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Unequal and Persistent Effects of Student Loan Policy: Evidence from Parent PLUS Reforms

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Federal student loan policy is designed as a uniform intervention, yet institutions differ in their reliance on specific sources of financing. We study how these differences shape the transmission of policy shocks using two reforms to the Parent Loans for Undergraduate Students (Parent PLUS) program: a 2012 tightening of credit standards that limited access to these loans and a 2015 revision that partially restored access. We conceptualize institutional vulnerability as dependence on Parent PLUS borrowing to sustain enrollment and revenues. Using a panel of U.S. colleges from 2006 to 2023, we estimate difference-in-differences, event-study, and synthetic control models. We find that Historically Black Colleges and Universities (HBCUs), which rely more heavily on Parent PLUS, experienced larger declines in borrowing and enrollment after 2012. Although borrowing rebounded after 2015, enrollment did not fully recover. We show that these effects reflect both demand- and supply-side responses. HBCUs responded by expanding admissions to offset lower yield rates and by reducing spending on instruction and student services, changes that coincided with declines in retention and graduation. These findings demonstrate that uniform credit policies can generate unequal and persistent institutional effects when institutions differ in their financial dependence.

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April 22, 2026

Abstract: Federal student loan policy is designed as a uniform intervention, yet institutions differ in their reliance on specific sources of financing. We study how these differences shape the transmission of policy shocks using two reforms to the Parent Loans for Undergraduate Students (Parent PLUS) program: a 2012 tightening of credit standards that limited access to these loans and a 2015 revision that partially restored access. We conceptualize institutional vulnerability as dependence on Parent PLUS borrowing to sustain enrollment and revenues. Using a panel of U.S. colleges from 2006 to 2023, we estimate difference-in-differences, event-study, and synthetic control models. We find that Historically Black Colleges and Universities (HBCUs), which rely more heavily on Parent PLUS, experienced larger declines in borrowing and enrollment after 2012. Although borrowing rebounded after 2015, enrollment did not fully recover. We show that these effects reflect both demand- and supply-side responses. HBCUs responded by expanding admissions to offset lower yield rates and by reducing spending on instruction and student services, changes that coincided with declines in retention and graduation. These findings demonstrate that uniform credit policies can generate unequal and persistent institutional effects when institutions differ in their financial dependence.

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I. Introduction

Federal student loan policy plays a central role in ensuring access to higher education in the United States. While these policies are typically designed as uniform interventions, their effects may vary substantially across institutions depending on differences in student populations, financial structures, and reliance on specific funding streams. This paper examines how institutional vulnerability to federal credit policy shapes the effects of student loan reforms.

We focus on the Parent Loans for Undergraduate Students (Parent PLUS) program, which allows parents to borrow to finance their children's college education. In academic year 2012-13, the U.S. Department of Education tightened credit standards for Parent PLUS loans, restricting access for many borrowers (Johnson et al., 2019; Nelson, 2012). In response to widespread concern about disparate impacts, the Department partially reversed these changes in 2015-16 by relaxing credit requirements and expanding the appeals process (U.S. Department of Education, 2014; William D. Ford Federal Direct Loan Program, 2014). These two policy shifts provide a useful setting to study how changes in credit availability affect institutions that differ in their reliance on parent borrowing.

We conceptualize institutional vulnerability as dependence on a specific source of revenue or financial access. Institutions that enroll larger shares of students who rely on parent borrowing are more exposed to changes in loan eligibility. Historically Black Colleges and Universities (HBCUs) represent a particularly important case. HBCUs enroll a disproportionate share of low-income and credit-constrained students and rely more heavily on Parent PLUS borrowing than other institutions (Darbhamulla & Jin, 2019; Fletcher et al., 2020). As a result, they may be especially sensitive to changes in federal credit policy.

Prior research documents that HBCU students are substantially more reliant on federal loans, including Parent PLUS, than their counterparts at other institutions. Nearly a quarter of HBCU students rely on Parent PLUS loans, compared to less than 10% nationally, and these loans often cover a larger share of total college costs (Darbhamulla & Jin, 2019). Moreover, borrowing patterns differ sharply by race: Parent PLUS usage increases with income among White families but decreases with income among Black families, raising concerns about repayment capacity. Descriptive analyses following the 2012 tightening also show disproportionately large declines in borrowing and enrollment at HBCUs (Anderson, 2013; Fishman, 2014).

Using institution-level data from the Integrated Postsecondary Education Data System (IPEDS) and Federal Student Aid (FSA), we construct a panel spanning academic years 2006-07 through 2023-24. We estimate the effects of the 2012 tightening and 2015 revision using a difference-in-differences (DD) framework with institution and year fixed effects. We complement this approach with event-study models, a triple-difference design that captures heterogeneity by pre-policy exposure, and a synthetic control analysis that constructs a comparison group based on pre-policy change trends and institution characteristics.

We find that HBCUs are substantially more responsive to changes in Parent PLUS loan policy than other institutions. Following the 2012 tightening, HBCUs experienced larger declines than non-HBCUs in both Parent PLUS recipients and undergraduate enrollment. In our main estimates, HBCUs experienced roughly a 25% larger decline in Parent PLUS recipients and a 10% larger decline in enrollment following the 2012 tightening. After the 2015 revision, Parent PLUS borrowing rebounded sharply at HBCUs (28.5% larger increase than non-HBCUs), but enrollment did not recover completely (9.7% smaller rebound than non-HBCUs). This finding suggests that restoring access to credit did not fully reverse earlier enrollment losses, pointing to persistent

effects of the initial disruption. This pattern is consistent with a broader literature on "scarring," which shows that adverse conditions at key decision points can have lasting consequences for long-term outcomes. Importantly, these effects are often most pronounced for individuals with fewer resources or weaker labor market attachment, highlighting how vulnerability can amplify the long-run impact of temporary shocks (e.g., Kahn, 2010; Oreopoulos et al., 2012; Schwandt & von Wachter, 2019).

Consistent with this interpretation, we also examine mechanisms underlying these effects. We find that HBCUs experienced larger declines in admission yield rates and expanded admissions following the 2015 revision (likely to offset lower yield). We find larger reductions in expenditures on instruction and student services at HBCUs. We also observe larger declines in retention rates in the short term and graduation rates in the longer term at HBCUs. Together, these results point to both demand-side student constraints and supply-side institutional responses related to these policy changes.

This study contributes to a broader understanding of how uniform policies can generate unequal and persistent effects across institutions. Rather than focusing solely on student-level responses to financial aid, we highlight how institutional dependence on specific revenue streams shapes both the magnitude and persistence of policy impacts. In doing so, we provide evidence that federal loan policy can generate both unequal and persistent institutional effects, particularly when institutions differ in their underlying financial vulnerability. While prior work has focused on student-level responses, our results highlight how institutional dependence on specific funding sources can amplify and propagate the effects of policy shocks over time, contributing to persistent differences in outcomes across institutions.

The remaining sections proceed as follows: Section II describes the institutional context and conceptual framework; Section III details the data sources and empirical strategy; Section IV presents results; and Section V concludes.

II. Institutional Context and Conceptual Framework

The Parent PLUS Loan Program and Policy Changes

The Parent PLUS loan program was introduced to help families finance college expenses by allowing parents of dependent undergraduate students to borrow up to the full cost of attendance minus other aid (FSA, n.d.). Initially designed for relatively high-income families, the program expanded over time as borrowing limits were removed and eligibility remained broadly accessible (Baum et al., 2019; Fain, 2020; Fishman, 2014; Looney & Lee, 2018; Zhou et al., 2019). Over time, the composition of Parent PLUS borrowers shifted. A growing share of low-income families, particularly Black families, began to rely on these loans despite limited capacity to repay (Jin & Darbhamulla, 2019; Zhou et al., 2019). As documented in prior work, Black families are more likely to borrow through Parent PLUS and often face higher debt burdens relative to income (Darbhamulla & Jin, 2019; Fletcher et al., 2020; Jackson et al., 2023; Wright-Kim et al., 2024). Black families, particularly those with a student attending an HBCU or another minority-serving institution, have worse repayment and default outcomes than families with students attending other types of institutions (Baum et al., 2019; Fain, 2020; Fletcher et al., 2020; Looney & Lee, 2018).

