Working Paper

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INVESTING IN THE WORKFORCE: THE IMPACT OF PERFORMANCE-BASED FUNDING ON STUDENT EARNINGS OUTCOMES

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Introduction

One of the main reasons why students attend college is to get a well-paying job upon completion. In Fall 2019, 84% of first-time, full-time students at four-year universities indicated that getting a better job was a very important factor in deciding to go to college. Seventy-three percent of all students, and 88% of students attending Historically Black Colleges and Universities, responded that making more money was a very important factor in attending (Stolzenberg et al., 2020). As total outstanding student debt increases past $1.5 trillion (Federal Reserve Bank of New York, 2021), it is likely that students and their families will continue to emphasize labor market outcomes in the college choice process.

Dating back to the Morrill Act of 1862, fostering economic growth has been a key component of the mission of public higher education institutions (Key, 1997; Liu, 2015). This has traditionally led to strong support for public colleges and universities. However, there has been growing skepticism in the value of public higher education in recent years due to concerns about the overall return on investment and state taxpayer subsidies going to programs considered less economically valuable (Kelchen, 2018b). Overall perceptions of higher education became less favorable during the 2010s, with a growing partisan divide that could jeopardize future state funding (Cantwell & Taylor, 2020; Parker, 2020).

States have responded to concerns about the value of higher education by requiring public colleges to meet student success metrics in order to receive funding. These performance-based funding (PBF) systems have been adopted by states across the political spectrum in an effort to hold colleges accountable for their outcomes (Kelchen, 2018). Thirty-two states used performance-based funding (PBF) to allocate at least some funding to public higher education in Fiscal Year 2020, and 41 states have done so at some point over the last 25 years (Rosinger et al., 2021).

A sizable body of research has examined the effects of PBF policies on student success metrics (see Ortagus et al. (2020) for a review of the literature). In general, these studies have found null or modest positive effects of PBF on outcomes, such as retention and degree completions. There is also evidence that PBF policies have led to unintended outcomes related to college access, such as increased selectivity at four-year colleges and two-year colleges increasing short-term certificate programs at the expense of associate degree programs. In response, states have begun to adopt equity-oriented metrics that directly incentivize colleges to successfully serve students from historically underrepresented communities such as students of color and Pell Grant recipients.

A growing number of states also include incentives in their PBF systems that are based on students' labor market outcomes, such as alumni earnings or the number of graduates in STEM, health, and other high-value or high-need fields. In Fiscal Year 2020, public universities in Wisconsin had a workforce incentive to graduate students in STEM and health majors, while technical colleges were funded in part based on job placement rates and the number of graduates in high-demand fields such as health care, accounting, and truck driving. Texas primarily funded its technical colleges on a returned value formula that was based on former students' wages and contributions to the tax base.

As shown in Table 1, 17 of the 22 states with funded PBF systems in the four-year sector and 20 of the 29 funded two-year PBF systems in Fiscal Year 2020 had a workforce PBF measure. These workforce metrics are nearly as common as equity provisions (20 states in the four-year sector and 22 states in the two-year sector) and proliferated in the early 2010s during the most recent wave of PBF policy adoptions. But some states operated workforce metrics during the 1990s and 2000s (Serban & Burke, 1998), which allows for an analysis of the long-term effects of PBF and workforce metrics on labor market outcomes.

See Figure 1. Trends in State PBF Adoption Over Time, 1997-2020

To this point, there has been no research on the effects of PBF on the earnings of former students. This is a crucial gap in the literature because, based on prior research, PBF systems have the potential to widen gaps between traditionally advantaged and disadvantaged subgroups of students. If colleges face incentives to increase the earnings of graduates, they may choose to focus on certain subgroups of students who are already well-served by the higher education system. However, they could also work to improve the labor market outcomes of students from lower-income families or independent students (the two subgroups that we can observe in earnings data) to both close equity gaps and receive more state funding. However, PBF policy design features, such as whether states explicitly incentivize workforce or equity metrics, likely shape the effectiveness of these policies in improving student earnings outcomes and reducing equity gaps.

In this paper, we leverage the first comprehensive longitudinal dataset of state PBF policy details, such as the percent of funds tied to student outcomes and the existence of equity provisions or workforce metrics, to examine the impact of PBF on student earnings outcomes. Our research questions are the following:

1. To what extent does the presence of a funded PBF policy affect student earnings outcomes?
2. To what extent do variations in state commitments to PBF affect student earnings outcomes?
3. To what extent does the presence of workforce or equity metrics in state PBF policies affect student earnings outcomes?
4. Do the effects of PBF policy design vary between all students and historically underrepresented groups of students?

Literature Review

The Intended and Unintended Consequences of PBF Adoption

Prior literature on PBF in higher education often focuses on the impact of PBF adoption on institutional outcomes that are incentivized by the PBF formulas, such as retention or degree completion (Ortagus et al., 2020). Early descriptive work typically found no relationship between PBF policies and student outcomes at PBF-participating institutions (Shin & Milton, 2004; Volkwein & Tandberg, 2008; Sanford & Hunter, 2011). Rabovsky (2012) leveraged national data and found limited or negative changes in retention rates, graduation rates, and bachelor's degrees produced after states implemented a PBF system. Additional descriptive studies have shown that PBF policies were not associated with retention or graduation rates (e.g., Rutherford & Rabovsky, 2014; Favero & Rutherford, 2019).

In addition, numerous quasi-experimental studies have sought to examine the impact of PBF adoption on the intended outcomes of retention and degree completion. Several studies have focused specifically on the influence of PBF policies on associate degree production at community colleges. Taken together, previous literature has shown that PBF adoption was unrelated to associate degree production in Ohio (Hillman et al., 2018), Washington (Hillman et al., 2015), and Tennessee (Hillman et al., 2018; Li & Ortagus, 2019). Prior work has also focused on the impact of PBF policies nationally at public four-year colleges and universities, finding that PBF adoption was unrelated to bachelor's degree production (Boland, 2018; Hillman et al., 2014).

Additional quasi-experimental work has explored the impact of PBF adoption at both two- and four-year institutions. Ward and Ost (2019) studied the effects of PBF adoption in Ohio and Tennessee and reported that PBF had no impact on total degree completions, first-to-second year retention, and six-year graduation rates. Another recent study of the same two states found that PBF systems led to fewer associate degrees but no change in bachelor's degree production (Hillman et al., 2018).

Performance management literature suggests that government reforms designed to improve performance do not necessarily work as intended and may cause a host of unintended consequences (e.g., Thompson, 1999). A primary issue associated with these government failures is the difficulty in accounting for increasingly complex institutional structures and political realities when designing performance-based reforms (Radin, 2000). A growing body of literature on PBF policies has taken this context into account and explored the unintended impacts of PBF adoption, focusing specifically on the relationship between PBF systems and enrollment among underserved students (Birdsall, 2018; Gándara & Rutherford, 2020; Umbricht et al., 2017).

In a quasi-experimental study focused on public four-year universities in Indiana, Umbricht et al. (2017) reported that PBF adoption limited access to higher education for racially minoritized and low-income students. Additional work on the same state using the same quasi-experimental approach showed that PBF led to decreases in admission rates and underrepresented student enrollment at public four-year institutions (Birdsall, 2018). A recent national study affirms prior work suggesting that PBF policies can restrict access to higher education for underserved students, as the authors found that PBF-participating institutions enroll more students with higher standardized test scores yet enroll fewer first-generation students (Gándara & Rutherford, 2020).

Recent scholarship has also explored the effects of introducing equity provisions as a way to mitigate the unintended consequences of PBF policies, reporting that equity provisions in PBF policies had a positive impact on Black student enrollment (Kelchen, 2018a) as well as Hispanic and low-income student enrollment (Gándara & Rutherford, 2018). In addition, previous work has shown that institutions may be gaming the PBF system by increasing their production of short-term certificates at the expense of associate degree production (Hillman et al., 2015, 2018; Hu, 2019; Li & Kennedy, 2018; Li & Ortagus, 2019). Despite a large body of literature on the impact of PBF policies in higher education, extant literature has yet to examine the considerable differences in the design of PBF systems or the impact of an increasingly popular metric in PBF formulas—students' labor market outcomes after leaving college.

A Growing Emphasis on Students' Labor Market Outcomes

State-supported higher education institutions are constantly competing for resources with other state priorities (Okunade, 2004; Weerts & Ronca, 2012). States vary considerably in their levels of funding for public higher education and the methods they use to allocate funding to students and colleges (Delaney & Doyle, 2018; Laderman & Weeden, 2020). Importantly, state appropriations are linked to higher rates of postsecondary enrollment and completion (e.g., Chakrabarti et al., 2020; Cummings et al., 2021). Justifications for states funding higher education are also connected with broader goals of maximizing public and private returns on investment, such as graduate earnings (Blagg & Blom, 2018; Toutkoushian & Paulsen, 2016).

Although appropriations vary widely across states, state funding for higher education is increasingly viewed as a method to boost economic prospects for the state and promote workforce development. For example, workforce linkages are also incentivized through state funding policies, such as statewide free college programs that focus on students in high-demand fields (Rosinger et al., 2021). Another notable example is the rise of merit aid programs across numerous states (Baker et al, 2020), which are often used as a tool to prevent brain drain and keep college graduates in state to contribute economically (Zhang & Ness, 2010).

PBF policies have taken part in this trend toward linking state funding to workforce outcomes as well. As noted previously, a growing number of PBF policies tie a portion of state funding to labor market outcomes through metrics, such as graduate earnings and high-demand or high-value degree completion. Li (2020) examined the impact of introducing targeted STEM incentives in PBF formulas and found that STEM incentives had a positive impact on the total number and relative share of STEM bachelor's degrees among PBF-adopting institutions. This suggests that workforce-related PBF programs have the potential to improve graduates' earnings if they are able to shift students into higher-paying fields. However, PBF policies that focus on earnings may further exacerbate longstanding gaps in post-college income by race, family income, and parental education due to labor market discrimination that would be outside of a college's control (Gaddis, 2015; Neumark, 2018). To date, however, we have little evidence regarding how PBF policies and their design features shape student earnings outcomes.

Theoretical Framework

We draw on agency theory to examine the impact of PBF policies on students' labor market outcomes. Agency theory describes the incentive-based relationship between the principal, such as a state government, and their agents, such as public colleges and universities, in which the principal provides financial resources to the agent for producing desired outcomes (Jensen & Meckling, 1976; Spence & Zeckhauser, 1971). In the case of performance funding for higher education, state governments incentivize colleges to focus on improving particular outcomes, typically students' progression toward a degree or degree completions (Ortagus et al., 2020). PBF policies reflect an effort to align institutional behavior and activities with state priorities, often relating to workforce and economic development goals (Kelchen, 2018b).

Performance funding has become an increasingly popular accountability strategy across public domains, but it has often failed to achieve desired outcomes and frequently leads to unintended consequences (Andrews & Moynihan, 2002; Radin, 2000; Thompson, 1999). Public administration scholars have noted that public sector reform efforts often fail for a number of reasons. Effects might be mediated by institutional capacity and ability to redirect resources to improve on specific metrics; lack of clarity on metrics Extent to which institutions/agent has control over the outcomes on which they are evaluated. As a result, we anticipate we may find little to moderate positive effects of PBF on student earnings outcomes.

While the overall effects of performance funding on student earnings may be muted, some particular design features of PBF systems may be more likely to result in positive impacts on earnings. Prior reform efforts have led to muted results frequently because they have not been sustained or are not viewed as serious efforts to improve service delivery (e.g., Thompson, 1999). Similar to other performance reform systems, PBF for higher education has gone through periods of discontinuations and instability within states over time, with states adopting, abandoning, and then readopting PBF (Rosinger et al., 2021). We examine how the share of funds at stake under PBF systems shapes student outcomes, anticipating that higher-dosage policies may be seen by higher education administrators and stakeholders as more serious reform efforts. As a result, campus leaders may have a greater incentive to respond in ways that improve outcomes for students.

