainment. The dotted lines represent 95 percent confidence intervals around each estimate.
Source: University System of Georgia administrative records.

Figure 3. Re-enrollment by term within three years of the new lifetime Pell limit, by treatment and enrollment status relative to the policy change

A. Enrollment by term




B. Difference-in-differences estimate




Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. Within this group, treated (High-Pell) students who received 5 or more FTE years of Pell are matched to observably-similar (Low-Pell) students who received less than 5 FTE years of Pell. In Panel B, each point denotes the average enrollment rate difference of High-Pell versus Low-Pell students in the pre-policy versus post-policy period. The dotted lines represent 95 percent confidence intervals around each estimate.
Source: University System of Georgia administrative records.

Table 1. Summary statistics of all students enrolled for 5 FTE years and matched sample by treatment status

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | All students enrolled for 5+ FTE years | | | | Matched sample enrolled for 5+ FTE years | | | |
| | Received 5+ FTE years of Pell | | Received < 5 FTE years of Pell | | Received 5+ FTE years of Pell | | Received < 5 FTE years of Pell | |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| *Pre-entry characteristics* | | | | | | | | |
| Female | 0.618 | 0.486 | 0.475 | 0.499 | 0.624 | 0.484 | 0.624 | 0.484 |
| Black | 0.608 | 0.488 | 0.188 | 0.391 | 0.613 | 0.487 | 0.613 | 0.487 |
| Asian | 0.071 | 0.256 | 0.057 | 0.231 | 0.063 | 0.244 | 0.060 | 0.237 |
| Latino | 0.042 | 0.201 | 0.040 | 0.196 | 0.039 | 0.193 | 0.042 | 0.201 |
| White | 0.242 | 0.428 | 0.680 | 0.467 | 0.251 | 0.434 | 0.251 | 0.434 |
| Race Other | 0.027 | 0.161 | 0.026 | 0.159 | 0.024 | 0.153 | 0.023 | 0.150 |
| Missing Race | 0.011 | 0.103 | 0.010 | 0.099 | 0.010 | 0.101 | 0.011 | 0.104 |
| SAT Math + Verbal Score | 937 | 142 | 1032 | 157 | 928 | 146 | 950 | 147 |
| Missing SAT | 0.062 | 0.241 | 0.035 | 0.183 | 0.064 | 0.245 | 0.046 | 0.21 |
| Assigned to Remedial Coursework | 0.247 | 0.431 | 0.119 | 0.323 | 0.244 | 0.430 | 0.194 | 0.395 |
| Age at Entry | 18.72 | 1.28 | 18.60 | 0.77 | 18.72 | 1.27 | 18.69 | 1.03 |
| EFC at Entry | $1,039 | $2,717 | $19,663 | $21,799 | $1,092 | $2,975 | $6,642 | $6,702 |
| Missing EFC at Entry | 0.016 | 0.125 | 0.328 | 0.470 | 0.014 | 0.119 | 0.206 | 0.405 |
| *Post-entry characteristics* | | | | | | | | |
| Age 5 FTE Year | 23.56 | 1.60 | 23.55 | 1.17 | 23.51 | 1.56 | 23.52 | 1.31 |
| EFC in 5 FTE Year | $551 | $1,098 | $11,412 | $16,520 | $476 | $1,029 | $534 | $1,244 |
| Cum Credits Att. at Start of 5 FTE Year | 136.28 | 16.77 | 135.04 | 12.59 | 136.20 | 15.74 | 136.28 | 13.32 |
| Cum Credits Earned at Start of 5 FTE Year | 120.05 | 16.39 | 118.50 | 15.37 | 120.46 | 15.92 | 120.78 | 15.09 |
| Cum GPA at Start of 5 FTE Year | 2.63 | 0.50 | 2.72 | 0.52 | 2.64 | 0.50 | 2.65 | 0.52 |
| Terms to 5 FTE Status | 15.47 | 2.47 | 15.78 | 2.46 | 15.34 | 2.33 | 15.42 | 2.33 |
| Total Pell FTE Years | 5.58 | 0.52 | 1.13 | 1.50 | 5.57 | 0.50 | 3.20 | 1.35 |
| Observations | 9,840 | | 36,926 | | 8,656 | | 7,932 | |

Notes: The sample in columns 1-4 includes all degree-seeking entrants to public four-year institutions in Georgia from 2002-2008 who enrolled for five or more FTE years within eight years of entry. Students with a record of transfer into USG after initial entry are excluded. The sample in columns 5-8 is restricted to the subset of 5 FTE students included in the matched analytic sample. See Figure 2 for details about the matching process. Source: University System of Georgia administrative records.