Concerns about rising default risk led the U.S. Department of Education to tighten credit standards in 2012. The revised policy expanded the definition of adverse credit history, resulting in a sharp increase in loan denials (Carey, 2013; Field, 2013; Hayes, 2013; Johnson et al., 2019; Nelson, 2012; Stratford, 2014). In response to substantial declines in borrowing and enrollment at affected institutions, the Department relaxed these standards in 2015 by shortening the lookback

period and expanding the appeals process (Stratford, 2014; U.S. Department of Education, 2014; William D. Ford Federal Direct Loan Program, 2014). These policy changes altered access to credit without targeting specific institutions, creating a setting in which exposure varied based on institutional characteristics rather than policy design.

Institutional Vulnerability and Exposure to Credit Policy

We conceptualize institutional vulnerability as the degree to which an institution depends on specific financial resources that are subject to policy change. In this context, exposure to Parent PLUS borrowing represents a key dimension of vulnerability. HBCUs are particularly exposed along this margin. Students at HBCUs are more likely to rely on loans, including Parent PLUS loans, and often depend on those funds to cover a substantial share of college costs. As a result, changes in credit availability may directly affect both student enrollment decisions and institutional revenue. This framework suggests two channels through which policy changes may operate. First, reduced access to credit may constrain students' ability to enroll, leading to declines in enrollment and yield rates (demand-side mechanism). Second, institutions facing enrollment and revenue shocks may adjust their behavior, for example by expanding admissions or reducing expenditures (supply-side mechanism). These responses may, in turn, affect student outcomes.

Relationship to Existing Literature

Existing research on Parent PLUS loans has largely been descriptive, documenting disparities in borrowing patterns, repayment outcomes, and institutional exposure (Anderson, 2013; Baum et al., 2019; Carey, 2013; Doubleday, 2013; Field, 2013; Fishman, 2014; Fletcher et al., 2020; Granville, 2022; Hayes, 2013; Johnson et al., 2019). Prior studies show that HBCUs experienced substantial declines in Parent PLUS borrowing following the 2012 tightening, along with associated reductions in institutional revenue (Anderson, 2013; Fishman, 2014). However,

this literature leaves open the question of how these policy changes causally affected institutions with differing levels of financial vulnerability.

More broadly, this study relates to literature on financial constraints and college access, which shows that access to financial aid (including loans) can shape enrollment decisions (e.g., Black et al., 2023; Dynarski, 2000; Dynarski, 2003; Kane, 1994; Marx & Turner, 2019). It also connects to work on institutional finance, which highlights how revenue shocks can influence institutional behavior and student outcomes (e.g., Bound et al., 2010; Bound et al., 2019; Chakrabarti et al., 2020; Hillman, 2020; Laderman et al., 2023).

Finally, our findings relate to a literature on the persistent effects of economic shocks. Studies of labor market entry show that individuals exposed to adverse conditions, such as graduating during a recession, experience long-lasting impacts on employment and earnings trajectories (Kahn, 2010; Oreopoulos et al., 2012; Schwandt & von Wachter, 2019). Importantly, this work shows that these scarring effects are often larger for more vulnerable populations, including those with fewer resources, weaker initial labor market attachment, or limited outside options. Related research documents persistence through occupational mismatch and slower career progression (Devereux, 2003; Hojo, 2026), as well as among vulnerable groups such as migrants (Lucchetti & Ruggieri, 2025).

We build on these literatures by providing causal evidence on how changes in federal credit policy affect institutions differently depending on their exposure to borrowing. Extending the idea of scarring to the institutional level, we show that temporary disruptions to credit access can generate both unequal and persistent effects when institutions differ in their underlying financial vulnerability. Rather than focusing solely on students, we emphasize how institutional dependence on financial aid programs shapes both the magnitude and persistence of responses to policy change.

III. Data and Methods

Data

Our data come from IPEDS and the FSA Title IV Program Volume Reports. IPEDS provides most of our institution-level outcome data, and the FSA Title IV Program Volume Reports provide data specific to Parent PLUS loans, such as the number of loan recipients and average amount awarded. We construct a panel dataset beginning in academic year 2006-07 and extending through 2023-24. Figure 1 provides a timeline showing the years of data included in our dataset as well as the years of both policy changes we study. Our dataset includes 18 years in total: six years prior to the 2012 tightening, three years between the 2012 and 2015 policy changes, and nine years after the 2015 revision.

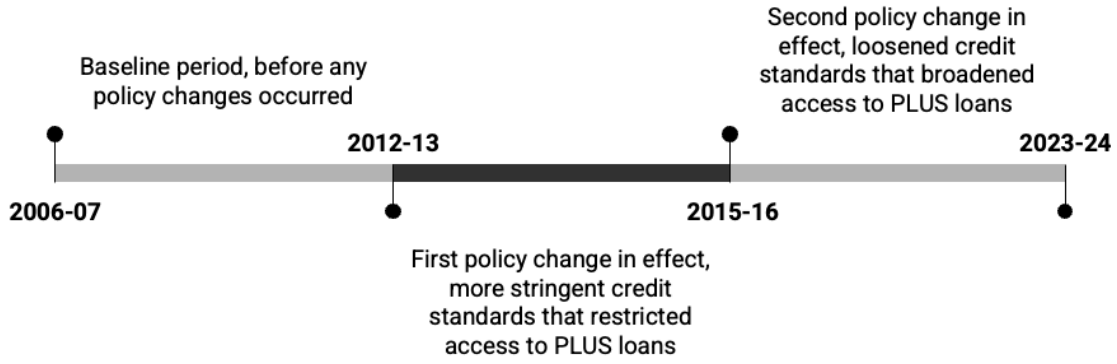

Figure 1. Timeline of policy changes.

To create our analytic sample, we first restrict the dataset to include institutions in the years they had at least one student who received a Parent PLUS loan. Given our focus on how policy changes impact HBCUs relative to non-HBCUs, we also restrict our sample based on institution characteristics. All HBCUs are public or private non-profit, so we exclude private for-profit institutions from our control group. We also drop administrative units (e.g., system offices), institutions that do not offer any degrees or certificates, and military academies from our sample. Because Parent PLUS loans are only available to parents of undergraduate students, we also drop

institutions with no undergraduate enrollment (i.e., institutions only offering graduate education). All HBCUs are two-year or four-year institutions, so we also exclude less-than-two-year institutions from our control group. We drop any institutions whose HBCU status changes during the years in our sample.[1] Because we include institution and year fixed effects, the models drop institutions that only had Parent PLUS loan recipients in one year during our sample period. Finally, to achieve a balanced panel, we exclude any institutions without all 18 years of data (2006-2023), resulting in a final sample of 20,628 institution-year observations. Table 1 summarizes each sample restriction and shows its impact on the sample size. The final sample includes 56 HBCUs and 1,090 non-HBCUs.

Table 1. Summary of sample restrictions.

Sample Restriction	Observations Excluded	Observations Remaining
Institution-year observations with > 0 Parent PLUS loan recipients	--	67,523
Exclude for-profit institutions	24,397	43,126
Exclude administrative units	11	43,115
Exclude institutions offering no awards (degree or certificate)	3	43,112
Exclude military academies	11	43,101
Exclude institutions with no undergraduate enrollment	55	43,046
Exclude less-than-two-year institutions	1,809	41,237
Exclude institutions whose HBCU status changes	10	41,227
Exclude institutions without all 18 years of data	20,599	20,628

Figure 2 presents descriptive trends in Parent PLUS recipients and undergraduate full-time equivalent (UGFTE) enrollment for HBCUs and non-HBCUs over time. Panel A shows that HBCUs consistently have higher levels of Parent PLUS borrowing and experience a sharp decline following the 2012 tightening of credit standards, followed by a rebound after the 2015 revision. Panel B shows that undergraduate enrollment at HBCUs declines relative to non-HBCUs after

[1] HBCU status only changes for one institution (American Baptist College in Nashville, TN) in 2015.

