



Comparing earnings outcome differences between all graduates and title IV graduates

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ABSTRACT

Recently, two public data products have been released that publish earnings outcomes for college graduates by program of study and institution: Post-Secondary Employment Outcomes and College Scorecard, from the Census Bureau and U.S. Department of Education, respectively. While the earnings data underlying the data products is similar, the purposes and scope of the products are different. College Scorecard focuses only on graduates that receive Title IV aid, while PSEO includes all graduates. This paper describes how the differences in these two samples affect the published earnings outcomes. For institutions in my sample, an average of sixty percent of baccalaureate graduates receive Title IV aid. I show that short-run earnings outcomes are very similar for these two samples, while longer-run outcomes (10 years after graduation) are significantly lower for the Title IV population, and that this difference grows consistently over time. I also show that program ranking can change significantly when considering the Title IV population rather than the entire graduate population.

Information on employment outcomes of college attendance and graduation is in high demand from students, parents, and administrators. Policymakers want to ensure that public investment in higher education is worth the cost, while students and parents want to be informed on the expected outcomes from different colleges and field choices, and how expected earnings compare with decisions over student debt load. Recent work by the Postsecondary Value Commission and Third Way have highlighted the value of measuring earnings and employment outcomes in understanding the value of investments in higher education.² News outlets have also recently started using College Scorecard data to evaluate the returns to post-graduate degrees, such as the recent reports from the Wall Street Journal.³

A number of efforts have been undertaken by federal and state governments to provide information on employment outcomes of college students. States have linked unemployment insurance wage records to graduate records, and published earnings outcomes on public-facing websites at the program (institution by field) level.⁴ The federal government has provided this information in two ways, College Scorecard and Post-Secondary Employment Outcomes, which are related, but have

different underlying purposes, data scopes, and earnings restrictions. First, in 2014 the Department of Education under the Obama Administration released College Scorecard, which published earnings outcomes for first-time students attending an institution who received Title IV financial aid. The Department of Education also recently published one- and two-year postgraduate earnings at the program level for graduates who received Title IV aid, the most recent data release in December 2020. College Scorecard's focus is outcomes for students who receive Title IV aid, since federal dollars are being used to support those students. While much attention is spent on the earnings outcomes for students, College Scorecard is also interested in measuring debt loads and debt-to-income ratios to give a picture of the return on investment for students. Finally, College Scorecard graduate outcomes are only available for students receiving degrees in 2016 and later, and therefore they only have short-run earnings outcomes. (one and two years post-graduation)

A related effort was undertaken at the Census Bureau starting in 2017, now referred to as the Post-Secondary Employment Outcomes (PSEO). PSEO is an experimental data product at Census, and publishes

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¹ The analysis, conclusions, and opinions expressed herein are those of the author alone and do not represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed, and no confidential data was used in this paper, and approved with DRB approvals CBDRB-FY21-CED006-0012 and CBDRB-FY22-CED006-0012. Thanks to Lee Tucker, Jordan Matsudaira, and Brian Fu for their comments on the paper; Larry Warren and Erika McEntarfer on their comments on an earlier draft, and to the PSEO partners for providing the data underlying this project. I also want to thank the two anonymous referees who provided very helpful suggestions.

² These reports are available here (<https://www.postsecondaryvalue.org/wp-content/uploads/2021/07/PVC-Final-Report-FINAL-7.2.pdf>) and here (<https://www.thirdway.org/report/which-college-programs-give-students-the-best-bang-for-their-buck>).

³ <https://www.wsj.com/articles/some-professional-degrees-leave-students-with-high-debt-but-without-high-salaries-11638354602>

⁴ Examples of states that have done this are Colorado, Texas, and North Carolina, among others.

earnings outcomes for *all* graduates by institution, degree type, and degree field.⁵

PSEO's focus is strictly on the employment and earnings side and was created to address the issue that states are unable to measure earnings outcomes for graduates that leave their state. In contrast with College Scorecard, for the institutions included in the data, PSEO releases earnings for all graduates irrespective of Title IV status.⁶ Additionally, while College Scorecard releases earnings outcomes both for entering students and graduates, PSEO only releases data on graduates. PSEO has graduates starting in 2001 and the ability to release longer-run earnings outcomes.

College Scorecard's primary purpose is transparency on student outcomes, and schools do not voluntarily provide graduate data to the Education Department, but the data on students come from the National Student Loan Data System, which only includes data on students who received Title IV aid. This makes comparisons between institutions in College Scorecard more natural because the underlying population is similar between institutions. These data contrast with the data available to Census for PSEO, which is voluntarily provided but only includes a small share of institutions in the country, but includes all graduates from an institution.⁷

Additionally, College Scorecard and PSEO have different restrictions on who is eligible to be counted in the earnings tabulations. College Scorecard drops individuals who have zero earnings in a reference year; are enrolled in another program in the reference year; died in the reference year; or received a higher degree in or before the reference year. While PSEO covers all award recipients, individuals are dropped from the published results if they do not have positive earnings for at least three quarters in the reference year, or if they do not earn at least the full-time equivalent of the federal minimum wage in the reference year. Using publicly available statistics, I calculate that of those graduates not enrolled, on average 94% of the graduates are included in the College Scorecard sample as they have non-zero earnings the first year after graduation. For the Post-Secondary Employment Outcomes, on average 68% of graduates are included in the sample.⁸

The purpose of this paper is to focus on one specific sample difference between PSEO and College Scorecard, the restriction to those receiving Title IV aid, and the earnings outcomes for those sets of graduates. Previous work has shown that there are two distinct groups that do not receive Title IV aid: lower- or middle-income students who are eligible but do not complete FAFSA, and higher-income individuals, who are not eligible (Kofoed, 2017). The former group do not complete the FAFSA (and are ineligible) mostly because it is complex, despite efforts to simplify the form (Dynarski & Scott-Clayton, 2006). Given that this group is so bimodal in expected outcomes, it is not clear if earnings will be the same or different when compared with Title IV students. This paper is not a direct comparison of College Scorecard and PSEO, but serves to inform users of both datasets on how the coverage differences explain differences in published earnings outcomes. To compare the earnings outcomes, I compare earnings for all graduates and Title IV graduates. I focus on three main differences between the two measures. First, I show that for the institutions in my sample, Title IV graduates

Table 1
Summary statistics.