Table 2. Matched sample characteristics of treated and comparison students by exposure status to the Pell lifetime rule change

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | Treated: Received 5+ FTE years of Pell | | | Comparison: Received < 5 FTE years of Pell | | | |
| | Exposed | Not Exposed | (2)-(1) | Exposed | Not Exposed | (2)-(1) | DID |
| *Pre-entry characteristics* | | | | | | | |
| Female | 0.627 | 0.622 | -0.005 | 0.627 | 0.622 | -0.005 | 0.000 |
| Black | 0.631 | 0.600 | -0.030 | 0.631 | 0.600 | -0.030 | -0.000 |
| Asian | 0.063 | 0.063 | 0.000 | 0.055 | 0.063 | 0.008* | -0.008 |
| Latino | 0.020 | 0.052 | 0.032*** | 0.027 | 0.053 | 0.025*** | 0.007 |
| White | 0.262 | 0.243 | -0.018 | 0.262 | 0.243 | -0.018 | 0.000 |
| Race Other | 0.021 | 0.026 | 0.005 | 0.020 | 0.025 | 0.005 | -0.000 |
| Missing Race | 0.003 | 0.015 | 0.012*** | 0.005 | 0.015 | 0.010*** | 0.001 |
| SAT Math + Verbal Score | 943 | 917 | -26.232*** | 958 | 945 | -12.665* | -13.568 |
| Assigned to Remedial Coursework | 0.219 | 0.262 | 0.042*** | 0.180 | 0.203 | 0.023 | 0.019 |
| Age at Entry | 18.72 | 18.71 | -0.009 | 18.67 | 18.71 | 0.047 | -0.056 |
| EFC at Entry | $967 | $1,178 | 206.392*** | $6,349 | $6,843 | 539.191* | -332.798 |
| *Post-entry characteristics* | | | | | | | |
| Age 5 FTE Year | 23.50 | 23.52 | 0.016 | 23.46 | 23.55 | 0.090** | -0.074 |
| EFC in 5 FTE Year | $500 | $460 | -39.207 | $565 | $513 | -52.932* | 13.725 |
| Cum Credits Attempted at Start of 5 FTE Year | 137.50 | 135.30 | -2.195*** | 137.87 | 135.18 | -2.681*** | 0.486 |
| Cum Credits Earned at Start of 5 FTE Year | 119.47 | 121.15 | 1.688*** | 120.11 | 121.23 | 1.122** | 0.566 |
| Cum GPA at Start of 5 FTE Year | 2.67 | 2.62 | -0.046*** | 2.66 | 2.64 | -0.017 | -0.029 |
| Observations | 3,532 | 5,124 | 8,656 | 3,446 | 4,486 | 7,932 | 16,588 |

*** p<0.01 ** p<0.05 * p<0.10

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. Within this group, treated students who received 5 or more FTE years of Pell are matched to observably-similar students who received less than 5 FTE years of Pell. Students not exposed to the new lifetime Pell limit are defined as those who last enrolled on or before fall 2011. Students exposed to the new lifetime Pell limit are defined as those who last enrolled on or after spring 2012. Means are reported in columns (1), (2), (4), and (5). Estimates of pre-post compositional differences are reported in columns (3) and (6). Estimates of the difference in pre-post differences between treated and comparison students are reported in column (7). Standard errors are clustered by institution and reported in parentheses.

Source: University System of Georgia administrative records.

Table 3. Estimates of the effect of the lifetime Pell limit reduction on financial aid receipt

| | (1) | (2) |
|---|---|---|
| *A. Pell Grant Aid* | -602.082*** | -705.708*** |
| | (41.642) | (51.357) |
| $R^2$ | 0.214 | 0.252 |
| Baseline mean | $1,299 | |
| *B. Other grant aid* | -32.187 | -51.331 |
| | (27.678) | (34.900) |
| $R^2$ | 0.049 | 0.051 |
| Baseline mean | $55 | |
| *C. Loans* | -11.314 | -1.846 |
| | (137.225) | (126.132) |
| $R^2$ | 0.139 | 0.168 |
| Baseline mean | $2,671 | |
| *D. Total financial aid* | -642.502*** | -758.212*** |
| | (152.889) | (140.366) |
| $R^2$ | 0.171 | 0.210 |
| Baseline mean | $4,033 | |
| Institution-by-term controls | N | Y |
| Student-by-term observations | 21,149 | |

*** p<0.01 ** p<0.05 * p<0.10

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. The analytic window is restricted to three terms following 5 FTE attainment with summer terms excluded. Results are estimated with multiple imputation OLS models that control for: race (Black, Hispanic, Asian, Other, and Missing race/ethnicity); U.S. citizenship status; Georgia residency status; initial degree pursued; remedial assignment at entry; SAT math and verbal scores (imputed where missing); age at entry; and student's Expected Family Contribution at entry (imputed where missing). All models also include entry cohort-by-institution and term fixed effects and a constant. Models that include institution-by-term controls also include the following covariates: number of undergraduate degree-seeking students, inflation-adjusted in-state tuition and fees, inflation-adjusted instructional expenditures per FTE student, unemployment rate in the commuting zone of each institution, and interactions of each institutional covariate with the treatment indicator. Robust standard errors, clustered by institution, are reported in parentheses.

Source: University System of Georgia administrative records.