2012 and remains lower in the post-2015 period, even as borrowing rebounds.[2] While these patterns are purely descriptive and do not account for other factors, they provide preliminary evidence of differential exposure to and responses following changes in Parent PLUS policy, motivating the causal analysis that follows.

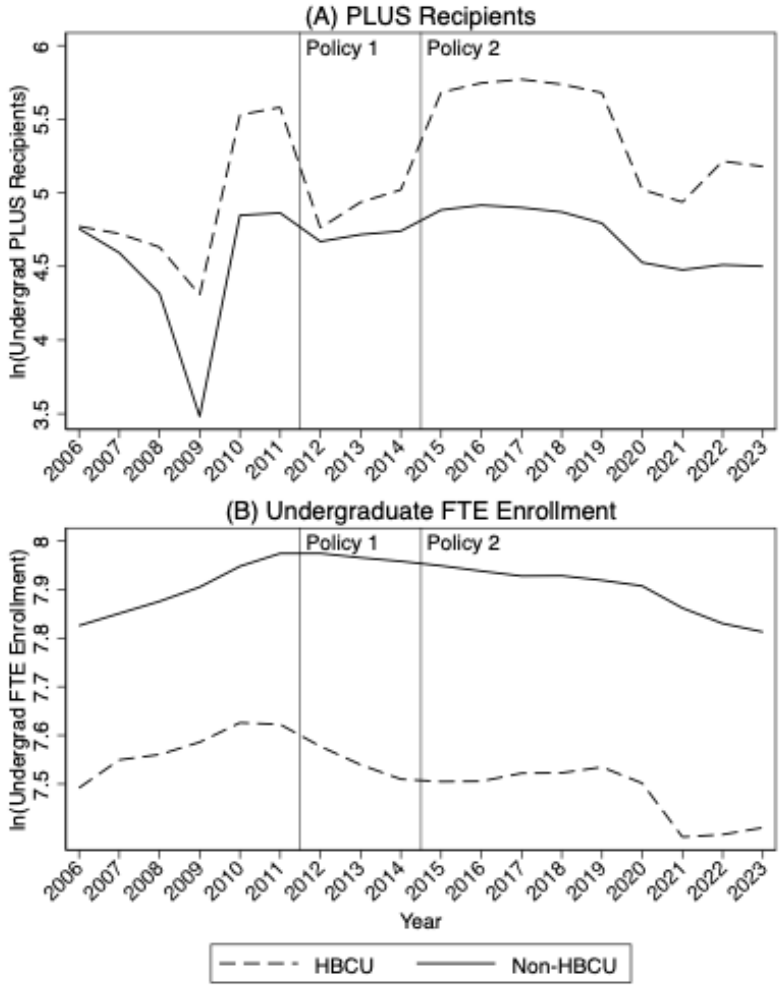

Figure 2. Trends in Parent PLUS recipients and UGFTE enrollment at HBCUs and non-HBCUs. *This figure plots mean outcomes for HBCU and non-HBCUs over the period 2006-2023. Panel A shows the natural log of Parent PLUS loan recipients, and Panel B shows the natural log of UGFTE enrollment. The dashed line represents HBCUs, and the solid line represents non-HBCUs. Vertical lines indicate the 2012 tightening of Parent PLUS credit standards (Policy 1) and the 2015 policy revision (Policy 2). These descriptive trends illustrate differences in levels and trajectories across institution types but do not control for other factors.*

Methods

[2] For both outcomes, we see evidence of differential effects of the COVID-19 pandemic beginning in 2020-2021.

We estimate the effects of Parent PLUS loan policy changes using a DD framework with institution and year fixed effects (γ_i and δ_t, respectively). We examine both borrowing and enrollment outcomes, where changes in Parent PLUS recipients capture policy-induced shifts in credit access that may translate into downstream enrollment effects. We estimate the following model:

$$(1) \qquad Y_{it} = \gamma_i + \delta_t + \beta_1(HBCU_i \times Policy1_t) + \beta_2(HBCU_i \times Policy2_t) + \varepsilon_{it}$$

where $Policy1_t$ indicates the period following the 2012 tightening of credit standards (2012-2014) and $Policy2_t$ indicates the period following the 2015 revision (2015-2023). The coefficients β_1 and β_2 capture differential changes for HBCUs relative to non-HBCUs under each policy regime, relative to the pre-2012 baseline. To account for correlation within institutions across time, we cluster our error term (ε_{it}) at the institution level.[3]

This design exploits the fact that both policy changes applied uniformly to all Title IV institutions (i.e., colleges participating in federal student aid programs), with no variation in treatment timing. Identification therefore relies on differences in exposure across institutions, particularly the greater reliance of HBCUs on Parent PLUS borrowing. The key identifying assumption is that, absent the policy changes, outcomes at HBCUs and non-HBCUs would have followed parallel trends. We provide visual and statistical evidence supporting this assumption in the event-study analysis below (Figures 2 and 3). The event-study specification, in which we allow treatment effects to vary flexibly over time relative to the year before the first policy change, allows us to examine dynamic effects and assess the parallel trends assumption more formally.

[3] We also run models with robust standard errors. The standard errors are generally larger when we cluster, so we report the more conservative estimates with clustered standard errors as our preferred model specification in Table 2.

We complement our baseline DD approach with several additional analyses. First, we estimate event-study models using the Callaway and Sant'Anna (2021) estimator, which minimizes biases associated with two-way fixed effects (Figure 3). Second, we implement a triple-difference design that interacts HBCU status, indicators for each policy regime, and pre-policy exposure to Parent PLUS borrowing to examine heterogeneity in responses across institutions (Table 3). Third, we use a synthetic control approach to construct a comparison group of non-HBCU institutions that closely match pre-policy trends, providing an alternative counterfactual for assessing the robustness of our findings (Figure 4).

IV. Results

Main Results

Table 2 presents DD estimates of the effects of Parent PLUS loan policy changes on our two main outcomes of interest: the natural log of Parent PLUS loan recipients (column 1) and the natural log of UGFTE enrollment (column 2). Following the 2012 tightening of credit standards, the number of Parent PLUS recipients declined significantly more at HBCUs than at non-HBCUs (a 25% larger decline). In contrast, after the 2015 revision that partially restored access to Parent PLUS loans, HBCUs experienced a significantly larger increase in Parent PLUS recipients (28.5% larger than non-HBCUs). Taken together, these patterns indicate that HBCUs are highly responsive to changes in the availability of parent credit, both when access is restricted and when it is expanded. Although changes in Parent PLUS recipients mechanically reflect policy-induced shifts in credit access, documenting this response is important for confirming that the policy generated meaningful variation in borrowing and for interpreting downstream enrollment effects.

Column 2 shows that UGFTE enrollment also declined more at HBCUs following the 2012 tightening, with an estimated 10% larger decline relative to non-HBCUs. Notably, enrollment at

HBCUs did not fully recover following the 2015 revision. The post-2015 coefficient remains negative and statistically significant. This pattern suggests that the enrollment shock induced by the 2012 tightening had persistent effects that were not reversed when borrowing access was partially restored. These findings suggest that short-term disruptions may have longer-lasting institutional consequences.

Table 2. Effects of Parent PLUS policy changes on borrowing and enrollment.

	(1) ln(Parent PLUS Recipients)	(2) ln(UGFTE Enrollment)
HBCU × Policy 1	-0.250**	-0.100***
	(0.087)	(0.026)
HBCU × Policy 2	0.285*	-0.097*
	(0.113)	(0.039)
Institution FE	✓	✓
Year FE	✓	✓
Observations	20,628	20,628
R-squared	0.871	0.981

Notes: This table reports DD estimates of the effects of the 2012 tightening and 2015 revision of Parent PLUS credit standards on institutional outcomes. The dependent variables are the log of undergraduate Parent PLUS recipients and the log of UGFTE enrollment. All specifications include institution and year fixed effects. Standard errors are clustered at the institution level and reported in parentheses. ***$p<0.001$, **$p<0.01$, *$p<0.05$.