	All Graduates	Title IV Graduates	Difference
50th Percentile Earnings			
1 year post-graduation	29,960	29,840	120
10 year post-graduation	56,940	54,580	2360*
Observation Count			
1 year post-graduation	624,000	389,000	
10 year post-graduation	198,000	112,000	

Notes: Author's calculation based on matched sample for graduates 2001–2006. Observation counts rounded. All Graduates includes all graduates in sample, while Title IV Graduates includes only graduates who received Title IV federal aid. 10 year post-graduation earnings is significantly different at the 10% significance level.

only comprise approximately 60% of graduates from a program. Second, I show that first-year earnings measures are comparable between the two samples, despite the coverage differences. 10 years after graduation, earnings diverge significantly for those cells with fewer Title IV graduates, which suggest different earnings trajectories for these students. Finally, I show that these differences in earnings measurement affect rankings of programs, such that for a given percentile ranking of a program using College Scorecard data, the ranking for all students may be 10 percentile points higher or lower.

The remainder of this paper proceeds as follows. The next section discusses the data I use for the project, and methodology for measuring earnings. Section 2 discusses comparisons of earnings outcomes and provides a number of graphs to illustrate the differences, while Section 3 discusses the effect these differences have on rankings of institutions and programs. Section 4 concludes.

1. Data and methodology

As part of the PSEO partnership, institutions and state higher education systems provide Census with data on graduates, enrolled students, and a number of other characteristics, including financial aid activity by academic year.⁹ Using this information, I can construct two samples of graduates: all graduates, and graduates who receive Title IV aid.¹⁰ For both samples, I apply the earnings restrictions used by PSEO, which are described in the introduction. All earnings are expressed in 2016 dollars using quarterly CPI-U.

To measure earnings outcomes, I use national Unemployment Insurance wage records, which are obtained through the Local Employment Dynamics Partnership. These wage records are different from the earnings records used in the actual production of College Scorecard, which are from tax records held by the IRS. While this difference will cause the earnings measurements to be different from College Scorecard's published numbers, that is outside the scope of the paper, since my focus is on how the difference in the sample of graduates affects the earnings outcome measurement.¹¹

To compare earnings outcomes between these two samples, I construct median earnings at the institution and degree field (4 digit

⁵ The other difference between these two data products is that College Scorecard uses tax data as the earnings source, which covers nearly all jobs, while PSEO uses LEHD wage records, which covers about 96% of all private sector jobs, but misses the self-employed, postal service, active military, and other job categories (Abowd et al., 2009).

⁶ Most states that provide data to Census do not provide Financial Aid data, and so Census is unable to publish earnings for Title IV students.

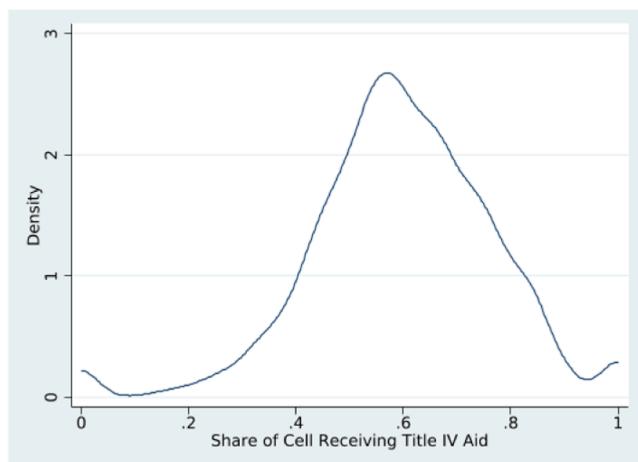
⁷ As of this writing, PSEO (U.S. Census Bureau, 2022) covers 22% of all US graduates, using 2018–2019 academic year as reference. Institutions included in PSEO are listed here: https://lehd.ces.census.gov/data/pseo/latest_release/all/pseo_all_institutions.csv

⁸ Calculations done using public use data from PSEO and College Scorecard.

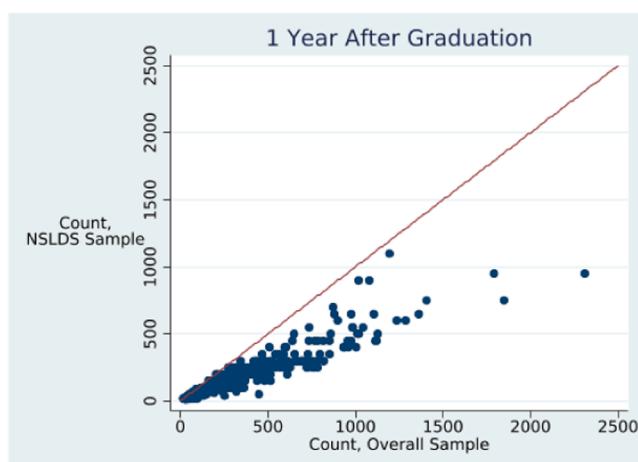
⁹ Institutions that provide Financial Aid data are State University of New York, City University of New York, Colorado Department of Higher Education, and University of Texas System. For reference, Table A1 and Figures A1-A3 in the appendix shows the difference between the institutions in my sample, and all institutions in the US.

¹⁰ Title IV financial aid includes Perkins Loans, Federal Subsidized or Unsubsidized Loans, and Pell Grants.

¹¹ For those interested in a fuller description of the differences, the 2015 Technical Paper from College Scorecard outlines some differences in earnings outcomes from UI and IRS sources: <https://collegescorecard.ed.gov/assets/UsingFederalDataToMeasureAndImprovePerformance.pdf>

**Fig. 1.** Kernel Density of Share Covered by NSLDS

Notes: Weighted kernel density calculation, where the observation level is the institution-graduation cohort-4 digit CIP.

**Fig. 2.** Scatterplot of Counts, Overall and NSLDS Sample

Notes: Each point is an institution-graduation cohort-4digit CIP, and counts are based on those with earnings in each category. Red line is 45° line from origin.

