

Postsecondary Gaps in Recovery from the COVID-19 Pandemic: Evidence from Public Colleges and Universities^{1,2}

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Abstract

We study changes in postsecondary student performance during and after the COVID-19 pandemic using administrative data on all 2015 – 2022 high school graduates in North Carolina who enrolled in an in-state public institution. Successful course completion rates increased briefly at four-year institutions at the start of the pandemic, but at both two- and four-year institutions, success rates and credit earning decreased for later cohorts. These declines have persisted for certain groups, including students from underrepresented racial and ethnic groups, economically disadvantaged and academically weaker students, as well as female students. The findings point to ongoing academic challenges faced by vulnerable college student populations in the post-pandemic period.

Keywords: postsecondary education; credit earning; persistence; achievement gaps; COVID-19 pandemic

¹This project was supported by the North Carolina Collaboratory at the University of North Carolina at Chapel Hill with funding appropriated by the North Carolina General Assembly via the American Rescue Plan Act of 2021 (H.R. 1319) (federal award identification number SLFRP0129).

²A final version of this article was published as: Gicheva, D., Edmunds, J.A., Hutchins, B.C., Eilam, N. & Arshavsky, N. (2026). Postsecondary gaps in recovery from the COVID-19 pandemic: Evidence from public colleges and universities. *Educational Researcher*. <https://doi.org/10.3102/0013189X261462499>

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The COVID-19 pandemic was one of the most broadly disruptive events in recent educational history, with school closures and online instruction starting in the spring of 2020 and continuing in many settings through much of 2020-21 (Jack, Halloran, Okun, & Oster, 2023). While there is growing evidence of large and persistent negative academic impacts for elementary and secondary students that have also widened the preexisting achievement gaps by socioeconomic status (e.g. Kuhfeld, Soland & Lewis, 2022; Jack, Halloran, Okun, & Oster, 2023; Lewis & Kuhfeld, 2023), the pandemic's longer-term impact on postsecondary students' academic performance is less clear (Polikof, Clay & Silver, 2023). Our study aims to fill this gap by documenting descriptive trends in academic performance at two- and four-year institutions using comprehensive data from the state of North Carolina on cohorts of students who graduated from high school before, during, and after the pandemic.

Using linked administrative records on high school graduates from the classes of 2015 through 2022 who enrolled immediately in a public two- or four-year institution, we examine how first-year credit attainment and persistence changed for different groups of students during and after the COVID-19 pandemic relative to pre-pandemic trends. We find that overall successful course completion rates increased briefly at four-year institutions at the start of the pandemic, which is consistent with these institutions implementing flexible grading policies during this period. However, success rates and credit earning dipped considerably below pre-pandemic levels starting in the fall of 2021 and have not recovered to their baseline levels for students from underrepresented racial and ethnic groups, economically disadvantaged and

academically weaker students, and for females. A decline in successful course completion and credit earning was observed as early as the Spring 2020 semester at two-year institutions, where the downward trends persisted for the later cohorts and were more pronounced for the same subgroups of students as at four-year institutions. Our findings for students from underrepresented racial and ethnic groups and economically disadvantaged and academically underprepared students point to concerning trends toward widening pre-pandemic gaps in academic achievement at the postsecondary level. We also provide evidence that some students at four-year institutions may have used the summer semesters to recover credits they failed to earn during the preceding academic year, which emphasizes the importance of providing high-quality course options during the summer.

Background

Given the importance of postsecondary education to today's economy (Strohl, Gulish & Morris, 2024) and concerns over the relatively low completion rates of students who enroll in postsecondary education (National Center for Education Statistics, 2022), policymakers and practitioners have given substantial attention to college students' persistence and course performance (Braxton et. al, 2013). Over the past decade, approximately three-quarters of students who started postsecondary education returned the following year, although the results were very different by sector, with persistence rates of approximately 87% for students in public four-years and rates of around 62% for students in two-year institutions (National Student Clearinghouse, 2025). Studies have found overall lower persistence rates for males, Black students, Hispanic students, and Native American students (Ross et al, 2012). Persistence in and completion of college are substantially driven by students' success in their college courses,

including the number of credits that they have earned (Adelman, 2006; Attewell & Monaghan, 2016; Clovis & Chang, 2021).

There are multiple mechanisms through which the pandemic could have impacted students' postsecondary persistence and number of earned credits, depending on where they were in their educational career in the spring of 2020. A growing body of research is highlighting the amount of learning loss that occurred in K-12 during the pandemic (Betthäuser, Bach-Mortensen & Engzell, 2023; Hanushek & Strauss, 2025). As one research study found, "U.S. students experienced an historic decline in test scores during the pandemic period...with declines large enough to overturn the gradual but clear progress of the last two to three decades" (Jack & Oster, 2023, p. 61). Research has shown that high school absences increased during the pandemic and academic performance declined, particularly for students of color and economically disadvantaged students (Fuller, Swiderski, Mikkelsen & Bastian, 2023; Dee, 2024). The pandemic closures also changed the composition of high school students' peers and imposed greater constraints on parents, both of which likely exacerbated existing socioeconomic inequalities (Agostinelli, Doepke, Sorrenti & Zilibotti, 2022).

Lack of reliable internet access and more time spent in remote instruction are associated with more pronounced learning losses in school districts serving high proportions of students from lower-income families or underrepresented racial and ethnic groups, although these factors do not account fully for the observed disparities (Fahle et al., 2025). Health disparities across families likely also contributed to inequalities in the educational impacts of the pandemic: underrepresented racial and ethnic groups were at higher risk of contracting COVID-19 or developing severe disease (Hooper et al., 2020; Magesh et al., 2021), and mental health problems increased more within households with lower income or from underrepresented racial and ethnic

groups (Parenteau et al., 2023). There is also evidence that Black adolescents experienced increased racial discrimination during the period of racial unrest that occurred in 2020 simultaneously with the COVID-19 pandemic (Del Toro & Wang, 2023).

Districts switching to remote instruction likely had negative impacts on middle and high school students' academic preparedness, with disproportionately larger learning losses for economically disadvantaged students and students from underrepresented racial and ethnic groups (Goldhaber et al., 2023; Jack et al., 2023). Beyond negative test score gains, the literature has documented declines in children's connection to and engagement in school (Maiya, Dotterer & Whiteman, 2021; Lyu & Wehby, 2023).

Experiencing COVID-19 in high school could also have changed students' postsecondary enrollment choices and may therefore have changed the composition of students attending college. There is evidence to suggest that drops in four-year enrollment occurred primarily among White and Asian students, students whose parents have a bachelor's degree, and students with the highest grade point average (Howell et al., 2021). The potential for changing student composition indicates that any analyses of postsecondary performance should account for students' background characteristics.

For students who were enrolled in postsecondary education at the peak of the pandemic, academic performance might have been affected by the extent to which they were more or less able to learn effectively online. There is extensive evidence on online learning in higher education, some of which shows negative impacts for students taking online courses (Bettinger, Fox, Loeb, & Taylor, 2017), while other studies show positive impacts (Means, Toyama, Murphy & Baki, 2013). Altindag, Filiz and Tekin (Forthcoming) uncover evidence that performance in online college classes tends to be worse, but the gap has shrunk somewhat since 2020. Students'

success in online courses could also depend on the extent to which they had good internet access or a setting that allowed for a quiet space for studying (Day et al., 2021).