Dynamic Effects

Figure 3 presents event-study estimates that trace the evolution of these effects over time. Coefficients represent differences between HBCUs and non-HBCUs relative to 2011 (i.e., the year before the first policy change).[4] Panel A shows effects on Parent PLUS recipients, and panel B shows effects on UGFTE enrollment. For Parent PLUS recipients, there is a sharp and immediate decline at HBCUs relative to non-HBCUs following the 2012 tightening. This decline persists through 2014. After the 2015 revision, differences in Parent PLUS recipients between HBCUs and non-HBCUs rebound to pre-2012 levels. Panel B shows that enrollment declines at HBCUs begin

[4] Appendix Table A1 reports the corresponding coefficients.

around the 2012 tightening and persist throughout the post-period. Although the estimates are imprecise (especially after 2015), the overall pattern suggests that enrollment at HBCUs remains lower relative to non-HBCUs in the post-period, with limited evidence of a full recovery following the 2015 revision. This divergence between borrowing and enrollment responses suggests that restoring credit access did not fully reverse earlier enrollment losses.

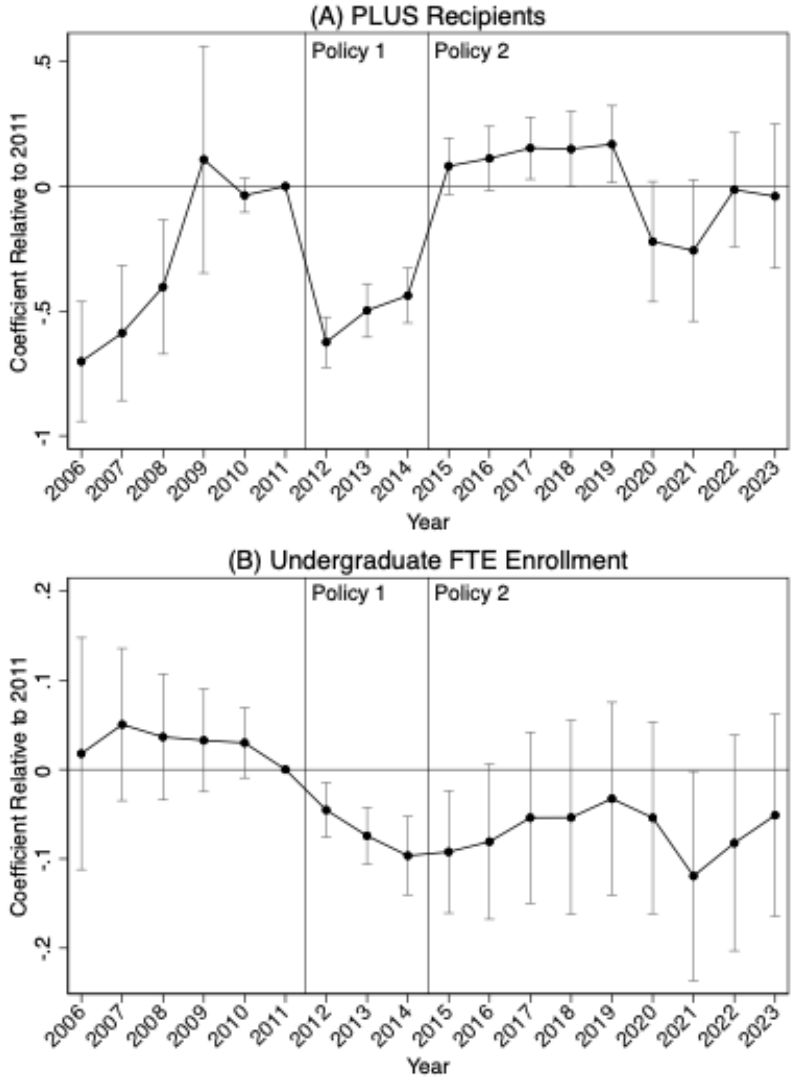

Figure 3. Event-study estimates of the effects of Parent PLUS policy changes. *Panel A shows year-specific effects on the log number of Parent PLUS recipients, and panel B shows effects on the log of UGFTE enrollment. Coefficients represent differences between HBCUs and non-HBCUs relative to 2011, controlling for institution and year fixed effects. Vertical lines indicate the 2012 tightening of Parent PLUS credit standards and the 2015 revision. Error bars denote 95% confidence intervals.*

Robustness Checks

Callaway and Sant'Anna

Figure 4 presents event-study estimates using the Callaway and Sant'Anna (2021) estimator, which allows for treatment effect heterogeneity and reduces bias in two-way fixed effects models.[5] The results closely mirror those from the standard event-study specification. For Parent PLUS recipients in panel A, there is a sharp decline immediately following the 2012 tightening and a rebound after 2015. Pre-treatment estimates are generally close to zero, which provides additional support for the parallel trends assumption. For UGFTE enrollment in panel B, the estimates again show persistent negative effects following the 2012 tightening, with little evidence of recovery after 2015. The consistency of these patterns across estimators strengthens the conclusion that the 2012 tightening had lasting enrollment consequences for HBCUs.

[5] Appendix Table A2 reports the corresponding estimates.

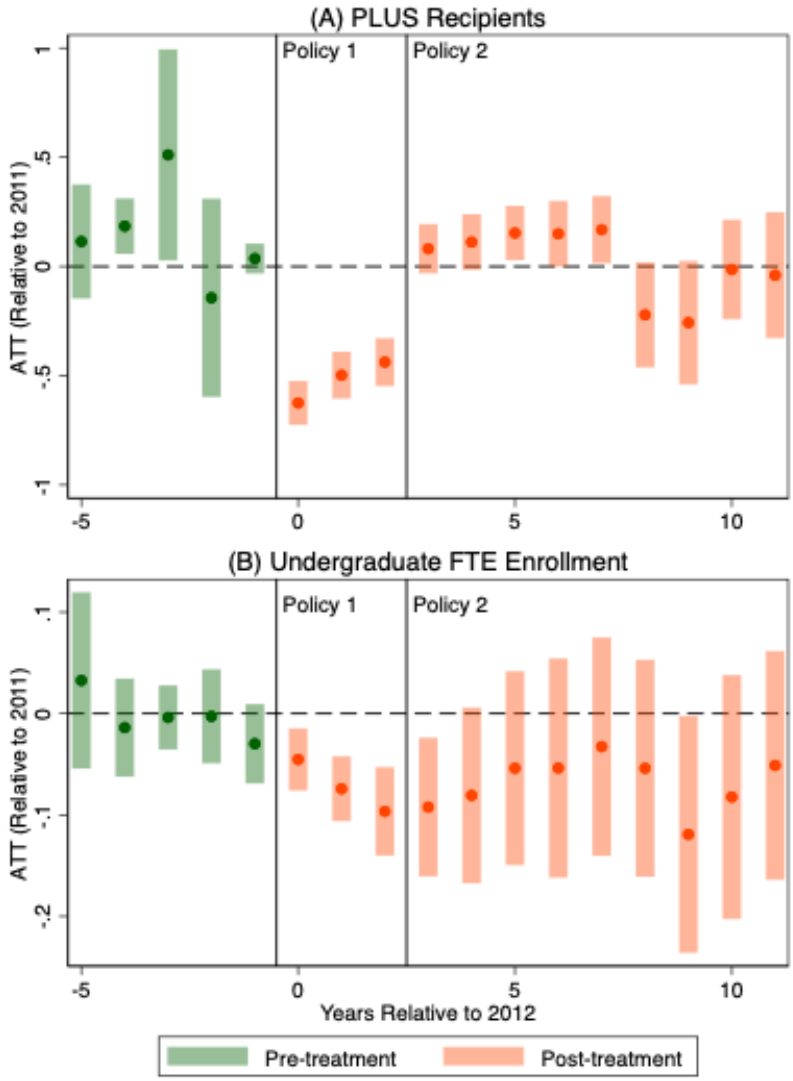

Figure 4. Callaway & Sant'Anna event-study estimates. *Panel A plots ATT estimates for log Parent PLUS recipients, and panel B plots ATT estimates for log UGFTE enrollment. Estimates are shown relative to the year before treatment (2011). Bars denote 95% confidence intervals.*

Triple-Difference

Table 3 reports triple-difference estimates that interact HBCU status, indicators for each policy regime, and pre-2012 exposure to Parent PLUS borrowing. Relative to non-HBCUs, HBCUs experienced significantly larger declines in Parent PLUS recipients following the 2012 tightening. The triple interaction coefficient is not statistically significant, suggesting that these declines did not differ among HBCUs with varying levels of exposure to Parent PLUS loans.