CIP) level.¹² I focus on baccalaureate degrees, since much of the attention is on those degrees. I restrict our sample of graduates to those graduating from 2001 to 2006, so that I calculate 10-year earnings outcomes for all graduates, which allows me to compare earnings outcomes and earnings growth over time.

Table 1 shows the average earnings of my sample. The first column is the entire population of graduates in our sample, and the second column shows earnings outcomes and sample sizes for the restricted sample of Title IV aid recipients.

2. Results of comparison

The first comparison is the share of the total count of graduates that receive Title IV financial aid. To measure the difference in coverage, I calculate the share of graduates receiving Title IV aid, where the

denominator is the total count of graduates in an institution-cohort-degree level-degree field cell. I show the distribution of these shares at the program (institution x field) level in Fig. 1. While some of the programs have a large share of their graduates receiving Title IV aid, there are a lot of programs that have less than 40 percent of their students receiving Title IV aid. I also show Fig. 2, which is a scatterplot of the counts, and includes a 45° line for reference.

However, these coverage differences will only matter to the extent that Title IV recipients have different earnings outcomes post-graduation compared with non-Title IV graduates. To measure the difference in earnings outcomes, I calculate the 50th percentile of the earnings distribution for the Overall and NSLDS samples, then measure the percent difference of this measure for each program.¹³ For example, a program with a percent difference of 20% implies that the median earnings of all graduates is 20% higher than the Title IV graduates.

To see how our measure of error lines up with share of Title IV aid recipients, Fig. 3 shows a scatterplot where the X-axis is share NSLDS, and the Y-axis is percent difference in the 50th percentile of earnings measure, for 1 year (left panel) and 10 years (right panel) after graduation. In the lower panels of Fig. 3, I summarize the scatterplots by collapsing them into deciles, and plotting the average, 90 and 10th percentile difference within each decile. These figures make it clear that in the first year after graduation, Title IV and overall earnings are effectively equal. However, 10 years after graduation, all deciles show that Title IV earnings outcomes are lower than for all graduates in all deciles of coverage, and the problem is worse for the lowest deciles (i.e. those programs with the least coverage of graduates).

Fig. 3 shows that while the initial differences in earnings are close to zero, over time the Title IV sample becomes less representative of earnings outcomes for all graduates. Another way to visualize this is to plot the kernel densities of the errors, to see where in the distribution the change is coming from, which is what Fig. 4 does below. Clearly, there is a large rightward shift in the distribution, which means that earnings outcomes from the Title IV sample underestimate earnings outcomes across the distribution.

Given the difference in earnings that show up after 10 years, the natural question is whether this growth is gradual or grow sharply in certain years post-graduation between these two groups. To measure how earnings differences grow over time, I calculated median earnings for both samples for each post-graduation year, and then graph the mean differences between these program-level medians in Fig. 5 below, along with 90% confidence intervals. This figure shows that earnings differences are statistically zero until year 4, and the point estimates grow gradually over time.

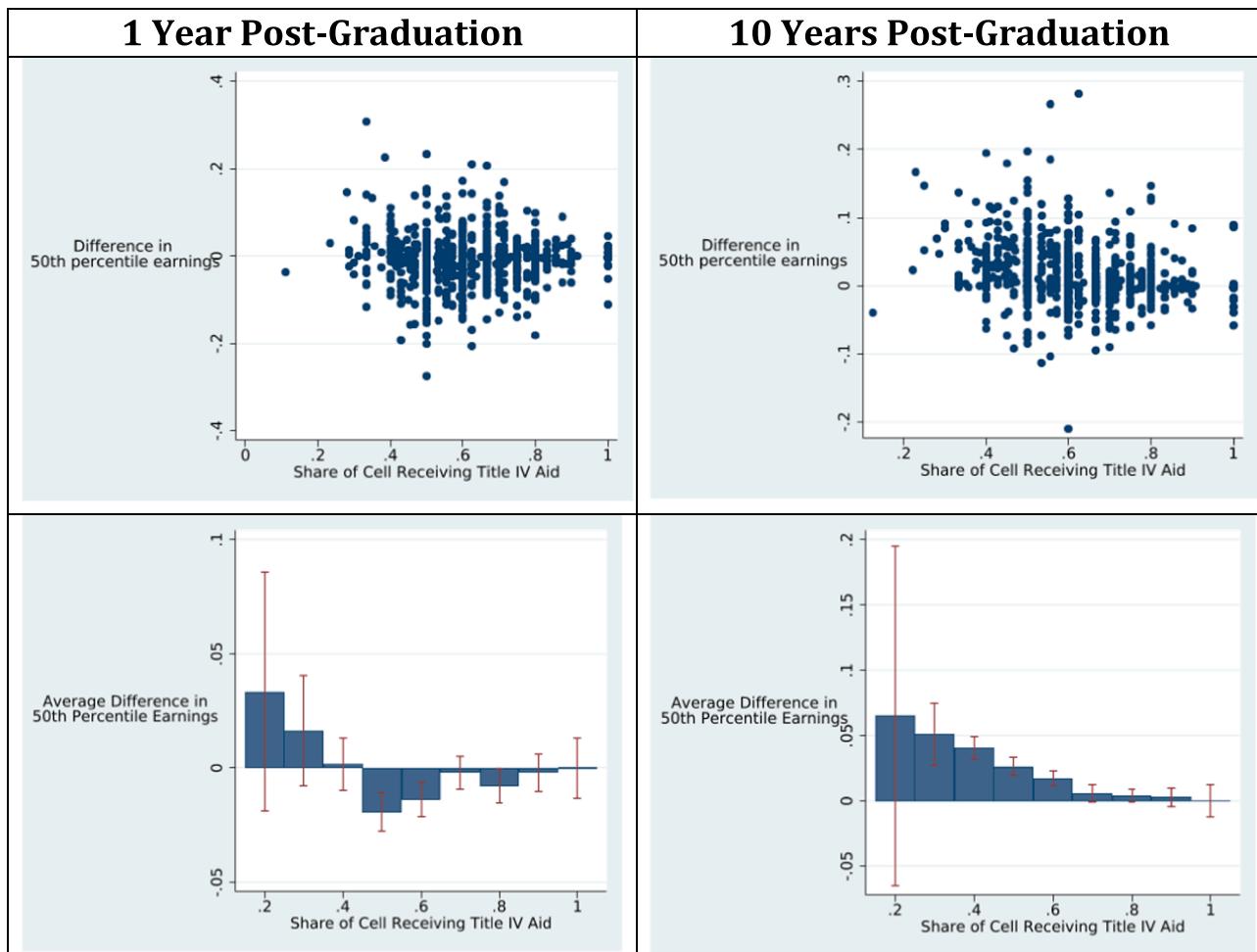
3. Distributional differences in outcomes