While PBF policies traditionally have focused on degree completion outcomes, states have increasingly incorporated workforce outcomes, such as student earnings, job placement rates, or degree completion in specific fields deemed high-demand or high-value, into the metrics on which colleges are evaluated. These efforts reflect a more explicit link to state workforce and economic development goals. As a result, public colleges and universities that are subject to PBF policies that include workforce metrics may be more likely to organize institutional behavior and activities toward improving students' labor market outcomes. For example, institutions may direct more resources toward career services or establish closer links with local and state industries in order to position graduates to better compete for jobs. Similarly, incentives to prioritize degree production in high-demand fields, which frequently include STEM and health fields, may result in higher earnings since STEM graduates tend to earn more than graduates in other fields on average (Melguizo & Wolniak, 2012; Webber, 2014). As a result, we anticipate that PBF systems with targeted workforce metrics will have a positive impact on student earnings outcomes.

PBF policies that include equity metrics that provide funding for public colleges and universities to enroll and/or graduate students from underserved groups, such as low-income or adult students, may also incentivize institutions to improve outcomes for these subgroups of students. Prior research offers some evidence that PBF systems with equity metrics can improve enrollment among some subgroups of underserved students (e.g., Gándara & Rutherford, 2018; Kelchen, 2018a), however, we know little about longer-term outcomes for these students. We anticipate that PBF systems that incentivize public colleges and universities to graduate students from traditionally underrepresented backgrounds will result in increased earnings among low-income and independent students, the traditionally underrepresented subpopulations we examine in this study.

To date, however, the majority of research on the impacts of PBF have focused on access and completion outcomes to examine its intended and unintended consequences (Ortagus et al., 2020). Students' labor market outcomes present an interesting empirical test of the effects of PBF, as until recently, these specific outcomes were not explicitly incentivized in most PBF systems. As our descriptive work above highlights,

performance metrics that specifically incentivize degree completion in high-demand or high-value fields and the earnings of a college's graduates are relatively new features of PBF systems. Yet since PBF systems reflect an interest of state governments to align institutional behavior and outcomes with workforce and economic development goals, understanding the impacts of PBF on labor market outcomes represents a critical yet understudied area of study.

Sample, Data, and Methods

To answer our research questions, we combined the first comprehensive longitudinal dataset of state performance funding policy details with data from federal sources on student post-college outcomes and institutional characteristics. We explain our sample, data, and methods in the following section.

Sample

The analytic sample for this paper consisted of degree-granting two-year and four-year public colleges and universities with available data between Fiscal Years 1997 and 2009 (to align with the availability of earnings data). We classified colleges into two-year and four-year institutions based on 2018 Carnegie basic classifications, using earlier classifications if the 2018 classification was not available. Colleges with basic code 23 (baccalaureate/associate institutions) were coded as two-year institutions because they primarily offered associate degrees. We also excluded special-focus institutions, graduate-only universities, and military academies. This resulted in 552 four-year and 1,091 two-year colleges, with not all colleges being observed in all years due to mergers, consolidations, and data not being available.

Data

The data for our study come from the InformEd States project's four-year initiative to create the first detailed longitudinal dataset of state PBF policy details (Ortagus et al., 2021). For more details on the data collection protocol, see Kelchen et al. (2019). The dataset includes information on whether a state approved a PBF policy for a given system or sector in a given year, whether the policy was actually funded, and the percent of the state's general fund budget tied to student outcomes. The dataset also includes information on whether there were equity incentives for particular groups of students (such as low-income and underrepresented minority) and for incentives to encourage more students to complete credentials in STEM, health, and other high-demand fields. Table 2 contains descriptive statistics for the dataset for two-year and four-year colleges, with separate columns for colleges that were ever subject to a funded PBF system during the period of our panel (Fiscal Years 1997 to 2009) and those that never had funds tied to student outcomes.

See Table 2. Summary Statistics of the Dataset

Our first treatment variable was a binary variable indicating whether a state had a funded PBF system in place in a sector in a given year. To examine the extent to which the share of funds tied to performance shaped student earnings outcomes, our second treatment variable was a continuous variable indicating the dosage of the PBF policy, or the percent of state general fund appropriations tied to performance metrics, in a sector within a given year. When some colleges within a sector were subject to PBF and others were not, we assigned those two groups different percentages. For example, when the Pennsylvania State System of Higher Education (PASSHE) universities operated under PBF and other public universities in the state did not, the PASSHE universities were all coded as having a share of funding tied to outcomes and non-PASSHE universities were coded as having 0% of funds tied to outcomes.

Our final set of treatment variables consisted of indicators that provide details on specific incentives within PBF systems. The first variable was whether a state funded an explicit workforce metric, such as earnings of former students, employment metrics, and whether students worked in high-demand fields such as STEM and health. The second variable was whether a state had a funded equity premium in a given year across any of four categories: underrepresented minority students, students from low-income families, adult students, and academically underprepared students. In Table 3, we show when states had funded PBF, workforce metrics, and equity metrics by sector.

The outcomes of interest were the earnings of students who received federal financial aid six and eight years after they entered college. This excluded students who were still enrolled at the time of measurement or were not observed as having any earnings. Six-year earnings data were available for cohorts starting college between Fiscal Years 1997 and 2009 and measured students between calendar years 2003 and 2015. This included mean, median, and the 25th and 75th percentiles of earnings as well as subgroup means by family income tercile (less than $30,000 per year, $30,000-$75,000 per year, and more than $75,000 per year) and dependency status. Eight-year data were available for the 1997 to 2007 cohorts and measured students between calendar years 2005 and 2015. Only mean, median, and the 25th and 75th percentiles of earnings were available.

The College Scorecard provides two-year pooled cohorts for student earnings outcomes. Each cohort except for 1997 and 2009 (for six-year earnings) show up in two different data files; for example, the FY2005 cohort is pooled with 2004 in one file and 2006 in another file. To estimate the 2005 cohort, we averaged the two files that contained that cohort. We then adjusted all of these values into 2020 dollars using the Consumer Price Index.

We included a number of college characteristics that likely shape characteristics of the student body and post-college outcomes independent of PBF policies. We included measures of institutional pricing, financial resources, and size that could affect how institutions respond to PBF incentives and could otherwise confound our estimates of the impact of PBF. These variables were in-state tuition and fees (logged), average amount of grant aid per student (logged), percent of students receiving aid, state appropriations per student

(logged), local appropriations per student (logged), instructional expenditures per student (logged), and full-time equivalent student enrollment (logged). We adjusted all financial variables into 2020 dollars using the Consumer Price Index. We also included demographic characteristics and economic conditions of states that could shape both college enrollment patterns and labor market outcomes. These measures included per-capita income (logged), unemployment rate, and population size by race and ethnicity (logged).

Methods

To estimate the effect of PBF policies on student earnings outcomes, we used two different methods for each sector with logged earnings as the outcome. Our primary method is a generalized difference-in-differences (DiD) framework with two-way fixed effects that allows for the treatment to take place in different time periods in different states and also supports continuous treatment variables. Similar to other studies that used national treatment groups (Gándara & Rutherford, 2020; Hagood, 2019), we did not construct a weighted comparison group. This is an appropriate decision because states had already begun to adopt PBF by the beginning of our time period and research finds relatively weak links between state characteristics and PBF policy adoption (Li, 2017; McLendon et al., 2006). We ran each DiD model for the cohort entering college when PBF policy features were measured, as well as one year before and one year after to check the robustness of our results.

We began by estimating the effects of a binary variable for whether a PBF system was funded, which is similar to the traditional estimates in the PBF literature except that we exclude states that had PBF on the books but did not fund it in a given fiscal year. We then used a continuous measure of the percentage of state funding tied to performance to examine the effects of dosage. In a supplementary analysis (found in the Appendix), we estimated models using terciles of funding at stake between 1997 and 2009 instead of a continuous PBF percentage measure. For four-year universities, the bottom tercile was at or below 0.97%, the middle tercile was at or below 4.19%, and the top tercile was above 4.20%. The tercile thresholds were lower among two-year colleges (1.02% and 2.00%). In both sectors, the omitted category was colleges in states with no funded PBF.

Our next two analyses examined the effects of PBF based on design characteristics. In the first analysis, we included variables for whether a college operated under a PBF policy with workforce metrics and whether there was a funded PBF policy without workforce metrics. We then conducted a similar analysis for the presence of equity metrics. In both regressions, the omitted category was colleges without funded PBF. In each model, we clustered standard errors at Federal Student Aid's OPEID level instead of at the IPEDS UnitID level because earnings data were reported by OPEID. Because we present a large number of coefficients in our analyses, we focus on $p<.01$ as the threshold for statistical significance in lieu of a formal Bonferroni correction.

A challenge with DiD analyses with treatment occurring across multiple time periods is that treatment effects may not be consistent over time, resulting in inaccurate estimates compared to the standard DiD with treatment all occurring in one period (Goodman-Bacon, 2021). We followed recommendations by Furquim et al. (2020) and recent advances in the econometrics literature in conducting event studies to test whether DiD results held across methods that account for pre-treatment years. As the literature has yet to congeal around a single event study estimation strategy, we used four different methods in Stata: *did_imputation* (Borusyak et al., 2021), *eventdd* (Clarke & Schyte, 2020), *did_multiplegt* (de Chaisemartin et al., 2021), and *eventstudyinteract* (Sun & Abraham, 2020). Each of these methods relies on slightly different parallel trends assumptions (Marcus & Saint'Anna, 2021), so results that hold across multiple specifications as well as the standard DiD models should be considered the strongest.

We conducted event study analyses using the presence of a funded PBF system as the outcome of interest, as recent analyses in event studies do not yet allow for continuous treatment variables or multiple treatment types (such as PBF with and without workforce metrics). For ease of presentation, we placed all four specifications on the same plot using the event_plot command (Borusyak, 2021). We used the same covariates as in the DiD models and clustered standard errors at the UnitID level instead of the OPEID level. This change in clustering, which is required to satisfy the commands, results in slightly smaller standard errors than when clustering among OPEIDs.

In order to meet the pre-treatment trends requirements of event studies, we excluded states that already had a funded PBF system in Fiscal Year 1997 (Arkansas, Florida, Kentucky, Missouri, and Tennessee for both sectors and Ohio for two-year colleges only). In a second specification, we focused on states that met the canonical event study requirement of maintaining the policy throughout the period of study. This also excluded Colorado, New Jersey, South Carolina, and Washington from both sectors, Michigan and South Dakota from the four-year sector, and Illinois from the two-year sector. If a state kept PBF on the books but moved between a funded and unfunded system during this time based on the state's budget situation in a given year (such as Kansas), we kept the state in the analysis. As shown in Appendix 1, the results for our main DiD analyses generally hold when using the same restricted samples as in the event study analyses.

Limitations

The College Scorecard earnings data includes all students who have received federal financial aid. While there are some advantages of this dataset, such as the data coming from administrative sources and including both dropouts and graduates, there are also several limitations. One is that only students who received federal financial aid are included in the earnings data. The percentage of students covered in the dataset varies considerably across colleges, but between 60% and 70% of all students are included in both the public two-year and public four-year sectors (Council of Economic Advisers, 2015). Students excluded from the dataset likely come from two groups: students from higher-income families who did not need

financial assistance and students from lower-income families who did not complete the Free Application for Federal Student Aid.

Earnings metrics will always be measured using a substantial lag following when students enter higher education. However, the final entering cohort in the College Scorecard data started college in Fiscal Year 2009. Institution-level earnings data were last updated in the 2017 data release before the Trump administration pivoted to focus on program-level earnings data of graduates. The 2019 and 2020 updates to the College Scorecard contained data on graduates up to two years after graduation using the 4-digit CIP code as the program level. However, since these metrics exclude non-completers and graduates of smaller programs and are incompatible with existing earnings metrics, we excluded them from our analyses. Although our analyses focus on earlier waves of PBF systems, our results still provide insights regarding the effects of PBF program designs and incentives on former students' earnings.

Another limitation of our analysis is that College Scorecard earning metrics are reported at the Federal Student Aid OPEID level instead of the IPEDS UnitID level. This means that some institutions' earnings outcomes are combined with other institutions due to the idiosyncratic ways that colleges entered into program participation agreements for federal financial aid with the U.S. Department of Education (Kelchen, 2019). In some cases, colleges within the same degree level (four-year and two-year) were combined into the same OPEID. This occurred with community and technical college systems in Louisiana and Alabama along with the Rutgers University and Texas A&M University systems in the four-year sector. In some cases, earnings data are combined across sectors, such as for the University of Connecticut and Pennsylvania State University systems. Altogether, 199 two-year colleges (at the UnitID level) and 91 four-year colleges were part of a broader OPEID. Clustering at the OPEID level helps to address these concerns, as does the fact that colleges within the same system almost always had similar PBF treatments.

