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A NATIONAL ANALYSIS OF VARIATIONS IN STATE FINANCIAL AID PROGRAM DESIGN AND STUDENT SUCCESS

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Financial aid in higher education is designed to improve college access and degree completion outcomes for students from all economic backgrounds, and research shows positive effects of aid on student outcomes (e.g., Nguyen et al., 2019). The majority of research on the role and influence of financial grant aid typically focuses on federal aid, such as Pell grants, rather than state-level aid, but individual states allocate over \$12 billion in student financial aid each year (authors' calculations using data from the National Center for Education Statistics' Integrated Postsecondary Education Data System). The proportion of state funding for higher education tied to student financial aid has grown, increasing from nearly 9 percent of state funds in 2006 to slightly over 11 percent in 2021 (Laderman & Kunkle, 2022).

State policymakers typically determine how much of a state's financial aid allocations will be distributed based on students' financial need, academic merit, or a combination of need and merit (Dynarski et al., 2022). States can assess financial need by examining a given student's family income or expected family contribution (EFC). States typically measure merit by a student's high school GPA, college entrance exam score (e.g., SAT or ACT), or performance on a statewide assessment. Despite substantial increases in the total amount of student financial aid allocated at the state level over the past two decades, the proportion of financial aid based on need has decreased 14.3 percent during that same time period (Baker et al., 2020).

Previous research has shown that state-level increases in merit-based financial aid are associated with decreases in state-level allocations of need-based financial aid, indicating a trade-off between state-level investments in merit- and need-based aid rather than increases in the total amount of student financial aid (McLendon et al., 2014). Financial aid can improve college access and student success outcomes for all types of students, but need-based aid, in particular, improves enrollment and persistence among students from

lower-income backgrounds (Kim, 2012). Despite the positive impact of federal Pell grants, need- or merit-based scholarships, and other forms of financial aid on educational attainment (Dynarski et al., 2022; Nguyen et al., 2019), little is known regarding the extent to which variations in how states allocate financial aid relate to students' likelihood of degree completion. Prior research has focused primarily on the effect of individual students receiving financial aid (Dynarski et al., 2022) or the effects of individual aid programs or types of programs on student outcomes (e.g., Gurantz, 2020; Zhang & Ness, 2010). Our current research complements these findings by examining how state-level policies relate to students' enrollment and completion, allowing for a holistic assessment of the student financial aid structures within states.

Prior work focusing on federal financial aid or individual financial aid programs has been unable to incorporate the varying ways in which states help students pay for college. The lack of empirical evidence pertaining to the role and influence of different types of state financial aid programs is largely due to the absence of a comprehensive dataset to capture the substantial differences in how individual states handle their financial aid allocations and program design. In this study, we leverage the first-ever comprehensive dataset outlining state-by-state financial aid program characteristics to address the following research questions:

- 1. To what extent do variations in how states allocate financial aid between financial need and academic merit relate to student enrollment and degree completion?***
- 2. To what extent does the design of state financial aid policies (e.g., definitions of need and merit) relate to student enrollment and degree completion?***

Literature Review

Background on State Financial Aid

College attendance is associated with gains that accrue not only to individuals but also to society through increased tax revenues, decreased reliance on social infrastructure programs, and increased civic engagement (Lochner, 2011; Ma et al., 2019). Economic theory would predict that students and their families would consider the private returns associated with a college degree in making decisions. However, decisions that only account for the private returns of educational attainment would lead to underinvestments in higher education from a societal perspective. The social benefits associated with higher educational attainment rates lead governments, both state and federal in the United States, to invest in higher education in an effort to encourage college enrollment and completion (Dynarski et al., 2022).

States subsidize the cost of higher education in two main ways: states provide appropriations to public colleges and universities that help institutions maintain relatively low tuition, and states offer financial aid to college students to lower the direct costs associated with enrolling and persisting toward a degree (Dynarski et al., 2022). While state appropriations to public colleges comprise the majority of state spending on higher education, states have a long history of providing financial aid to college students. Spending on financial aid

programs has grown in recent years, as noted in the introduction (Laderman & Kunkle, 2022). While states differ substantially in their approaches to higher education funding and the extent to which they fund public colleges and financial aid programs (Laderman & Kunkle, 2022; Rosinger et al., 2022), all states offer some form of financial aid to college students.

State policymakers create financial aid programs to help meet a variety of goals, such as improving high school achievement and graduation rates, increasing college enrollment and completion, encouraging college graduates to stay in their home state, and meeting workforce needs in high-demand fields (Deming & Dynarski, 2010; Dynarski et al., 2022; Harrington et al., 2016). To do so, states frequently target aid to certain populations of students, such as students with financial need or academic merit. Initially, state aid programs focused primarily on financial need, and—often with matching funds from the federal government—aimed to promote college enrollment and completion among students from low-income families (Doyle, 2008).

Beginning in the 1990s and early 2000s, states began to enact broad-based merit aid programs designed to keep high-achieving students in state for college and beyond (Doyle, 2008), though evidence is mixed on whether the programs meet that goal (e.g., Harrington et al., 2016; Sjoquist & Winters, 2015; Zhang & Ness, 2010). These programs, such as Georgia’s HOPE Scholarship, Florida’s Bright Future Scholarship, and West Virginia’s PROMISE program, typically covered a majority of tuition at public colleges for students who met fairly generous academic criteria, such as having a “B” average high school GPA and/or minimum standardized test score (Dynarski et al., 2022). At least 25 states have implemented a broad-based merit aid program (Sjoquist & Winters, 2015). In fact, our novel data show that at least 31 states have had some type of merit-based program between fiscal years (FYs) 2004 and 2020. Merit-based aid tends to disproportionately go toward middle- and upper-income and White students (Long & Riley, 2007), who often face fewer structural barriers in K12 education. More recently, states have enacted “free college” programs, such as the Tennessee Promise and New York’s Excelsior Scholarship, aimed at increasing college affordability for eligible students (Mishory & Granville, 2019). Free college programs may have need and/or merit requirements and typically cover tuition only (Dynarski et al., 2022; Rosinger et al., 2021).

Impacts of State Financial Aid

Given the long history of government investment in financial aid in the United States, a large body of literature investigates the effects of financial aid on college enrollment, completion, and other outcomes (see Deming and Dynarski (2010), Dynarski et al. (2022), and Nguyen et al. (2019) for more complete literature reviews). In general, research tends to point toward positive effects of financial aid on college enrollment, persistence, and completion. The effects of financial aid seem particularly large for need-based aid programs (Nguyen et al., 2019) and among low-income students (Dynarski et al., 2022). Some research indicates that state financial aid programs have had a smaller effect than private foundation and institutional grants, that often provide much larger award amounts, though the effect is still positive (Nguyen et al., 2019). Other work indicates the

effects of state aid on enrollment and completion are particularly strong for Black and Latinx community college students (Monarrez et al., 2021).

Studies that examine the impact of state aid programs typically focus on individual programs or types of programs. For example, many studies have examined the impact of broad-based merit aid programs on various student outcomes. Studies of individual state's merit-aid programs show this type of aid has been associated with gains in enrollment, for instance, in Georgia (Cornwell et al., 2006; Dynarski, 2000). Evidence from Tennessee indicated that the state's HOPE Scholarship program shifted some students, particularly lower-income students, from community colleges to four-year colleges (Bruce & Carruthers, 2014). Other studies indicate merit aid programs may exacerbate enrollment gaps: Enrollment gains in Georgia, which has served as an early model for many other states' merit-aid programs, have been found to be particularly pronounced among students from higher-income and White families (Cornwell & Mustard, 2007; Dynarski, 2000). Research has shown that merit aid programs have increased college completion in some states (for example, in West Virginia (Scott-Clayton & Zafar, 2019)), though evidence from Georgia is mixed (Sjoquist & Winters, 2015), and evidence from New Mexico points to gains in completion for academically prepared students, measured by GPA, but decreases among less prepared students (Erwin & Binder, 2020). National studies of merit aid programs across adopting states have demonstrated that state merit aid programs increase enrollment and reduce the number of students who leave the state for college (Zhang & Ness, 2010) and can increase college completion (Sjoquist & Winters, 2015).

A smaller-but-growing group of more recent studies examine the impacts of free college programs that have emerged across states. Early evidence on these programs reported gains in enrollment at eligible institutions in Tennessee (Bell, 2021; Nguyen, 2020) and Oregon (Gurantz, 2020). These studies have indicated short-term increases in community college enrollment and decreases in four-year college enrollment in response to free college programs (Bell, 2021; Gurantz, 2020; Nguyen, 2020) but potentially longer-term increases in enrollment overall (Gurantz, 2020). New York's Excelsior Scholarship, a free college program that extends to four-year colleges has been found to primarily fund higher-income students, and the program's complexity may deter eligible students from receiving or maintaining aid (Scott-Clayton et al., 2022).

Overall, evidence indicates that state financial aid programs have the potential to influence students' educational attainment. However, varied enrollment and completion effects across states and programs point to a need for a more complete understanding of how states can design financial aid programs to promote degree completion and reduce racial inequities in educational attainment.

[Contribution of Present Study](#)

The extant literature on state financial aid has generally focused on individual state programs (e.g., Cornwell et al., 2006; Dynarski, 2000; Scott-Clayton et al., 2022) or large groups of aid programs, such as broad-based

merit aid programs (e.g., Sjoquist & Winters, 2015; Zhang & Ness, 2010) or free college programs (e.g., Rosinger et al., 2021). Such studies offer insight into how particular programs or types of programs are likely to influence student outcomes. However, prior work offers little insight into states' comprehensive approaches to financial aid. States typically offer multiple financial aid programs (e.g., Everett et al., 2023; Steel et al., 2021), with some targeted to students based on financial need, academic merit, both need and merit, or other criteria. These programs differ substantially across states in their design. For example, the eligibility criteria for aid recipients vary widely across individual states (Domina, 2014; Rosinger et al., 2021). Yet few studies have examined how states' comprehensive approaches to financial aid relate to college completion, particularly among racially minoritized students, or how eligibility criteria shape these same outcomes.

When researchers have looked at state spending on financial aid, they frequently rely on data from the National Association of State Student Aid Grants and Programs (NASSGAP) to examine the share of funding allocated based on financial need versus other criteria (e.g., Baker et al., 2020; Rosinger et al., 2022). This categorization of need-based aid and non-need-based aid tells us little about the extent to which states use academic merit criteria in determining aid eligibility since non-need-based aid combines individual programs that include merit components with those that do not.

In addition to the rough breakdown of need-based versus non-need-based aid available through NASSGAP, this national dataset does not offer information regarding how states define "financial need" and "academic merit." States may use the calculation of a student's expected family contribution from FAFSA information or they may set an income threshold or other requirement. For aid with merit components, states may require students to meet GPA or standardized test score requirements (or both) in addition to other considerations. Researchers have posited that the effects of financial aid may depend more on program design than on student characteristics due to barriers for students to apply and maintain eligibility (Dynarski et al., 2022). However, due to a lack of data on program requirements, scholars have yet to examine the influence of financial aid program design at a national level.