College Scorecard currently only publishes median earnings outcomes for graduates, rather than additional points in the distribution, so I have thus far focused on that moment in the distribution. In this subsection, I measure other moments of the distribution. To that end, in this short section, I replicate Figs. 3 and 4 for the 25 and 75th percentiles, which are also published in the PSEO data product, because it sheds light on whether publishing additional moments of the distribution would be advisable for College Scorecard.

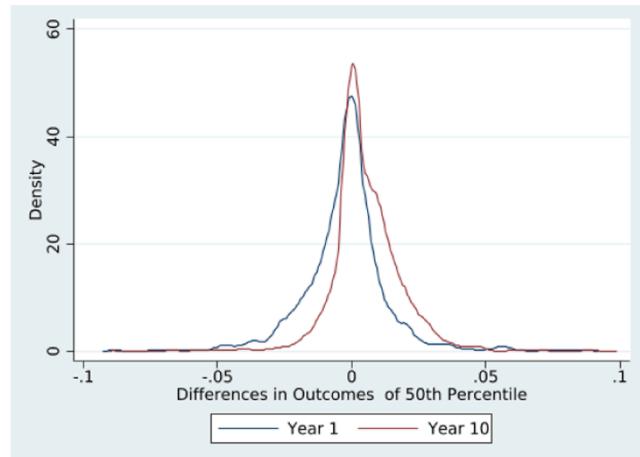
What the figures below show (Figs. 6–9) is that the mismeasurement issues are even worse at the tails of the distribution. While there is minimal bias for the 25th percentile of earnings (and if anything, for the first year after graduation, Title IV outcomes over-estimate earnings, as shown in Fig. 6 Panel C), the difference in the 75th percentile of earnings

¹² If a student has a double major, they have two observations in the data set. This is consistent with both College Scorecard (<https://collegescorecard.ed.gov/assets/FieldOfStudyDataDocumentation.pdf> - page 5) and PSEO methodology (<https://lehd.ces.census.gov/doc/PSEOTechnicalDocumentation.pdf> - page 5)

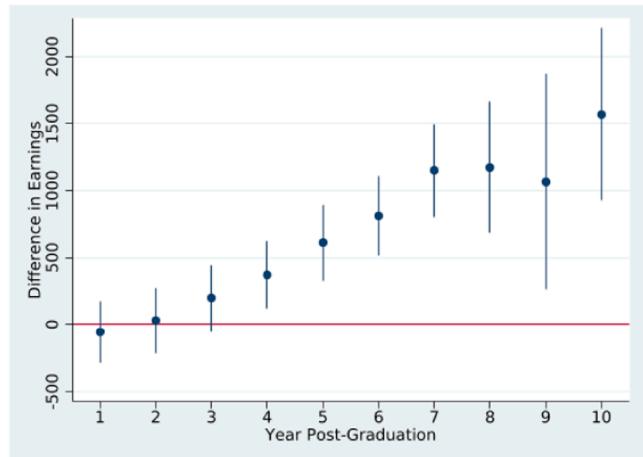
¹³ More technically, in the following graphs, I display the relative error (from Davis et al. (1998)), which is $\frac{PCT_ALL - PCT_FA}{(PCT_ALL + PCT_FA)/2}$, where PCT_FA and PCT_ALL are the 50th percentile of earnings for those receiving financial aid and all graduates, respectively.

**Fig. 3.** Scatterplot of DHS Errors of 50th Percentile Earnings, by Share Receiving Title IV Aid

Notes: Top panels are the raw error scatterplots, where each point represents an unweighted institution-graduation cohort-4 digit CIP cell. The lower panels are binned into share covered (in deciles). Error bands are the 90th and 10th percentiles of the scatterplots.

**Fig. 4.** Distribution of DHS Error for 50th Percentile Earnings, 1 and 10 years post-graduation

Notes: Kernel density calculation (weighted by person count of cell), where the observation level is the institution-graduation cohort-4 digit CIP, and relative error is the DHS error, described in text above.

**Fig. 5.** Differences in Median Earnings by Year

Notes: Means and 90% confidence intervals come from year dummy coefficients when regressing earnings differences at the program level on year dummies.

is substantial, especially for longer-run earnings outcomes. Fig. 8 Panel D shows that at all levels of coverage shares, the bias is positive and much larger than the bias at the 50th percentile, which suggests that graduates that enter high-earning careers are disproportionately taken