It is possible that PBF programs may have affected the earnings of student cohorts who entered college prior to the implementation of PBF. Even though these cohorts likely did not see any changes on retention or completion, they could have still benefited from any changes that the college made in response to PBF. These could include enhancements to career services or job placement initiatives designed to improve student earnings. If this is the case, treatment effects may have been muted somewhat as a result of prior cohorts receiving some of the institutional responses to PBF.

Finally, in spite of growing attention paid to gaps in outcomes by race and ethnicity in both state PBF systems and across society more broadly, we could not use earnings by race in our analysis. This is because since the College Scorecard is based on data for FAFSA filers and the FAFSA does not currently include a question on race or ethnicity, there is no way to ascertain students' racial backgrounds without a national student-level data system. This analysis could be possible by piecing together multiple states' data systems, but otherwise it is not feasible until a question on race/ethnicity is added to the FAFSA in 2023.

Results

In this section, we present the results of our difference-in-differences analyses followed by our event study analyses. Each table represents a separate set of regression specifications, with logged earnings (both overall and by student subgroup) being the outcome of interest.

Difference-in-differences results

We began by using a binary measure of whether a college was operating under a PBF system in a given year. As shown in Table 4, the presence of a funded PBF system resulted in statistically significant increase in the earnings of former students at four-year universities six and eight years after college entry. This increase was around one percent for students who entered college in the year that PBF was implemented, with generally similar coefficients across the earnings distribution and for different subgroups of students. In the two-year sector, overall effects were null for the cohort that entered college in the year that PBF was interested, although there were positive effects on six-year earnings for the cohort that entered in the following year.

See Table 4. Effects of a Funded PBF Policy on Student Earnings Outcomes

Next, we leveraged our dataset to provide the first causal estimates of PBF dosage on student outcomes. As shown in Table 5, the percentage of funds tied to student outcomes was not related to the earnings of students six or eight years following college entry in either sector. This suggests that while the presence of a policy can benefit students, higher-dosage policies do not provide additional improvements in earnings. Indeed, our analyses by dosage tercile (as shown in Appendix 2) finds positive effects for the lowest-dosage tercile in both sectors compared to colleges with no PBF. The medium tercile of dosage is also positive and significant for the four-year sector, while the high tercile is effectively zero across two-year and four-year institutions.

See Table 5. Effects of PBF Dosage (Percent) on Student Earnings Outcomes

We then examined the effects of PBF policy design based on workforce or equity provisions. Table 6 shows the results of DiD models with two separate treatment variables compared to the reference group of no funded PBF: PBF without workforce metrics and PBF with workforce metrics. Among four-year universities, there were positive effects of both workforce and non-workforce PBF on student earnings. However, the effects for mean and median earnings as well as for students historically disadvantaged in the labor market (the 25th percentile of earnings and students from lower-income families) were somewhat larger when workforce metrics were not present. In the two-year sector, the two PBF groups produced null effects on student earnings.

See Table 6. Effects of PBF Workforce Metrics on Student Earnings Outcomes.

The pattern of results was somewhat different when comparing the effects of PBF systems with and without equity metrics to colleges not operating under funded PBF systems. While both types of PBF showed some positive effects in the four-year sector, the effects were generally larger when equity metrics were present for six-year earnings and larger when equity metrics were not present for eight-year earnings. The presence of equity metrics generated larger effects on earnings for the groups that we could observe that are most closely aligned with how states operationalize equity: students from lower-income families and independent students (a proxy for older students).

See Table 7. Effects of PBF Equity Metrics on Student Earnings Outcomes.

Event study results

As an additional set of analyses, we also conducted event studies to examine the effects of the presence of funded PBF policies on the earnings of former students. Figures 1 and 2 show the results of four different types of event studies on earnings in the four-year sector, with Figure 1 excluding universities that were subject to PBF in 1997 and Figure 2 also excluding universities that saw PBF dropped before the end of our panel in 2009. In the pre-treatment years across both figures, two event study models (*did_imputation* and *eventstudyinteract*) consistently generated positive and significant coefficients, *did_multiplegt* was around zero, and *eventdd* rose from negative and significant coefficients to zero around the time of PBF adoption.

Earnings immediately following PBF adoption were modestly positive or indistinguishable from zero in most cases, with *eventstudyinteract* again having the most positive coefficients. Over time, the point estimates became more negative, although they were generally indistinguishable from zero. The *did_imputation* model generated the most negative coefficients, which differed from its more positive orientation in the pre-treatment years. Dropping colleges in states or systems that abandoned PBF by 2009 (Figure 2) resulted in somewhat more positive coefficients compared to including all states that adopted PBF after 1997 (Figure 1). This provides some suggestive evidence that keeping PBF over time had some positive benefits, which is in line with the DiD results.

See Figure 1. Event Studies, 4 Years, post-1997 PBF Starters

See Figure 2. Event Studies, 4-years, had PBF in 2009

In the two-year sector (Figure 3 excluding colleges subject to PBF in 1997 and Figure 4 also excluding colleges that saw PBF systems dropped by 2009), the general pattern of results was similar but more negative. The *did_imputation* and *eventstudyinteract* models again showed positive effects for the two years prior to college entry, which could be a result of colleges providing additional services to students who started college before PBF was adopted but were exposed to PBF before graduation. The *eventdd* model was again negative in early pre-treatment years, while *did_multiplegt* was around zero. After the PBF adoption year, *eventstudyinteract* generated positive and significant coefficients for the next several years, while the

other models were negative or insignificant. Taken together, the event study analyses across both sectors suggest a somewhat more pessimistic view of the effect of PBF on student earnings than do the DiD analyses.

See Figure 3. Event Studies, 2-years, post-1997 PBF Starters

See Figure 4. Event Studies, 2-years, had PBF in 2009

Discussion

A growing number of states across the ideological spectrum are turning to performance-based funding systems in an effort to improve student outcomes and enhance the trust of legislators and the general public in higher education. Yet the large body of research on the effectiveness of the presence of PBF policies on student access, retention, and completion outcomes has shown at most muted improvements that can be attributed to PBF while also indicating several unintended consequences of these policies that raise a variety of equity concerns (Ortagus et al., 2020).

In this paper, we advance the body of knowledge on PBF in four main ways. First, this is the first research to use student earnings as an outcome in spite of some states' long-standing policies that incentivize colleges to graduate students in high-demand fields. Second, we used a continuous treatment measure that examines the percentage of funds tied to student outcomes instead of relying on an indicator variable for the presence of a PBF system that may or may not have actually been funded in that given year. Third, we constructed an indicator for whether states tied funds to workforce or equity metrics in a given year to see if targeted funding improved labor market outcomes. Finally, we conducted multiple event study models to see whether results hold across four recently-developed econometric techniques.

One key finding of our research is that the presence of a funded PBF policy may improve the earnings of former students who attended four-year universities, although this varies across model specifications. The DiD models in the four-year sector consistently show positive effects of having any PBF on earnings on the order of one percent, with some evidence that the increases are larger for students from lower-income families and toward the bottom of the post-college income distribution. The event study models are inconsistent in their post-treatment estimates, with a mix of null and modest positive findings depending on the model used. The findings when using a binary treatment measure in the two-year sector are generally null across both the DiD and event study models. The less encouraging results from the two-year sector align with prior research finding that PBF encouraged community colleges to shift students from associate degree programs to certificate programs that were more lucrative to the college but with lower labor market payoffs for students (Hillman et al., 2015; Li & Kennedy, 2018).

While advocacy groups have consistently pushed for a larger share of funds to be tied to student outcomes (Miller & Morphew, 2017; Snyder et al., 2020), our research on earlier state PBF systems did not find that

increasing the amount of money at stake improved students' labor market outcomes. If anything, lower-stakes PBF systems generated more positive results than higher-stakes systems. This result highlights the potential importance of considering a more nuanced dosage measure, which we were able to do thanks to a painstaking data collection process.

Our detailed data also allowed us to examine whether student earnings varied based on the presence or absence of workforce or equity metrics. Workforce metrics seem to have little additional value to student earnings beyond what were present in a PBF policy without workforce metrics. We found some promise in equity metrics improving the outcomes of students relative to PBF without equity, which is an encouraging sign. However, because it is impossible to parse out how much money is tied to equity in most states' PBF formulas, we cannot answer whether stronger equity-based formulas generate larger improvements in earnings. One key remaining question to consider is how much funding is necessary to encourage colleges to successfully serve low-income, minority, adult, and first-generation students, as some formulas with equity metrics do not provide enough bonus funds to truly incentivize colleges to serve historically underrepresented students (McKinney & Hagedorn, 2017).

One potential factor that could limit the ability of colleges to respond to PBF incentives and improve students' earnings outcomes is persistent labor market discrimination that results in lower wages and fewer employment opportunities for people of color (Fryer et al.,2013; Quillian et al., 2017, 2020). Prior research indicates that racially minoritized job candidates are less likely to be selected for interviews (Quillian et al., 2017), less likely to receive job offers (Quillian et al., 2020), and tend to be offered lower wages on average than their white peers (Fryer et al., 2013). Colleges have little control over discrimination in the labor market that may lead to lower wages among some students relative to others. As a result, impacts of efforts colleges make to improve student earnings outcomes, such as investing in career services and building connections with local industry, may always be muted in the presence of widespread labor market discrimination. Consequently, colleges that serve larger numbers of students of color may be disadvantaged when it comes to being evaluated on metrics that inherently advantage some students over others. Data on student earnings outcomes disaggregated by race is not currently available through large-scale, publicly available federal postsecondary data sources; however, future analyses may consider the potentially disparate effects of PBF policies, particularly those that prioritize workforce outcomes, on the earnings of students of color and the often underfunded institutions that enroll and graduate large numbers of students of color.

Our results raise several important questions for additional areas of future research. The first is to examine labor market outcomes for the most recent wave of PBF systems. Until the U.S. Department of Education resumes publishing institution-level earnings data in the College Scorecard, it is impossible for researchers to conduct a national analysis using the earnings of all former students. However, it is possible to focus on a subsample of states using state administrative data sources. In ongoing work, we are examining the effects of

PBF on other post-college outcomes such as debt and repayment. This allows us to study more cohorts of students and thus captures more recent PBF systems.

Qualitative research is also needed to understand any actions that colleges took in response to workforce-oriented PBF systems. While researchers have interviewed stakeholders in states with workforce provisions (Dougherty et al., 2012; Zerquera & Ziskin, 2020), these interviews have not focused on whether and how colleges react to having funding tied to student labor market outcomes. As these policies continue to proliferate, understanding institutional responses will become even more important.

Finally, the expectations for quantitative analyses of state policies are changing rapidly due to concerns raised about traditional DiD models and a host of new event study models designed to at least partially accommodate treatment occurring in different time periods (Goodman-Bacon, 2021). As the four event study commands that we ran generated different results, we encourage researchers to run multiple event study commands as a robustness check until the field agrees on a single best model. Our DiD results should also be revisited once event study commands can accommodate colleges switching between treated and untreated conditions as well as handling continuous treatment measures.

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Table 1: Trends in state PBF policy adoption over time, 1997-2020.

	Four-year universities (number of states)				Two-year colleges (number of states)			
Fiscal year	Approved PBF	Funded PBF	Funded workforce	Funded equity	Approved PBF	Funded PBF	Funded workforce	Funded equity
1997	6	5	1	2	7	6	4	3
1998	8	7	3	4	8	7	5	3
1999	6	6	1	2	8	8	5	4
2000	6	6	2	3	7	7	5	4
2001	8	8	3	5	8	8	6	5
2002	9	8	3	4	9	7	4	3
2003	6	6	2	3	5	5	3	2
2004	5	4	1	2	5	4	2	1
2005	5	5	2	2	4	4	2	1
2006	7	7	4	3	5	5	2	1
2007	8	8	4	3	5	5	2	1
2008	11	11	5	4	7	7	3	1
2009	11	10	5	6	7	4	2	1
2010	10	8	3	4	10	5	2	3
2011	10	6	4	5	11	6	2	5
2012	10	7	3	6	12	8	3	8
2013	17	14	11	9	17	13	7	11
2014	22	17	13	12	24	21	13	15
2015	22	16	15	14	25	22	17	16
2016	24	18	16	15	26	22	17	18
2017	25	19	17	17	30	25	18	19
2018	26	18	16	16	32	26	19	20

2019	26	21	19	19	32	20	21	22
2020	25	22	17	20	31	30	20	22

Source: Authors' data collection and review of state policy documents.