Table 4. Estimates of the effect of the lifetime Pell limit reduction on the probability of re-enrollment, credits attempted and earned, and term GPA

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | All student-by-term observations | | Restricted to enrolled terms only | |
| *A. Re-enrolled* | 0.040*** | 0.036*** | | |
| | (0.009) | (0.010) | | |
| $R^2$ | 0.207 | 0.206 | | |
| Baseline mean | 0.859 | | | |
| *B. Term credits attempted* | 0.591*** | 0.615*** | 0.148 | 0.206 |
| | (0.147) | (0.145) | (0.115) | (0.138) |
| $R^2$ | 0.217 | 0.216 | 0.092 | 0.094 |
| Baseline mean | 10.97 | | 12.75 | |
| *C. Term credits earned* | 0.546*** | 0.608*** | 0.180 | 0.276* |
| | (0.146) | (0.148) | (0.122) | (0.138) |
| $R^2$ | 0.224 | 0.228 | 0.113 | 0.120 |
| Baseline mean | 9.99 | | 11.59 | |
| *D. Term GPA* | | | 0.016 | 0.049 |
| | | | (0.030) | (0.033) |
| $R^2$ | | | 0.106 | 0.109 |
| Baseline mean | | | 2.55 | |
| Institution-by-term controls | N | Y | N | Y |
| Student-by-term observations | 53,412 | | 47,233 | |

*** p<0.01 ** p<0.05 * p<0.10

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. The analytic window is restricted to four terms following 4.5 FTE attainment with summer terms excluded. Results are estimated with multiple imputation OLS models that control for: race (Black, Hispanic, Asian, Other, and Missing race/ethnicity); U.S. citizenship status; Georgia residency status; initial degree pursued; remedial assignment at entry; SAT math and verbal scores (imputed where missing); age at entry; and student's Expected Family Contribution at entry (imputed where missing). All models also include entry cohort-by-institution and term fixed effects and a constant. Models that include institution-by-term controls also include the following covariates: number of undergraduate degree-seeking students, inflation-adjusted in-state tuition and fees, inflation-adjusted instructional expenditures per FTE student, unemployment rate in the commuting zone of each institution, and interactions of each institutional covariate with the treatment indicator. Robust standard errors, clustered by institution, are reported in parentheses.

Source: University System of Georgia administrative records.

Table 5. Estimates of the effect of the Pell Grant eligibility change on bachelor's degree attainment overall and time to degree completion

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | BA before 6 FTE year | | BA w/in 8 years of entry | | BA in year 6-8 since entry | | BA ever | |
| Post-2011 x Treated | 0.004 | 0.003 | 0.025* | 0.023* | 0.036** | 0.031* | 0.012 | 0.010 |
| | (0.017) | (0.017) | (0.014) | (0.013) | (0.016) | (0.016) | (0.016) | (0.016) |
| Treated | -0.031** | -0.022* | -0.002 | 0.010 | 0.030** | 0.052*** | 0.006 | 0.021* |
| | (0.013) | (0.013) | (0.014) | (0.014) | (0.014) | (0.013) | (0.012) | (0.012) |
| Post-2011 | -0.169*** | -0.474*** | -0.096*** | -0.262*** | 0.001 | 0.216*** | -0.090*** | -0.138*** |
| | (0.017) | (0.017) | (0.015) | (0.021) | (0.017) | (0.028) | (0.017) | (0.024) |
| $R^2$ | 0.029 | 0.168 | 0.010 | 0.137 | 0.003 | 0.092 | 0.0114 | 0.116 |
| Controls | N | Y | N | Y | N | Y | N | Y |
| Comparison mean post-2011 | 0.544 | | 0.728 | | 0.454 | | 0.769 | |
| Observations | 16,588 | | | | | | | |

*** p<0.01 ** p<0.05 * p<0.10

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. Results are estimated with linear probability models. Models with controls are from multiple imputation specifications that include the following covariates: race dummy variables (Black, Hispanic, Asian, Other, and Missing race/ethnicity); U.S. citizen dummy variable; Georgia resident dummy variable; pursued bachelor's degree at entry dummy variable; assigned to remedial coursework at entry dummy variable; SAT math and verbal scores (imputed where missing); age at entry; and the student's Expected Family Contribution at entry (imputed where missing). All models with controls also include entry cohort-by-institution fixed effects and a constant. Standard errors are clustered by institution and reported in parentheses.

Source: University System of Georgia administrative records.