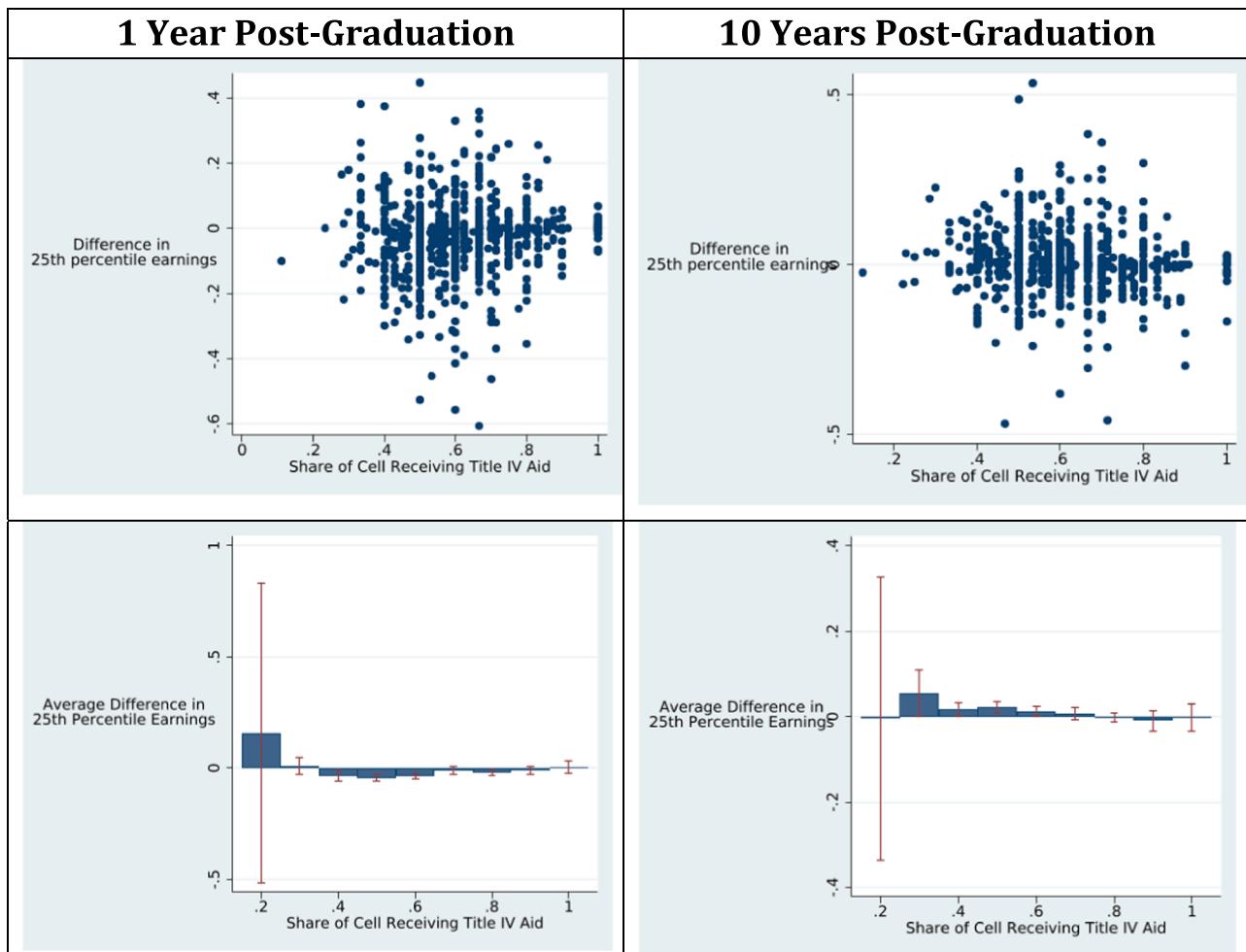


Fig. 6. Scatterplot of DHS Errors of 25th Percentile Earnings, by Share Receiving Title IV Aid

Notes: Top panels are the raw error scatterplots, while the lower panels are binned into share covered (in deciles). Error bands are the 90th and 10th percentiles of the scatterplots.

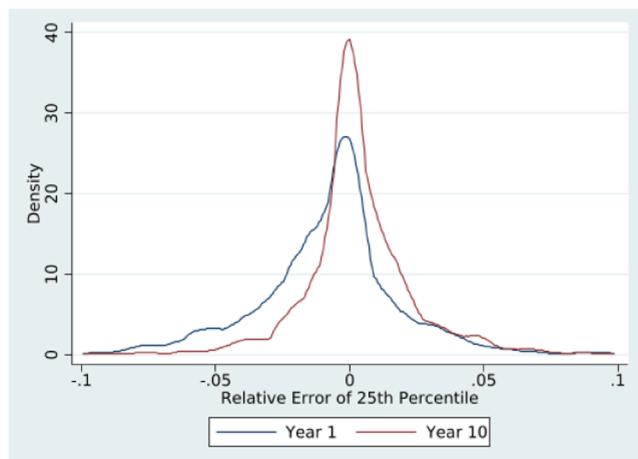


Fig. 7. Distribution of DHS Error for 25th Percentile Earnings, 1 and 10 years post-graduation

Notes: Weighted kernel density calculation, where the observation level is the institution-graduation cohort-4 digit CIP, and relative error is the DHS error, described in text above.

by individuals who did not receive Title IV aid. For those programs in the lowest decile of earnings, 10 year earnings are 20% lower for the Title IV sample compare to the sample of all graduates, while programs at the median of coverage (60% of graduates covered), the Title IV sample understates earnings by 5%, still a substantial difference. While the other moments showed no systematic bias in the first year after graduation, Figs. 8 and 9 show that there is bias for the 75th percentile even one year after graduation.

4. Effect on rankings

While not an intended purpose of College Scorecard, news outlets use the College Scorecard data to rank schools and programs.¹⁴ In this section, I show how differences in the sample (Title IV versus all graduates) causes changes in these rankings.

To measure the effect of these differences, I consider three possible rankings, which I show for the Title IV and Overall samples. First, the rank of schools across all fields based on median income in the first year post-graduation, which is Fig. 10. It appears from this graph that the

¹⁴ Optimal recently launched a website (GradReports.com) which specifically ranks schools by field of study outcomes from College Scorecard. Additionally, many new rankings of colleges use earnings as a main input into their rankings, as discussed here: <https://www.nytimes.com/2016/10/21/business/how-much-graduates-earn-drives-more-college-rankings.html>