Notes:

(1) Not all PBF systems covered every public institution within a sector in a state.
(2) "Approved" refers to having a PBF system on the books through legislative or system documents that was eligible for funding.
(3) "Funded" means that colleges received funds tied to student outcomes in the given fiscal year.

Table 2. Summary Statistics of the Dataset.

	Four-year universities				Two-year colleges			
	Ever PBF		Never PBF		Ever PBF		Never PBF	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Any funded PBF	24.7	(43.1)	0	--	19.7	(39.8)	0	--
Percent PBF (if funded)	0.68	(1.63)	0	--	0.45	(1.44)	0	--
Workforce premium	9.6	(29.5)	0	--	9.2	(28.9)	0	--
Any equity premium	13.8	(34.5)	0	--	10.4	(30.5)	0	--
6-year earnings: Median	36,591	(6,377)	39,114	(7,719)	28,001	(4,780)	28,570	(5,035)
6-year earnings: Mean	39,291	(6,605)	41,818	(8,083)	31,309	(4,718)	31,505	(4,979)
6-year earnings: 25th percentile	22,747	(4,938)	23,905	(5,345)	15,098	(3,450)	15,915	(3,628)
6-year earnings: 75th percentile	51,058	(8,239)	54,938	(10,769)	42,538	(5,992)	42,571	(6,416)
6-year earnings: Low-income	37,103	(7,198)	39,306	(8,240)	28,926	(4,117)	29,465	(4,877)
6-year earnings: Middle-income	40,020	(6,109)	41,909	(7,599)	35,729	(4,130)	36,100	(4,336)
6-year earnings: High-income	41,980	(6,225)	44,249	(8,053)	38,891	(4,704)	39,021	(4,741)
6-year earnings: Dependents	38,289	(6,540)	40,059	(7,225)	30,335	(4,519)	30,358	(5,212)
6-year earnings: Independents	41,324	(7,939)	43,721	(8,235)	31,925	(4,825)	32,264	(5,509)
8-year earnings: Median	41,031	(7,226)	44,600	(8,888)	31,106	(4,199)	31,514	(5,717)
8-year earnings: Mean	44,720	(7,989)	48,286	(9,627)	34,838	(5,357)	34,853	(5,888)
8-year earnings: 25th percentile	25,818	(5,652)	27,826	(6,272)	16,790	(3,784)	17,567	(4,247)
8-year earnings: 75th percentile	57,508	(9,890)	62,662	(12,375)	47,177	(6,768)	46,962	(7,471)
FTE enrollment	10,355	(9,707)	9,518	(8,757)	4,392	(10,249)	3,070	(7,306)

Undergrad share of FTE	87.6	(9.2)	88.3	(10.5)	100	--	100	--
Per-FTE instructional spending	7,743	(3,417)	8,719	(4,848)	5,418	(3,246)	6,265	(4,196)
Share of undergrads part-time	23.6	(15.1)	21.6	(16.6)	58.3	(14.4)	52.1	(18.9)
In-state tuition	5,753	(2,216)	6,162	(2,822)	2,907	(1,825)	3,349	(2,322)
Amount of state grant	2,737	(1,414)	2,968	(1,371)	1,480	(769)	1,339	(848)
Amount of institutional grant	3,322	(1,877)	3,665	(2,261)	1,371	(894)	1,342	(1,185)
Percent receiving state grant	33.8	(21.0)	37.7	(23.0)	30.2	(20.4)	31.3	(29.6)
Percent receiving institutional grant	33.7	(20.6)	27.9	(18.3)	13.9	(16.3)	14.0	(17.0)
Per-FTE state appropriations	8,379	(4,162)	10,076	(6,738)	5,123	(3,900)	6,015	(5,941)
Per-FTE local appropriations	29	(309)	45	(479)	1,878	(2,994)	1,764	(2,390)
Per-capita state income	42,115	(5,831)	46,348	(7,134)	44,293	(6,513)	41,487	(5,733)
State unemployment rate	4.9	(1.0)	4.9	(1.1)	5.1	(1.1)	4.9	(1.0)
State share of adults w/BA	16.9	(3.3)	18.6	(3.6)	17.7	(3.3)	16.7	(3.3)
State number of young students	523,876	(414,648)	843,480	(774,849)	846,122	(758,055)	396,734	(250,919)
Share of Black young adults	12.3	(10.3)	16.4	(11.9)	13.3	(8.9)	20.7	(16.8)
Share of Hispanic young adults	8.0	(9.7)	8.2	(8.1)	10.6	(10.8)	5.0	(5.9)
Share of Native young adults	1.2	(2.3)	0.6	(1.7)	1.0	(2.1)	0.6	(1.3)
Number of observations	4,284		2,804		10,710		3,089	
Number of colleges	332		220		835		256	

Sources: Authors' data collection (all PBF policy variables), College Scorecard (debt, repayment, and earnings outcomes), Bureau of Labor Statistics and Census (state-level demographic and economic characteristics), Integrated Postsecondary Education Data System (all others)

Notes:
(1) All financial values were adjusted into 2020 dollars using the Consumer Price Index.
(2) All variables are from between Fiscal Years 1997 and 2009, except earnings (which are for cohorts beginning college in Fiscal Years 1997 through 2009).

Table 3: Funded PBF status by state and year, 1997-2020.

	Two-year colleges			Four-year universities		
State	Any PBF	Workforce PBF	Equity PBF	Any PBF	Workforce PBF	Equity PBF
Alabama	2019-20		2019-20			
Arizona				2013-17	2013-17	
Arkansas	1997, 2008, 2019-20	2019-20	2019-20	1997, 2008, 2019-20	2019-20	2019-20
California	2019-20	2019-20	2019-20			
Colorado	2001-03, 2016-20	2001-03, 2016-20	2001-03, 2016-20	2001-03, 2016-20	2016-20	2001-03, 2016-20
Connecticut	2017-20					
Florida	1997-2020	1997-2020	1997-99, 2016-19	1997-99, 2008, 2013-20	1998, 2008, 2013-20	2015-20
Hawaii	2012-20	2012-20	2012-20	2017-20	2017-20	2017-20
Illinois	1999-2001, 2013-20	1999-2001	1999-2001, 2013-20	2013-14	2013-14	2013-14
Indiana	2010-20	2010, 2013-20	2010-20	2007-20	2013-20	2009-20
Kansas	2006-20	2013-20	2013-20	2006-20	2006-20	2006-20
Kentucky	1997-98, 2018-20	1997-98, 2018-20	1997-98, 2018-20	1997-98, 2018-20	1997-98, 2018-20	1997-98, 2018-20
Louisiana	2017-20	2017-20	2017-20	2017-20	2017-20	2017-20
Massachusetts	2014-17	2016-17	2014-17	2016-17 (non-UMass)	2016-17 (non-UMass)	2016-17 (non-UMass)
Maine				2014-18 (most)	2014-18 (most)	2014-18 (most)
Michigan	2013-20			2006-07, 2013-20	2006-07, 2013-20	2015-20
Minnesota	2008-09, 2012-19	2014-19	2012-13, 2016	2008-09, 2012-17 [all], 2018-19 [MnSCU]	2008-09, 2014-17 [all], 2018-19 [MnSCU]	2008-09, 2014-17
Missouri	1997-2001, 2014-16	1997-2001, 2014-16	1997-2001, 2014-16	1997-2001, 2014-16	2014-16	1997-2001
Mississippi				2014	2014	2014
Montana	2015-20	2015	2015-20	2015-20	2015	2015-20
North Carolina	1999-2020		1999-2020			
North Dakota	2014-20			2014-20		
New Jersey	2000-02		2000-02	2000-02, 2020		2000-02, 2020
New Mexico	2013-20	2013-20	2013-20	2013-20	2013-20	2013-20
Nevada	2015-20	2015-20	2015-20	2015-20	2015-20	2015-20
New York	2014-18 (most)	2014-18 (most)	2014-18 (most)			
Ohio	1997-99, 2011-20	2011-20	2011-20	1998-2020	2008-20	1998-2020
Oklahoma	2002-20		2012-20	2002-20		2012-20

Oregon				2008-20	2015-20	2012-20
Pennsylvania				2001-19 (PASSHE)	2001-19 (PASSHE)	2001-19 (PASSHE)
Rhode Island	2019-20	2019-20		2019-20	2019-20	2019-20
South Carolina	1998-2002 (all), 2014-20 (SCTCS)	1998-2002 (all), 2014-20 (SCTCS)		1998-2002	1998-2002	
South Dakota				2000-03, 2005-13	2000-03, 2005-13	
Tennessee	1997-2020	1997-2020	2011-20	1997-2020	2011-20	2011-20
Texas	2014-20	2014-20	2014-20	2009-11	2009-11	2009-11
Utah	2014-20	2015-20	2014-20	2014-20	2015-20	2014-20
Virginia	2017-20	2017-20	2017-20			
Vermont	2020			2020 (non-UVM)	2020 (non-UVM)	
Washington	1998-99, 2010-20		2010-20	1998-99	1998-99	
Wisconsin	2015-20 (WTCS)	2015-20 (WTCS)	2015-20 (WTCS)	2019-20	2019-20	2019-20
Wyoming	2013-20	2013-20				

Source: Authors' review of state policy documents.

Notes:
(1) A state was included if the PBF system remained approved between periods in which funding occurred. For example, Florida kept a PBF system on the books for community colleges between 2009 and 2013 before resuming funding in 2014. If a state stopped funding a system before 2020 but it remained on the books through 2020, the last year of funding was included.
(2) Arkansas is counted as funded in FY 1997 even though funds passed into law were later withheld.

Table 4: Effects of a funded PBF policy on student earnings outcomes.

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
6-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median	0.0067	0.0110**	0.0147***	0.0008	0.0029	0.0086**
	(0.0035)	(0.0034)	(0.0039)	(0.0034)	(0.0033)	(0.0033)
Mean	0.0082*	0.0124***	0.0156***	-0.0008	0.0021	0.0086**
	(0.0034)	(0.0034)	(0.0038)	(0.0032)	(0.0032)	(0.0030)
25th percentile	0.0116*	0.0169***	0.0210***	0.0004	0.0023	0.0103*
	(0.0049)	(0.0047)	(0.0053)	(0.0045)	(0.0047)	(0.0047)
75th percentile	0.0069*	0.0095**	0.0121***	-0.0007	0.0016	0.0067*
	(0.0030)	(0.0030)	(0.0035)	(0.0034)	(0.0033)	(0.0031)
Low-income	0.0058	0.0121**	0.0173***	0.0092	0.0135**	0.0143**
	(0.0042)	(0.0044)	(0.0050)	(0.0048)	(0.0049)	(0.0047)
Middle-income	0.0082*	0.0134***	0.0158***	0.0064	0.0109*	0.0134***
	(0.0034)	(0.0033)	(0.0040)	(0.0047)	(0.0043)	(0.0039)
High-income	0.0077*	0.0096**	0.0122**	0.0119	0.0162**	0.0146*
	(0.0039)	(0.0036)	(0.0038)	(0.0064)	(0.0054)	(0.0058)
Dependent	0.0069	0.0111**	0.0149***	-0.0002	0.0027	0.0088*
	(0.0036)	(0.0036)	(0.0041)	(0.0037)	(0.0039)	(0.0036)
Independent	0.0063	0.0113*	0.0154**	-0.0007	0.0006	0.0071
	(0.0044)	(0.0044)	(0.0050)	(0.0041)	(0.0040)	(0.0037)
Max observations	5,969	6,482	6,475	9,666	10,636	10,550
	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
8-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median	0.0039	0.0078*	0.0118***	-0.0035	-0.0029	0.0073
	(0.0037)	(0.0035)	(0.0033)	(0.0033)	(0.0035)	(0.0037)
Mean	0.0064	0.0103**	0.0130***	-0.0061	-0.0044	0.0072*
	(0.0038)	(0.0036)	(0.0032)	(0.0032)	(0.0035)	(0.0034)
25th percentile	0.0029	0.0095	0.0152***	-0.0040	-0.0025	0.0104
	(0.0055)	(0.0051)	(0.0045)	(0.0047)	(0.0051)	(0.0054)
75th percentile	0.0064	0.0099**	0.0118***	-0.0070*	-0.0050	0.0052
	(0.0036)	(0.0032)	(0.0029)	(0.0031)	(0.0034)	(0.0034)
Max observations	4,952	5,473	5,458	7,895	8,875	8,769

Notes:
(1) All models include the control variables shown in Table 2 and state and year fixed effects. Each coefficient is the result of a separate regression.