Table 6. Estimates of the effect of the Pell Grant eligibility change on bachelor's degree attainment overall and time to degree by year of 5 FTE attainment

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | BA before 6 FTE year | BA w/in 8 years of entry | BA in year 6-8 since entry | BA ever |
| 5 FTE before 2012-13 | -0.014 | 0.012 | 0.036 | -0.003 |
| | (0.024) | (0.023) | (0.026) | (0.027) |
| 5 FTE in 2012-13 | -0.021 | 0.023 | 0.041** | 0.015 |
| | (0.019) | (0.016) | (0.019) | (0.015) |
| 5 FTE after 2012-13 | 0.096*** | 0.043 | 0.003 | 0.028 |
| | (0.027) | (0.027) | (0.033) | (0.027) |
| Tests of equal effects (p-values) | 0.0160 | 0.114 | 0.818 | 0.207 |
| $R^2$ | 0.178 | 0.158 | 0.111 | 0.132 |
| Comparison mean before 2012-13 | 0.473 | 0.733 | 0.448 | 0.795 |
| Comparison mean in 2012-13 | 0.669 | 0.788 | 0.403 | 0.807 |
| Comparison mean after 2012-13 | 0.428 | 0.582 | 0.582 | 0.621 |
| Observations | | 16,588 | | |

*** p<0.01 ** p<0.05 * p<0.10

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. Results are estimated with linear probability models. Models with controls are from multiple imputation specifications that include the following covariates: race dummy variables (Black, Hispanic, Asian, Other, and Missing race/ethnicity); U.S. citizen dummy variable; Georgia resident dummy variable; pursued bachelor's degree at entry dummy variable; assigned to remedial coursework at entry dummy variable; SAT math and verbal scores (imputed where missing); age at entry; and the student's Expected Family Contribution at entry (imputed where missing). All models with controls also include institution fixed effects and a constant. Standard errors are clustered by institution and reported in parentheses.

Source: University System of Georgia administrative records.

Table 7. Estimates of the effect of the lifetime Pell Grant eligibility change on bachelor's degree attainment by zero-EFC status in 5 FTE year, HOPE scholarship receipt in 5 FTE year, and receipt of two Pell awards status in 2009-10 / 2010-11 (N = 16,588)

| | (1) BA before 6 FTE year | (2) BA w/in 8 years of entry | (3) BA ever |
|---|---|---|---|
| *A. Zero-EFC status in 5 FTE year* | | | |
| Zero EFC | -0.020 | -0.000 | -0.009 |
| | (0.022) | (0.018) | (0.021) |
| EFC Greater Than Zero | 0.041* | 0.060*** | 0.041** |
| | (0.021) | (0.019) | (0.018) |
| Tests of equal effects (p-values) | 0.039 | 0.036 | 0.078 |
| $R^2$ | 0.666 | 0.806 | 0.834 |
| Comparison mean post-2011: Zero EFC | 0.514 | 0.702 | 0.747 |
| Comparison mean post-2011: EFC > 0 | 0.601 | 0.777 | 0.810 |
| *B. Received Georgia HOPE Scholarship in 5 FTE year* | | | |
| No | 0.005 | 0.026* | 0.012 |
| | (0.021) | (0.014) | (0.016) |
| Yes | 0.007 | 0.015 | 0.012 |
| | (0.038) | (0.026) | (0.024) |
| Tests of equal effects (p-values) | 0.968 | 0.701 | 0.994 |
| R2 | 0.669 | 0.807 | 0.836 |
| Comparison mean post-2011: Did not receive HOPE | 0.509 | 0.702 | 0.747 |
| Comparison mean post-2011: Received HOPE | 0.770 | 0.897 | 0.909 |
| *C. Received two Pell awards in 2009-10/2010-11* | | | |
| No | 0.028 | 0.030* | 0.013 |
| | (0.024) | (0.015) | (0.019) |
| Yes | -0.032 | 0.009 | 0.004 |
| | (0.026) | (0.025) | (0.027) |
| Tests of equal effects (p-values) | 0.095 | 0.483 | 0.800 |
| $R^2$ | 0.670 | 0.806 | 0.834 |
| Comparison mean post-2011: Did not receive two Pell awards | 0.539 | 0.704 | 0.753 |
| Comparison mean post-2011: Received two Pell awards | 0.550 | 0.764 | 0.792 |

*** p<0.01 ** p<0.05 * p<0.10

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. Results are estimated with multiple imputation linear probability models that include the following covariates: race dummy variables (Black, Hispanic, Asian, Other, and Missing race/ethnicity); U.S. citizen dummy variable; Georgia resident dummy variable; pursued bachelor's degree at entry dummy variable; assigned to remedial coursework at entry dummy variable; SAT math and verbal scores (imputed where missing); age at entry; and the student's Expected Family Contribution at entry (imputed where missing). All models also include entry cohort-by-institution fixed effects and a constant. Standard errors are clustered by institution and reported in parentheses.

Source: University System of Georgia administrative records.