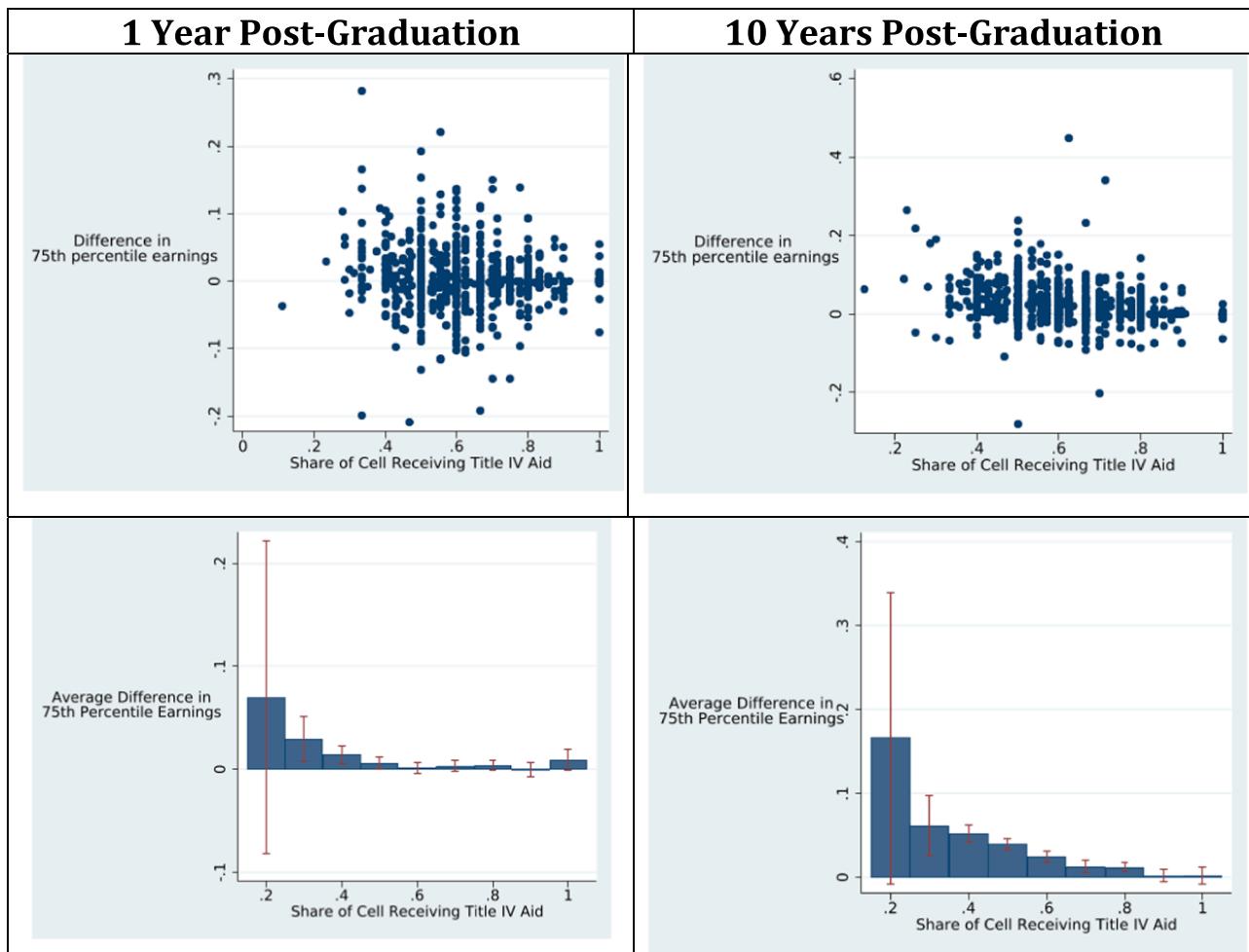


Fig. 8. Scatterplot of DHS Errors of 75th Percentile Earnings, by Share Receiving Title IV Aid

Notes: Top panels are the raw error scatterplots, while the lower panels are binned into share covered (in deciles). Error bands are the 90th and 10th percentiles of the scatterplots.

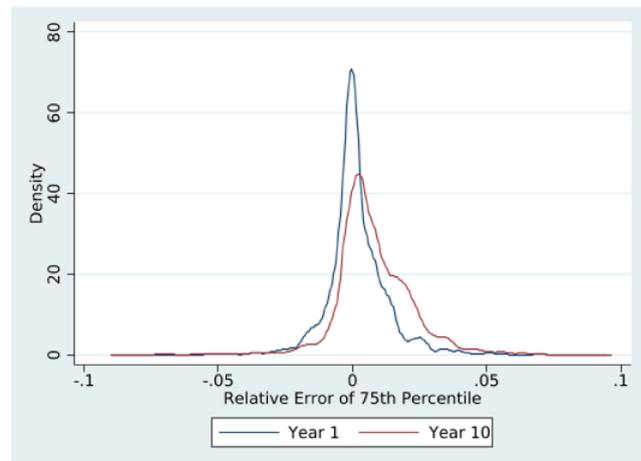


Fig. 9. Distribution of DHS Error for 75th Percentile Earnings, 1 and 10 years post-graduation

Notes: Weighted kernel density calculation, where the observation level is the institution-graduation cohort-4 digit CIP, and relative error is the DHS error, described in text above.

Title IV sample does a good job capturing the rank of schools compared to one another.