(2) Standard errors are clustered at the OPEID level to account for College Scorecard data being reported at the OPEID level instead of the UnitID level.
(3) * signifies p<.01. ** signifies p<.005, and *** signifies p<.001.

Table 5: Effects of PBF dosage (percent) on student earnings outcomes.

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
6-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median	-0.00306	-0.00143	0.00002	0.00005	0.00040	0.00183
	(0.00142)	(0.00131)	(0.00015)	(0.00093)	(0.00086)	(0.00086)
Mean	-0.00232	-0.00069	-0.00002	0.00030	0.00040	0.00140
	(0.00132)	(0.00125)	(0.00013)	(0.00096)	(0.00085)	(0.00078)
25th percentile	-0.00392	-0.00203	-0.00009	-0.00049	0.00008	0.00179
	(0.00177)	(0.00162)	(0.00026)	(0.00130)	(0.00128)	(0.00121)
75th percentile	-0.00154	-0.00002	0.00010	0.00025	0.00044	0.00135
	(0.00123)	(0.00115)	(0.00013)	(0.00100)	(0.00085)	(0.00086)
Low-income	-0.00296	-0.00126	-0.00032	0.00141	0.00186	0.00263
	(0.00159)	(0.00145)	(0.00021)	(0.00135)	(0.00127)	(0.00130)
Middle-income	-0.00202	-0.00019	0.00013	0.00097	0.00075	0.00148
	(0.00140)	(0.00132)	(0.00013)	(0.00102)	(0.00080)	(0.00078)
High-income	-0.00100	0.00034	0.00008	0.00245	0.00276**	0.00294*
	(0.00136)	(0.00126)	(0.00016)	(0.00097)	(0.00092)	(0.00105)
Dependent	-0.00238	-0.00044	0.00017	0.00037	0.00030	0.00128
	(0.00126)	(0.00124)	(0.00015)	(0.00081)	(0.00087)	(0.00088)
Independent	-0.00270	-0.00168	-0.00043	0.00048	0.00068	0.00175
	(0.00176)	(0.00162)	(0.00018)	(0.00145)	(0.00124)	(0.00109)
Max observations	5,969	6,482	6,475	9,666	10,636	10,550
	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
8-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median	-0.00203	-0.00205	-0.00087	-0.00130	-0.00028	0.00088
	(0.00126)	(0.00121)	(0.00126)	(0.00096)	(0.00096)	(0.00093)
Mean	-0.00171	-0.00153	-0.00034	-0.00119	-0.00056	0.00057
	(0.00124)	(0.00121)	(0.00127)	(0.00092)	(0.00092)	(0.00093)
25th percentile	-0.00293	-0.00303	-0.00226	-0.00111	-0.00034	0.00067
	(0.00188)	(0.00180)	(0.00182)	(0.00139)	(0.00135)	(0.00119)
75th percentile	-0.00128	-0.00106	0.00045	-0.00171	-0.00102	0.00003
	(0.00122)	(0.00113)	(0.00125)	(0.00086)	(0.00084)	(0.00084)

Max observations	4,952	5,473	5,458	7,895	8,875	8,769

Notes:
(1) All models include the control variables shown in Table 2 and state and year fixed effects. Each coefficient is the result of a separate regression.
(2) Standard errors are clustered at the OPEID level to account for College Scorecard data being reported at the OPEID level instead of the UnitID level.
(3) * signifies p<.01. ** signifies p<.005, and *** signifies p<.001.

Table 6: Effects of PBF workforce metrics on student earnings outcomes.

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
6-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median						
PBF with workforce	0.00132	0.00754	0.01160*	0.00139	0.00632	0.01088
	(0.00452)	(0.00396)	(0.00415)	(0.00448)	(0.00418)	(0.00445)
PBF without workforce	0.01098	0.01412**	0.01785**	0.00045	0.00029	0.00635
	(0.00440)	(0.00470)	(0.00556)	(0.00462)	(0.00483)	(0.00491)
Mean						
PBF with workforce	0.00355	0.00959	0.01247**	-0.00231	0.00277	0.00841
	(0.00440)	(0.00412)	(0.00407)	(0.00444)	(0.00420)	(0.00396)
PBF without workforce	0.01192**	0.01496***	0.01874***	0.00017	0.00152	0.00875
	(0.00418)	(0.00439)	(0.00514)	(0.00438)	(0.00469)	(0.00462)
25th percentile						
PBF with workforce	-0.00008	0.00600	0.01116	-0.00677	-0.00333	0.00539
	(0.00636)	(0.00547)	(0.00554)	(0.00641)	(0.00608)	(0.00602)
PBF without workforce	0.02093***	0.02680***	0.03100***	0.00482	0.00643	0.01486
	(0.00594)	(0.00616)	(0.00749)	(0.00595)	(0.00677)	(0.00729)
75th percentile						
PBF with workforce	0.00510	0.00951*	0.01190**	-0.00170	0.00254	0.00598
	(0.00396)	(0.00362)	(0.00385)	(0.00433)	(0.00395)	(0.00400)
PBF without workforce	0.00826	0.00950	0.01240	-0.00009	0.00091	0.00742
	(0.00382)	(0.00394)	(0.00486)	(0.00470)	(0.00488)	(0.00483)
Low-income						
PBF with	0.00164	0.00889	0.01125	0.00319	0.00594	0.00508

workforce	(0.00562)	(0.00564)	(0.00567)	(0.00562)	(0.00533)	(0.00518)
PBF without workforce	0.00914	0.01512*	0.02350***	0.01290	0.01984	0.02277**
	(0.00506)	(0.00544)	(0.00691)	(0.00682)	(0.00795)	(0.00801)
Middle-income						
PBF with workforce	0.00807	0.01509***	0.01611***	0.00415	0.01516	0.01564**
	(0.00454)	(0.00430)	(0.00466)	(0.00625)	(0.00603)	(0.00547)
PBF without workforce	0.00822	0.01186**	0.01552**	0.00795	0.00711	0.01124
	(0.00418)	(0.00406)	(0.00507)	(0.00662)	(0.00589)	(0.00553)
High-income						
PBF with workforce	0.00622	0.00949	0.01307**	0.00123	0.01085	0.00882
	(0.00458)	(0.00417)	(0.00427)	(0.00956)	(0.00674)	(0.00745)
PBF without workforce	0.00887	0.00968	0.01121	0.01879	0.02085	0.01985
	(0.00523)	(0.00499)	(0.00522)	(0.00838)	(0.00824)	(0.00877)
Dependent						
PBF with workforce	0.00373	0.00923	0.01261**	0.00166	0.00346	0.00781
	(0.00515)	(0.00470)	(0.00431)	(0.00522)	(0.00493)	(0.00455)
PBF without workforce	0.00949	0.01275**	0.01717**	-0.00134	0.00211	0.00979
	(0.00431)	(0.00447)	(0.00570)	(0.00506)	(0.00572)	(0.00552)
Independent						
PBF with workforce	0.00027	0.00775	0.01097	-0.00566	0.00052	0.00788
	(0.00592)	(0.00591)	(0.00618)	(0.00605)	(0.00572)	(0.00508)
PBF without workforce	0.01101	0.01453*	0.01995**	0.00242	0.00063	0.00632
	(0.00532)	(0.00545)	(0.00660)	(0.00527)	(0.00538)	(0.00523)
Max observations	5,969	6,482	6,475	9,666	10,636	10,550

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
8-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median						
PBF with workforce	0.00071	0.00587	0.01076*	-0.00175	-0.00372	0.00924
	(0.00486)	(0.00461)	(0.00401)	(0.00476)	(0.00483)	(0.00535)
PBF without workforce	0.00646	0.00942	0.01272*	-0.00461	-0.00249	0.00569
	(0.00514)	(0.00494)	(0.00453)	(0.00437)	(0.00475)	(0.00522)
Mean						
PBF with workforce	0.00147	0.00865	0.01130**	-0.00353	-0.00403	0.00963
	(0.00473)	(0.00478)	(0.00380)	(0.00503)	(0.00454)	(0.00449)
PBF without workforce	0.01024	0.01165	0.01451**	-0.00765	-0.00457	0.00534
	(0.00529)	(0.00496)	(0.00455)	(0.00416)	(0.00484)	(0.00509)
25th percentile						
PBF with workforce	-0.00858	0.00119	0.00875	-0.00037	-0.00439	0.01185
	(0.00749)	(0.00727)	(0.00585)	(0.00703)	(0.00749)	(0.00749)

PBF without workforce	0.01184	0.01628	0.02078***	-0.00619	-0.00134	0.00925
	(0.00731)	(0.00650)	(0.00570)	(0.00633)	(0.00703)	(0.00765)
75th percentile						
PBF with workforce	0.00358	0.01026	0.01243**	-0.00711	-0.00684	0.00702
	(0.00465)	(0.00471)	(0.00376)	(0.00459)	(0.00417)	(0.00455)
PBF without workforce	0.00854	0.00955	0.01125**	-0.00689	-0.00388	0.00379
	(0.00498)	(0.00423)	(0.00388)	(0.00422)	(0.00482)	(0.00494)
Max observations	4,952	5,473	5,458	7,895	8,875	8,769

Notes:
(1) All models include the control variables shown in Table 2 and state and year fixed effects. Each coefficient is the result of a separate regression.
(2) Standard errors are clustered at the OPEID level to account for College Scorecard data being reported at the OPEID level instead of the UnitID level.
(3) * signifies p<.01. ** signifies p<.005, and *** signifies p<.001.

Table 7: Effects of PBF equity metrics on student earnings outcomes.

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
6-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median						
PBF with equity	0.00411	0.01089	0.01832***	0.00059	0.00200	0.01158*
	(0.00524)	(0.00471)	(0.00516)	(0.00390)	(0.00427)	(0.00424)
PBF without equity	0.00930	0.01107	0.00993	0.00100	0.00357	0.00598
	(0.00438)	(0.00460)	(0.00545)	(0.00448)	(0.00408)	(0.00429)
Mean						
PBF with equity	0.00704	0.01444**	0.02068***	-0.00058	-0.00009	0.00943
	(0.00499)	(0.00465)	(0.00501)	(0.00368)	(0.00412)	(0.00380)
PBF without equity	0.00939	0.00990	0.00887	-0.00095	0.00377	0.00787
	(0.00440)	(0.00467)	(0.00531)	(0.00453)	(0.00417)	(0.00401)
25th percentile						
PBF with equity	0.00510	0.01396	0.02248**	0.00555	0.00841	0.01807**
	(0.00699)	(0.00619)	(0.00701)	(0.00559)	(0.00642)	(0.00630)
PBF without equity	0.01819*	0.02039**	0.01900*	-0.00415	-0.00263	0.00365
	(0.00651)	(0.00664)	(0.00733)	(0.00571)	(0.00542)	(0.00577)
75th percentile						
PBF with equity	0.00767	0.01291**	0.01827***	-0.00170	-0.00242	0.00593
	(0.00441)	(0.00403)	(0.00491)	(0.00367)	(0.00394)	(0.00374)