There were also changes in postsecondary grading policies and practices during the pandemic (Day et al., 2021) that affected students' grades and successful completion of college courses. More liberal pass-fail policies could have increased students' successful completion rates, particularly during the first few semesters after the start of the pandemic. In the case of North Carolina, the Community College System issued a guidance at the start of the pandemic for colleges to add grading options of WE (Withdraw Emergency) and IE (Incomplete Emergency), while following system-wide guidance, the public four-year institutions in the state introduced flexible grading policies in 2020 that allowed students to convert letter grades to some variation of "Pass" or "Satisfactory."

Nonacademic factors have also played an important role during this period. Relatively high prevalence of COVID-19 infections and mental health problems among college students (e.g. Hu et al., 2022) are likely to have impacted their academic performance. A survey administered to undergraduate students at Arizona State University in the spring of 2020 documents substantial decreases in wages and hours for working students, as well as reductions in family income (Aucejo, French, Araya & Zafar, 2020), and Rodríguez-Planas (2022a) finds similar trends in a survey of Queens College students administered a few months after the start of the pandemic. Pell Grant recipients in the Rodríguez-Planas (2022a) study sample were most likely to experience food and shelter insecurity. Inadequate internet access may have also played a role for the negative impacts of the pandemic on some college students (Jaggars et al., 2021; Katz, Jordan & Ognyanova, 2025).

Our study complements the literature documenting the COVID-19 pandemic's immediate disruptions to postsecondary students' academic progress. Offering early evidence from a sample of Virginia Community College System students, Bird, Castleman and Lohner (2022) document increases of 2.7 percentage points in course withdrawals and 1.3 percentage point higher failure rates in the spring of 2020 associated with the switch to online instruction, and Bulman and Fairlie (2022) document a similar decrease of around 3 percentage points in community college successful completion rates in California driven by an increase in withdrawals. Howell et al. (2022) find that for students in the 2019 high school graduating cohort, the pandemic did not seem to affect persistence rates at four-year institutions in the U.S., and persistence actually increased for Black, Hispanic, and Native Hawaiian students. This is in contrast to two-year institutions where persistence declined for all subgroups, especially for Hispanic, White, and Asian students. Persistence rates for students from the high school class of 2020 decreased by 2.6 percentage points in the four year public sector; the decrease in persistence was smaller for community college students, likely because the study sample includes a large share of older students whose persistence rates increased during the pandemic (Howell et al., 2022).

More recent data from two Canadian universities suggests that average grade point average (GPA) increased during the pandemic and remains higher as of the Spring 2023 semester in the humanities and social sciences but is comparable to its pre-pandemic levels or slightly lower in business, engineering, and the health sciences (Kuperman et al., 2025). In the U.S., Westrick et al. (2024) found that first-year GPA increased for the high school classes of 2020 and 2021 at private more selective institutions and to a lower extent at selective public institutions but generally did not change or decreased slightly at less selective institutions. Using data from France, Dagorn and Moulin (2025) show a continuous drop in reenrollment rates for first-year

university students, from a 16% decrease in 2020 to a 29% decrease in 2021 and a 32% decrease in 2022.

Our study contributes to the literature by providing novel evidence on the longer-term shifts in U.S. college students' academic performance concurrent with the COVID-19 pandemic and extending beyond the semesters immediately following its onset. Unlike other studies that focus on a single institution, the trends we uncover are representative of a wide range of postsecondary institutions serving students from a variety of backgrounds. This allows us to document heterogeneities in the post-pandemic recovery rates of different groups of students, and these results enhance our understanding of the ways in which already existing gaps in educational achievement have widened since the pandemic.

Data and Methods

Setting

Our study is based on administrative data from public two- and four-year institutions in the state of North Carolina. The University of North Carolina (UNC) System includes 16 four-year institutions and enrolls around 190,000 new and continuing undergraduate students in a given year. The institutions in the System include five historically Black colleges and universities, and across the System, underrepresented racial and ethnic groups account for slightly over a third of the total undergraduate student body. More than 80 percent of students are from North Carolina, with close to one third of students receiving Pell Grants. The North Carolina Community College System (NCCCS) consists of 58 community colleges that serve all 100 counties in the state and enrolls over 250,000 curriculum students each year, with around 40 percent of students being from underrepresented racial and ethnic groups. North Carolina residents account for 98 percent of the community college student population. Of North Carolina

residents who enroll in any college immediately after completing high school, around 80 percent attend a public in-state institution (Tippet & Kahn, 2018).

Data Source

Our NCCCS and UNC System data is at the course level and includes the number of attempted and earned credits and the final letter grade for each course, including grades that indicate withdrawal from the class.⁶ Unique student identifiers allow us to link the postsecondary transcript data to student-level records from the North Carolina Department of Public Instruction (NCDPI), which oversees the state’s public schools serving children in pre-kindergarten through 12th grade. These data provide information about each student’s high school graduation year, the school they graduated from, weighted cumulative GPA, demographic characteristics, economically disadvantaged status (as determined by NCDPI), English language learner status, and disability status. We use weighted high school GPA as a measure of baseline achievement, as standardized test scores are not available for all cohorts due to the pandemic.⁷ We use the term “underrepresented racial and ethnic groups” (URE) to refer to students who identify as non-White, non-Asian, or Hispanic of any race.

We aggregate the college transcript data to the student-by-semester level. We exclude courses for which the number of attempted credits is zero or missing, developmental education (remedial) courses, and courses whose grading scale is designated as “audit,” “transfer,” or “not

⁶ Public institutions in North Carolina generally operate on the semester system during the fall and spring semesters. Some institutions in the UNC System offer a small number of part-of-term course options, which are not differentiated in the data; we observe only whether the course was offered during the fall or spring and the number of credit hours students could earn. Four-year institutions typically have two summer terms, which we aggregate for the analyses of summer coursetaking.

⁷ Over the sample period, North Carolina implemented two changes that had nontrivial impacts on high school students’ GPA. Starting with the 2015-16 year, the state switched from a 7-point to a 10-point grading scale, lowering the cutoffs for each letter grade. Effective with the class of 2019, students earn one additional GPA point for Advanced Placement (AP) and International Baccalaureate (IB) courses, down from two points for prior cohorts. To avoid the confounding effects of these policy changes, in our analyses we focus on a student’s relative GPA rank within their cohort.

graded.” The Online Appendix to the paper shows trends in developmental education coursetaking at two-year institutions, which, concurrently with the pandemic, was impacted by a program specific to North Carolina community colleges called RISE (Reinforced Instruction for Student Excellence), which placed more students in college credit-bearing math and English courses instead of developmental education courses; this program was implemented between 2019 and 2020 but was paused in 2021. The letter grade, number of attempted credits, and number of quality points (numeric grade times attempted credits) are provided for each course.

Sample

Our focus in this paper is on first-year academic performance for students who enroll in a public institution in their state immediately after completing high school, so we restrict the sample accordingly. We keep only observations for the fall and spring semesters following the student’s high school graduation date. For analyses of summer coursetaking, we look at the summer following the first year of college. These sample restrictions exclude, for example, summer bridge programs that take place before the first fall; observations for students who take a gap year after high school or who enroll in an institution outside the UNC and NCCC Systems; dual course credits earned during high school; and any observations after the first year of college. Because we link the college transcript data to the students’ NCDPI records, our analyses also exclude students who did not attend a public high school in North Carolina. Restricting the analyses to first-year students allows us to analyze trends in academic performance independently from persistence in previous years. Excluding students who did not enroll immediately after high school ensures that each cohort was exposed to a similar extent to the COVID-19 pandemic during high school and college.