Table 8. Robustness of estimates of effects on bachelor's degree attainment overall and time to completion to alternative matching solutions

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | Alternative Matched Samples | | | | |
| | Main Matched Sample | CEM | CEM | CEM | CEM | PSM |
| *A. BA before 6 FTE year* | 0.003 | 0.004 | 0.005 | 0.018 | -0.003 | 0.006 |
| | (0.017) | (0.013) | (0.016) | (0.015) | (0.031) | (0.017) |
| *B. BA w/in 8 years of entry* | 0.023* | 0.008 | 0.012 | 0.022 | 0.035 | 0.031** |
| | (0.013) | (0.015) | (0.016) | (0.015) | (0.022) | (0.013) |
| *C. BA in years 6-8 since entry* | 0.031* | 0.025 | 0.025 | 0.031 | 0.037* | 0.054*** |
| | (0.016) | (0.018) | (0.019) | (0.018) | (0.021) | (0.010) |
| *D. BA ever* | 0.010 | -0.001 | -0.010 | 0.015 | 0.019 | 0.017 |
| | (0.016) | (0.015) | (0.014) | (0.015) | (0.022) | (0.013) |
| Covariates used in matching solution | | | | | | |
| Entry Cohort | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Post-2011 Enrollment Status | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Enrolled Continuously in Years 1-4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Credits Attempted at Start of 5 FTE Year | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Years to Attain 5 FTE Status | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Gender | ✓ | | ✓ | | ✓ | ✓ |
| Race | ✓ | | ✓ | | ✓ | ✓ |
| EFC in 5 FTE Year | ✓ | | | ✓ | ✓ | ✓ |
| Credits Earned at Start of 5 FTE Year | | | | | ✓ | |
| Cumulative GPA at Start of 5 FTE Year | | | | | ✓ | |
| Observations | 16,588 | 25,995 | 24,844 | 20,148 | 8,678 | 16,588 |

*** p<0.01 ** p<0.05 * p<0.10

Notes: All samples are restricted to degree-seeking entrants to public, four-year institutions in Georgia from 2002-2008 who attended a USG institution for five or more FTE years within eight years of entry. Students with a record of transfer into USG after initial entry are excluded. Sample sizes vary across columns (1)-(5) because each set of covariates used in the matching solution returns a different set of observational identical treated and comparison students. Results in column 6 estimate the probability of High-Pell status separately by exposure status to the policy change and then match High- to Low-Pell students with the same exposure status and similar predicted probabilities (i.e., within +/- 0.05 percentage points). All results are estimated with multiple imputation linear probability models that include the full set of covariates. See Table 5 for details. Standard errors are clustered by institution and reported in parentheses. Source: University System of Georgia administrative records.

APPENDIX A

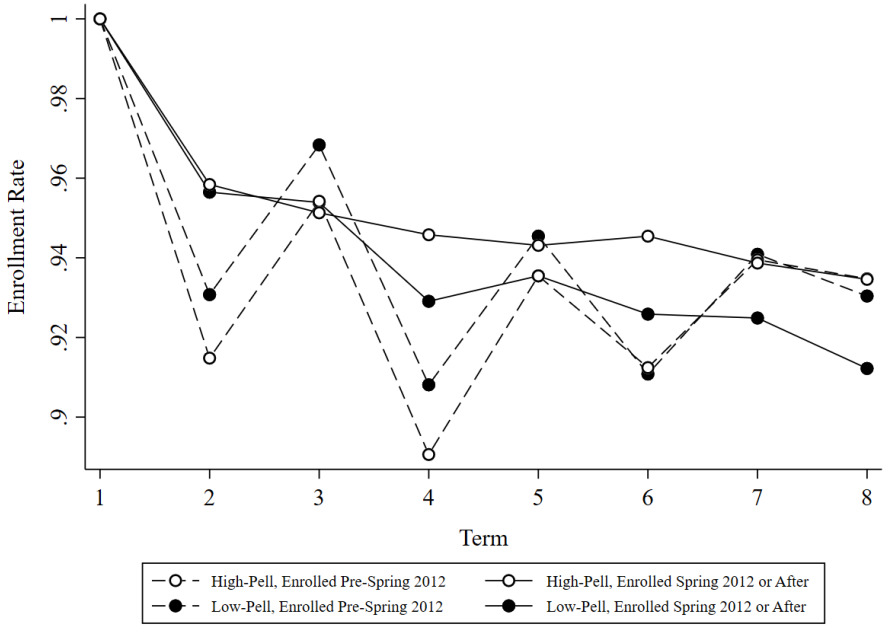
In Figure A1, I present evidence that the parallel trends assumption is violated in the full sample. The figure plots enrollment rates in the first four years of college for students who entered college several years before the Pell lifetime limit took effect and who enrolled for at least 5 FTE years in college. In Panel A, the solid lines show re-enrollment rates for students who were exposed to the new lifetime limit and the dashed lines show the same for students who were not exposed. Students affected and unaffected by the new lifetime limit (based on their lifetime receipt of Pell aid) are denoted by white and black circles, respectively.

Panel A shows evidence of differential changes in early enrollment behavior by treatment and exposure status. During their first four years of college, students who would have been affected by the new lifetime limit but were not exposed re-enrolled at or below the rates of students who were neither affected, nor exposed. By comparison, beginning in term four, affected and exposed students consistently re-enrolled at higher rates than their unaffected but exposed peers. In Panel B, I show that these differences are statistically significant.