PBF without equity	0.00604	0.00535	0.00410	0.00018	0.00480	0.00739
	(0.00396)	(0.00411)	(0.00460)	(0.00474)	(0.00433)	(0.00430)
Low-income						
PBF with equity	0.00475	0.01408	0.02269***	0.01619**	0.01993**	0.01617
	(0.00624)	(0.00582)	(0.00597)	(0.00536)	(0.00611)	(0.00642)
PBF without equity	0.00689	0.00978	0.01026	0.00549	0.01046	0.01322
	(0.00533)	(0.00601)	(0.00752)	(0.00584)	(0.00578)	(0.00596)
Middle-income						
PBF with equity	0.00810	0.01579***	0.02070***	0.01352	0.01549*	0.01308
	(0.00495)	(0.00445)	(0.00535)	(0.00611)	(0.00588)	(0.00521)
PBF without equity	0.00821	0.01047	0.00937	0.00236	0.00859	0.01363*
	(0.00429)	(0.00453)	(0.00536)	(0.00586)	(0.00504)	(0.00495)
High-income						
PBF with equity	0.00550	0.01074	0.01763***	0.01700	0.01746	0.00915
	(0.00547)	(0.00488)	(0.00492)	(0.00909)	(0.00788)	(0.00787)
PBF without equity	0.00992	0.00817	0.00487	0.00902	0.01558	0.01781
	(0.00535)	(0.00510)	(0.00585)	(0.00739)	(0.00650)	(0.00768)
Dependent						
PBF with equity	0.00775	0.01511**	0.02199***	-0.00107	-0.00307	0.00559
	(0.00502)	(0.00484)	(0.00583)	(0.00426)	(0.00523)	(0.00437)
PBF without equity	0.00615	0.00622	0.00561	0.00061	0.00725	0.01155
	(0.00512)	(0.00514)	(0.00535)	(0.00517)	(0.00467)	(0.00462)
Independent						
PBF with equity	0.00418	0.01253	0.01882**	0.00010	-0.00170	0.00675
	(0.00626)	(0.00613)	(0.00650)	(0.00465)	(0.00511)	(0.00475)
PBF without equity	0.00832	0.00983	0.01099	-0.00135	0.00236	0.00736
	(0.00594)	(0.00591)	(0.00711)	(0.00568)	(0.00511)	(0.00483)
Max observations	5,969	6,482	6,475	9,666	10,636	10,550

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
8-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median						
PBF with equity	0.00037	0.00513	0.01242*	0.00203	0.00284	0.01474**
	(0.00527)	(0.00503)	(0.00463)	(0.00343)	(0.00390)	(0.00449)
PBF without equity	0.00853	0.01086	0.01124	-0.00985	-0.00917	0.00070
	(0.00447)	(0.00458)	(0.00468)	(0.00482)	(0.00478)	(0.00505)
Mean						
PBF with equity	0.00206	0.00670	0.01181*	0.00014	0.00105	0.01394***
	(0.00504)	(0.00493)	(0.00444)	(0.00322)	(0.00385)	(0.00388)
PBF without	0.01196	0.01435**	0.01416**	-0.01319*	-0.01019	0.00136

equity	(0.00513)	(0.00496)	(0.00478)	(0.00493)	(0.00485)	(0.00490)
25th percentile						
	-0.00700	0.00050	0.01040	0.00431	0.00796	0.02151**
PBF with equity	(0.00736)	(0.00717)	(0.00650)	(0.00543)	(0.00638)	(0.00671)
PBF without equity	0.01557	0.01966**	0.01974**	-0.01341	-0.01362	0.00071
	(0.00707)	(0.00642)	(0.00622)	(0.00668)	(0.00641)	(0.00698)
75th percentile						
	0.00378	0.00874	0.01339**	-0.00243	-0.00176	0.00997
PBF with equity	(0.00491)	(0.00454)	(0.00439)	(0.00329)	(0.00382)	(0.00387)
PBF without equity	0.00968	0.01113	0.01028	-0.01211	-0.00842	0.00106
	(0.00475)	(0.00440)	(0.00403)	(0.00480)	(0.00479)	(0.00488)
Max observations	4,952	5,473	5,458	7,895	8,875	8,769

Notes:
(1) All models include the control variables shown in Table 2 and state and year fixed effects. Each coefficient is the result of a separate regression.
(2) Standard errors are clustered at the OPEID level to account for College Scorecard data being reported at the OPEID level instead of the UnitID level.
(3) * signifies p<.01. ** signifies p<.005, and *** signifies p<.001.