Following the 2015 revision, HBCUs experienced larger increases in Parent PLUS recipients, but the negative triple interaction indicates that more Parent PLUS-exposed HBCUs experienced weaker recoveries. For UGFTE enrollment, there is no evidence that HBCUs experienced differential declines following the 2012 tightening. However, the positive triple interaction suggests that more Parent PLUS-exposed HBCUs experienced somewhat smaller enrollment declines. Following the 2015 revision, there is no significant average difference for HBCUs, but the negative triple interaction indicates that more exposed HBCUs experienced weaker enrollment recoveries. These results suggest that while the initial contraction affected HBCUs broadly, recovery was more limited at institutions with greater prior reliance on Parent PLUS borrowing.

Table 3. Triple-difference estimates by pre-policy change Parent PLUS exposure.

	(1) ln(Parent PLUS Recipients)	(2) ln(UGFTE Enrollment)
	Panel A: Policy 1 = 2012-2014	
HBCU × Policy 1	-0.451***	-0.053
	(0.062)	(0.034)
Policy 1 × Exposure	0.079***	-0.024***
	(0.010)	(0.004)
HBCU × Policy 1 × Exposure	-0.027	0.047*
	(0.047)	(0.021)
	Panel B: Policy 2 = 2015-2023	
HBCU × Policy 2	0.529***	-0.045
	(0.086)	(0.042)
Policy 2 × Exposure	-0.056***	0.038***
	(0.017)	(0.007)
HBCU × Policy 2 × Exposure	-0.235**	-0.073*
	(0.081)	(0.032)
Observations	20,628	20,628
R-squared	0.871	0.981

Notes: Each column reports estimates from a triple-difference specification interacting HBCU status, policy period indicators, and institutions' pre-2012 exposure to Parent PLUS borrowing (standardized). Policy 1 corresponds to the 2012 tightening, and Policy 2 corresponds to the 2015 revision. All regressions include institution and year fixed effects. Standard errors clustered at the institution level. ***p<0.001, **p<0.01, *p<0.05.

Synthetic Control

Figure 5 presents synthetic control estimates comparing outcomes at HBCUs to a weighted combination of non-HBCU institutions selected to match pre-2012 trends and institutional characteristics. For Parent PLUS recipients, the synthetic control results closely mirror the DD estimates. HBCUs experience a sharp decline following the 2012 tightening and a strong rebound after 2015, confirming that they were highly responsive to changes in borrowing access. For undergraduate enrollment, the synthetic control results are more nuanced. In the preferred specification, HBCUs appear somewhat less adversely affected on the enrollment margin than the synthetic control. This contrasts with the DD estimates, which show larger declines at HBCUs relative to the full set of non-HBCUs.

This difference reflects the choice of comparison group. The synthetic control approach constructs a counterfactual based on institutions with similar pre-policy trends, whereas the DD estimates use the full set of non-HBCUs. Relative to these more comparable institutions, HBCUs appear somewhat less adversely affected on the enrollment margin. These differences highlight the sensitivity of enrollment estimates to the choice of comparison group, though the overall pattern of post-2012 divergence and limited recovery remains broadly consistent across specifications. Across alternative specifications, the synthetic control results show similar directional patterns, including post-2012 declines and incomplete recovery (Appendix Figures A1 and A2)[6].

[6] Appendix Table A3 documents a measure of pre-treatment fit for each specification.

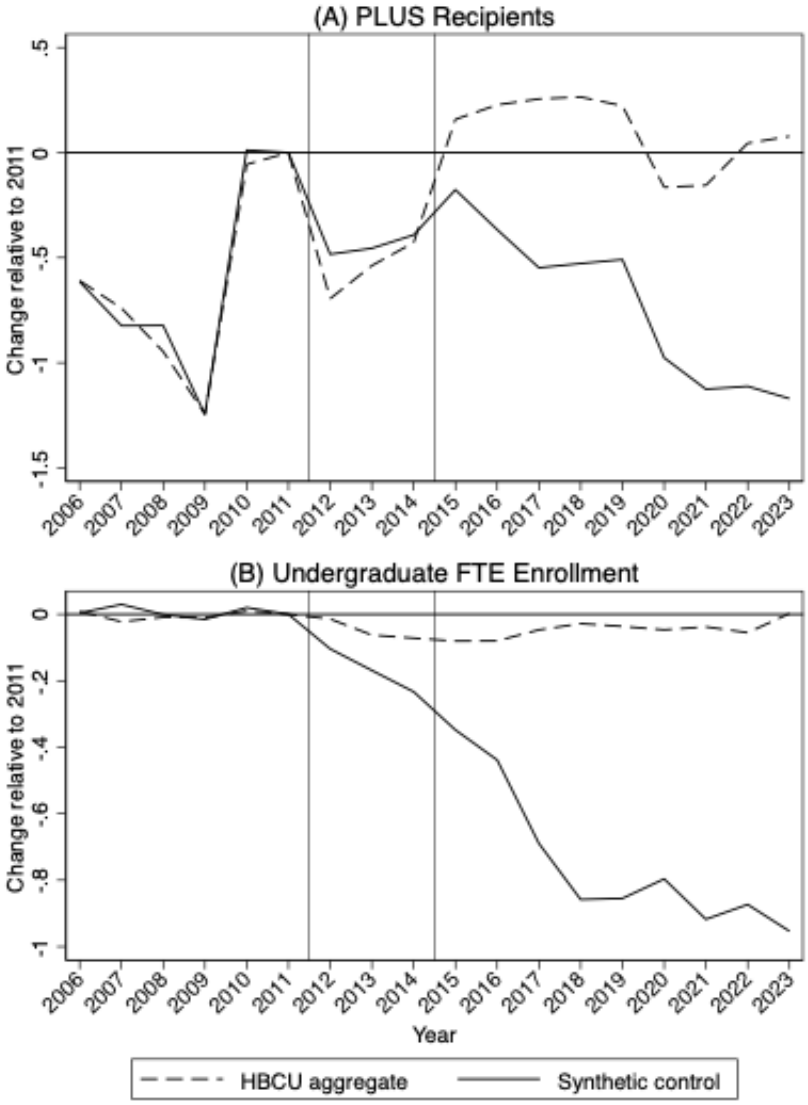

Figure 5. Synthetic control estimates of the effects of Parent PLUS policy changes. *Panel A plots normalized trends in Parent PLUS recipients for HBCUs and their synthetic control, and panel B plots normalized trends in UGFTE enrollment. Both panels are normalized to 2011, the final pre-treatment year. Vertical lines indicate the 2012 tightening of Parent PLUS credit standards and the 2015 revision.*

Mechanisms and Heterogeneity

Alternative Outcomes as Mechanisms

To better understand why enrollment declines persist despite partial recovery in borrowing access, Table 4 examines outcomes related to student demand, institutional behavior, and student

success.[7] We find no evidence of differential changes in applications at HBCUs relative to non-HBCUs. After the 2015 revision, we observe a statistically significant increase in the logged number of students admitted, perhaps in response to the lower yield rate (i.e., the proportion of admitted students who enroll). Following the 2012 tightening, yield declines by 3.2% more for HBCUs and, after the 2015 revision, by 6.6% more. The difference between these effects is also statistically significant, indicating that HBCUs faced increasing difficulty converting admitted students into enrolled students over time. One interpretation is that institutions respond strategically to lower yield by expanding the pool of admitted students to stabilize enrollment.