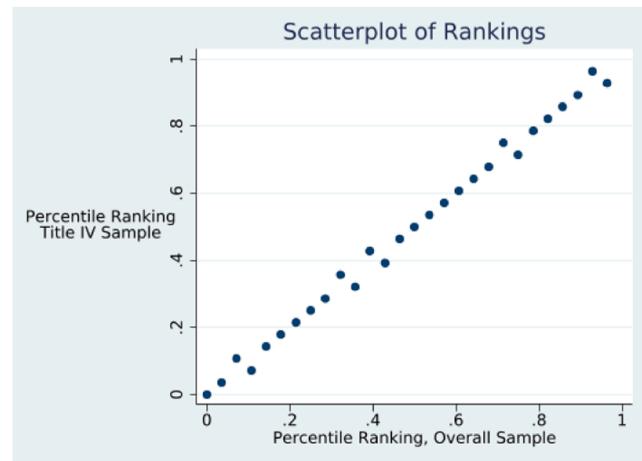
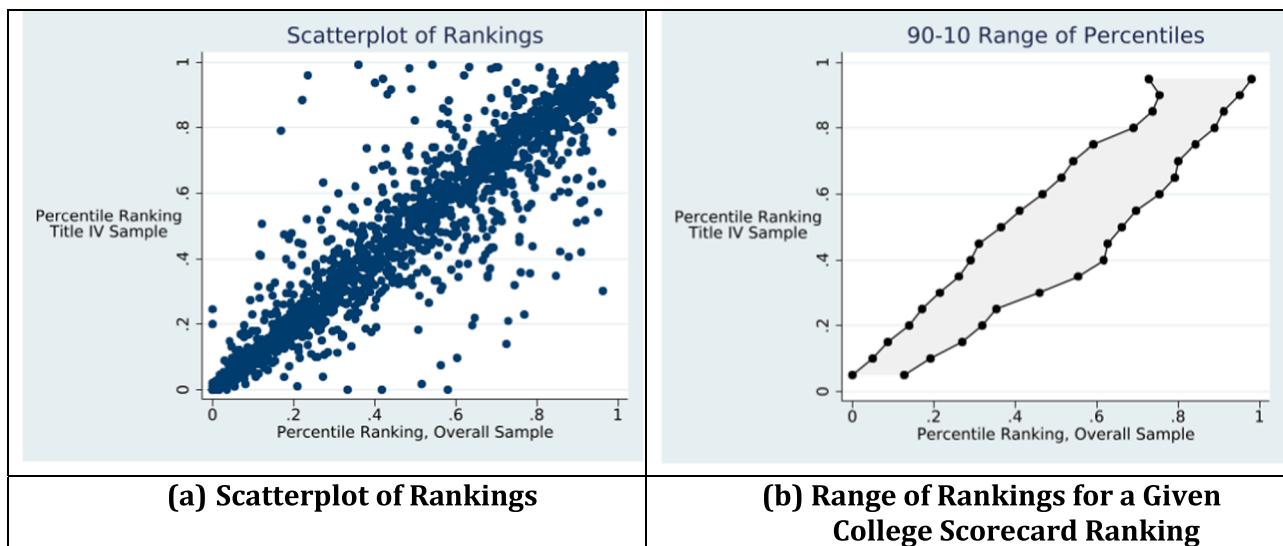
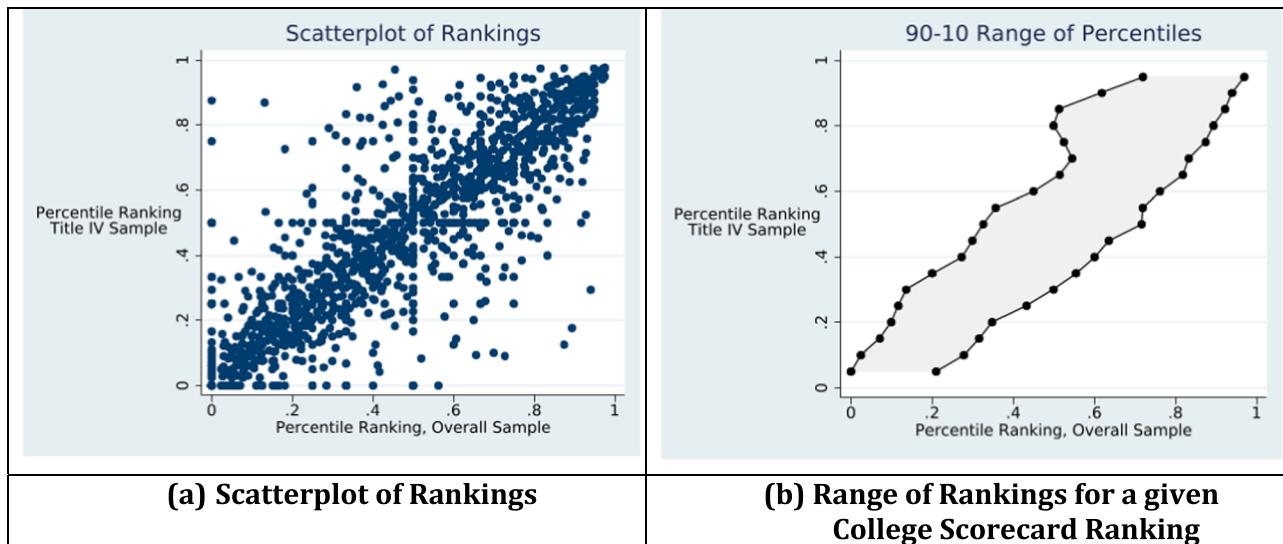


Fig. 10. Comparison of Institution Rankings from Overall and NSLDS Samples
Notes: Each scatterplot point represents an institution, and their relative ranking (in percentile terms) based on the 50th percentile of earnings for the overall and NSLDS samples.

Second, I consider the rank of fields within a school (in percentile terms), which I show in Fig. 11. The scatterplot in Panel A shows that while most points are close to the 45° line, there is wide variability

**Fig. 11.** Comparison of Rankings by Field, within School

Notes: Panel (a) displays the raw scatterplot of rankings, where each dot represents an institution-program, and its relative rank compared to other programs within the same institution. Panel (b) shows the smoothed 10–90 percentile range of ranks for a given NSLDS percentile ranking.

**Fig. 12.** Comparison of Rankings by School, within Program

Notes: Panel (a) displays the raw scatterplot of rankings, where each dot represents an institution-program, and its relative rank compared to other programs within the same institution. Panel (b) shows the smoothed 10–90 percentile range of ranks for a given NSLDS percentile ranking.

around that, such that the rankings using NSLDS do not capture the true rank for a number of programs. To capture the variability of these rankings, in Panel B I plot smoothed 90th and 10th percentile ranking values for the overall sample, for a given percentile ranking from the NSLDS sample, which shows that there is a wide range of possibilities. For a field ranked in the 50th percentile by the Title IV earnings outcomes, the true rank based on all graduates could be anywhere from 40th percentile to over 60th percentile.

A similar story is shown in Fig. 12, which compares schools by program. I find similarly variable results to Fig. 12, and Panel B shows that the distribution is even wider for this ranking, suggesting that there is substantial uncertainty about the true ranking, given the ranking from the NSLDS sample. In results not disclosed, I also did these graphs with rankings of earnings 10 years after graduation, and the results were very similar, although the bands in Panel B are slightly wider, suggesting even more uncertainty.

Overall, these results show that outcomes for Title IV students underestimate longer-run earnings outcomes for graduates, while early-career outcomes appear to be accurately measured. Finally, the variation in rankings depending on the sample suggests larger differences within field than the mean differences can measure, which suggests some fields have much larger differences in earnings, which I think is an area for important research.