As noted previously, states differ substantially in their approach to student financial aid (e.g., Laderman & Kunkle, 2022; Rosinger et al., 2022). States vary in the extent to which they provide funding to students through financial aid, the extent to which they allocate financial aid based on financial need and/or academic merit, and the metrics they use to identify students who are eligible to receive financial aid. Our study leverages a novel, longitudinal, national dataset capturing state spending on financial aid based on students' financial need, academic merit, or both criteria to investigate how states' comprehensive financial aid approaches influence student outcomes, particularly among racially minoritized students.

Method

Data

We draw the primary data for the current study from the first-ever comprehensive, national dataset outlining state-by-state financial aid program characteristics over time. Prior to beginning data collection, the lead authors crafted a data dictionary with a description of each measure. After revising this dictionary based on feedback from the rest of the authors, a portion of the research team conducted all of the data collection steps outlined below with a set of pilot states. This portion of the research team then revised the data dictionary and ensured that the entire set of authors agreed with the data frame. While not directly focused on policy adoption, we followed the guidance of Kelchen and colleagues (2019) in preparing for and executing data collection. Throughout the data collection process (approximately two and a half years), the entire research team generally met bi-weekly to discuss challenges in finding data or seeking clarifications in coding decisions. Whenever an impasse was reached, the authors discussed until consensus was reached. These conferrals occurred throughout the entire process detailed below. After we completed initial data collection, the lead authors split the states and reviewed their set of states' data and documentation to verify consistent coding and interpretation decisions across states wherever possible.

We reviewed over 4,000 financial aid documents to collect detailed data on states' financial aid policies for FYs 2004-2020.^{1,2} We examined the language of the policies (from legislative text and state higher education websites and reports), creating a list of programs that included eligibility criteria that were based on one of three areas: financial need (need-based), academic qualifications (merit-based), or both financial need and academic qualifications criteria (combo-based).³ Given our focus on eligibility criteria for the aid programs, if an aid program included eligibility criteria aligning with one of these categories but we could not assess how that was operationalized, we did not include that program in our list of state financial aid programs. More specifically, if a program's selection process solely included a review of essays or recommendations, we excluded the program since the review criteria was not clear (e.g., there was no stated GPA requirement or minimum test score). For example, we excluded Vermont's Next Generation Scholarship program, which stopped awarding new funding in 2016, because the program application included open-ended questions, and the review process for how students were selected was not clear.

¹ We select 2004 as the beginning of the panel given that it becomes exponentially more difficult to collect state data prior to this point. We select 2020 as the end point since this year allowed us enough time to collect financial aid data from states and to have enrollment outcome data from IPEDS.

² As a final check, we used NASSGAP data to verify that we had considered all state financial aid programs for inclusion in the study.

³ We did not include programs that solely funded certificate-seeking students or that operated as loan forgiveness programs. We also excluded 529 education savings plans.

Finally, we only included programs for which first-year entering college students were eligible. For instance, many states have scholarships for students in teacher education fields, but we excluded those that required students to already be enrolled in college to receive the award. We excluded these programs since they are more likely to relate to completion than to enrollment, and our research questions consider both outcomes. Likewise, we excluded programs for dually enrolled students—high-school students taking college coursework—whenever possible since these students would not be reflected in our enrollment outcome measure. These decisions mean that, while we have created a comprehensive set of state financial aid programs, we do not compile the totality of financial aid offered by states.

For each of the three categories (need-, merit-, and combo-based aid), we collected the following for each FY: amount of aid awarded and disbursed, number of students who received aid, and eligibility requirements for the most inclusive program in the state in a given FY. We first explored state documents, including annual reports on state financial aid programs, to collect this information. If we could not find required information or had questions about the data, we would then contact state higher education officials for clarification. If state officials were not able to provide data or clarification (given that some states do not track state financial aid expenditures systematically), we supplemented our data with NASSGAP data on the amount disbursed and number of recipients. For two states, New Hampshire and Rhode Island, we were unable to find any data on their financial aid programs since Rhode Island did not maintain this type of data statewide and New Hampshire could not direct our research team to an agency that tracks this information. We were able to collect at least one year of data for all other states.

For the amount and number of recipients, we focused on the totals for all undergraduate students for the entire FY whenever possible.⁴ When we were unable to collect the amount of aid or number of recipients for any of those three categories, we considered those two variables to be missing for all state financial aid for that FY. For example, we were missing merit-based aid information for South Dakota in FY 2005. Because of that, we considered need-, merit-, and combo-based aid to be missing for South Dakota in FY 2005. This restriction affects one year for South Dakota, nine years for Nevada, and ten years for Delaware. We did this to ensure that we could have a holistic examination of the state financial programs in a given FY. These additional restrictions led us to 796 state-year observations of award amount and number of recipients for need-, merit-

⁴ Occasionally, states only collected these data for new students or by academic term instead of a unique count for the entire FY. When this happened, we noted it in our data and used the most inclusive figure available. For example, this meant that, when a state reported data by academic term, we could add the amount disbursed together (since this created the total for the year) but we selected the fall semester for recipients when possible, so as to not overcount the number of recipients in a given FY. That means that our estimates in some cases are likely overestimates of the generosity of aid per recipient.

, and combo-based state financial aid.⁵ We adjusted all dollar amounts for inflation, so that the amount of aid is in 2020 dollars.⁶ From these data, we created aid-per-recipient measures (e.g., need-based aid amount in 2020 dollars divided by need-based number of recipients for a given FY).

We attempted to collect the eligibility requirements for the most inclusive program for each type of state financial aid. For need-based aid, we noted whether the program had an income requirement, an EFC requirement, or some other need criteria. For merit-based aid, we noted whether the program had a GPA requirement, a college entrance exam requirement (either the SAT or ACT), or some other merit criteria. For combo-based aid, we noted whether the program had any of the criteria we collected separately for need- and merit-based aid. For each requirement, we collected the threshold the state set for students to be eligible for aid where possible. We defined the most inclusive program as the program with the most generous eligibility criteria.⁷ For example, if there were two merit-based programs in a state, and Program A had a GPA requirement of at least a 3.5 while Program B had a GPA requirement of at least a 3.0, we considered program B to be the most inclusive merit-based program in the state (this frequently happened where states provided a larger grant to students who met the more restrictive eligibility criteria). When the eligibility criteria were functionally similar, we selected the grant program that had the largest number of recipients for that given FY.

For these variables, we relied heavily on the Internet Archive: Wayback Machine to provide historical versions of state websites and historical annual financial aid reports that listed the eligibility requirements for programs. We also used the Thomson Reuters Westlaw Database to locate historical state administrative code that outlined program requirements. When we could not find a primary source for eligibility criteria and we had data in the years surrounding the missing year that did not change, we imputed the missing data.⁸ If the amount and number of recipients for a type of financial aid was zero (i.e., the state did not award that type of

⁵ Of the missing 54 state-year observations, New Hampshire and Rhode Island are completely missing (34), South Dakota is missing one year (1), Delaware is missing ten years (10), and Nevada is missing nine years (9). The total number of observations with no missing would be 850 (50 states multiplied by 17 years of data).

⁶ We used the U.S. Bureau of Labor Statistics Consumer Price Index inflation calculator to adjust the dollar amounts to 2020 dollars (https://www.bls.gov/data/inflation_calculator.htm). As an example, for FY 2004, we input \$1,000 in May 2004 and the calculator shared that this would be \$1,355.86 in May 2020 (we use \$1,000 to ensure enough significant digits for the adjustment). Therefore, the adjustment for FY 2004 was 1.35586. We do this for all FYs except 2020.

⁷ When an extensive program with multiple sub-programs exists under one umbrella program (e.g., Louisiana TOPS, Florida Bright Futures, Alaska Performance Scholarship) and aid type (need, merit, or combo), we use the most inclusive tier of eligibility requirements for students to code eligibility requirements. See Appendix [Table A1](#) which lists all programs that we used for each state over the panel.

⁸ For example, in FY 2010, the most inclusive merit-aid program in Massachusetts was the John & Abigail Adams Scholarship. We were unable to find a historical website that included information on the eligibility criteria in this year, and the state higher education agency was unable to clarify what the eligibility criteria had been. We did, however, have primary documents for FY 2009 and 2011 that showed the eligibility criteria for the grant. Given that the eligibility criteria in those two surrounding years did not change, we imputed that data in for FY 2010. In very rare instances, we imputed data with only one surrounding year of data, often the first year a program was offered. For example, we could not find primary documents for FY 2006 for Massachusetts (the first year of the John & Abigail Adams Scholarship). However, we were able to find them for FY 2007 and given that they did not change for several years, we imputed the data from 2007 into 2006.

financial aid for a given FY), we coded the eligibility criteria as missing in order, as we detail in our analytic strategy, to create clean comparison groups for aid requirements.

While collecting the eligibility criteria data, we realized that some states explicitly mention using EFC as part of the need- or combo-based aid requirements while others simply noted using “demonstrated financial need.” When we sought clarification from states on the “demonstrated financial need” criteria, we found that several used the EFC to determine this amount. For this reason, we created measures for “need” requirements for need- and combo-based aid that was for states that used EFC or “demonstrated need.” This decision means that the final set of eligibility criteria for our analytic dataset included: income (need), demonstrated need (need), GPA (merit), college entrance exam (merit), income (combo), demonstrated need (combo), GPA (combo), and college entrance exam (combo).

We supplemented the state financial aid data with institutional characteristics from the U.S. Department of Education’s Integrated Postsecondary Education Data System (IPEDS). IPEDS provided all outcome measures and a majority of the covariates. We merged all four- and two-year public institutions that enrolled undergraduate students with the state financial aid data.⁹ Our final analytic dataset includes 29,068 institution-year observations.

For research questions one and two, the outcomes include enrollment, graduation rate, and completions. Enrollment measures included total undergraduate and full-time undergraduate for the fall.¹⁰ Graduation rate and completions measures included associate and bachelor’s degrees.¹¹ For the enrollment measures, we linked the state financial aid data so that the FY occurs at the same time as the fall measure (e.g., FY 2004 state financial aid data, which is academic year 2003-2004, is linked to fall 2003 enrollment). This decision allows us to examine the contemporaneous association between state financial aid and enrollment.

For the graduation rate and completion measures, we linked the state financial aid data so that the FY occurs during the first year of enrollment based on earning a degree in 150% of expected time to completion. This decision means that associate degrees are linked with 2 years after the expected first year of enrollment and bachelor’s degrees are linked with 5 years after the expected first year (e.g., FY 2004 state financial aid data would link to an expected first year of 2003-2004 which would be a completion year of 2005-2006 for associate and 2008-2009 for bachelor’s degree). Given the timing of IPEDS data releases, these linkages mean

⁹ We consider institutions to enroll undergraduate students if variable `ft_ug` equals 1.

¹⁰ We use levels (`efalevel` in IPEDS) 2 and 22 for total and full-time undergraduate enrollment respectively.