The sample includes four cohorts of students whose high school experience and first year in college could not have been impacted by COVID-19 (2015 through 2018) and four cohorts that may have been impacted to various degrees (2019 through 2022). Our final estimation sample includes 210,008 unique students at four-year institutions and 192,793 community college students. Table 1 shows descriptive statistics for the last pre-COVID-19 cohort and each of the four cohorts that attended college during or after the pandemic.

At four-year institutions (panel A), we see increases relative to the baseline 2018 cohort in the shares of Hispanic students, English language learners, students with disabilities, and students with below-median high school GPA that start with the 2019 cohort and so predate the onset of the pandemic. We also see more female, Asian, and economically disadvantaged students from the 2020 and 2021 cohorts enrolling in public four-year institutions. In panel B, we observe similar increases in the shares of Hispanic students, English language learners, and students with disabilities at two-year institutions that predate the onset of COVID-19. The share of economically disadvantaged students is highest for the 2019 cohort, after which it starts trending down to below-baseline levels for the last two cohorts. In contrast with the trend at four-year institutions, baseline achievement improved slightly at two-year institutions for the classes of 2020 and 2021, which indicates that there may have been a shift of high school graduates with above-median GPA from four- to two-year institutions in the state.⁸ Weighted high school GPA shows pronounced drops after 2018 for both samples, which can be explained by the change in weights for AP and IB courses.

⁸ Table B2 in the Online Appendix shows descriptive evidence that high school graduates with GPA in the top 25% were relatively more likely to enroll in two-year versus four-year institutions after 2020. While two-year enrollment rates generally decreased in North Carolina after the onset of the COVID-19 pandemic, the drop was most pronounced for low-achievement and economically disadvantaged students and for English language learners. We examine enrollment trends in more detail in a companion paper (Eilam et al., 2026).

Outcomes

We examine performance through six main outcomes that measure academic progress: 1) number of attempted credits; 2) number of earned credits; 3) share of courses completed with a C or better; 4) share of courses withdrawn or incomplete; 5) fall-to-spring persistence; and 6) summer enrollment.

First, we analyze how the number of attempted credits in a given semester changed for the post-pandemic cohorts, relative to students who graduated from high school between 2015 and 2018. In additional analyses shown in the Online Appendix, we also examine trends in full-time (12 or more attempted hours) versus part-time enrollment and attempted credits conditional on full-time and on part-time attendance.

We define the number of earned credits to include courses in which the student earned a grade of C (2.0) or better, as well as those completed with a grade of “Satisfactory” (S), “Pass” (P), and “High Pass” (H).⁹ We use this definition of credit earning because courses completed with lower grades often do not count toward a student’s major or general curriculum requirements, and community college students cannot transfer courses in which they earned a grade lower than a C to a four-year institution in the state. We also construct an indicator for the share of courses that the student completed successfully, as defined above.

Our fourth outcome is intended to examine in more detail what drives changes in earned credits. We construct an outcome variable measuring the share of courses that the student did not complete, which includes grades of “Withdraw” (W), “Incomplete” (I or IN), and “In Progress”

⁹ Grades of S, P, and H typically account for about 1.5 percent of courses taken at four-year institutions, but this share increased to over 11 percent in the spring of 2020. The academic relief policies that four-year institutions adopted in 2020 generally allowed students to count these courses toward their major. Only the “P” grade appears in the community college sample and is used almost exclusively for developmental education or other non-credit bearing courses that we exclude from the analyses.

(IP). The difference between the share of courses completed successfully and the share of courses that the student did not complete is accounted for by courses completed with grades of D or F; these percentages can be calculated by the reader, but we also show results for this outcome in the Online Appendix.

The fifth outcome is persistence between a student's first fall and spring semesters; persistence past the first year is analyzed in a separate paper (Eilam et. al, 2026). A student enrolled in the fall is defined as persisting if they attempted any credits in the subsequent spring semester at any public in-state institution of the same level. The sample for these analyses excludes 3 percent of the UNC sample and 14 percent of the NCCCS sample whose initial enrollment occurred in the spring following their high school graduation. Our final outcome is a binary indicator for enrollment in the summer following a student's first year in college.¹⁰ It is possible that students use summer terms to make up for unearned credits during the preceding fall and spring, although we do not test directly whether the summer enrollment is in classes that a student withdrew from or failed in the previous terms.

Descriptive statistics for all outcomes measured at baseline (the Fall 2018 and Spring 2019 semesters) are available in Table B1 in the Online Appendix. It should be noted that for attempted credits and fall-to-spring persistence, the COVID-19 pandemic should not have been a factor until the fall of 2020 because the Spring 2020 values for these outcomes were determined prior to March. For all other outcomes, the Spring 2020 semester is the first one that could have been impacted.

Analyses

¹⁰ In supplementary analyses not shown here, we also examined the number of attempted and earned summer credits but found them to be fairly constant over time conditional on taking any summer classes.

This section provides an overview of the regression specifications we estimate; more details about our empirical approach are provided in Online Appendix A. We report results from an event study model, which allows us to visualize the trends in the outcomes of interest, conditional on student characteristics, prior to and after the start of the pandemic. For student i who graduated from high school s and enrolled at postsecondary institution j , we estimate the following model:

$$y_{ijst} = \alpha_t + X_i' \gamma + \delta_j + \eta_s + \varepsilon_{ijst} \quad (1)$$

The subscript t denotes specific semesters (e.g., Fall 2021) for all but two of the outcomes y_{ijst} – persistence and summer enrollment – that are measured at an annual frequency and for which t indexes academic years. For outcomes measured with semester frequency, we use pre-pandemic data to control for underlying seasonal differences; for example, community college students tend to attempt slightly more credits in the fall. Thus, when we compare the Fall 2020 semester to Spring 2019 for instance, we can focus on differences associated with the post-pandemic period subtracting away preexisting differences between fall and spring semesters. The specification in equation (1) controls for the student characteristics shown in Table 1, denoted by X_i , and also includes high school and postsecondary institution fixed effects, η_s and δ_j respectively, to control for baseline differences among high schools and institutions of higher education. We report the coefficient estimates for the vector α_t , which contains separate intercepts for each semester, with Spring 2019 used as baseline, or each academic year, where 2018-19 is used as the base year. The standard errors we report throughout the paper are clustered at the postsecondary institution level.