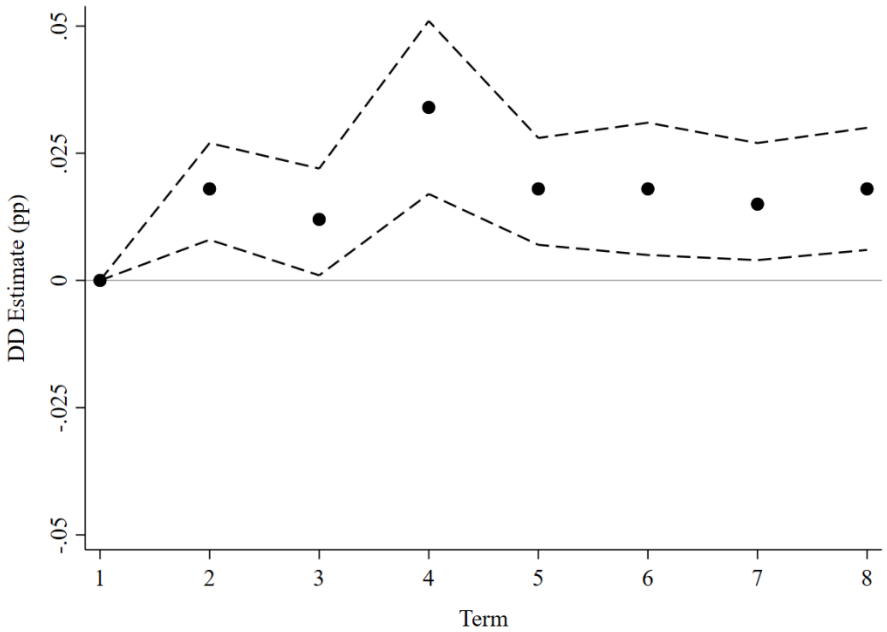
Because all students in the analysis entered college four or more years before Congress enacted the new lifetime Pell limit, it is impossible that this policy change caused the observed enrollment differences in Figure A1. Furthermore, in Table A1, I report estimates of compositional differences between treated and comparison students in the full sample. Consistent with the enrollment trends, the results reveal different compositional changes in the treated and comparison groups over time, which provides further evidence that the parallel trends assumption is rejected in the full sample.

Figure A1. Re-enrollment rates in years 1-4 of college among all students enrolled for 5 or more full-time-equivalent years, by treatment and enrollment status relative to the policy change

A. Enrollment by term




B. Difference-in-differences estimate




Notes: The sample is comprised of all students who attended a USG institution for five or more FTE years within eight years of entry. Within this group, treated students are defined as those who received 5 or more FTE years of Pell. Comparison students received less than 5 FTE years of Pell. Summer terms are excluded. In Panel B, each point denotes the average enrollment rate difference of High-Pell versus Low-Pell students in the post- vs. pre-policy period. The dotted lines represent 95 percent confidence intervals around each estimate.

Source: University System of Georgia administrative records.

Table A1. Unmatched sample characteristics by treatment and exposure status to the lifetime rule change

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | Received 5+ FTE years of Pell | | | Received < 5 FTE years of Pell | | | |
| | Exposed | Not Exposed | (2)-(1) | Exposed | Not Exposed | (2)-(1) | DID |
| *Pre-entry characteristics* | | | | | | | |
| Female | 0.624 | 0.614 | -0.010 | 0.472 | 0.478 | 0.006 | -0.016 |
| Black | 0.619 | 0.599 | -0.020 | 0.182 | 0.194 | 0.012 | -0.032* |
| Asian | 0.077 | 0.066 | -0.012 | 0.057 | 0.056 | -0.001 | -0.010 |
| Latino | 0.023 | 0.056 | 0.033*** | 0.030 | 0.051 | 0.021*** | 0.012** |
| White | 0.249 | 0.237 | -0.012 | 0.702 | 0.655 | -0.048*** | 0.036** |
| Race Other | 0.027 | 0.026 | -0.001 | 0.025 | 0.027 | 0.003 | -0.004 |
| Missing Race | 0.004 | 0.015 | 0.011*** | 0.003 | 0.017 | 0.014*** | -0.003 |
| SAT Math + Verbal Score | 945 | 930 | -15.233*** | 1043 | 1021 | -22.131 | 6.899 |
| Assigned to Remedial Coursework | 0.223 | 0.266 | 0.043*** | 0.101 | 0.138 | 0.038*** | 0.005 |
| Age at Entry | 18.71 | 18.72 | 0.010 | 18.59 | 18.61 | 0.021* | -0.011 |
| EFC at Entry | $902 | $1,143 | 240.549*** | $19,721 | $19,596 | -125.419 | 365.968 |
| *Post-entry characteristics* | | | | | | | |
| Age 5 FTE Year | 23.49 | 23.60 | 0.112** | 23.47 | 23.63 | 0.166*** | -0.054 |
| EFC in 5 FTE Year | $580 | $530 | -49.460** | $12,495 | $10,355 | -2,140.207*** | 2,090.747*** |
| Cum Credits Att at Start of 5 FTE Year | 136.34 | 136.24 | -0.099 | 136.41 | 133.50 | -2.908*** | 2.809*** |
| Cum Credits Earn at Start of 5 FTE Year | 118.50 | 121.22 | 2.724*** | 118.44 | 118.57 | 0.129 | 2.595*** |
| Cum GPA at Start of 5 FTE Year | 2.67 | 2.61 | -0.068*** | 2.74 | 2.69 | -0.048** | -0.020 |
| Observations | 4,214 | 5,626 | 9,840 | 19,555 | 17,371 | 36,926 | 46,766 |