¹¹ We use levels (`grtype` for graduation rate in IPEDS) 29 and 30 for the adjusted cohort and number of completing students with associate degrees respectively. We use levels 8 and 12 for the adjusted cohort and number of completing students with bachelor’s degrees respectively. We then divide the number of completions by the adjusted cohort and multiply by 100 to create the graduation rate. Both measures are for 150% of expected time to completion. We only included each of these measures for institutions that awarded at least 20 students the respective degrees (e.g., total completions for associate degrees is only available for institutions that awarded at least 20 associate degrees in the given year).

that we have enrollment outcome data for all years of state financial aid data, associate degree outcome data for all years except FY 2020, and bachelor’s degree outcome data for all years except FY 2017 to 2020.

For research question one, examining spending on state financial aid per recipient, all outcome measures include an overall measure and one separated for racial/ethnic group (i.e., American Indian/Alaskan Native, Asian and Pacific Islander, Black, Latinx, White).^{12,13} For research question two, due to sample size restrictions in the number of states with eligibility criteria, we only use the overall measure of the outcomes.¹⁴ For covariates, we create measures of whether state aid can be used at public two-year, not-for-profit private institutions, and for-profit institutions (respectively), in-district/in-state tuition, federal grant percentage, federal grant average award, institutional grant percentage, institutional grant average award, state unemployment rate, region, sector, and urbanicity. All of these measures come from IPEDS except for binaries for whether aid can be used in a given sector (which comes from our state data collection) and state unemployment rate (which comes from the U.S. Bureau of Labor Statistics). We linked all of these covariates to the FY of state financial aid data so that they are contemporaneous to when the state financial aid was being disbursed (e.g., FY 2004 state financial aid data is linked to 2003-2004 data). We also create a measure of prior enrollment for the enrollment outcome regressions (e.g., FY 2004 state financial aid data is linked to 2003-2004 enrollment for outcome and 2002-2003 enrollment for prior enrollment) and a measure of total enrollment for the graduation rate and completions regressions (e.g., FY 2004 state financial aid data is linked to 2003-2004 total undergraduate enrollment).

Analysis

After descriptively examining the data, we estimate OLS regressions to analyze the correlational relationship between state financial aid and students’ enrollment and completion. We estimate two primary models, aligning with the research questions. As research question one focuses on the relationship between state aid per recipient and the outcomes, model one is:

$$y_{it} = \beta_0 + \beta_1 \text{need per recipient}_{it} + \beta_2 \text{merit per recipient}_{it} + \beta_3 \text{combo per recipient}_{it} + \gamma X_{it} + \alpha_t + v_s$$

¹² When we restrict the graduation rate and completions measures for only institutions with at least 20 of the respective awards, we do this within the outcome subpopulation. For example, while overall associate degrees, graduation rate, and completions measures are available for any institutions that awarded at least 20 associate degrees, American Indian/Alaskan Native students’ associate degrees measures are only available for institutions that awarded at least 20 associate degrees to American Indian and Alaskan Native students.

¹³ IPEDS racial data changes starting in 2010-2011, creating one measure for Asian students and another for Native Hawaiian and other Pacific Islander students. However, in years prior, these students were all combined into a single measure. Since we cannot separate the Native Hawaiian and other Pacific Islander students out of the outcomes data in those prior years, we combine the students into a single measure after the data change. For graduation rate, we add the two measures and then divide by 2 (creating an average of the two separate graduation rates).

¹⁴ As we highlight in the results section, the number of institutions that are removed for the analytic sample for research question two is primarily driven by the number of states that do not have merit- and combo-based programs (and therefore correctly do not have eligibility criteria for those types of aid).

We estimate a separate model for each of the six general outcome variables (total undergraduate enrollment, full-time undergraduate enrollment, associate degree graduation rate, bachelor’s degree graduation rate, associate degree completions, and bachelor’s degree completions) for the overall measure and for individual racial/ethnic groups. Our key covariates of interest are the measures of need-based aid per recipient, merit-based aid per recipient, and combo-based aid per recipient (in thousands). We also include the set of covariates outlined in the prior section. For the enrollment outcome models, we include a prior year measure of enrollment (so the estimates are a measure of the relationship between state financial aid and enrollment *controlling for* prior enrollment). For the graduation rate and completions outcome models, we include a measure of total undergraduate enrollment from the same year as the state financial aid data. We include α_t for year fixed effects and cluster standard errors at the state level. We estimate model one twice, once as shown above and the second time including institution fixed effects. When we estimate the institution fixed effects models, we remove region, sector, and urbanicity given that these rarely vary over time.

Research question two focuses on the relationship between state financial aid eligibility criteria and student success outcomes by restricting analyses to states with one of our three types of financial aid programs – need, merit, and combo. Model two is generally:

$$y_{it} = \beta_0 + \theta \text{eligibility}_{fit} + \gamma X_{it} + \alpha_t + \nu_s$$

We estimate this model separately for each financial aid type (f) of need, merit, and combo. For each model, we include the respective eligibility criteria for the type of financial aid. These individual binaries equal 1 when the institution is located in a state that had the respective requirement in a given FY and 0 when that institution is located in a state that did not have the respective requirement but *did* have that type of aid. For example, Florida required a college entrance exam in FY 2015 as criteria to access the most inclusive merit-based program. In contrast, Colorado in the same year did not require a college entrance exam for its merit-based program, while Idaho could not have that requirement because it did not have a merit-based program. In model 2, this would mean that, in FY 2015, the binary for requiring a college entrance exam for merit-based aid would be 1 for Florida, 0 for Colorado, and missing for Idaho (i.e., dropped from the analysis). In this way, we are able to estimate the relationship between student outcomes and the presence of certain requirements only within states that have the respective type of state financial aid. We generally used the same set of covariates as model 1 and again clustered standard errors at the state level. The only change is that, for each set of models (need-, merit-, and combo-based), we changed the binaries for whether state aid can be used in public two-year, not-for-profit private, and for-profit institutions to be specific to each type of aid (e.g., when estimating the model for need-based aid, we included binaries for whether need-based aid can be used at public two-year, not-for-profit private, and for-profit institutions, respectively). Due to sample size restrictions and a lack of variation, we do not estimate this model using institution fixed effects.

Results

Summary Statistics

Given the policy concerns that, over time, need-based aid has been crowded out by merit- and combo-based aid, and the equity concerns inherent within that shift, we first explored to what extent the percentage of total state aid devoted to need-based aid shifts over time. [Figure 1](#) shows that both the number of recipients and the amount of need-based aid have been decreasing over time. While the change in recipients over time was relatively small (from nearly 76% of total aid recipients in FY 2004 to 68% in FY 2020), the change in amount was fairly large. In FY 2004, the need-based aid amount was 57% of the total state financial aid amount (all in 2020 dollars). By FY 2020, this number dropped over 15 percentage points to a little less than 41%. There is clear evidence that, among the state financial aid programs we included in our data, states have significantly reduced the percentage of money being provided based solely on students' financial need.

Regarding the state financial aid variables, states awarded approximately \$1,762 in need-based aid per recipient, \$1,389 in merit-based aid per recipient, and \$2,058 in combo-based aid per recipient, on average over the period (see [Table 1](#)). Though, given [Figure 1](#) and the likelihood that states have varying trends in their approaches to aid, we explored these averages in greater detail. Figures 2-4 show aid amount per recipient over time and across states in heatplots. Using [Figure 2](#) to explain the figures, the FY is across the x-axis. Each state is arrayed along the y-axis. In this figure, each cell is the average amount of need-based aid per recipient. White cells are FYs when we could not find data for a given state in that year. Yellow cells are FYs when the state accurately has \$0 of need-based aid per recipient (due to the state not having a program that meets our definition of need-based aid). More yellowish green cells mean that the annual aid per recipient is on the lower end and more blue/purple cells mean that the annual aid per recipient is higher. Idaho and Mississippi were the only states that never have a need-based program that meets our inclusion criteria for the entire panel.

We found no clear temporal pattern across states with need-based aid per recipient, with some states increasing their need-based aid per recipient (e.g., Alaska, Colorado) and others either decreasing their amount per recipient (e.g., Tennessee) or removing need-based aid (e.g., Georgia, Wyoming). New Jersey, Washington, and New York to a certain extent have the most consistent large amounts of need-based aid. We anchor the heatplot color schemes denoting larger and smaller amounts of aid per recipient across Figures 2, 3, and 4, which allows for easier comparison. Therefore, while [Figure 2](#) shows that individual states, e.g., New Jersey, Washington, contributed more need-based aid than other states, we can see based on a visual review of Figures 3 and 4 that this amount was small when compared to the amount of merit- and especially combo-based aid per recipient.

Turning to [Figure 3](#), we see that even though states provided \$1,389 in merit-based aid per recipient, this amount significantly varies across states. In fact, more so than need-based aid per recipient, we find several

states that consistently have darker blue/purple cells (practically large amounts per recipient) at the same time that there are nearly 20 states with yellow cells (at least one year with no money spent on merit-based aid). Seventeen states had \$0 of merit-aid per recipient for the entire panel.¹⁵ Arkansas, Florida, Georgia, Louisiana, Montana, Oklahoma and West Virginia generally had consistently large amounts of merit aid per recipient. In recent years, Indiana had also begun providing a significant amount of funding per recipient based on merit. None of these states provided particularly large amounts of need-based aid per recipient, providing additional evidence that states appear to be generous within one particular aid type.

[Figure 4](#) also shows the more extreme variation we found for merit-based aid, though there are several states with even larger combo-based aid per recipient. Similar to merit-based aid, a substantial number of states had \$0 of combo-based aid per recipient across the entire period.¹⁶ California, Connecticut, Florida, Indiana, Maryland, Massachusetts, Mississippi, New Mexico, Oklahoma, South Carolina, Tennessee, Virginia, and West Virginia had fairly consistent blue/purple cells. Of note, Maryland and Massachusetts had the largest amounts of aid per recipient we have across all three figures. This trend does not generally seem to be in response to macroeconomic shifts, as these amounts are fairly consistent throughout the panel. This figure also shows that states generally spent the most money on the combo-based aid.

[Table 1](#) includes the summary statistics of key variables. We found that 25% of institution-year observations for need-based aid ever included income as a requirement and 66% for demonstrated need. For merit-based aid, 67% used GPA while 53% used a college entrance exam for merit-based aid. Combo-based aid, in order of prevalence, required GPA (84%), income (49%), demonstrated need (48%), and college entrance exam (37%). These statistics suggest that while need-based aid far more frequently required demonstrated need, combo-based was about equally likely to collect income and demonstrated need data. For both merit- and combo-based aid, GPA was the preferred requirement, though test scores are required in nearly half of the states with these programs. We note that this is true even though our panel ends with FY 2020, which means we did not include any eligibility requirements that shifted after the start of the COVID-19 pandemic (when a significant share of institutions were forced to go test-optional due to the lack of open testing sites). We also explored the additional “other requirement” column for each type of aid. The primary trend we found was that merit-based aid frequently included additional coursework requirements beyond GPA or college entrance exam.