To document heterogeneities in how academic performance changed during and after the COVID-19 pandemic, we conduct subgroup analyses by gender, URE status, economically

disadvantaged status, and high school GPA. Using Z_i as a binary indicator for subgroup membership, we estimate the following specification for each set of complementary subgroups:

$$y_{ijst} = \beta_t^0 + \beta_t^1 \times Z_i + X_i' \gamma + \delta_j + \eta_s + \varepsilon_{ijst} \quad (2)$$

In the specification in equation (2), the β_t^0 coefficients measure the difference in the outcome relative to the baseline period for the reference group (e.g. males, non-URE, non-economically-disadvantaged, or above-median high school GPA) in the semester or academic year indexed by t . We report the coefficient estimates for β_t^1 , which show the differences in deviations from the baseline period for each subgroup relative to the change for the corresponding reference group. For example, when Z_i is an indicator for female, $\beta_{Spring2020}^1$ measures the covariate-adjusted difference for females relative to the difference for males from the baseline Spring 2019 semester. Thus, the total difference in performance for females relative to females' baseline performance is given by $\beta_{Spring2020}^0 + \beta_{Spring2020}^1$. We estimate a separate regression for each pair of subgroups.

In the following section, we begin by presenting the event study estimation results for equation (1), followed by heterogeneity analyses for successful course completion based on equation (2). Results for the rest of the subgroup analyses are shown in Online Appendix B.

Results

Trends in Credit Earning

We begin by examining the number of attempted credits at four-year institutions. The results in panel (a) of Figure 1 point to a slight downward trend in attempted credits prior to 2020. Attempted credits declined further after 2020, but this decrease appears to be a continuation of the preexisting trend rather than a new phenomenon, and the magnitude of the

decrease relative to baseline is fairly small in magnitude: about 0.25 credits per semester. Figure B1 in the Online Appendix shows that with the exception of the Spring 2021 semester, the slight downward trend in attempted credits at four-year institutions can be attributed to full-time students taking slightly fewer credits rather than to fewer students attending full-time.

Credits earned successfully (with a grade of C or better) at four-year institutions showed a pronounced jump of around 0.75 hours in the spring of 2020 and a smaller not statistically significant increase in the fall of 2020, which, as panels (c) and (d) suggest, were largely driven by a decrease in the share of classes completed with a D or F. In the spring of 2020 in particular, there was an increase of around 5 percentage points in successful course completion rates, but not an associated decrease in withdrawals and incompletes, which remained fairly constant at four-year institutions throughout the sample period. This indicates that the UNC System's flexible grading policies may have helped many students avoid grades of D or F in the early pandemic semesters. After the initial jump, the share of classes completed successfully, as well as the number of credits earned per semester, was lower than pre-pandemic levels for the 2021 cohort but rebounded by the end of the sample period. Taken together, these results suggest that four-year students from the high school class of 2021 experienced large disruptions coinciding with the COVID-19 pandemic, but credit earning appears to have recovered. Later in this section, we show evidence that this is not the case for all students.

Figure 2 points to similarities and some important differences in credit accumulation trends at two-year institutions. Attempted and earned credits increased early in the sample period but leveled off for the 2016 – 2018 cohorts, while successful course completion rates were

mostly constant prior to the pandemic.¹¹ After 2020, there was a drop in attempted credits and a larger decrease in earned credits that continued through the fall of 2022. The trend in attempted credits is consistent with findings from related qualitative work, which indicate that to help less prepared students succeed, some advisors were encouraging these students to take lighter courseloads (Hutchins et. al, 2026). Our analyses also show that, unlike at four-year institutions, the decrease in attempted credits was due to more students attending part-time (see Figure B2 in the Online Appendix for more detail).

In contrast to four-year institutions, the decrease in successful course completion for community college students was driven by more withdrawals and incompletes, while the share of courses completed with a grade of D or F remained stable over the sample period, with the exception of the spring of 2020 when it decreased by 9 percentage points. Withdrawals and incompletes increased by 11 percentage points in the spring of 2020, which aligns with the NCCCS guidance for colleges to add the emergency withdrawal and incomplete grading options. A comparable sharp increase in withdrawals in the spring of 2020 offset by a decrease in failing grades has also been documented for community college students in California (Bulman & Fairlie, 2022). Overall, the results suggest that on average, the post-COVID-19 changes in community college students' credit earning was more pronounced than the changes in four-year students' credit accumulation, with the decrease persisting for the later cohorts in our data. North Carolina community college students are less likely to complete classes, driven by a sustained increase in course withdrawals.

Trends in Fall-to-Spring Persistence and Summer Enrollment

¹¹ The results for developmental education coursetaking shown in Figure B4 in the Online Appendix suggest that the early increase in attempted credits is almost exactly offset by a decrease for the first two cohorts in the number of developmental education credits.

Decreases in successful course completion rates, and well as other pandemic-induced stressors, can have impacts on persistence. Panel (a) in Figure 3 shows that relatively fewer four-year students in the 2020 and 2021 cohorts were persisting between the fall and spring semesters of their first year. A one- to two- percentage point decrease in first-year persistence for four-year students constitutes a fairly substantial change because the baseline persistence rate for this group was 95 percent. Persistence returned to its pre-pandemic trend for the high school class of 2022. For two-year institutions, we see evidence in panel (b) of Figure 3 that the 2020 and to some extent 2021 cohorts also experienced a drop in fall-to-spring persistence relative to the pre-existing trend.

Students may have tried to recover credits through summer school enrollment, and we see this, particularly at four-year institutions. The results in panel (c) of Figure 3 show an increase of around 5 percentage points in the share of four-year students taking summer courses starting in 2020. Panel (d) suggests that community college students may have been less likely than students at four-year institutions to use the summer terms to speed up their credit accumulation at the peak of the pandemic. There was an upward trend in summer coursetaking in the pre-pandemic years that leveled off for the 2019 and 2020 cohorts before continuing its upward trajectory.

Subgroup Differences

While as a whole, college student performance may have rebounded after the COVID-19 pandemic, it is important to consider whether this is the case for all students, or if there are differences in recovery rates across groups. We focus on heterogeneity in successful course completion rates, results for which we show in Figure 4; results from subgroup analyses for all other outcomes are shown in Figures B5 – B16 in the Online Appendix. As discussed earlier, the

coefficient estimates we show represent the difference between the subgroup of interest (e.g. economically disadvantaged) and the reference group (e.g. non-economically disadvantaged) in the change relative to the base year value for the respective group. A negative coefficient estimate does not necessarily mean that the outcome decreased for the given subgroup; it can indicate that the outcome increased by less than the increase for the relevant reference group.

Panel (a) shows that at four-year institutions, success rates improved more for low-performing students in the spring of 2020. This is consistent with other evidence from the early stages of the pandemic that lower-performing students were better able to take advantage of flexible grading policies (Rodríguez-Planas, 2022b). This also holds true for underrepresented racial and ethnic groups (as shown in panel (b)). These relative improvements in performance were not observed at two-year institutions, where we see relative drops in Spring 2020 performance for low-GPA and economically disadvantaged students.

Following the peak of the pandemic, successful completion rates were lower for females, URE, and economically disadvantaged students. Successful completion rates remained similar for students with below- and above-median high school GPA in the spring of 2021, possibly because universities still had grade relief policies in place, but dropped sharply for the lower-performing group in the fall of 2021 and did not recover fully through the end of our sample period. We see similar gaps at two- and four-year institutions for the last two cohorts, but Online Appendix B shows that the differences at community colleges were mainly driven by higher withdrawal rates for the subgroups we examine, while higher shares of courses completed with D or F were driving the subgroup differences at four-year institutions. The supplemental analyses in Online Appendix B also offer suggestive evidence that prior to the COVID-19 pandemic, there was a trend toward a relative increase in credit earning for URE and economically disadvantaged

community college students in North Carolina, which would have served to shrink the underlying gaps in these outcomes, but the pandemic appears to have ended this trend.