We also examine institutional responses through expenditures that are closely tied to the student experience. HBCUs experienced large and statistically significant declines in instructional spending following both policy changes, with a reduction of 13.0% after 2012 and 25.8% after 2015. The difference between these effects is statistically significant, indicating that spending cuts intensified over time. We observe a similar pattern for student services, though only the estimate for the 2012 tightening is statistically significant. These results are consistent with a revenue channel. Reductions in enrollment likely translate into declines in tuition revenue, which in turn force institutions to adjust spending. Cuts to instruction and student services may then affect the quality of the student experience, potentially reinforcing enrollment challenges. Also consistent with cost-cutting, we observe a significantly larger increase in student-faculty ratios at HBCUs following the 2015 revision (Appendix Table A4), suggesting that institutions may have increased class sizes to control labor costs (i.e., the most expensive resource for universities).

Finally, we examine measures of student success. We find a small but statistically significant decline in first- to second-year retention after the 2012 tightening (-2.1 percentage

[7] Additional outcomes are reported in Appendix Table A4.

points), though this effect does not persist after 2015. This finding suggests that student enrollment responses may differ across cohorts, with continuing students more likely to experience the 2012 tightening as a negative shock to financing, while new entrants made enrollment decisions under the new credit regime. In contrast, graduation rates decline significantly following the 2015 revision (-4.2 percentage points), with a statistically significant difference between the two policy periods. This delayed response likely reflects lags in graduation reporting: because graduation rates are measured three to six years after initial enrollment, cohorts affected by the 2012 tightening do not appear in these data until several years later. These retention and graduation patterns are consistent with the idea that financial disruptions can have downstream effects on student progression.

Overall, the results point to a combination of demand-side and supply-side mechanisms. Reduced access to Parent PLUS loans appears to have weakened students' ability to enroll, as reflected in lower yield rates, while institutions responded by expanding admissions and reducing expenditures, particularly on instruction. These adjustments may have further affected students' academic experiences and contributed to longer-run declines in completion.

Table 4. Mechanisms for main results.

	(1) ln(Applicants)	(2) ln(Admitted)	(3) Yield Rate	(4) ln(Instruction $)	(5) ln(Student Serv. $)	(6) Retention Rate	(7) Grad. Rate
HBCU × Policy1 (β_1)	-0.072	-0.062	-0.032*	-0.130***	-0.128*	-0.021*	-0.010
	(0.051)	(0.045)	(0.015)	(0.023)	(0.051)	(0.009)	(0.010)
HBCU × Policy2 (β_2)	-0.014	0.164**	-0.066***	-0.258***	-0.115	-0.011	-0.042***
	(0.070)	(0.060)	(0.016)	(0.040)	(0.067)	(0.011)	(0.010)
p-value ($H_0: \beta_1 = \beta_2$)	0.408	0.000	0.006	0.002	0.824	0.343	0.000
Observations	15,291	15,279	15,265	20,608	20,608	19,827	20,263
R-squared	0.936	0.942	0.783	0.983	0.825	0.812	0.921

Notes: Each column reports estimates from DD models with institution and year fixed effects. Standard errors clustered at the institution level are reported in parentheses. We take the natural log of the following outcomes: applicants, admitted students, and expenditures. Yield rate is defined as the proportion of admitted students who enroll. Expenditures are adjusted for inflation and reported in 2023 dollars as expenditures per student. Retention rate is the proportion of first-year students who are retained in the second year. Graduation rate is the proportion of first-year students who graduate within 150% of normal time. ***p<0.001, **p<0.01, *p<0.05.

Heterogeneity by Student Type

Table 5 examines heterogeneous effects by student type, distinguishing between total enrollment, first-time students (i.e., new students), continuing students (i.e., students in their second year or beyond), and other undergraduate, degree-seeking students. Consistent with our main results, the decline in total undergraduate enrollment at HBCUs following the 2012 tightening is driven primarily by first-time students, who experience a large and statistically significant reduction in enrollment. In contrast, the effects on continuing students are smaller and not statistically significant. This pattern is consistent with differences in decision margins across students. First-time students can adjust their enrollment decisions in response to changes in financial aid availability, whereas continuing students have already made an initial enrollment investment and may face higher academic, financial, and psychological costs of switching institutions or leaving college altogether.[8] From the perspective of new cohorts, the post-2012 environment may not represent a "loss" of access to credit but rather a new baseline. In contrast, continuing students are more likely to experience the policy as a negative shock.

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[8] Prior literature suggests that one of the top reasons Black students say they choose HBCUs is because of their relatives' desires or preferences (McDonough et al., 1997). This may suggest that Black students at HBCUs feel a particularly strong personal connection to their institution, making it more difficult to leave once they have committed to that institution and made progress toward a degree.

Table 5. Heterogeneous effects by student type.

	(1) ln(Total UG Enrollment)	(2) ln(New Students)	(3) ln(Continuing Students)	(4) ln(Other Students)
HBCU × Policy 1	-0.068**	-0.118***	-0.044	-0.046
	(0.023)	(0.031)	(0.030)	(0.027)
HBCU × Policy 2	-0.065	-0.078	-0.066	-0.062
	(0.039)	(0.044)	(0.044)	(0.041)
p-value ($H_0: \beta_1 = \beta_2$)	0.926	0.317	0.583	0.672
Observations	20,070	20,070	20,070	20,070
R-squared	0.982	0.964	0.977	0.980

Notes: Each column reports estimates from DD models with institution and year fixed effects. Standard errors clustered at the institution level are reported in parentheses. New students are first-time undergraduate entrants. Continuing students are undergraduates in their second year or beyond. Other students include undergraduate students not classified as first-time or continuing. All outcomes are in natural logs. ***p<0.001, **p<0.01, *p<0.05.

V. Discussion and Conclusion

This paper examines how institutional vulnerability shapes the effects of federal student loan policy. Using two reforms to the Parent PLUS program, we show that institutions more dependent on parent borrowing (particularly HBCUs) experience larger and more persistent effects from changes in credit access. The 2012 tightening of credit standards led to sharp declines in both borrowing and enrollment at HBCUs, and although borrowing rebounded following the 2015 revision, enrollment did not fully recover. These findings indicate that disruptions to credit access can generate lasting consequences that are not easily reversed.

Our results point to a combination of demand-side and supply-side mechanisms. On the demand side, reduced access to Parent PLUS loans appears to have constrained students' ability to enroll, as reflected in declines in yield rates. On the supply side, institutions responded to enrollment and revenue shocks by expanding admissions and reducing expenditures, particularly on instruction and student services. These adjustments likely altered the academic environment in ways that contributed to longer-run declines in retention and graduation outcomes. Taken together, the evidence suggests that credit shocks operate not only through student financial constraints but also through institutional responses that can amplify and propagate their effects over time.

These findings align with a broader literature on scarring effects, which shows that temporary shocks can generate persistent consequences, particularly for more vulnerable populations. In our context, this pattern extends to institutions: colleges that are more dependent on Parent PLUS borrowing experience not only larger immediate disruptions but also more persistent effects over time. While prior work has documented scarring at the individual level, our results suggest that similar dynamics operate at the institutional level, where vulnerability to specific funding sources amplifies both the magnitude and persistence of policy impacts.

A key implication of these findings is that restoring access to credit does not necessarily undo the consequences of earlier restrictions. Even after borrowing levels rebounded following the 2015 revision, enrollment at HBCUs remained lower relative to comparison institutions. This pattern is consistent with disruptions to student pipelines, reductions in institutional resources, or changes in perceived institutional quality—dynamics that may be difficult to reverse once set in motion.