[Figure 5](#) includes the list of states that have ever had each of the eligibility requirements for the most inclusive aid program. The first column shows the states that have ever had an income requirement for need-based aid

¹⁵ These states include Alaska, Alabama, Arizona, California, Connecticut, Hawai'i, Iowa, Maine, Minnesota, North Carolina, Nebraska, New Mexico, Pennsylvania, Texas, Virginia, Vermont, and Washington.

¹⁶ These states include Alabama, Arizona, Georgia, Illinois, Kentucky, Maine, Montana, North Carolina, North Dakota, Nebraska, New Jersey, Nevada, Ohio, Pennsylvania, South Dakota, Utah, Vermont, and Wisconsin.

(Arkansas, California, Massachusetts, New York, Ohio, Oregon, Pennsylvania, and Washington). The next column shows the states that ever had a need requirement for need-based aid, GPA requirement for merit-based aid, college entrance exam requirement for merit-based aid, income requirement for combo-based aid, need requirement for combo-based aid, GPA requirement for combo-based aid, and college entrance exam requirement for combo-based aid. Across the types of requirements, the majority of states used demonstrated need (measured as either EFC or some other assessment of student's financial need). It could be that the use of demonstrated need was partially due to the ease of using this measure given that students who completed the FAFSA could have it automatically sent to the institution. It could also mean that students who receive state aid are encouraged to first maximize their federal aid (potentially allowing states to reduce their support for students).

[Table 2](#) also includes the summary statistics for the outcome variables. We found that the outcome measures of enrollment were fairly close to the prior year, with 7,450 (7,394 prior year) for total and 4,284 (4,251 prior year) for full-time. During our panel, the average associate degree graduation rate was nearly 29% (with an average of 646 completions) while the average bachelor's graduation rate was nearly 49% (with an average of 1,919 completions).

Main Analysis

Tables 2-7 include the regression analysis estimates for research question one. Each table includes a separate outcome variable. Using [Table 2](#) as an example, this table includes the estimates for model one for total undergraduate enrollment. Column 1 includes the covariates and year fixed effects while column 2 adds institution fixed effects (and removes the time-invariant institutional characteristics from the covariates). Therefore, looking at first column 1 and 2, we found no statistically significant relationship between aid per recipient and overall undergraduate enrollment. However, we did find some statistically significant relationships when examining the estimates for different racial groups. Focusing on the institution fixed effect results (always labeled column 2), we found evidence of a negative relationship between need-based aid per recipient and Asian and Pacific Islander and White student enrollment (driven by part-time enrollment). When controlling for fixed institutional characteristics, an additional \$1,000 of need-based aid per recipient correlated with 7 fewer Asian and Pacific Islander students and 27 fewer White students (a practically small relationship given the enrollment standard deviation across the panel was 1,176 and 4,617, respectively). We also found a generally negative relationship between combo-based aid per recipient and American Indian/Alaskan Native, Black, and White students' overall enrollment (with Latinx students having a positive correlation). For merit-based aid, we found divergent results with American Indian/Alaskan Native students having a positive relationship with overall enrollment and White students having a negative one. Analyses in [Table 3](#) reveal that the negative relationship between merit-based aid and White student enrollment is driven by part-time enrollment among White students. Still, all of these estimates were practically small.

[Table 3](#) shifts the outcome variable to full-time enrollment where we still did not find clear evidence of a relationship between aid per recipient and full-time enrollment. We found a positive correlation between need-based aid per recipient and Latinx student enrollment as well as between merit-based aid per recipient and American Indian/Alaskan Native and Black students. For combo-based aid, we found similar patterns to the overall enrollment for Black and Latinx students (practically small negative and positive correlations, respectively). Therefore, whether examining overall or full-time enrollment, we found little evidence of a practically significant relationship between the amount of aid per recipient and enrollment.

[Table 4](#) shows the relationship between state financial aid and associate degree graduation rate. We found a practically small, significant relationship between the amount of merit-based aid per recipient and overall associate degree graduation rate (\$1,000 increase in aid associated with approximately 0.3 percentage points lower graduation rate when including institution fixed effects). The evidence also suggests a small, positive relationship between combo-based aid per recipient and associate degree graduation rate (\$1,000 increase in aid associated with 0.2 percentage point higher graduation rate when including institution fixed effects). This finding appeared to be driven primarily by Black, Latinx, and White students' graduation rates. We also found that, when controlling for institution-specific characteristics, White students had a correlation of 0.8 percentage point higher graduation rate for an additional \$1,000 of need-based aid. We found no clear patterns in the relationship between financial aid and bachelor's degree graduation rate in [Table 5](#). Only American Indian/Alaskan Native students showing a statistically significant relationship when including fixed effects (1 percentage point lower bachelor's degree graduation rate). Thus, the primary relationship between aid per recipient and graduation rates was focused on associate degrees, though the estimates were small in magnitude.

Similar to [Table 4](#), [Table 6](#) shows that the amount of combo-based aid per recipient had a positive relationship with associate degree completions (\$1,000 additional correlated with nearly 13 additional completions). This estimate, while practically small, appeared to be driven primarily by Asian and Pacific Islander and Latinx students (whereas the graduation rate findings were driven by Black, Latinx, and White students). Latinx students also had a positive association between the graduation rate and merit-based aid per recipient. Diverging from [Table 4](#), we found a negative relationship between Black and Latinx students' associate degree completions and need-based aid per recipient (still practically small estimates given that the standard deviation is 137 and 327, respectively).

[Table 7](#) shows a similarly sized relationship between the amount of combo-based aid per recipient and bachelor's degree completions (\$1,000 additional correlated with nearly 12 additional completions). The same subgroup of students appears to drive these findings, though we also found that American Indian/Alaskan Native and White students appear to have the opposite relationship. We also found that Asian and Pacific Islander students had an additional 8 bachelor's degree completions for an additional \$1,000 in merit-based

aid per recipient. Overall, similar to graduation rate, we found little evidence of practically significant relationships between aid per recipient and completions.

Addressing research question two, [Table 8](#) includes the estimates of the relationship between state financial aid eligibility criteria and the student outcomes. Each column of the table includes estimates for a different outcome and each panel presents the estimates from models including a different type of financial aid (panel A: need, panel B: merit, panel C: combo). The first cell of Table 8, panel A, shows a practically small, significant positive relationship between income as a need-based aid eligibility criterion and overall undergraduate enrollment. Among states that disbursed need-based aid, institutions in states requiring income enrolled 53 more students compared to institutions in states that did not require income. We also found evidence that institutions in states that required demonstrated need for need-based aid were associated with lower associate degree graduation rates (approximately 4 percentage points).

[Table 8](#), panel B shows the estimates from the merit-based aid eligibility criteria models. We found positive relationships, among institutions in states that disbursed merit-based aid, between requiring a GPA and overall enrollment (117 additional students) and requiring a college entrance exam and associate degree completions (145 additional graduates). Panel C of the table provides the estimates for combo-based aid criteria. The most consistent finding for these eligibility criteria was that requiring a college entrance exam, when compared to institutions located in states with combo-based aid that did not require it, had a negative relationship with enrollment and graduation rates. We found that requiring a college entrance exam correlated with lower overall and full-time enrollment (75 and 40 students, respectively). While the magnitudes of those estimates are on the smaller side, we found that this requirement was also associated with an 11 percentage point decrease in the associate degree graduation rate and 6 percentage point decrease in the bachelor's degree graduation rate. Finally, we found that, among institutions located in states that disbursed combo-based aid, requiring demonstrated need was associated with fewer bachelor's degree completions (nearly 234 fewer).

Discussion

Our analysis of detailed, longitudinal data on state financial aid demonstrates how resources devoted to need-based aid (the total amount disbursed, the number of recipients, and the aid per recipient) have declined over time in relation to aid that incorporates merit qualifications for eligibility. We found mixed evidence on the relationship between state financial aid and students' enrollment and completion using a novel dataset with detailed data on need-, merit-, and combo-based aid. Our analysis provides no clear evidence of a practically significant relationship between the amount of aid per recipient and the student success outcomes. In contrast, we found suggestive evidence that requiring a college entrance exam for combo-based aid was associated with smaller enrollments and lower graduation rates (though this relationship was not replicated when requiring these exams for merit-based aid). We also found that requiring demonstrated need for combo-based aid was

correlated with fewer bachelor's degree completions and that requiring a GPA for merit-based aid was correlated with larger overall enrollment.

Continuing to add nuance to understanding of state financial aid, the results show that combo-based aid, which includes both need and merit requirements, had a positive relationship with associate and bachelor's degree completions and associate degree graduation rates. Though, these findings often differed when we explored the racial subgroups. These divergent findings highlight the need to explore beyond the overall average, as different subgroups of students may have unique experiences with different forms of state financial aid. However, all of these estimates are practically small, leading us to conclude that we do not find strong evidence of a practically significant relationship between the amount of state financial aid per recipient and student success outcomes.

When we examine these relationships with eligibility requirements for state financial aid, we find evidence for more practically significant relationships. The most consistent finding from these estimates is that institutions in states that require a college entrance exam for access to combo-based aid have lower enrollments and graduation rates. While the lower enrollments are practically small, the predicted 6 percentage points smaller bachelor's degree graduation rates equal nearly 0.34 of a standard deviation of the overall bachelor's degree graduation rate in the data.¹⁷ This finding is not replicated when requiring college entrance exams for merit-based aid (in fact, requiring these exams correlates positively with associate degree completions), which leads us to conclude that there is either something particular about combo-based aid programs broadly or the combo-based aid programs that do not require college entrance exams more specifically. States that did not require a college entrance exam (or GPA) as eligibility criteria for combo-based aid typically used a combination of coursework or state standardized test requirements. It appears that institutions located in those states may have higher graduation rates and it would be useful for future research to explore why this pattern exists.

Requiring demonstrated need, typically operationalized as cost of attendance minus EFC (derived from the FAFSA), in the first year of on-time enrollment is associated with a lower associate degree graduation rate. This finding aligns with a 0.21 standard deviation lower associate degree graduation rate.¹⁸ While this evidence is not causal, it would appear that demonstrated need for need-based aid is associated with worse associate degree outcomes for students. It is possible that using a FAFSA-based measure of financial need increases the barriers students face in maintaining need-based aid in states with this requirement. Prior research indicates college students sometimes fail to refile FAFSA to maintain financial aid once in college (Bird & Castleman,

¹⁷ We divided the point estimate for the regression by the respective standard deviation for each outcome (17.69 for bachelor's degree graduation rate).

¹⁸ We use the same general formula of footnote 17, with the standard deviation of associate degree graduation rate (17.61).

2014), which would suggest that many of these same students would lose access to state aid in addition to federal aid. Though, based on our current understanding of the implementation of financial aid policy, most institutions obtain students' income information from the FAFSA. Therefore, it is not clear if this pattern is about the barriers to refile the FAFSA or something inherent within the need calculations.

While our work expands our understanding of state financial aid and its relationship with student success, there are still significant gaps in the field's and policy actors' understandings of state aid. Future research should systematically examine the thresholds set by different institutions to see if these relate to student outcomes. Further, if possible, it would be helpful for future work to explore the potential for investigating the causal relationship between the novel estimates of state financial aid contributions and student outcomes. Relating directly to our findings, it would be useful for future research to investigate whether the college entrance exam findings differ for institutions with test-optional admissions or by other institutional characteristics, such as selectivity.