Figure 1: Event studies, 4-years, post-1997 PBF starters

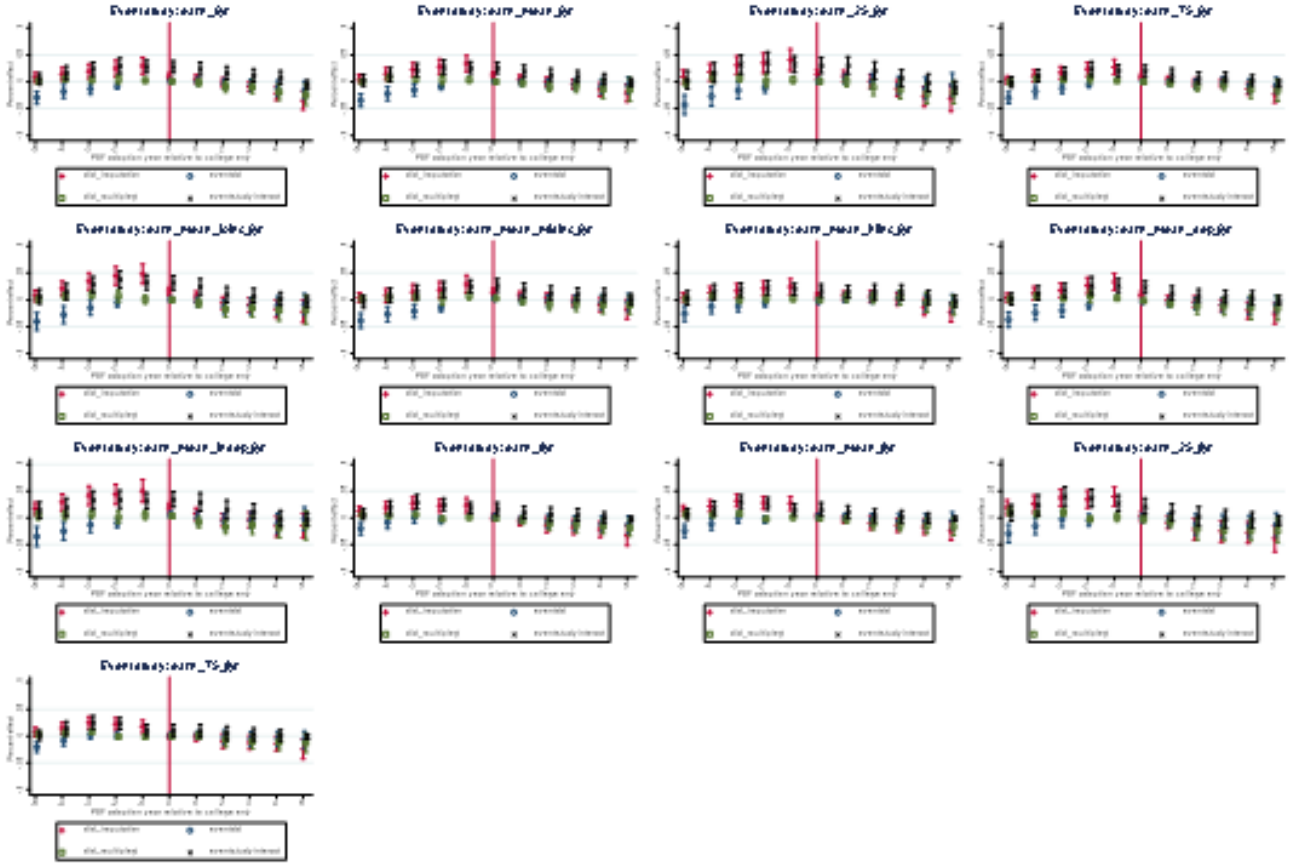


Figure 2: Event studies, 4-years, had PBF in 2009

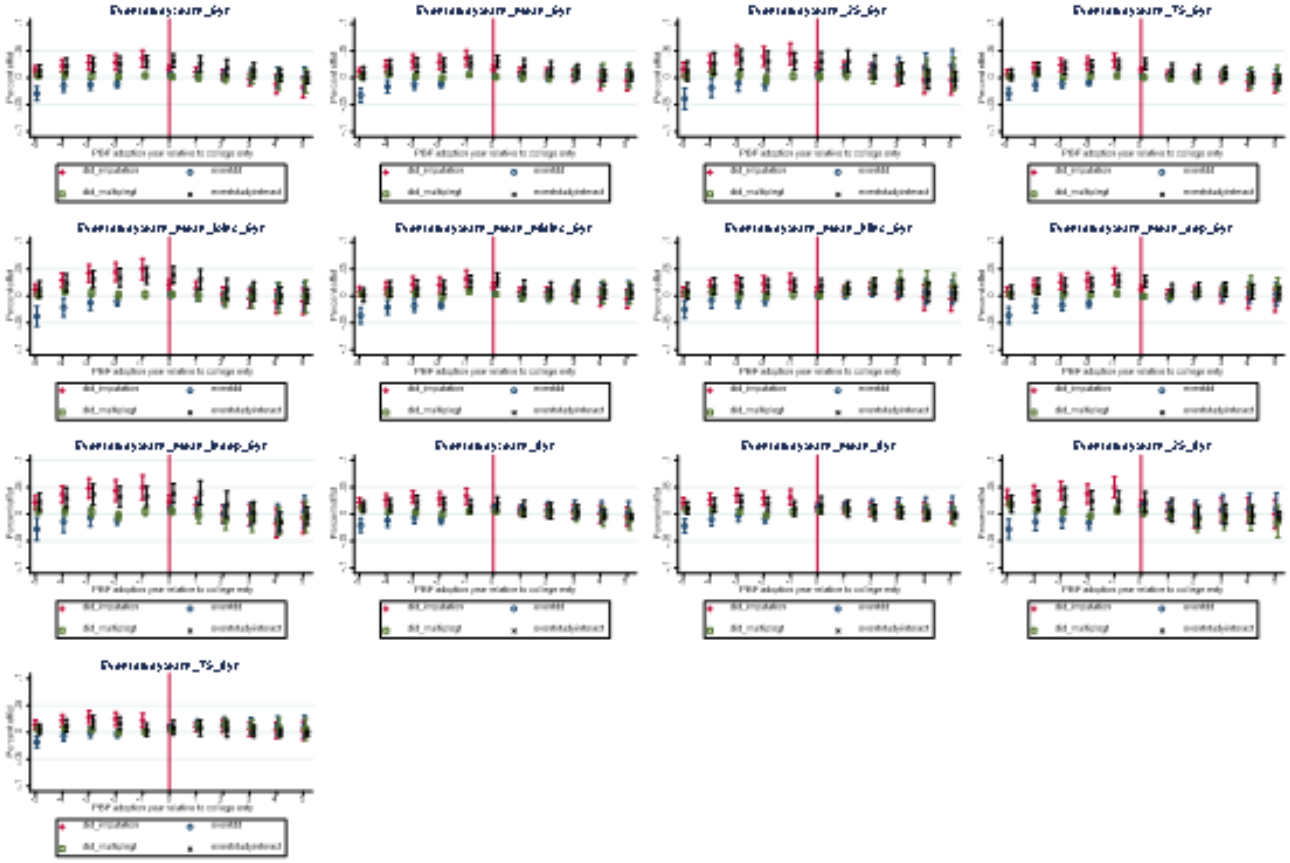


Figure 3: Event studies, 2-years, post-1997 PBF starters

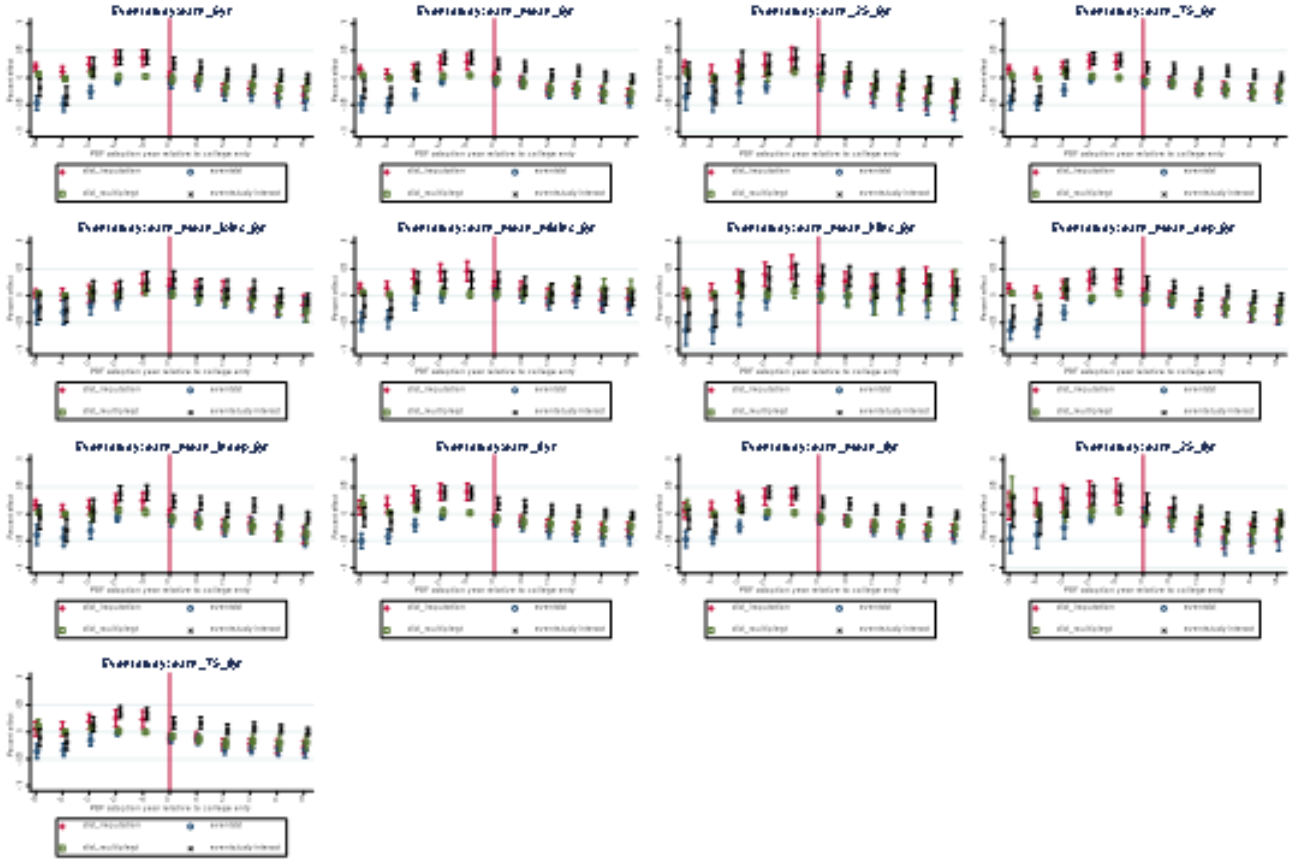
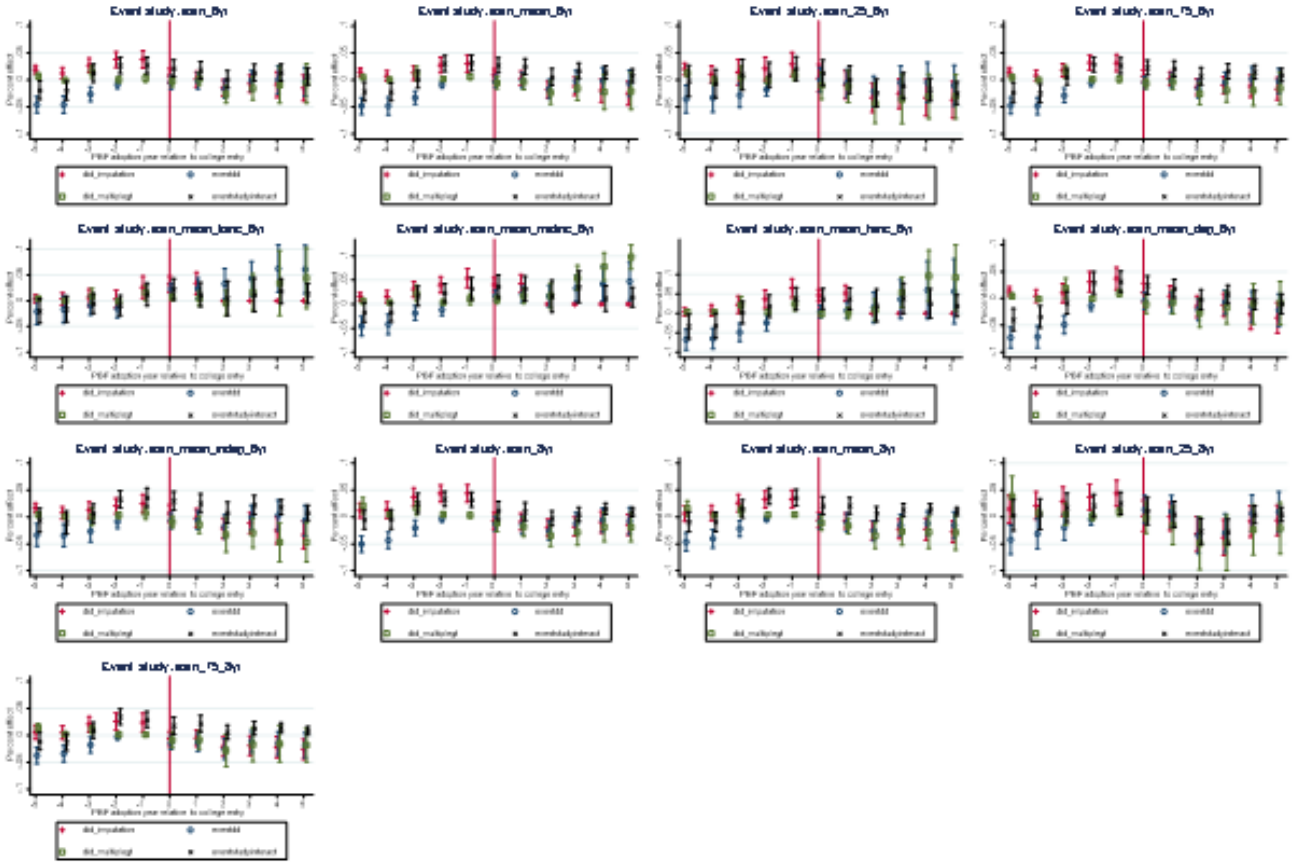


Figure 4: Event studies, 2-years, had PBF in 2009



Appendix 1: Effects of a funded PBF policy on student earnings outcomes (alternative samples).

Panel A: Excluding colleges subject to PBF in 1997.

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
6-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median	0.0040	0.0095*	0.0149***	0.0041	0.0047	0.0106**
	(0.0040)	(0.0038)	(0.0044)	(0.0037)	(0.0038)	(0.0038)
Mean	0.0050	0.0096*	0.0147***	0.0004	0.0022	0.0101**
	(0.0039)	(0.0038)	(0.0039)	(0.0037)	(0.0038)	(0.0034)
25th percentile	0.0088	0.0152**	0.0215***	0.0014	0.0010	0.0101
	(0.0059)	(0.0054)	(0.0059)	(0.0053)	(0.0058)	(0.0057)
75th percentile	0.0034	0.0066	0.0110**	0.0022	0.0025	0.0080*
	(0.0034)	(0.0034)	(0.0034)	(0.0036)	(0.0036)	(0.0034)
Low-income	0.0024	0.0106*	0.0184**	0.0140**	0.0184***	0.0170***
	(0.0048)	(0.0048)	(0.0048)	(0.0053)	(0.0052)	(0.0048)
Middle-income	0.0059	0.0119**	0.0156***	0.0130*	0.0153**	0.0149***
	(0.0038)	(0.0038)	(0.0038)	(0.0051)	(0.0050)	(0.0045)
High-income	0.0073	0.0086*	0.0116**	0.0228**	0.0272***	0.0222**
	(0.0047)	(0.0043)	(0.0047)	(0.0074)	(0.0060)	(0.0070)
Dependent	0.0030	0.0072	0.0135**	0.0026	0.0050	0.0125**
	(0.0043)	(0.0041)	(0.0043)	(0.0042)	(0.0047)	(0.0041)
Independent	0.0052	0.0120*	0.0175**	-0.0006	-0.0013	0.0072
	(0.0052)	(0.0051)	(0.0052)	(0.0048)	(0.0049)	(0.0042)
Max observations	5,392	5,857	5,850	8,301	9,141	9,059

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
8-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median	-0.0006	0.0035	0.0109**	-0.0019	-0.0006	0.0108**
	(0.0042)	(0.0038)	(0.0042)	(0.0037)	(0.0039)	(0.0042)
Mean	0.0020	0.0056	0.0113**	-0.0041	-0.0023	0.0099**
	(0.0043)	(0.0039)	(0.0037)	(0.0037)	(0.0039)	(0.0037)
25th percentile	-0.0034	0.0042	0.0147**	-0.0014	0.0033	0.0155**
	(0.0066)	(0.0060)	(0.0053)	(0.0057)	(0.0060)	(0.0059)
75th percentile	0.0024	0.0047	0.0091**	-0.0060	-0.0050	0.0060
	(0.0042)	(0.0036)	(0.0034)	(0.0034)	(0.0036)	(0.0035)
Max observations	4,475	4,948	4,933	6,777	7,626	7,538

Panel B: Excluding colleges subject to PBF in 1997 or who were no longer subject to PBF by 2009.

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
6-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median	0.0045	0.0110*	0.0181**	0.0032	0.0075	0.0149**
	(0.0060)	(0.0054)	(0.0057)	(0.0066)	(0.0066)	(0.0056)
Mean	0.0098	0.0137**	0.0184***	0.0017	0.0062	0.0131*
	(0.0059)	(0.0051)	(0.0052)	(0.0067)	(0.0069)	(0.0057)
25th percentile	0.0154	0.0185*	0.0235**	-0.0047	-0.0014	0.0089
	(0.0084)	(0.0076)	(0.0079)	(0.0087)	(0.0100)	(0.0085)
75th percentile	0.0051	0.0095*	0.0140**	0.0044	0.0081	0.0132*
	(0.0052)	(0.0044)	(0.0043)	(0.0068)	(0.0066)	(0.0057)
Low-income	0.0088	0.0163*	0.0236***	0.0294*	0.0307**	0.0211*
	(0.0075)	(0.0066)	(0.0070)	(0.0123)	(0.0100)	(0.0090)
Middle-income	0.0085	0.0143**	0.0204***	0.0386***	0.0398***	0.0313***
	(0.0055)	(0.0048)	(0.0051)	(0.0086)	(0.0081)	(0.0071)
High-income	0.0130	0.0114*	0.0143*	0.0510***	0.0527***	0.0456***
	(0.0066)	(0.0057)	(0.0056)	(0.0114)	(0.0101)	(0.0098)
Dependent	0.0104	0.0117*	0.0166**	-0.0006	0.0075	0.0177*
	(0.0057)	(0.0052)	(0.0053)	(0.0077)	(0.0089)	(0.0074)
Independent	0.0086	0.0171*	0.0213**	0.0010	0.0020	0.0083
	(0.0083)	(0.0076)	(0.0079)	(0.0087)	(0.0089)	(0.0077)
Max observations	4,683	5,088	5,082	6,847	7,555	7,477

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
8-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median	0.0022	0.0080	0.0143**	-0.0091	-0.0076	0.0128*
	(0.0072)	(0.0060)	(0.0055)	(0.0061)	(0.0075)	(0.0062)
Mean	0.0071	0.0117	0.0147*	-0.0104	-0.0108	0.0097
	(0.0081)	(0.0067)	(0.0060)	(0.0067)	(0.0082)	(0.0065)
25th percentile	0.0004	0.0089	0.0196*	-0.0068	-0.0023	0.0173
	(0.0116)	(0.0103)	(0.0088)	(0.0096)	(0.0118)	(0.0088)
75th percentile	0.0079	0.0095	0.0106*	-0.0094	-0.0103	0.0060
	(0.0072)	(0.0058)	(0.0048)	(0.0068)	(0.0079)	(0.0060)
Max observations	3,890	4,301	4,286	5,581	6,298	6,215

Notes:
(1) All models include the control variables shown in Table 2 and state and year fixed effects. Each coefficient is the result of a separate regression.
(2) Standard errors are clustered at the OPEID level to account for College Scorecard data being reported at the OPEID level instead of the UnitID level.