*** p<0.01 ** p<0.05 * p<0.10

Notes: The sample is restricted to students who attended a USG institution for five or more FTE years within eight years of entry. Students not exposed to the new lifetime Pell limit are defined as those who last enrolled on or before fall 2011. Students exposed to the new lifetime Pell limit are defined as those who last enrolled on or after spring 2012. Means are reported in columns (1), (2), (4), and (5). Estimates of pre-post compositional differences are reported in columns (3) and (6). Estimates of the difference in pre-post differences between treated and comparison students are reported in column (7). Standard errors are clustered by institution and reported in parentheses. Source: University System of Georgia administrative records.

APPENDIX B

Table B1. Academic performance at the start of the 5 FTE enrollment year for matched students, by treatment status and year of 5 FTE attainment

| | Credits Attempted at Start of 5 FTE Year | | | Credits Earned at Start of 5 FTE Year | | |
|---|---|---|---|---|---|---|
| Year of 5 FTE Attainment | All Students | Treated Students | Comparison Students | All Students | Treated Students | Comparison Students |
| 2006 | 138.48 | 137.91 | 139.11 | 117.94 | 115.82 | 120.26 |
| 2007 | 138.16 | 137.41 | 139.01 | 114.96 | 113.96 | 116.09 |
| 2008 | 136.12 | 135.77 | 136.51 | 115.33 | 114.85 | 115.86 |
| 2009 | 138.06 | 137.90 | 138.24 | 119.42 | 119.15 | 119.71 |
| 2010 | 136.48 | 136.37 | 136.61 | 121.71 | 121.67 | 121.75 |
| 2011 | 134.92 | 134.71 | 135.15 | 123.45 | 123.39 | 123.50 |
| 2012 | 134.92 | 135.03 | 134.80 | 125.10 | 124.98 | 125.23 |
| 2013 | 137.80 | 138.39 | 137.13 | 114.98 | 115.54 | 114.35 |
| 2014 | 137.22 | 139.71 | 134.91 | 104.17 | 105.96 | 102.52 |
| | GPA at start of 5 FTE Year | | | Terms to 5 FTE Attainment | | |
| Year of 5 FTE Attainment | All Students | Treated Students | Comparison Students | All Students | Treated Students | Comparison Students |
| 2006 | 2.64 | 2.62 | 2.66 | 14.03 | 14.04 | 14.02 |
| 2007 | 2.64 | 2.65 | 2.63 | 15.08 | 15.09 | 15.06 |
| 2008 | 2.64 | 2.65 | 2.64 | 15.64 | 15.62 | 15.67 |
| 2009 | 2.59 | 2.59 | 2.60 | 15.87 | 15.83 | 15.92 |
| 2010 | 2.64 | 2.65 | 2.63 | 15.21 | 15.14 | 15.30 |
| 2011 | 2.67 | 2.65 | 2.69 | 14.73 | 14.70 | 14.76 |
| 2012 | 2.69 | 2.67 | 2.70 | 14.80 | 14.77 | 14.83 |
| 2013 | 2.57 | 2.57 | 2.58 | 17.52 | 17.51 | 17.54 |
| 2014 | 2.49 | 2.50 | 2.48 | 20.11 | 20.16 | 20.07 |

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. Within this group, treated students who received 5 or more FTE years of Pell are matched to observably-similar students who received less than 5 FTE years of Pell.

Source: University System of Georgia administrative records.

Table B2. Robustness of effect estimates on the probability of re-enrollment, credits attempted and earned, and term GPA when restricting the sample to graduates

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Not conditioned on enrollment | | Restricted to enrolled terms only | |
| | Main sample | Sample restricted to graduates | Main sample | Sample restricted to graduates |
| *A. Re-enrolled* | 0.036*** | 0.029*** | | |
| | (0.010) | (0.006) | | |
| $R^2$ | 0.206 | 0.084 | | |
| Baseline mean | 0.859 | 0.948 | | |
| *B. Term credits attempted* | 0.615*** | 0.533*** | 0.206 | 0.181 |
| | (0.145) | (0.163) | (0.138) | (0.158) |
| $R^2$ | 0.216 | 0.123 | 0.094 | 0.088 |
| Baseline mean | 10.97 | 12.35 | 12.75 | 13.03 |
| *C. Term credits earned* | 0.608*** | 0.540*** | 0.276* | 0.237 |
| | (0.148) | (0.182) | (0.138) | (0.168) |
| $R^2$ | 0.228 | 0.131 | 0.120 | 0.097 |
| Baseline mean | 9.99 | 11.68 | 11.59 | 12.31 |
| *D. Term GPA* | | | 0.049 | 0.052 |
| | | | (0.033) | (0.038) |
| $R^2$ | | | 0.109 | 0.106 |
| Baseline mean | | | 2.55 | 2.745 |
| Student-by-term observations | 53,412 | 39,034 | 47,233 | 37,296 |