Surprisingly, we do not find substantial, consistent evidence of a relationship between the amount of state aid per recipient and enrollment and completion outcomes. While there is no clear pattern regarding which states have ever required a college entrance exam for the largest combo-based aid program, we did find one for the need-based aid eligibility criteria. Only two states, Ohio and Pennsylvania, require both income and demonstrated need for eligibility to their largest need-based aid program in the same FY. As demonstrated in [Figure 5](#), both Massachusetts and Oregon have these requirements across the panel, but this is due to a switch in the largest program. Thus, the difference in findings for income and demonstrated need requirements may, at least partially, be about different state regimes for financial aid.

Student financial aid is a substantial, and growing, share of the total state support for higher education. As the country transitions out of the COVID-19 pandemic, it faces enrollment declines and state funding challenges that could affect both institutions and students. Our national analysis reveals the considerable complexity associated with designing financial aid programs with student success as the primary consideration. We believe our research is too exploratory to provide didactic recommendations to policymakers about which types of state financial aid are better for student success (e.g., to invest in financial aid programs that include criteria for both need and academic considerations). This caution is especially warranted given the small magnitude of the estimates we found when comparing financial aid funding per recipient. Our most consistent finding, that requiring college entrance exams for combo-based aid relates to smaller enrollments and lower graduation rates, does not replicate when we examine requiring those exams for merit-based aid.

Instead, we urge policymakers and policy intermediary organizations to explore the reasoning behind certain criteria being used for the different types of aid in order to investigate if there are potentially less costly (e.g., the price of taking a college entrance exam) or burdensome (e.g., the FAFSA) requirements that could be

established. Given the inconsistent findings across subgroups of students and design types, the field and country would benefit from more research examining the holistic state financial aid environment in order to create a politically viable and operationally effective financial aid strategy for state policymakers seeking to ensure an affordable college education.

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Table 1. Descriptives

	Mean (SD)	Number
State Financial Aid		
Need aid per recipient	1762.22 (1106.95)	29068
Merit aid per recipient	1389.15 (1917.93)	29068
Combo aid per recipient	2057.70 (2903.03)	29068
Income requirement (need)	0.25 (0.43)	27457
Demonstrated need requirement (need)	0.66 (0.47)	27457
GPA requirement (merit)	0.67 (0.47)	14322
SAT requirement (merit)	0.53 (0.50)	14337
Income requirement (combo)	0.49 (0.50)	14873
Demonstrated need requirement (combo)	0.48 (0.50)	14873
GPA requirement (combo)	0.84 (0.37)	14873
SAT requirement (combo)	0.37 (0.48)	14873
Outcomes		
Undergraduate enrollment	7450.52 (8074.29)	28977
Undergraduate enrollment (full-time)	4284.08 (5627.73)	28970
Associate graduation rate (150%)	28.52 (17.61)	15594
Bachelor's graduation rate (150%)	48.81 (17.69)	7189
Associate completions (150%)	645.62 (818.37)	18531
Bachelor's completions (150%)	1918.83 (2140.29)	7976

Note. Means with standard deviations included in parentheses. Means of binary variables reflect proportions.

Table 2. Relationship between state financial aid and total enrollment.

	Overall		American Indian/ Alaskan Native		Asian and Pacific Islander		Black		Latinx		White	
	1	2	1	2	1	2	1	2	1	2	1	2
Need	4.059 (11.318)	-41.767 (21.700)	-0.603 (0.330)	-0.966 (0.656)	1.695 (1.298)	-6.689** (2.259)	1.479 (2.329)	2.201 (5.376)	3.467 (5.618)	5.786 (5.696)	-4.602 (5.075)	-26.809* (10.896)
Merit	-6.196 (5.633)	-10.318 (8.016)	-0.042 (0.166)	0.568** (0.213)	-0.483 (0.665)	0.779 (0.650)	1.198 (1.351)	3.575 (2.297)	-1.537 (1.255)	-0.138 (1.424)	-3.005 (2.695)	-12.286* (5.236)
Combo	1.142 (2.262)	-0.716 (4.620)	-0.109 (0.103)	-0.338* (0.159)	0.068 (0.391)	0.206 (0.518)	-0.179 (0.717)	-2.072* (0.942)	1.475 (1.043)	3.184* (1.435)	-1.197 (1.568)	-6.287* (2.626)
N	24578	24626	24578	24626	24578	24626	24578	24626	24578	24626	24578	24626

Note. Table includes need-, merit-, and combo-based aid per recipient in the thousands (so each estimate is for a \$1,000 change). Column 1 includes covariates and year fixed effects. Column 2 includes covariates, year fixed effects, and institution fixed effects. Covariates include: prior year total enrollment, any aid eligible for use at public two-year institution, any aid eligible for use at not-for-profit private institution, any aid eligible for use at for-profit, in-district/in-state tuition, federal grant percentage, federal grant average award, institutional grant percentage, institutional grant average award, state unemployment rate, region, sector, urbanicity, and year fixed effects. We remove region, sector, and urbanicity in institution fixed effects models. $p < .01^{**}$, $p < .05^*$

Table 3. Relationship between state financial aid and full-time enrollment.

	Overall		American Indian/ Alaskan Native		Asian and Pacific Islander		Black		Latinx		White	
	1	2	1	2	1	2	1	2	1	2	1	2
Need	0.256 (4.328)	6.132 (12.505)	-0.419 (0.263)	-0.379 (0.487)	0.883 (0.762)	-2.074 (1.647)	0.941 (1.235)	4.464 (3.294)	0.225 (2.114)	7.515* (3.266)	-2.395 (2.934)	-1.689 (6.868)
Merit	-1.432 (2.459)	1.013 (3.955)	0.026 (0.122)	0.501** (0.173)	-0.198 (0.422)	0.897 (0.527)	0.681 (0.863)	3.018* (1.247)	-0.314 (0.565)	-0.158 (0.531)	-0.487 (1.331)	-3.459 (2.767)
Combo	1.398 (1.322)	0.154 (2.460)	-0.081 (0.056)	-0.198 (0.118)	-0.015 (0.298)	0.120 (0.375)	-0.043 (0.436)	-1.516** (0.524)	0.724 (0.569)	1.857* (0.725)	-0.302 (0.616)	-2.780 (1.540)
N	24578	24626	24578	24626	24578	24626	24578	24626	24578	24626	24578	24626

Note. Table includes need-, merit-, and combo-based aid per recipient in the thousands (so each estimate is for a \$1,000 change). Column 1 includes covariates and year fixed effects. Column 2 includes covariates, year fixed effects, and institution fixed effects. Covariates include: prior year full-time enrollment, any aid eligible for use at public two-year institution, any aid eligible for use at not-for-profit private institution, any aid eligible for use at for-profit, in-district/in-state tuition, federal grant percentage, federal grant average award, institutional grant percentage, institutional grant average award, state unemployment rate, region, sector, urbanicity, and year fixed effects. We remove region, sector, and urbanicity in institution fixed effects models. $p < .01^{**}$, $p < .05^*$

Table 4. Relationship between state financial aid and associate degree graduation rate.

	Overall		American Indian/ Alaskan Native		Asian and Pacific Islander		Black		Latinx		White	
	1	2	1	2	1	2	1	2	1	2	1	2
Need	-0.087 (0.727)	0.286 (0.290)	1.848 (1.003)	0.571 (2.079)	-0.564 (0.771)	-0.654 (0.834)	-0.535 (0.672)	-0.107 (0.366)	0.508 (0.451)	-0.406 (0.391)	-0.144 (0.807)	0.760* (0.315)
Merit	-0.327 (0.290)	-0.317* (0.155)	1.020 (0.550)	1.044 (0.741)	-0.530 (0.582)	-0.359 (0.586)	-0.286 (0.283)	-0.456 (0.250)	-0.271 (0.403)	-0.235 (0.253)	-0.389 (0.316)	-0.253 (0.164)
Combo	-0.038 (0.202)	0.248** (0.066)	0.923 (0.539)	0.042 (1.492)	0.217 (0.299)	0.073 (0.191)	0.094 (0.252)	0.395** (0.112)	0.283 (0.174)	0.160* (0.081)	0.058 (0.210)	0.271** (0.075)
N	12688	12725	838	838	3770	3772	7149	7162	6581	6590	11752	11789

Note. Table includes need-, merit-, and combo-based aid per recipient in the thousands (so each estimate is for a \$1,000 change). Column 1 includes covariates and year fixed effects. Column 2 includes covariates, year fixed effects, and institution fixed effects. Covariates include: total undergraduate enrollment, any aid eligible for use at public two-year institution, any aid eligible for use at not-for-profit private institution, any aid eligible for use at for-profit, in-district/in-state tuition, federal grant percentage, federal grant average award, institutional grant percentage, institutional grant average award, state unemployment rate, region, sector, urbanicity, and year fixed effects. We remove region, sector, and urbanicity in institution fixed effects models. p<.01**, p<.05*

Table 5. Relationship between state financial aid and bachelor’s degree graduation rate.

	Overall		American Indian/ Alaskan Native		Asian and Pacific Islander		Black		Latinx		White	
	1	2	1	2	1	2	1	2	1	2	1	2
Need	0.703 (0.639)	0.407 (0.322)	3.934** (1.176)	-1.164 (2.150)	0.084 (0.777)	0.386 (1.053)	1.273 (0.856)	0.233 (0.467)	0.868 (0.679)	-0.045 (0.488)	0.743 (0.654)	0.417 (0.327)
Merit	-0.673 (0.345)	0.158 (0.176)	0.826 (0.836)	-1.016* (0.482)	-0.171 (0.400)	0.756 (0.625)	-0.348 (0.624)	0.213 (0.266)	-0.774 (0.433)	-0.399 (0.274)	-0.536 (0.291)	0.142 (0.165)
Combo	0.159 (0.266)	-0.030 (0.069)	0.366 (0.539)	-0.081 (0.336)	0.220 (0.291)	-0.113 (0.238)	0.315 (0.231)	0.021 (0.105)	0.289 (0.256)	0.091 (0.080)	0.239 (0.256)	0.028 (0.067)
N	7100	7116	965	970	3894	3902	5238	5246	4917	4926	6465	6475

Note. Table includes need-, merit-, and combo-based aid per recipient in the thousands (so each estimate is for a \$1,000 change). Column 1 includes covariates and year fixed effects. Column 2 includes covariates, year fixed effects, and institution fixed effects. Covariates include: total undergraduate enrollment, any aid eligible for use at public two-year institution, any aid eligible for use at not-for-profit private institution, any aid eligible for use at for-profit, in-district/in-state tuition, federal grant percentage, federal grant average award, institutional grant percentage, institutional grant average award, state unemployment rate, region, sector, urbanicity, and year fixed effects. We remove region, sector, and urbanicity in institution fixed effects models. $p < .01^{**}$, $p < .05^*$

Table 6. Relationship between state financial aid and associate degree completions.