(3) * signifies p<.01. ** signifies p<.005, and *** signifies p<.001.

Panel B: Excluding colleges subject to PBF in 1997 or who were no longer subject to PBF by 2009.

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
6-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median	0.0045	0.0110*	0.0181**	0.0032	0.0075	0.0149**
	(0.0060)	(0.0054)	(0.0057)	(0.0066)	(0.0066)	(0.0056)
Mean	0.0098	0.0137**	0.0184***	0.0017	0.0062	0.0131*
	(0.0059)	(0.0051)	(0.0052)	(0.0067)	(0.0069)	(0.0057)
25th percentile	0.0154	0.0185*	0.0235**	-0.0047	-0.0014	0.0089
	(0.0084)	(0.0076)	(0.0079)	(0.0087)	(0.0100)	(0.0085)
75th percentile	0.0051	0.0095*	0.0140**	0.0044	0.0081	0.0132*
	(0.0052)	(0.0044)	(0.0043)	(0.0068)	(0.0066)	(0.0057)
Low-income	0.0088	0.0163*	0.0236***	0.0294*	0.0307**	0.0211*
	(0.0075)	(0.0066)	(0.0070)	(0.0123)	(0.0100)	(0.0090)
Middle-income	0.0085	0.0143**	0.0204***	0.0386***	0.0398***	0.0313***
	(0.0055)	(0.0048)	(0.0051)	(0.0086)	(0.0081)	(0.0071)
High-income	0.0130	0.0114*	0.0143*	0.0510***	0.0527***	0.0456***
	(0.0066)	(0.0057)	(0.0056)	(0.0114)	(0.0101)	(0.0098)
Dependent	0.0104	0.0117*	0.0166**	-0.0006	0.0075	0.0177*
	(0.0057)	(0.0052)	(0.0053)	(0.0077)	(0.0089)	(0.0074)
Independent	0.0086	0.0171*	0.0213**	0.0010	0.0020	0.0083
	(0.0083)	(0.0076)	(0.0079)	(0.0087)	(0.0089)	(0.0077)
Max observations	4,683	5,088	5,082	6,847	7,555	7,477

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
8-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median	0.0022	0.0080	0.0143**	-0.0091	-0.0076	0.0128*
	(0.0072)	(0.0060)	(0.0055)	(0.0061)	(0.0075)	(0.0062)
Mean	0.0071	0.0117	0.0147*	-0.0104	-0.0108	0.0097
	(0.0081)	(0.0067)	(0.0060)	(0.0067)	(0.0082)	(0.0065)
25th percentile	0.0004	0.0089	0.0196*	-0.0068	-0.0023	0.0173
	(0.0116)	(0.0103)	(0.0088)	(0.0096)	(0.0118)	(0.0088)
75th percentile	0.0079	0.0095	0.0106*	-0.0094	-0.0103	0.0060
	(0.0072)	(0.0058)	(0.0048)	(0.0068)	(0.0079)	(0.0060)
Max observations	3,890	4,301	4,286	5,581	6,298	6,215

Notes:
(1) All models include the control variables shown in Table 2 and state and year fixed effects. Each coefficient is the result of a separate regression.
(2) Standard errors are clustered at the OPEID level to account for College Scorecard data being reported at the OPEID level instead of the UnitID level.
(3) * signifies p<.01. ** signifies p<.005, and *** signifies p<.001.

Appendix 2: Effects of PBF dosage (by tercile) on student earnings outcomes.

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
6-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median						
Low PBF	0.01392***	0.01731***	0.01138**	0.00678	0.00955**	0.01179***
	(0.00356)	(0.00395)	(0.00358)	(0.00357)	(0.00335)	(0.00335)
Medium PBF	0.00505	0.01220**	0.01725***	-0.00540	-0.00642	-0.00599
	(0.00443)	(0.00425)	(0.00440)	(0.00479)	(0.00539)	(0.00549)
High PBF	-0.01228	-0.00564	0.00173	-0.00331	0.00130	0.01075
	(0.00745)	(0.00684)	(0.00733)	(0.00607)	(0.00585)	(0.00623)
Mean						
Low PBF	0.01461***	0.01804***	0.01251***	0.00512	0.00909*	0.01380***
	(0.00367)	(0.00413)	(0.00340)	(0.00324)	(0.00326)	(0.00303)
Medium PBF	0.00712	0.01352***	0.01843***	-0.00780	-0.00825	-0.00603
	(0.00415)	(0.00399)	(0.00419)	(0.00452)	(0.00516)	(0.00519)
High PBF	-0.00958	-0.00245	0.00586	-0.00335	0.00130	0.00931
	(0.00685)	(0.00653)	(0.00718)	(0.00634)	(0.00575)	(0.00523)
25th percentile						
Low PBF	0.02374***	0.02863***	0.02012***	0.00471	0.00556	0.01053
	(0.00508)	(0.00550)	(0.00523)	(0.00499)	(0.00479)	(0.00497)
Medium PBF	0.00669	0.01593**	0.02162***	0.00307	0.00285	0.00648
	(0.00633)	(0.00564)	(0.00592)	(0.00612)	(0.00756)	(0.00754)
High PBF	-0.01443	-0.00751	0.00201	-0.01432	-0.00734	0.00775
	(0.00949)	(0.00862)	(0.00952)	(0.01010)	(0.01000)	(0.00957)
75th percentile						
Low PBF	0.01040**	0.01099**	0.00613	0.00595	0.00899*	0.01025***
	(0.00331)	(0.00346)	(0.00289)	(0.00335)	(0.00321)	(0.00302)
Medium PBF	0.00706	0.01198***	0.01616***	-0.00984	-0.01063	-0.00983
	(0.00364)	(0.00361)	(0.00401)	(0.00475)	(0.00525)	(0.00555)
High PBF	-0.00512	0.00121	0.00875	-0.00171	0.00315	0.00847
	(0.00651)	(0.00598)	(0.00707)	(0.00639)	(0.00548)	(0.00554)
Low-income						
Low PBF	0.01256	0.01908***	0.01590**	0.01189*	0.01665***	0.01448***
	(0.00499)	(0.00569)	(0.00500)	(0.00448)	(0.00465)	(0.00436)
Medium PBF	0.00539	0.01372	0.02117***	0.01047	0.00937	0.00528
	(0.00591)	(0.00556)	(0.00586)	(0.00740)	(0.00865)	(0.00978)

High PBF	-0.01523	-0.00659	0.00247	0.00181	0.01002	0.01888
	(0.00836)	(0.00743)	(0.00842)	(0.00971)	(0.00914)	(0.00842)
Middle-income						
Low PBF	0.01328***	0.01822***	0.01283***	0.01143	0.01735***	0.01823***
	(0.00369)	(0.00387)	(0.00346)	(0.00466)	(0.00476)	(0.00433)
Medium PBF	0.00798	0.01424***	0.01780***	0.00221	0.00454	0.00242
	(0.00410)	(0.00399)	(0.00460)	(0.00718)	(0.00665)	(0.00675)
High PBF	-0.00821	0.00089	0.00741	-0.00008	0.00227	0.01014
	(0.00723)	(0.00670)	(0.00760)	(0.00799)	(0.00654)	(0.00603)
High-income						
Low PBF	0.01211**	0.01250**	0.00675	0.01252	0.01904**	0.02101**
	(0.00427)	(0.00435)	(0.00383)	(0.00752)	(0.00616)	(0.00673)
Medium PBF	0.00632	0.00965	0.01442***	0.00599	0.00324	-0.00613
	(0.00438)	(0.00398)	(0.00412)	(0.00889)	(0.00798)	(0.00805)
High PBF	-0.00313	0.00293	0.00997	0.01723	0.02465**	0.02391
	(0.00752)	(0.00688)	(0.00659)	(0.00873)	(0.00831)	(0.00994)
Dependent						
Low PBF	0.01436***	0.01700***	0.01033*	0.00692	0.01214**	0.01477***
	(0.00369)	(0.00431)	(0.00370)	(0.00385)	(0.00389)	(0.00354)
Medium PBF	0.00340	0.01011	0.01532***	-0.01251	-0.01382	-0.01157
	(0.00455)	(0.00412)	(0.00449)	(0.00521)	(0.00616)	(0.00584)
High PBF	-0.00767	-0.00032	0.00957	0.00269	0.00521	0.00992
	(0.00652)	(0.00639)	(0.00802)	(0.00610)	(0.00631)	(0.00612)
Independent						
Low PBF	0.01279	0.01616**	0.01371*	0.00472	0.00517	0.01033*
	(0.00568)	(0.00546)	(0.00492)	(0.00379)	(0.00400)	(0.00375)
Medium PBF	0.00617	0.01613*	0.02332***	-0.00527	-0.00691	-0.00308
	(0.00604)	(0.00601)	(0.00634)	(0.00550)	(0.00613)	(0.00614)
High PBF	-0.01512	-0.00905	0.00019	-0.00636	0.00089	0.01036
	(0.00896)	(0.00850)	(0.00927)	(0.00950)	(0.00828)	(0.00698)
Max observations	5,969	6,482	6,475	9,666	10,636	10,550

	PBF adoption year relative to college entry					
	Four-year universities			Two-year colleges		
8-year earnings (log)	t-1	t	t+1	t-1	t	t+1
Median						
Low PBF	0.00990*	0.01605***	0.01422***	0.00005	-0.00076	0.01074*
	(0.00368)	(0.00396)	(0.00372)	(0.00359)	(0.00366)	(0.00382)
Medium PBF	0.00145	0.00561	0.01237**	-0.00147	-0.00549	-0.00029
	(0.00529)	(0.00417)	(0.00393)	(0.00464)	(0.00519)	(0.00539)

High PBF	-0.00808	-0.00856	0.00178	-0.01619*	-0.00311	0.00615
	(0.00620)	(0.00663)	(0.00654)	(0.00589)	(0.00587)	(0.00645)
Mean						
Low PBF	0.01302**	0.01841***	0.01521***	-0.00213	-0.00059	0.01232***
	(0.00395)	(0.00436)	(0.00390)	(0.00323)	(0.00333)	(0.00330)
Medium PBF	0.00419	0.00847	0.01379***	-0.00648	-0.00920	-0.00374
	(0.00493)	(0.00388)	(0.00347)	(0.00456)	(0.00533)	(0.00538)
High PBF	-0.00807	-0.00676	0.00315	-0.01485	-0.00388	0.00554
	(0.00604)	(0.00640)	(0.00658)	(0.00595)	(0.00553)	(0.00570)
25th percentile						
Low PBF	0.01210	0.02195***	0.02148***	-0.00028	0.00019	0.01511*
	(0.00577)	(0.00559)	(0.00494)	(0.00571)	(0.00540)	(0.00568)
Medium PBF	-0.00191	0.00490	0.01383*	-0.00035	-0.00318	0.00223
	(0.00720)	(0.00555)	(0.00522)	(0.00602)	(0.00754)	(0.00792)
High PBF	-0.01390	-0.01215	-0.00332	-0.02011	-0.00693	0.00640
	(0.00920)	(0.00979)	(0.00932)	(0.00928)	(0.00966)	(0.00938)
75th percentile						
Low PBF	0.01123**	0.01582***	0.01144***	-0.00346	-0.00202	0.00987**
	(0.00363)	(0.00379)	(0.00322)	(0.00324)	(0.00330)	(0.00326)
Medium PBF	0.00483	0.00918	0.01370***	-0.00672	-0.00777	-0.00306
	(0.00487)	(0.00356)	(0.00329)	(0.00460)	(0.00534)	(0.00556)
High PBF	-0.00441	-0.00430	0.00786	-0.01589**	-0.00638	0.00151
	(0.00587)	(0.00608)	(0.00654)	(0.00528)	(0.00482)	(0.00546)
Max observations	4,952	5,473	5,458	7,895	8,875	8,769

Notes:
(1) All models include the control variables shown in Table 2 and state and year fixed effects. Each coefficient is the result of a separate regression.
(2) Standard errors are clustered at the OPEID level to account for College Scorecard data being reported at the OPEID level instead of the UnitID level.
(3) * signifies p<.01. ** signifies p<.005, and *** signifies p<.001.
(4) The reference group for this analysis is no funded PBF.