Conclusion

Although at this point researchers and educators generally agree that the COVID-19 pandemic constituted a major disruption to the K – 12 education sector in the United States and other developed countries with persistent negative impacts on student learning, there is limited evidence as to the extent to which the pandemic has impacted college students. There have been calls in the literature for high-quality evidence on the pandemic’s impacts on education beyond high school (e.g. Polikoff, Clay & Silver, 2023). We use linked high school and college student records for all students at public institutions in the state of North Carolina to document how academic performance at two- and four-year institutions has changed following the COVID-19 pandemic.

We find that, overall, credit earning at four-year institutions increased during the spring of 2020, when institutions implemented flexible grading policies that may have helped students complete their courses successfully, but then dropped during the 2021-22 academic year, largely as a result of students earning more grades of D or F. There was a corresponding decrease in the share of students persisting between the fall and spring semesters.

Changes in credit earning and fall-to-spring persistence were even more pronounced at community colleges, where more students have been withdrawing from their classes. Course completion rates appear to be rebounding for more recent cohorts, especially at four-year institutions, but it is yet unclear what the long-term trends would be for students who attended college at the height of the pandemic.

We also identify concerning differences for some historically marginalized racial and ethnic groups, as well as for academically underprepared students and females. Educators and policymakers need to be aware of the slower recovery rates for economically disadvantaged students, students of color, and students who performed worse in high school, as these groups tend to have lower college completion rates and are more likely to need additional academic supports.

It is important to note that our study is largely descriptive because all students were similarly exposed to the COVID-19 pandemic, so we are unable to disentangle the pandemic's impacts from the effects of other concurrent events and policies. The pandemic brought on large economic shocks such as changes in the unemployment rate and income fluctuations through federal stimulus payments; political unrest and the Black Lives Matter protests also impacted the college-aged population. It is important for researchers and policymakers to continue to monitor the trends in college students' academic recovery as the economic and political context across the U.S. continue to change.

References:

- Agostinelli, F., Doepke, M., Sorrenti, G., & Zilibotti, F. (2022). When the great equalizer shuts down: Schools, peers, and parents in pandemic times. *Journal of Public Economics*, 206, 104574.
- Altindag, D. T., S. Filiz, E., & Tekin, E. (Forthcoming). Is online education working? *Educational Evaluation and Policy Analysis*, 01623737241274802.
- Aucejo, E. M., French, J., Araya, M. P. U., & Zafar, B. (2020). The impact of COVID-19 on student experiences and expectations: Evidence from a survey. *Journal of Public Economics*, 191, 104271.
- Adelman, C. (2006). *The toolbox revisited: paths to degree completion from high school through college*. Retrieved from Washington, DC:
<https://www2.ed.gov/rschstat/research/pubs/toolboxrevisit/index.html>
- Attewell, P. A., & Monaghan, D. B. (2016). How many credits should an undergraduate take? *Research in Higher Education*, 57, 682-713.
- Bethhäuser, B.A., Bach-Mortensen, A. M. & Engzell, P. (2023) A systematic review and meta-analysis of the evidence on learning during the COVID-19 pandemic. *Nature Human Behavior*, 7, 375-385.
- Bettinger, E. B., Fox, L., Loeb, S., & Taylor, E. S. (2017). Virtual classrooms: how online college courses affect student success. *American Economic Review*, 107(9), 2855-2875.

- Bird, K. A., Castleman, B. L., & Lohner, G. (2022). Negative impacts from the shift to online learning during the COVID-19 crisis: Evidence from a statewide community college system. *AERA Open*, 8, 23328584221081220.
- Braxton, J. M., Doyle, W. R., Hartley III, H. V., Hirschy, A. S., Jones, W. A., & McLendon, M. K. (2013). *Rethinking college student retention*. John Wiley & Sons.
- Bulman, G., & Fairlie, R. (2022). The impact of COVID-19 on community college enrollment and student success: Evidence from California administrative data. *Education Finance and Policy*, 17(4), 745-764.
- Clovis, M.A. & Chang, M. (2021). Effects of academic momentum on degree attainment for students beginning college at 2-year institutions. *Journal of College Student Retention: Research, Theory & Practice*, 23: 2, 322-336.
- Dagorn, E., & Moulin, L. (2025). Dropping out of university in response to the COVID-19 pandemic. *Economics of Education Review*, 104, 102604.
- Day, T., Chang, I.-C. C., Chung, C. K. L., Doolittle, W. E., Housel, J., & McDaniel, P. N. (2021). The immediate impact of COVID on postsecondary teaching and learning. *The Professional Geographer*, 73(1), 1-13. doi:10.1080/00330124.2020.1823864
- Dee, T. S. (2024). Higher chronic absenteeism threatens academic recovery from the COVID-19 pandemic. *Proceedings of the National Academy of Sciences*, 121(3), e2312249121.
- Del Toro, J., & Wang, M. T. (2023). Online racism and mental health among Black American adolescents in 2020. *Journal of the American Academy of Child & Adolescent Psychiatry*, 62(1), 25–36.

- Eilam, N., Edmunds, J., Gicheva, D., Arshavsky, N., Hutchins, B., Visser, M. (2026). The Effect of COVID-19 on Postsecondary Enrollment and Persistence: Evidence from North Carolina. Working Paper.
- Fahle, E. M., Kane, T. J., Patterson, T., Reardon, S. F., Staiger, D. O., & Stuart, E. A. (2025). School district and community factors associated with test score declines during the COVID-19 pandemic. *Teachers College Record*, 127(6–7), 87–123.
- Fuller, S. C., Swiderski, T., Mikkelsen, C., & Bastian, K. C. (2025). In School, Engaged, on Track? The Effect of the Pandemic on Student Attendance, Course Grades, and Grade Retention in North Carolina. *Educational Researcher*, 54(2), 78-90.
- Goldhaber, D., Kane, T. J., McEachin, A., Morton, E., Patterson, T., & Staiger, D. O. (2023). The educational consequences of remote and hybrid instruction during the pandemic. *American Economic Review: Insights*, 5(3), 377–392.
- Hanushek, E. A. & Strauss, B. (2024) United States: The size and variation of the pandemic learning losses. In Ed. Crato, N. & Patrinos, H.A., *Improving National Education Systems After COVID-19: Moving Forward After PIRLS 2021 and PISA 2022*. Springer, 189-203.
- Hooper, M. W., Nápoles, A. M., & Pérez-Stable, E. J. (2020). COVID-19 and racial/ethnic disparities. *JAMA*, 323(24), 2466–2467.
- Howell, J., Hurwitz, M., Ma, J., Pender, M., Perfetto, G., Wyatt, J., & Young, L. (2021). *College enrollment and retention in the era of COVID*. Retrieved from Princeton, NJ: <https://research.collegeboard.org/media/pdf/enrollment-retention-covid2020.pdf>