	Overall		American Indian/ Alaskan Native		Asian and Pacific Islander		Black		Latinx		White	
	1	2	1	2	1	2	1	2	1	2	1	2
Need	43.310 (24.507)	-8.764 (15.096)	-7.121 (6.713)	-5.134 (4.488)	-1.187 (3.631)	-8.623 (4.992)	13.044 (8.415)	-11.679* (4.712)	24.729 (13.161)	-34.995* (16.232)	25.911 (22.796)	-6.582 (7.029)
Merit	8.120 (9.378)	5.704 (3.674)	-0.088 (1.793)	0.682 (1.016)	-1.706 (2.964)	0.121 (1.649)	-1.036 (3.583)	-0.325 (1.103)	-15.278 (8.302)	11.472* (5.683)	7.417 (8.062)	-2.786 (2.228)
Combo	-5.930 (7.349)	13.254** (3.751)	1.913 (1.633)	-4.301 (2.431)	-0.945 (1.519)	2.872** (0.870)	7.212** (2.254)	1.384 (1.137)	2.916 (5.847)	9.305** (2.881)	-7.549 (5.192)	0.205 (1.319)
N	16649	16686	990	990	4503	4504	8645	8657	7952	7959	15538	15575

Note. Table includes need-, merit-, and combo-based aid per recipient in the thousands (so each estimate is for a \$1,000 change). Column 1 includes covariates and year fixed effects. Column 2 includes covariates, year fixed effects, and institution fixed effects. Covariates include: total undergraduate enrollment, any aid eligible for use at public two-year institution, any aid eligible for use at not-for-profit private institution, any aid eligible for use at for-profit, in-district/in-state tuition, federal grant percentage, federal grant average award, institutional grant percentage, institutional grant average award, state unemployment rate, region, sector, urbanicity, and year fixed effects. We remove region, sector, and urbanicity in institution fixed effects models. p<.01**, p<.05*

Table 7. Relationship between state financial aid and bachelor's degree completions.

	Overall		American Indian/ Alaskan Native		Asian and Pacific Islander		Black		Latinx		White	
	1	2	1	2	1	2	1	2	1	2	1	2
Need	-62.379 (52.076)	-12.694 (18.140)	-8.549 (5.002)	-1.804 (2.431)	-18.682 (29.345)	-1.058 (10.090)	9.338 (14.310)	-3.764 (3.688)	-8.694 (35.454)	-7.181 (13.660)	27.060 (34.874)	-12.903 (10.916)
Merit	-19.036 (20.988)	-1.550 (9.384)	3.044 (2.416)	3.553* (1.569)	-1.538 (8.445)	7.773** (2.478)	-9.755 (7.181)	3.890 (2.094)	-26.192 (15.987)	7.551 (4.398)	7.247 (13.445)	-8.431 (8.608)
Combo	19.112 (9.557)	11.549* (5.098)	-1.513 (1.000)	-1.387** (0.515)	13.694* (6.223)	4.108* (1.782)	12.173 (6.343)	1.529 (1.020)	15.508 (9.764)	12.055** (3.401)	-11.624 (6.919)	-4.591* (2.283)
N	7562	7570	931	934	3937	3941	5425	5429	5098	5102	6959	6964

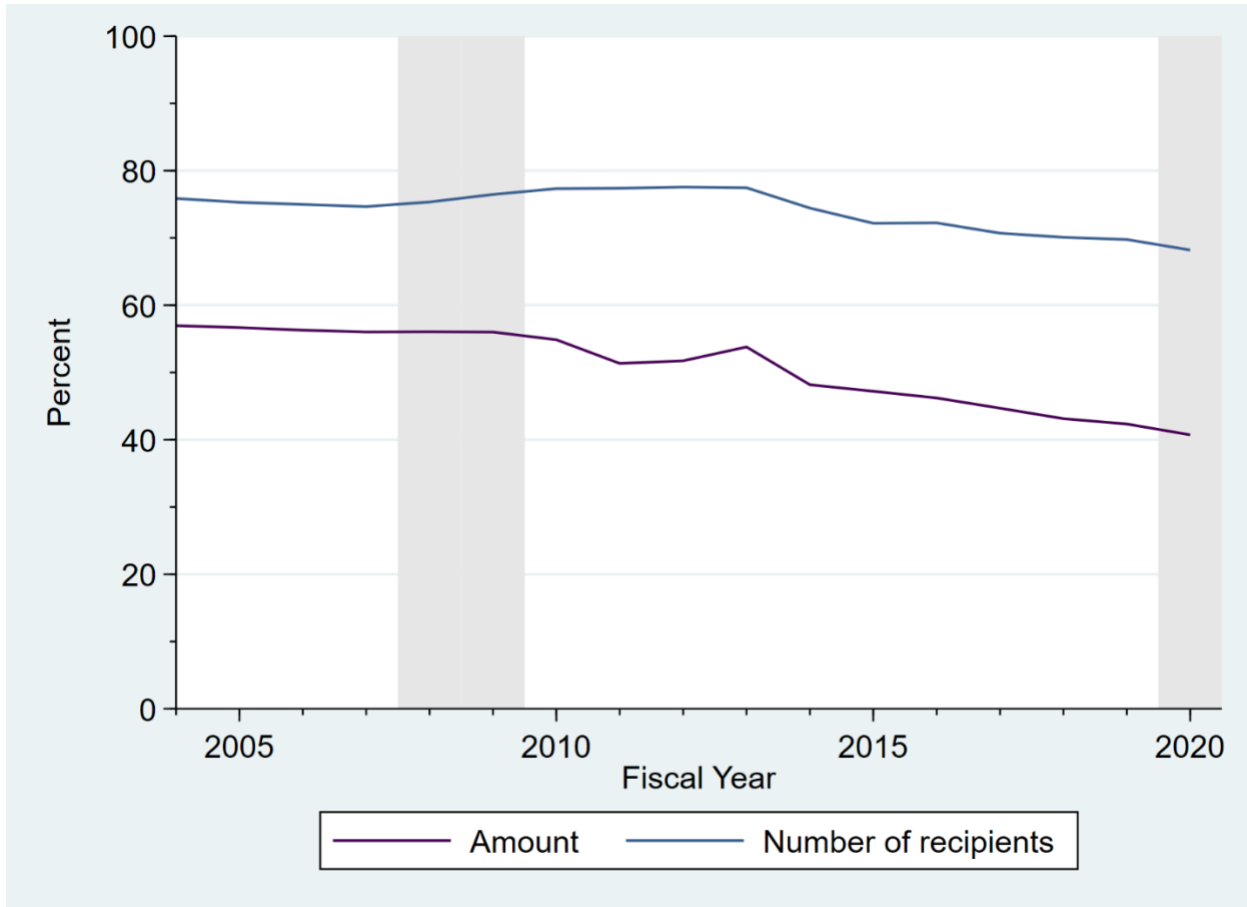
Note. Table includes need-, merit-, and combo-based aid per recipient in the thousands (so each estimate is for a \$1,000 change). Column 1 includes covariates and year fixed effects. Column 2 includes covariates, year fixed effects, and institution fixed effects. Covariates include: total undergraduate enrollment, any aid eligible for use at public two-year institution, any aid eligible for use at not-for-profit private institution, any aid eligible for use at for-profit, in-district/in-state tuition, federal grant percentage, federal grant average award, institutional grant percentage, institutional grant average award, state unemployment rate, region, sector, urbanicity, and year fixed effects. We remove region, sector, and urbanicity in institution fixed effects models. p<.01**, p<.05*

Table 8. Relationship between eligibility requirements for state financial aid and student outcomes.

	Enrollment		Grad rate		Completions	
	<i>All</i>	<i>FT</i>	<i>Associates</i>	<i>Bachelor's</i>	<i>Associates</i>	<i>Bachelor's</i>
Panel A: Need-based aid requirements						
Income	53.363* (26.408)	9.663 (14.455)	-0.242 (2.217)	1.720 (2.659)	77.278 (45.807)	187.199 (122.159)
Demonstrated need	42.247 (26.359)	-4.225 (16.108)	-3.717** (1.307)	-0.671 (1.899)	47.796 (39.839)	-105.345 (113.306)
N	23333	23333	12151	6708	15807	7155
Panel B: Merit-based aid requirements						
GPA	116.341** (28.852)	32.344 (16.755)	2.620 (4.152)	-3.057 (3.018)	-24.367 (79.488)	-62.750 (87.796)
SAT	-6.146 (26.743)	-9.315 (16.990)	-4.732 (2.496)	-2.064 (1.891)	144.825* (53.128)	-180.260 (118.412)
N	11581	11581	5416	3836	7854	4129
Panel C: Combo-based aid requirements						
Income	17.435 (50.555)	11.524 (17.681)	5.439 (3.451)	2.409 (2.221)	102.069 (99.392)	-162.937 (123.211)
Demonstrated need	-29.027 (33.458)	-3.599 (11.796)	4.350 (2.858)	-0.082 (1.603)	84.481 (90.290)	-233.598* (97.602)
GPA	37.698 (65.219)	27.510 (28.465)	-6.765 (3.573)	-4.800 (2.547)	-81.008 (109.900)	106.504 (209.525)
SAT	-75.264* (32.873)	-39.732** (14.281)	-10.701* (4.001)	-5.906** (1.763)	-29.615 (88.901)	-27.854 (181.832)
N	12091	12091	6216	3256	8074	3648