More broadly, this study shows how uniform federal policies can generate unequal and persistent effects across institutions. Because exposure to Parent PLUS borrowing varies systematically across colleges, a policy that is nominally universal can produce highly uneven impacts in practice. Institutions serving larger shares of low-income and credit-constrained students are more likely to experience both immediate disruptions and longer-term consequences. In this sense, institutional vulnerability functions as a key mediator of policy effects, shaping both the magnitude and persistence of responses.

These findings have important implications for the design of federal student loan policy. Recent policy discussions have included proposals to further restrict parent borrowing or impose additional limits on federal loans. Our results suggest that such changes may have unintended consequences for institutions that rely more heavily on these funding streams, particularly those serving historically disadvantaged populations. Policies that alter access to credit may therefore affect not only individual borrowers but also institutional capacity, student support, and ultimately student success. Accounting for institutional heterogeneity through targeted support, phased implementation, or complementary funding mechanisms may help mitigate unintended disparities.

This study has several limitations. Because we rely on institution-level data, we are unable to directly observe individual student responses or examine heterogeneity across student

subgroups. In addition, although we employ multiple empirical strategies, differences between HBCUs and comparison institutions may still influence our estimates. Nonetheless, the consistency of results across approaches supports the central conclusion that institutional dependence on Parent PLUS borrowing plays a critical role in shaping responses to policy change.

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Appendix: Tables and Figures

Table A1. Event-study estimates (relative to 2012 tightening).

Year (Relative to 2012)	Parent PLUS Recipients		UGFTE Enrollment	
	Coeff.	Std. Error	Coeff.	Std. Error
2006 (-6)	-0.702***	(0.122)	0.018	(0.066)
2007 (-5)	-0.588***	(0.138)	0.050	(0.043)
2008 (-4)	-0.404**	(0.137)	0.037	(0.036)
2009 (-3)	0.107	(0.232)	0.033	(0.029)
2010 (-2)	-0.036	(0.035)	0.030	(0.020)
2011 (-1)	--	--	--	--
2012 (0)	-0.625***	(0.051)	-0.045**	(0.016)
2013 (1)	-0.498***	(0.055)	-0.074***	(0.016)
2014 (2)	-0.438***	(0.056)	-0.097***	(0.022)
2015 (3)	0.081	(0.058)	-0.092**	(0.035)
2016 (4)	0.112	(0.065)	-0.081	(0.044)
2017 (5)	0.153*	(0.063)	-0.054	(0.049)
2018 (6)	0.150	(0.077)	-0.054	(0.055)
2019 (7)	0.168*	(0.079)	-0.033	(0.055)
2020 (8)	-0.222	(0.123)	-0.054	(0.055)
2021 (9)	-0.257	(0.144)	-0.119*	(0.060)
2022 (10)	-0.014	(0.116)	-0.082	(0.062)
2023 (11)	-0.040	(0.147)	-0.051	(0.058)

Notes: This table reports event-study estimates from DD models with institution and year fixed effects. Coefficients represent differences between HBCUs and non-HBCUs relative to the omitted category (2011, the year prior to the 2012 policy change). Standard errors clustered at the institution level are reported in parentheses. The 2012 tightening corresponds to event time 0, and the 2015 revision corresponds to event time 3. ***$p<0.001$, **$p<0.01$, *$p<0.05$.

Table A2. Callaway & Sant'Anna event-study estimates.

Year (Relative to 2012)	Parent PLUS Recipients		UGFTE Enrollment	
	Coeff.	Std. Error	Coeff.	Std. Error
2006 (-6)	0.114	(0.138)	0.033	(0.045)
2007 (-5)	0.184**	(0.062)	-0.014	(0.026)
2008 (-4)	0.511*	(0.233)	-0.004	(0.016)
2009 (-3)	-0.143	(0.233)	-0.003	(0.025)
2010 (-2)	0.036	(0.032)	-0.030	(0.022)
2011 (-1)	--	--	--	--
2012 (0)	-0.625***	(0.050)	-0.045**	(0.017)
2013 (1)	-0.498***	(0.054)	-0.074***	(0.017)
2014 (2)	-0.438***	(0.056)	-0.096***	(0.023)
2015 (3)	0.081	(0.061)	-0.092*	(0.038)
2016 (4)	0.112	(0.067)	-0.081	(0.048)
2017 (5)	0.153*	(0.068)	-0.054	(0.050)
2018 (6)	0.150	(0.081)	-0.054	(0.059)
2019 (7)	0.168*	(0.083)	-0.033	(0.058)
2020 (8)	-0.222	(0.125)	-0.054	(0.057)
2021 (9)	-0.257	(0.139)	-0.119	(0.062)
2022 (10)	-0.014	(0.119)	-0.082	(0.059)
2023 (11)	-0.040	(0.149)	-0.051	(0.059)

Notes: Estimates from Callaway and Sant'Anna (2021) DD estimator using doubly robust inverse probability weighting. Coefficients represent average treatment effects on the treated (ATT) relative to the pre-treatment period (2011). Standard errors clustered at the institution level. ***$p<0.001$, **$p<0.01$, *$p<0.05$.

Table A3. Pre-treatment fit for synthetic control.

Specification	Parent PLUS RMSPE	UGFTE RMSPE
Baseline only	0.000	0.000
Covariates only	1.576	0.094
Baseline + covariates	0.000	0.000
Three lags (2006, 2009, 2011) + covariates	0.068	0.024

Notes: This table reports the pre-treatment root mean squared prediction error (RMSPE) for synthetic control models using alternative sets of predictors. Lower RMSPE values indicate better fit between treated and synthetic units in the pre-treatment period (2006-2011). Specifications differ in whether they include only lagged outcomes ("Baseline only"), only institutional covariates ("Covariates only"), or combinations of both. In specifications using the full set of lagged outcomes, RMSPE approaches zero due to exact matching on multiple pre-treatment periods, which may reflect overfitting rather than improved out-of-sample predictive performance. The preferred specification (three lags plus covariates) balances pre-treatment fit and parsimony while avoiding overfitting.

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Table A4. Additional mechanisms and outcomes.

	(1) % with Inst Aid	(2) ln(Avg Inst Aid $)	(3) ln(Scholarship & Grant Aid)	(4) ln(Academic Support $)	(5) Student-Faculty Ratio
HBCU × Policy1 (β_1)	0.070	-0.011	0.276	-0.027	0.020
	(0.047)	(0.042)	(0.472)	(0.176)	(0.247)
HBCU × Policy2 (β_2)	0.100	-0.104*	-0.597	-0.163	1.023**
	(0.059)	(0.050)	(0.616)	(0.172)	(0.387)
p-value ($H_0: \beta_1 = \beta_2$)	0.441	0.058	0.142	0.021	0.002
Observations	20,289	19,938	20,608	20,608	17,189
R-squared	0.553	0.930	0.934	0.800	0.869

Notes: Each column reports estimates from DD models with institution and year fixed effects. Standard errors clustered at the institution level are reported in parentheses. Institutional grant aid (Inst Aid) reflects financial aid provided directly by institutions. We measure the proportion of students with any institutional grant aid and the average amount of institutional grant aid. We take the natural log of institutional grant aid amount and expenditure outcomes. Student-faculty ratio is the average number of students per faculty member. ***p<0.001, **p<0.01, *p<0.05.