- Howell, J., Hurwitz, M., Ma, J., Pender, M., Perfetto, G., & Wyatt, J. (2022). *College enrollment and retention in the era of COVID: Fall 2021 update on continued pandemic impacts*. College Board.
https://research.collegeboard.org/media/pdf/enrollment_retention_covid2021_post.pdf.
- Hu, K., Godfrey, K., Ren, Q., Wang, S., Yang, X., & Li, Q. (2022). The impact of the COVID-19 pandemic on college students in USA: Two years later. *Psychiatry research*, 315, 114685.
- Hutchins, B., Arshavsky, N., Edmunds, J., Eilam, N., Gicheva, D. (2026). Staff and Students' Perceptions of the Influence of the COVID-19 Pandemic on Students' High School and Postsecondary Experiences. Working Paper.
- Jack, R., Halloran, C., Okun, J., & Oster, E. (2023). Pandemic schooling mode and student test scores: Evidence from US school districts. *American Economic Review: Insights*, 5(2), 173-190. doi:<https://doi.org/10.1257/aeri.20210748>
- Jack, R. & Oster, E. (2023). COVID-19, school closures and outcomes. *The Journal of Economic Perspectives*, 37:4, 51-70.
- Jaggars, S. S., Motz, B. A., Rivera, M. D., Heckler, A., Quick, J. D., Hance, E. A., & Karwisch, C. (2021). The Digital Divide among College Students: Lessons Learned from the COVID-19 Emergency Transition. Policy Report. *Midwestern Higher Education Compact*.
- Katz, V. S., Jordan, A. B., & Ognyanova, K. (2025). Digital inequalities and US undergraduate outcomes over the first two years of the COVID-19 pandemic. *PloS one*, 20(3), e0319000.

- Kuhfeld, M., Soland, J., & Lewis, K. (2022). Test score patterns across three COVID-19-impacted school years. *Educational Researcher*, 51(7), 500-506.
- Kuperman, V., Geva, E., Taler, V., & Thériault, K. (2025). Recovery from university grade inflation after the COVID-19 pandemic varies by faculty. *Studies in Higher Education*, 1-16.
- Lewis, K., & Kuhfeld, M. (2023). Education's Long COVID: 2022-23 Achievement Data Reveal Stalled Progress toward Pandemic Recovery. *Center for School and Student Progress at NWEA*.
- Lyu, W., & Wehby, G. L. (2023). Child flourishing, school engagement, physical activity, and screen time during the coronavirus disease 2019 pandemic in 2020. *Academic pediatrics*, 23(3), 659-666.
- Magesh, S., John, D., Li, W. T., Li, Y., Mattingly-App, A., Jain, S., Chang, E. Y., & Ongkeko, W. M. (2021). Disparities in COVID-19 outcomes by race, ethnicity, and socioeconomic status: a systematic review and meta-analysis. *JAMA Network Open*, 4(11), e2134147.
- Maiya, S., Dotterer, A. M., & Whiteman, S. D. (2021). Longitudinal changes in adolescents' school bonding during the COVID-19 pandemic: Individual, parenting, and family correlates. *Journal of Research on Adolescence*, 31(3), 808-819.
- Means, B., Toyama, Y., Murphy, R., & Baki, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. *Teachers college record*, 115(3), 1-47.

- National Center for Education Statistics. (2022). Undergraduate Retention and Graduation Rates. *Condition of Education*. U.S. Department of Education, Institute of Education Sciences. Retrieved 9/11/2025 from <https://nces.ed.gov/programs/coe/indicator/ctr>.
- National Student Clearinghouse Research Center (2025). Persistence and Retention. National Student Clearinghouse. Retrieved 9/11/2025 from <https://nscresearchcenter.org/persistence-retention/>
- Parenteau, A. M., Boyer, C. J., Campos, L. J., Carranza, A. F., Deer, L. K., Hartman, D. T., ... & Hostinar, C. E. (2023). A review of mental health disparities during COVID-19: Evidence, mechanisms, and policy recommendations for promoting societal resilience. *Development and Psychopathology*, 35(4), 1821-1842.
- Polikof, M., Clay, I., & Silver, D. (2023). Beyond Test Scores: Broader Academic Consequences of the COVID-19 Pandemic on American Students. Report from a Consensus Panel. *Center on Reinventing Public Education*.
- Rodríguez-Planas, N. (2022a). Hitting where it hurts most: COVID-19 and low-income urban college students. *Economics of Education Review*, 87, 102233.
- Rodríguez-Planas, N. (2022b). COVID-19, college academic performance, and the flexible grading policy: A longitudinal analysis. *Journal of Public Economics*, 207, 104606.
- Ross, T., Kena, G., Rathbun, A., KewalRamani, A., Zhang, J., Kristapovich, P., and Manning, E. (2012). *Higher Education: Gaps in Access and Persistence Study* (NCES 2012-046). U.S. Department of Education, National Center for Education Statistics. Washington, DC: Government Printing Office.

Strohl, J., Gulish, A. & Morris C. (2024) The future of good jobs: Projections through 2031.

Washington, DC: Georgetown University Center on Education and the Workforce.

Retrieved 9/11/2025 from cew.georgetown.edu/goodjobsprojections2031.

Tippet, R. & Kahn, N. (2018) Postsecondary enrollments report: 2009-2016 North Carolina

public high school graduates. MyFuture NC Data Brief. <https://www.myfuturenc.org/wp-content/uploads/2018/09/DataBrief-College-Access-FINAL2.pdf>

Westrick, P. A., Angehr, E. L., Shaw, E. J., & Marini, J. P. (2024). Recent Trends in College

Readiness and Subsequent College Performance: With Faculty Perspectives on Student Readiness. Technical Report, *College Board*,

<https://research.collegeboard.org/reports/college-access/recent-trends-college-readiness>.