5. Conclusions

Earnings and employment outcomes for graduates remain an important piece of information for policymakers, students, and parents as they consider what program or institution to enroll in. In the past few years, two such major efforts have occurred, Post-Secondary Employment Outcomes and College Scorecard. College Scorecard focuses on Title IV students, since its main purpose measure outcomes for graduates

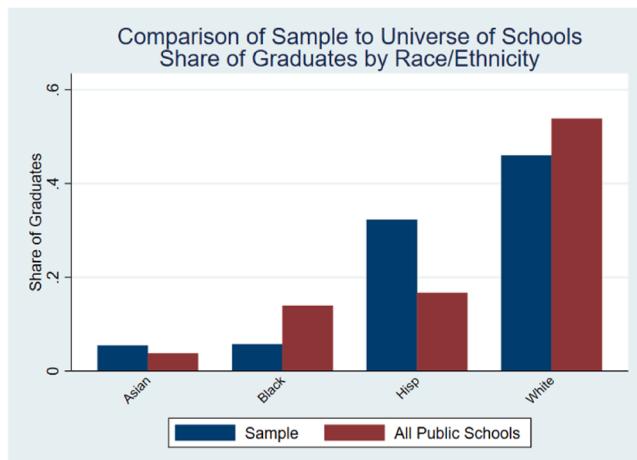


Fig. A1. Comparing Racial Demographics between All and Sample Schools
Note: Author's calculations using College Scorecard Institution-Level data, available for download here: <https://data.ed.gov/dataset/college-scorecard-all-data-files/resources>. 43 schools are in the sample category, and 1929 schools are in "all" category.

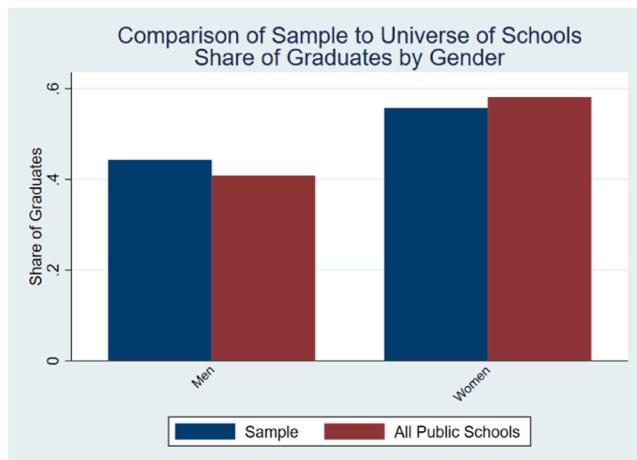


Fig. A2. Comparing Gender Shares between All and Sample Schools
Note: Author's calculations using College Scorecard Institution-Level data, available for download here: <https://data.ed.gov/dataset/college-scorecard-all-data-files/resources>. 43 schools are in the sample category, and 1929 schools are in "all" category.

receiving federal investment. In contrast, PSEO publishes earnings and employment outcomes for all graduates in covered institutions, but is a voluntary federal-state partnership.

The goal of this paper is to measure how different earnings outcomes are for Title IV graduates relative to all graduates, which is one key difference between PSEO and College Scorecard. I show that in the average program in my sample, 60% of the graduates have received Title IV aid. I also show that initial earnings are very similar between the samples. At the program level, lower Title IV coverage is associated with more divergence in outcomes between the samples. Finally, I show that these differences in earnings cause programs to change rankings, such that for a given median program for College Scorecard, the true ranking – based on outcomes from all graduates – may be 10 percentile points higher or lower.

This paper has two main takeaways. On average, the results released from College Scorecard for the first year after graduation are comparable to the outcomes for the entire population of graduates. However, over time, these earnings outcomes diverge significantly, meaning that

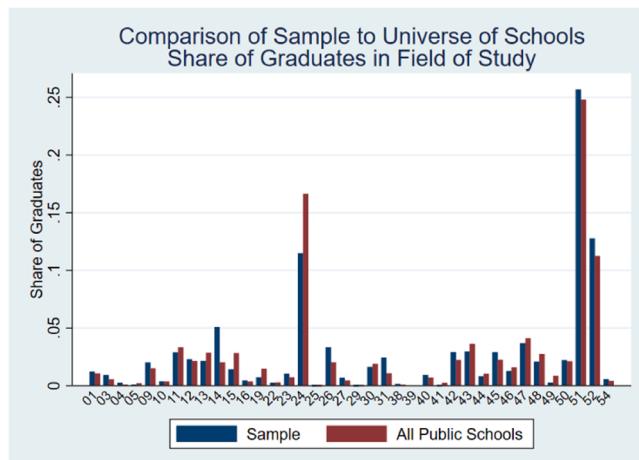


Fig. A3. Comparing Field of Study Shares between All and Sample Schools
Note: Author's calculations using College Scorecard Institution-Level data, available for download here: <https://data.ed.gov/dataset/college-scorecard-all-data-files/resources>. 43 schools are in the sample category, and 1929 schools are in "all" category. The x-axis is two-digit CIP codes.

Table A1
Comparisons Between All Institutions and Sample Institutions.

	Institutions in this sample	All Bachelors- Granting Institutions
Admission Rate	0.8026 0.1622	0.7176 0.1896
SAT Verbal – 25th Percentile	515 54.6279	509.4762 54.7231
SAT Verbal – 75th Percentile	620.65 49.8105	607.474 52.9224
SAT Math – 25th Percentile	507 50.2729	503.0195 60.4319
SAT Math – 75th Percentile	615 69.6986	605.0779 68.2828
Number of Institutions	43	604

Note: Author's calculations using College Scorecard Institution-Level data, available for download here: <https://data.ed.gov/dataset/college-scorecard-all-data-files/resources>. Note that only 462 institutions in the second column have SAT scores in the College Scorecard data, while 604 have non-missing admission rates.

long-run earnings outcomes for Title IV students are significantly lower than non-Title IV students. This is not a new finding, but more work needs to be done on the causes that underlie that lower earnings growth for Title IV graduates.

Appendix

[Fig. A1–A3, Table A1](#)

CRediT authorship contribution statement

Andrew Foote: Conceptualization, Data curation, Methodology, Formal analysis, Writing – original draft, Investigation.

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