*** p<0.01 ** p<0.05 * p<0.10

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. The analytic window is restricted to four terms following 4.5 FTE attainment with summer terms excluded. Results are estimated with multiple imputation OLS models that control for: race (Black, Hispanic, Asian, Other, and Missing race/ethnicity); U.S. citizenship status; Georgia residency status; initial degree pursued; remedial assignment at entry; SAT math and verbal scores (imputed where missing); age at entry; student's Expected Family Contribution at entry (imputed where missing); number of undergraduate degree-seeking students; inflation-adjusted in-state tuition and fees; inflation-adjusted instructional expenditures per FTE student; unemployment rate in the commuting zone of each institution; and interactions of each institution-level covariate with the treatment indicator. All models also include entry cohort-by-institution and term fixed effects and a constant. Robust standard errors, clustered by institution, are shown in parentheses.

Source: University System of Georgia administrative records.

Table B3. Estimates of the effect of the Pell Grant eligibility change on bachelor's degree attainment by zero-EFC status in 5 FTE year, excluding students with family incomes between $23,000 and $32,000

| | (1) | (2) | (3) |
|---|---|---|---|
| | BA before 6 FTE year | BA w/in 8 years of entry | BA ever |
| Zero EFC | 0.004 | 0.018 | 0.005 |
| | (0.022) | (0.015) | (0.017) |
| EFC Greater Than Zero | 0.037 | 0.057*** | 0.039* |
| | (0.024) | (0.020) | (0.019) |
| Tests of equal effects (p-values) | 0.233 | 0.098 | 0.151 |
| $R^2$ | 0.661 | 0.802 | 0.833 |
| Comparison mean post-2011: Zero EFC | 0.504 | 0.690 | 0.738 |
| Comparison mean post-2011: EFC > 0 | 0.600 | 0.780 | 0.814 |
| Observations | | 14,640 | |

*** p<0.01 ** p<0.05 * p<0.10

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. The income restriction corresponds to the group of students who no longer automatically qualified for maximum Pell awards when the new lifetime Pell limit also took effect. Results are estimated with multiple imputation linear probability models that include the following covariates: race dummy variables (Black, Hispanic, Asian, Other, and Missing race/ethnicity); U.S. citizen dummy variable; Georgia resident dummy variable; pursued bachelor's degree at entry dummy variable; assigned to remedial coursework at entry dummy variable; SAT math and verbal scores (imputed where missing); age at entry; and the student's Expected Family Contribution at entry (imputed where missing). All models also include entry cohort-by-institution fixed effects and a constant. Standard errors are clustered by institution and reported in parentheses.

Source: University System of Georgia administrative records.

Table B4. Estimates of the effect of the lifetime Pell limit reduction on the probability of re-enrollment, credits attempted and earned, and bachelor's degree completion when the matched sample is restricted to students who received 3 or more FTE years of Pell Grant aid

| Term-level Outcomes | (1) Effect Estimate | Degree Outcomes | (2) Effect Estimate |
|---|---|---|---|
| *A. Re-enrolled* | 0.033** | *D. BA before 6 FTE year* | -0.011 |
| | (0.013) | | (0.021) |
| $R^2$ | 0.198 | $R^2$ | 0.172 |
| Baseline mean | 0.866 | Baseline mean | 0.559 |
| *B. Term credits attempted* | 0.560*** | *E. BA w/in 8 years of entry* | 0.014 |
| | (0.180) | | (0.022) |
| $R^2$ | 0.213 | $R^2$ | 0.141 |
| Baseline mean | 11.08 | Baseline mean | 0.749 |
| *C. Term credits earned* | 0.474** | *F. BA in year 6-8 since entry* | 0.021 |
| | (0.224) | | (0.020) |
| $R^2$ | 0.228 | $R^2$ | 0.095 |
| Baseline mean | 10.14 | Baseline mean | 0.466 |
| | | *G. BA ever* | 0.002 |
| | | | (0.020) |
| | | $R^2$ | 0.124 |
| | | Baseline mean | 0.784 |
| Observations | 39,270 | Observations | 12,071 |

*** p<0.01 ** p<0.05 * p<0.10

Notes: The sample is restricted to matched students who attended a USG institution for five or more FTE years within eight years of entry. In column (1), the analytic window is restricted to four terms following 4.5 FTE attainment with summer terms excluded. Results are estimated with multiple imputation OLS models. See tables 4 and 5 for the list of controls included in the models in columns (1) and (2), respectively. Robust standard errors, clustered by institution, are shown in parentheses.

Source: University System of Georgia administrative records.