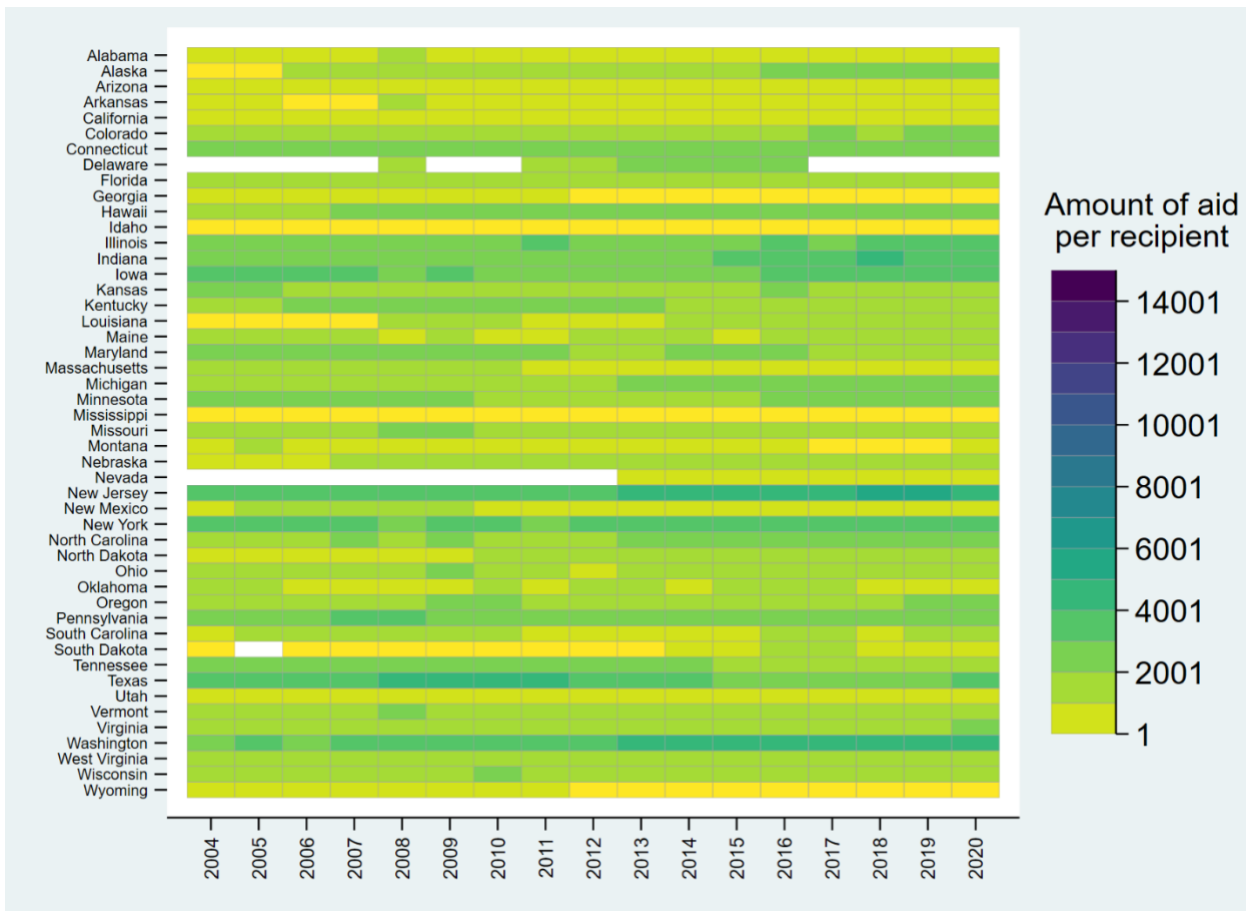
Note. The first two outcomes are forms of enrollment (total, full-time), the second two are 150% of on-time completion graduation rates (associate and bachelor's), and the third two are completions (associate and bachelor's). Panel A presents estimates for a model including the need-based aid requirements (income and demonstrated need). Panel B presents estimates for a model including the merit-based aid requirements (GPA and college entrance exam). Panel C presents estimates for a model including the combo-based aid requirements (income, demonstrated need, GPA, and college entrance exam). Covariates for all models include: total undergraduate enrollment, in-district/in-state tuition, federal grant percentage, federal grant average award, institutional grant percentage, institutional grant average award, state unemployment rate, region, sector, urbanicity, and year fixed effects. Models also include three binaries for whether the respective type of aid (need-, merit-, or combo-based) can be used in public two-year, not-for-profit private, or for-profit institutions. $p < .01^{**}$, $p < .05^*$

Figure 1. Need-based state aid as a percentage of total state aid over time.



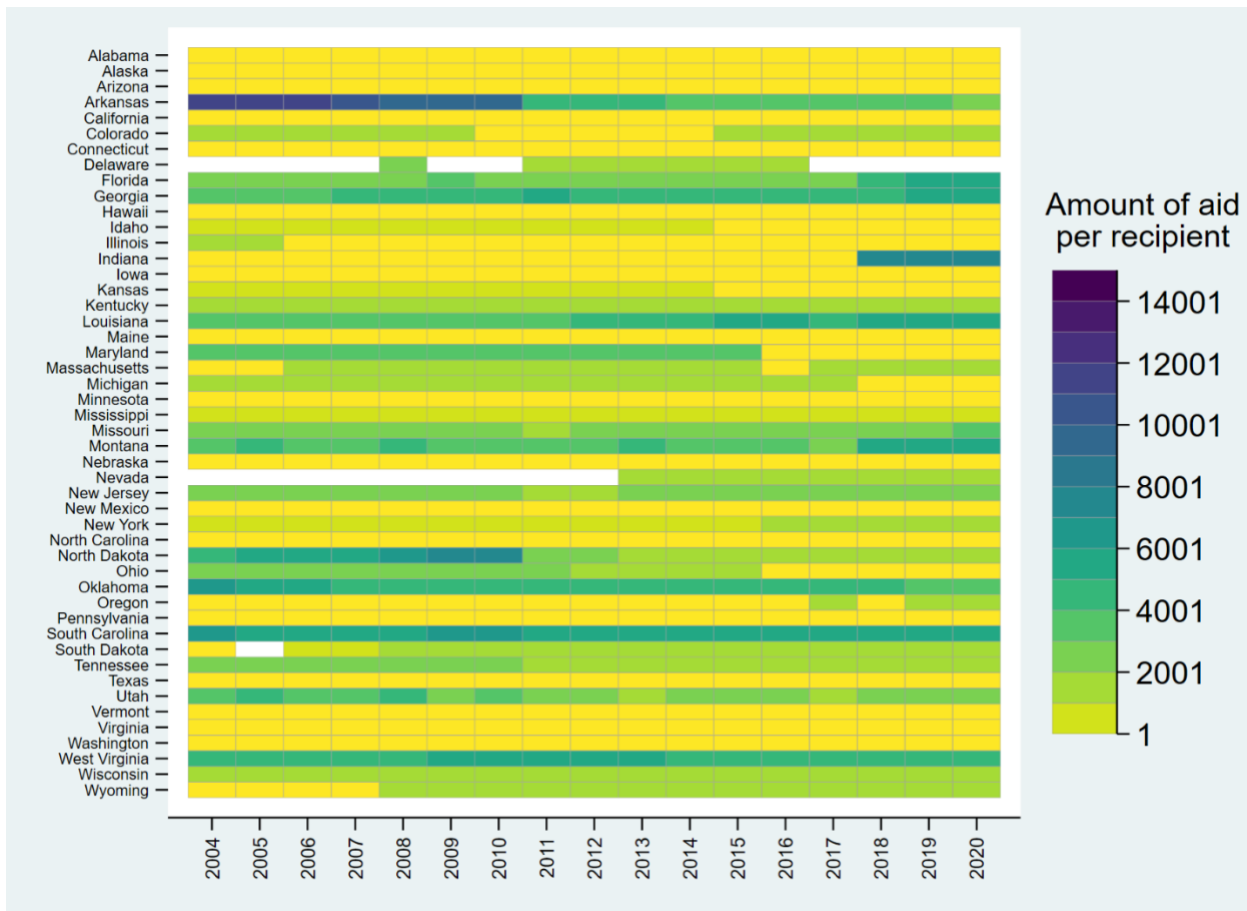
Note. The purple line shows the percentage of the total state aid amount that is disbursed based on need (the underlying amounts have been adjusted for inflation and are in 2020 dollars). The blue line shows the percentage of the total number of state aid recipients that is disbursed based on need. Fiscal years 2008, 2009, and 2020 are shaded in gray to visualize recessionary periods.

Figure 2. Need-based aid per recipient over time.



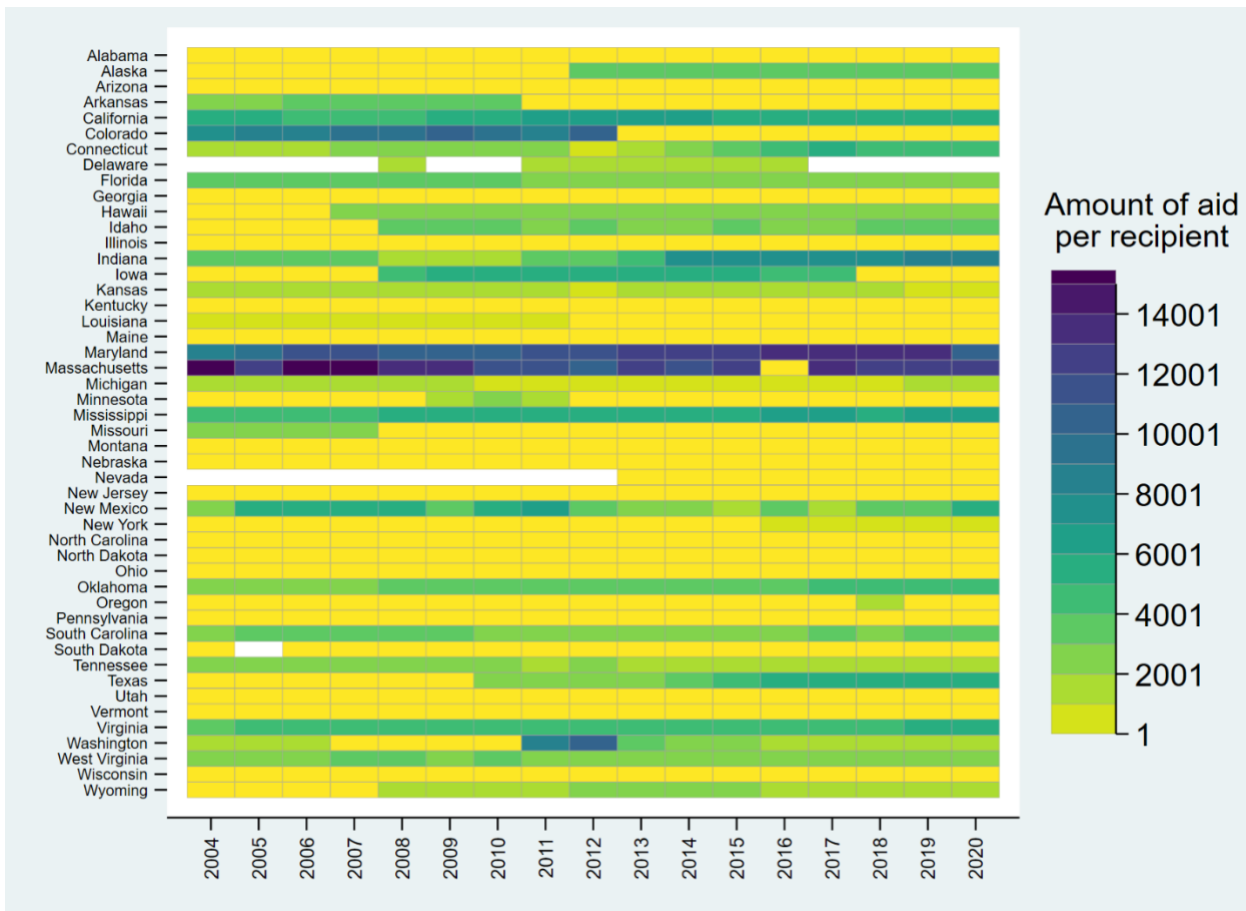
Note. Color variation shows the annual amount of need-based aid per recipient for each state (need-based amount in 2020 dollars divided by need-based aid recipients). White cells are years when we were unable to locate data on state financial aid programs (i.e., Delaware, Nevada, South Dakota). Yellow cells are when states have \$0 of need-based aid per recipient in a given fiscal year. More yellowish green cells have smaller annual amounts than darker green/blue cells. The cutoffs for each color are held constant across Figures 2, 3, and 4. Data collection excludes New Hampshire and Rhode Island due to lack of publicly available documentation of state aid programs and information from the state.