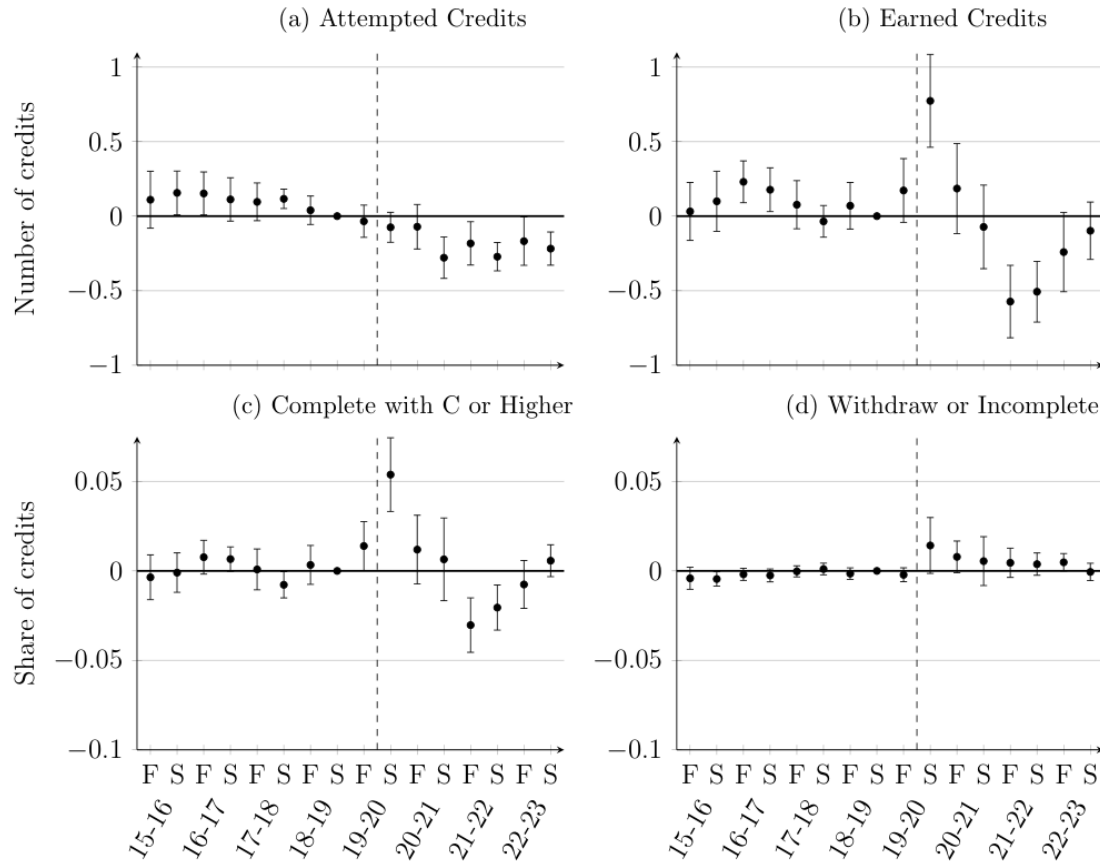
Table 1: Sample Descriptive Statistics

	Cohort				
	2018	2019	2020	2021	2022
A. Four-Year Institutions					
Female	0.578	0.589	0.597***	0.596***	0.588
Economically disadvantaged	0.389	0.395	0.400**	0.399**	0.380**
English language learner	0.030	0.063***	0.074***	0.062***	0.058***
Student with disability	0.043	0.052***	0.050***	0.057***	0.056***
Black	0.230	0.229	0.228	0.238**	0.222**
Hispanic	0.063	0.071***	0.082***	0.087***	0.091***
American Indian	0.009	0.009	0.009	0.009	0.009
Asian	0.052	0.054	0.061***	0.064***	0.070***
White	0.591	0.582**	0.576***	0.557***	0.558***
High school GPA below median	0.179	0.196***	0.196***	0.219***	0.205***
Weighted high school GPA	4.130	3.775***	3.816***	3.842***	3.927***
	(0.638)	(0.509)	(0.511)	(0.543)	(0.552)
Number of students	27744	27214	26498	26928	24770
B. Two-Year Institutions					
Female	0.528	0.535	0.546***	0.533	0.532
Economically disadvantaged	0.590	0.614***	0.587	0.581**	0.578***
English language learner	0.098	0.147***	0.146***	0.128***	0.135***
Student with disability	0.128	0.146***	0.135**	0.138***	0.144***
Black	0.199	0.201	0.186***	0.175***	0.187***
Hispanic	0.144	0.157***	0.163***	0.173***	0.190***
American Indian	0.012	0.011	0.011	0.010**	0.009***
Asian	0.026	0.025	0.027	0.029*	0.029*
White	0.565	0.551***	0.567	0.567	0.539***
High school GPA below median	0.624	0.633**	0.607***	0.595***	0.622
Weighted high school GPA	3.197	3.018***	3.094***	3.154***	3.136***
	(0.783)	(0.693)	(0.716)	(0.727)	(0.779)
Number of students	25001	26512	24137	23192	22384

Note: Stars denote statistically significant differences from the 2018 cohort means. Standard deviations for the continuous variables are shown in parentheses.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Figure 1: Credit Earning at Four-Year Institutions



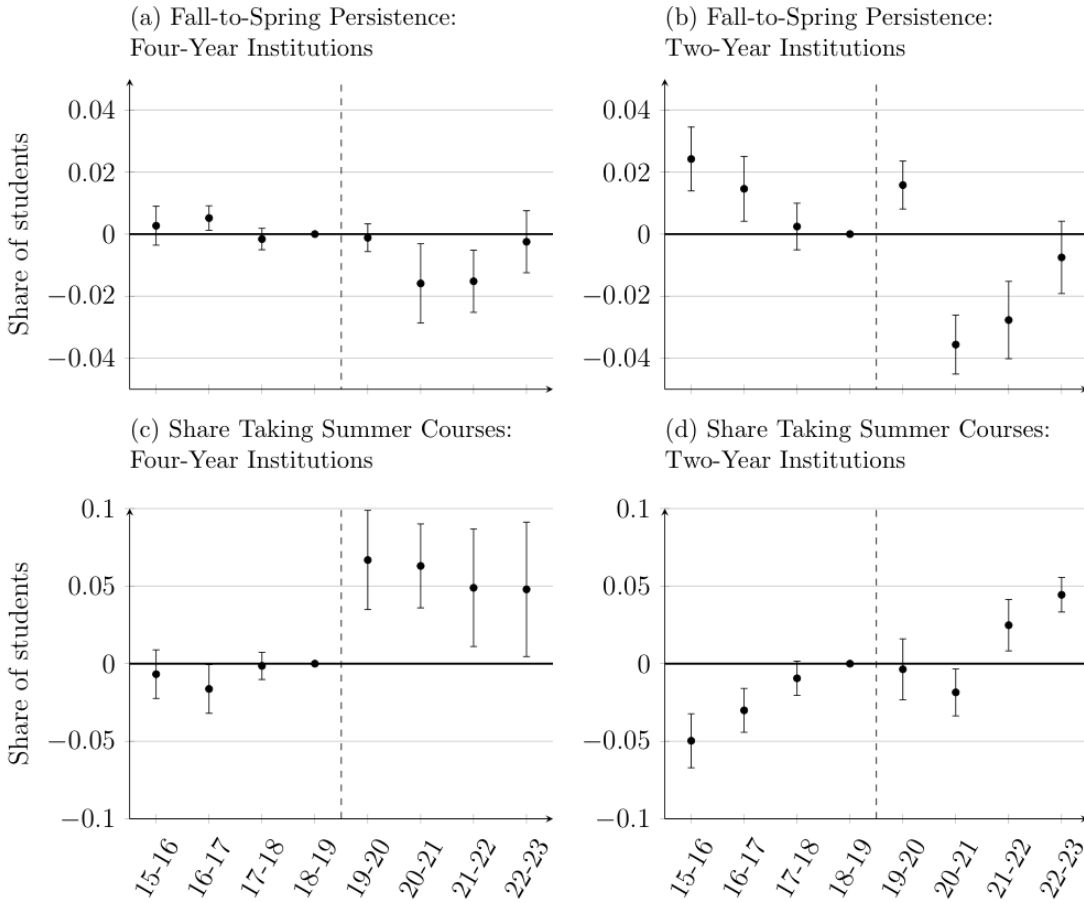
Note: Coefficient estimates and 95% confidence intervals for the model in equation (1) representing the covariate-adjusted difference in each outcome relative to the Spring 2019 semester. The sample consists of 210,008 unique student observations. The dependent variables are adjusted for underlying pre-pandemic differences between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure 1 consists of four scatter plots, (a) through (d), showing the distribution of credit types across semesters from 15-16 to 22-23. A vertical dashed line is present in all plots at the 19-20 semester boundary.