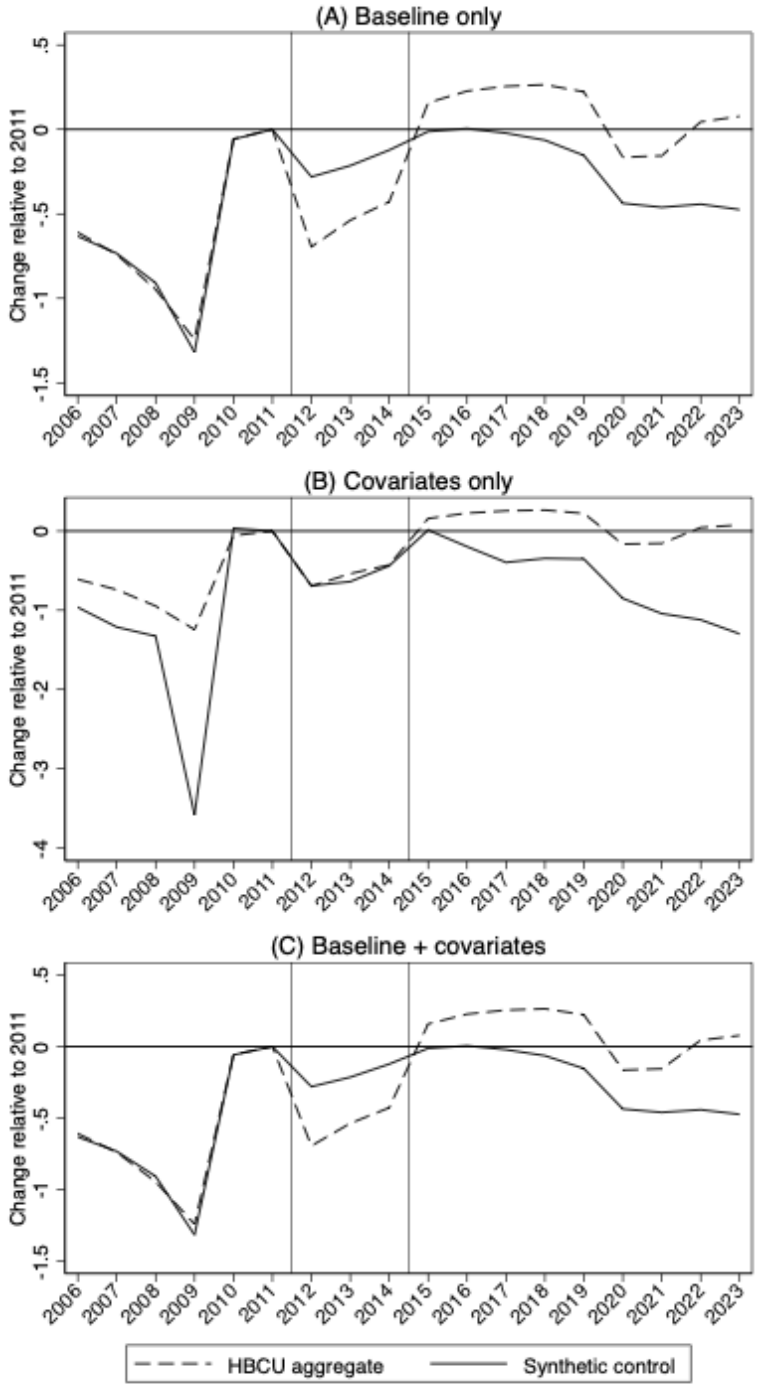

Figure A1. Synthetic control estimates across alternative specifications for Parent PLUS recipients. *This figure presents synthetic control estimates for Parent PLUS recipients using alternative sets of predictors. Panel (A) uses only lagged outcome values from the pre-treatment period (2006-2011), panel (B) uses only institutional covariates averaged over the pre-treatment period, and panel (C) combines lagged outcomes and covariates. In each panel, the dashed line represents the observed average outcome for HBCUs, while the solid line represents the estimated synthetic control constructed from non-HBCU institutions. Outcomes are normalized to equal zero in 2011, the final pre-policy year. Vertical lines denote the 2012 tightening of Parent PLUS credit standards and the 2015 revision. These figures demonstrate that the main results in the text (Figure 4), which use a specification with three pre-treatment lags and covariates, are robust to alternative choices of predictors.*

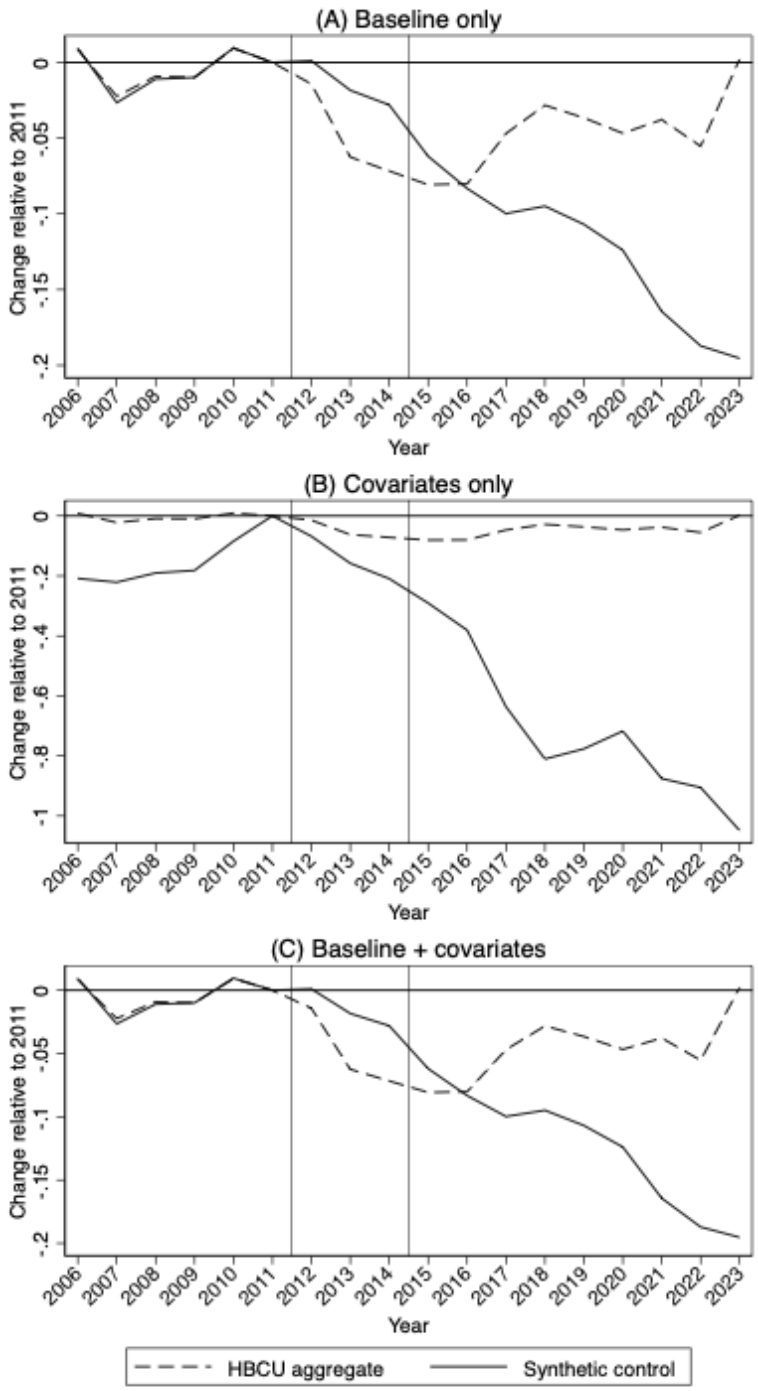

Figure A2. Synthetic control estimates across alternative specifications for UGFTE enrollment. *This figure presents synthetic control estimates for UGFTE enrollment using alternative sets of predictors. Panel (A) uses only lagged outcome values from the pre-treatment period (2006-2011), panel (B) uses only institutional covariates averaged over the pre-treatment period, and panel (C) combines lagged outcomes and covariates. In each panel, the dashed line represents the observed average outcome for HBCUs, while the solid line represents the estimated synthetic control constructed from non-HBCU institutions. Outcomes are normalized to equal zero in 2011, the final pre-policy year. Vertical lines denote the 2012 tightening of Parent PLUS credit standards and the 2015 revision. These figures demonstrate that the main results in the text (Figure 4), which use a specification with three pre-treatment lags and covariates, are robust to alternative choices of predictors*