Figure 3. Merit-based aid per recipient over time.



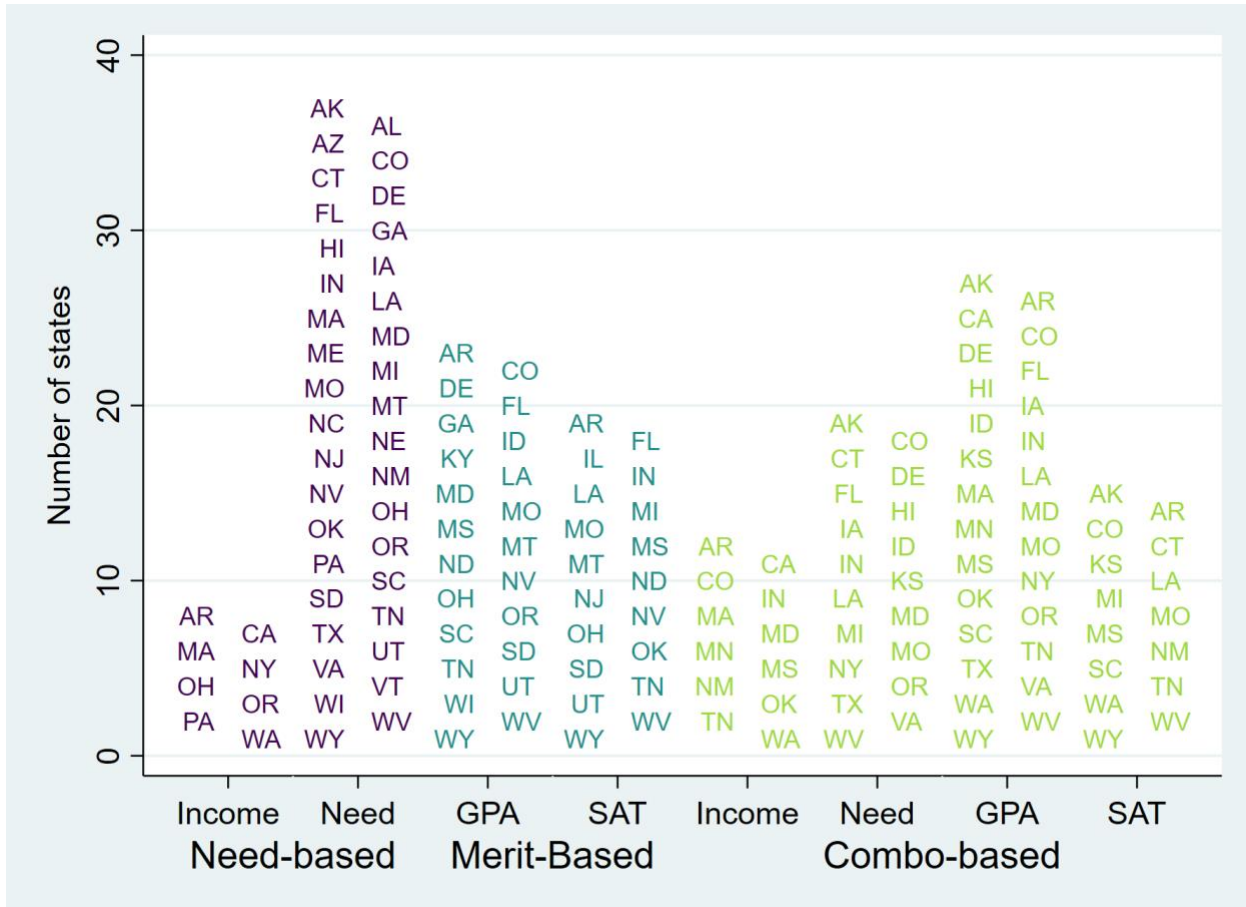
Note. Color variation shows the annual amount of merit-based aid per recipient for each state (merit-based amount in 2020 dollars divided by merit-based aid recipients). White cells are years when we were unable to locate data on state financial aid programs (i.e., Delaware, Nevada, South Dakota). Yellow cells are when states have \$0 of merit-based aid per recipient in a given fiscal year. More yellowish green cells have smaller annual amounts than darker blue/purple cells. The cutoffs for each color are held constant across Figures 2, 3, and 4. Data collection excludes New Hampshire and Rhode Island due to lack of publicly available documentation of state aid programs and information from the state.

Figure 4. Combo-based aid per recipient over time.



Note. Color variation shows the annual amount of combo-based aid per recipient for each state (combo-based amount in 2020 dollars divided by combo-based aid recipients). White cells are years when we were unable to locate data on state financial aid programs (i.e., Delaware, Nevada, South Dakota). Yellow cells are when states have \$0 of combo-based aid per recipient in a given fiscal year. More yellowish green cells have smaller annual amounts than darker blue/purple cells. The cutoffs for each color are held constant across Figures 2, 3, and 4. Data collection excludes New Hampshire and Rhode Island due to lack of publicly available documentation of state aid programs and information from the state.

Figure 5. States that have ever had each eligibility requirement for most inclusive aid program.



Note. Each column shows the states that have ever (across the entire panel) had the respective eligibility requirement. The first column shows states that have ever had an income requirement for need-based aid. In order, going from left to right, the other columns show need requirement for need-based aid, GPA requirement for merit-based aid, college entrance exam requirement for merit-based aid, income requirement for combo-based aid, need requirement for combo-based aid, GPA requirement for combo-based aid, and college entrance exam requirement for combo-based aid. States are listed alphabetically, based on their abbreviation and color-coded based on which type of state aid the column belongs to (purple for need-based, blue for merit-based, and green for combo-based). Data collection excludes New Hampshire and Rhode Island due to lack of publicly available documentation of state aid programs and information from the state.

Appendix

Table A1. All programs used for each state across the entire panel.

State	Need Programs	Merit Programs	Combo Programs
AK	AlaskAdvantage Education Grant		Alaska Performance Scholarship
AL	Alabama Student Assistance Program		
AR	Arkansas Student Assistance Grant, Higher Education Opportunity (Go! Opportunities) Grant	Academic Challenge Scholarship, Governor's Scholars	Arkansas Academic Challenge Scholarship
AZ	Arizona Leveraging Educational Assistance Partnership, Leveraging Educational Assistance Partnership		
CA	Cal Grant C		Cal Grant B
CO	Undergraduate Need	Centennial Scholars (formerly Colorado Undergraduate Merit)	Governors Opportunity Scholarship
CT	CT Aid for Public/Private Schools, Roberta B. Willis Need Scholarship (formerly Governor's Need Scholarship)		Capitol Scholars, Roberta B. Willis Need and Merit Scholarship (formerly Governor's Need and Merit Scholarship)
DE	Aid for Needy Students	SEED	Scholarship Incentive Program
FL	Florida Student Assistance Grant	Bright Futures Scholarship (Gold Seal Vocational Scholars)	Mary McLeod Bethune Matching Grant
GA	LEAP	HOPE	
HI	Opportunity Grant		Hawaii B Plus Scholarship
IA	Iowa Tuition Grant		All Iowa Opportunity Scholarship
ID		Robert R. Lee (Promise) A - Professional-Technical	Idaho Opportunity Scholarship Program
IL	Monetary Award Program	Merit Recognition Scholarship	
IN	Frank O'Bannon Grant	Next Generation Hoosier Educators Scholarship	21st Century Scholars, Frank O'Bannon (Core 40 Diploma award)
KS	Kansas Comprehensive Grant	Vocational Scholarship (Career Technical Workforce Grant)	State Scholars/Kansas State Scholars
KY	Kentucky Tuition Grant	KEES	
LA	GO Grant	TOPS (TOPS Tech Criteria)	LA LEAP
MA	Access Grant, MASS Grant	John & Abigail Adams Scholarship	Christian Herter Memorial Scholarship

MD	Part-Time Grant	Distinguished Scholars Award	Community College Promise Scholarship, Guaranteed Access Grant
ME	Maine State Grant Program		
MI	Michigan Tuition Grant	Michigan Merit Award, Michigan Promise	Michigan Competitive Scholarship
MN	Minnesota State Grant		Minnesota Achieve Scholarship Program
MO	Access (formerly Gallagher Student Assistance Grant)	A+, Bright Flight	Missouri College Guarantee Program
MS		Mississippi Tuition Assistance Grant	Higher Ed Legislative Plan
MT	Best and Brightest-Need, MTAP Baker, Montana Access	Best and Brightest-Merit, MUS Honors	
NC	NC Community College Grant, UNC Need-Based Grant, NC Need-Based Scholarship, NC Student Incentive Grant, State Contractual Scholarship		
ND	State Grant	ND Academic/CTE Scholarships, ND Scholars	
NE	Nebraska Opportunity Grant/Nebraska State Grant		
NJ	Tuition Aid Grant	Bloustein, NJ STARS	
NM	Student Incentive Grant		New Mexico Scholars
NV	Silver State Opportunity Grant, Student Access Grant/Regents' Higher Education Opportunity Award	Governor Guinn Millennium Scholarship Program	
NY	Enhanced Tuition Award, Excelsior Scholarship, Tuition Assistance Program	NYS Scholarships for Academic Excellence	NYS Achievement and Investment in Merit Scholarships
OH	Ohio College Opportunity Grant Program, Ohio Instructional Grant Program	Ohio Academic Scholarship	
OK	Oklahoma Tuition Aid Grant Program	Regional University Baccalaureate Scholarship	Oklahoma's Promise
OR	Oregon Opportunity Grant	Oregon Promise	Oregon Promise
PA	Pennsylvania State Grant		
SC	Need-Based Grant	HOPE Scholarship	SC Higher Education Tuition Grants
SD	Need Based Grant	South Dakota Opportunity Scholarship	
TN	Tennessee Student Assistance Award	Tennessee HOPE	HOPE Access Award

TX	Tuition Equalization Grant		TEXAS Grant, Top Ten Percent Scholarship
UT	Access Utah, HESSP-UCOPE, UHEAA	New Century, Regents	
VA	Virginia Commonwealth Award		Virginia Guaranteed Assistance Program
VT	Vermont Incentive Grant		
WA	Washington College Grant/State Need Grant		College Bound Scholarship, Get Ready for Math and Science, Washington State Promise Scholarship
WI	Wisconsin Grant (formerly Wisconsin Higher Education Grant)	Academic Excellence Scholarship	
WV	Higher Education Adult Part-Time Students (HEAPS) Grant	WV PROMISE	WV Higher Education Grant
WY	LEAP	Hathaway Provisional Scholarship	Hathaway Need Based Scholarship

Note. Each row represents all programs that we categorized as the most inclusive at any point in the panel. When programs are listed in multiple columns for a single state, the state changed part of the programs' eligibility criteria during the panel, shifting our categorization. Data collection excludes New Hampshire and Rhode Island due to lack of publicly available documentation of state aid programs and information from the state.