- (a) Attempted Credits:** The Y-axis is 'Number of credits' ranging from -1 to 1. Data points are black dots with vertical error bars. The distribution is centered around 0, with a slight increase in positive values after the 19-20 semester.
- (b) Earned Credits:** The Y-axis is 'Number of credits' ranging from -1 to 1. Data points are black dots with vertical error bars. The distribution is centered around 0, with a slight increase in positive values after the 19-20 semester.
- (c) Complete with C or Higher:** The Y-axis is 'Share of credits' ranging from -0.1 to 0.05. Data points are black dots with vertical error bars. The distribution is centered around 0, with a slight increase in positive values after the 19-20 semester.
- (d) Withdraw or Incomplete:** The Y-axis is 'Share of credits' ranging from 0 to 0.1. Data points are black dots with vertical error bars. The distribution is centered around 0, with a slight increase in positive values after the 19-20 semester.

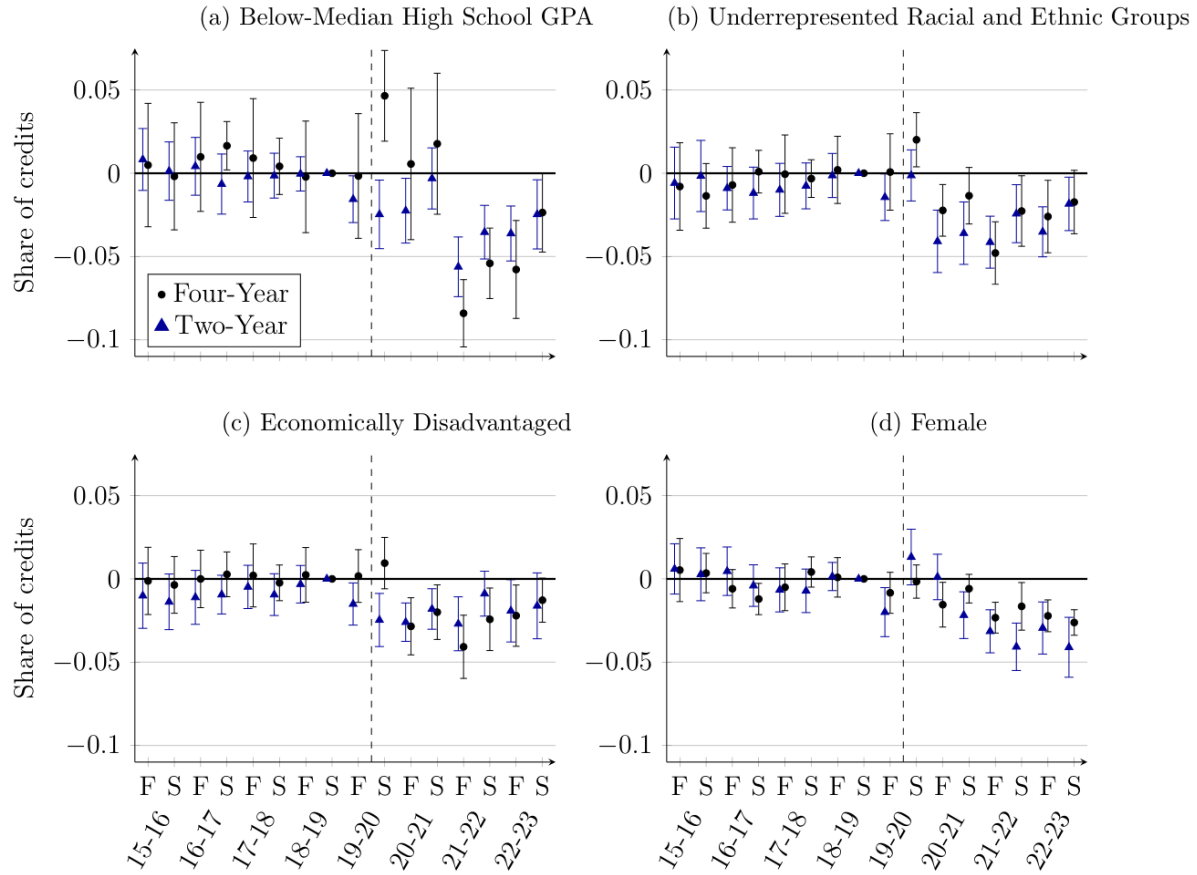
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Figure 3: Fall-to-Spring Persistence and Summer Enrollment after the First Year



Note: Coefficient estimates and 95% confidence intervals for the model in equation (1) representing the covariate-adjusted difference in each outcome relative to the 2018-19 academic year. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure 4: Successful Course Completion by Subgroup



Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its Spring 2019 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic differences between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Postsecondary Gaps in Recovery from the COVID-19 Pandemic: Evidence from Public Colleges and Universities

ONLINE APPENDIX

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A. Detailed Methodology

a. *Frequency of Outcome Observation*

We conduct the event study analyses at the student-semester level for the outcomes that allow this, namely the number of attempted and earned credits, the share of classes completed successfully, and the share of withdrawals or incompletes. In these cases, the subscript t in equations (1) and (2) indexes semesters. For outcomes measured once per year (summer course-taking and fall-to-spring persistence), t indexes academic years.

b. *Controlling for Seasonal Variations*

We control for seasonal variations in outcomes y_{ijst} measured with semester frequency by using data for the 2015 – 2018 cohorts to estimate:

$$y_{ijst} = \alpha_0 + \alpha_1 Fall_t + e_{it}$$

The indicator for fall terms allows for each outcome's mean value to differ in the fall and spring semesters. We then construct seasonally adjusted outcomes y_{ijst}^* for the full sample period as the difference between the actual and predicted outcome and use these values in the main event study model.

When conducting heterogeneity analyses, we control for seasonal variations in each of the outcomes separately by subgroup by interacting the fall term indicator with subgroup indicators in a separate regression for each subgroup category. For example, we estimate semester-specific intercepts for female and male students and also for economically disadvantaged and non-disadvantaged students, but not for female economically disadvantaged

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students. Specifically, given the binary indicator for subgroup membership Z_i , we account for fall-versus-spring variations using data only for the 2015 – 2018 cohorts to estimate:

$$y_{it} = \alpha_{0i} + \alpha_{1i}(Fall_t \times Z_i) + e_{it}$$

for each of the outcomes used in the event study models. As before, we use the coefficient estimates from the model above to construct adjusted values for the outcomes of interest for all years in the data, given by the difference between the actual and predicted values of each outcome, which we use in equation (2). This approach allows for the academic performance of different groups of students to exhibit different seasonal variations but relies on the assumption that the pre-2020 seasonal trends for each subgroup can be extrapolated for the post-2020 period.

B. Supplementary Results

Table B1: Baseline Outcome Means

	Four-year institutions		Two-year institutions	
	Fall 2018	Spring 2019	Fall 2018	Spring 2019
Attempted credits	14.80	14.89	11.31	11.38
(excluding developmental education)	(1.742)	(1.995)	(3.972)	(3.937)
Full-time status (12+ attempted credits)	0.985	0.978	0.604	0.591
Earned credits	12.26	12.23	8.49	8.46
	(4.297)	(4.495)	(5.294)	(5.378)
Share of credits completed with C or higher	0.835	0.823	0.661	0.644
Share of withdrawals or incompletes	0.034	0.043	0.129	0.142
Share of credits completed with D or F	0.125	0.131	0.210	0.214
Fall-to-spring persistence	0.951		0.796	
Share of students taking summer courses		0.201		0.303

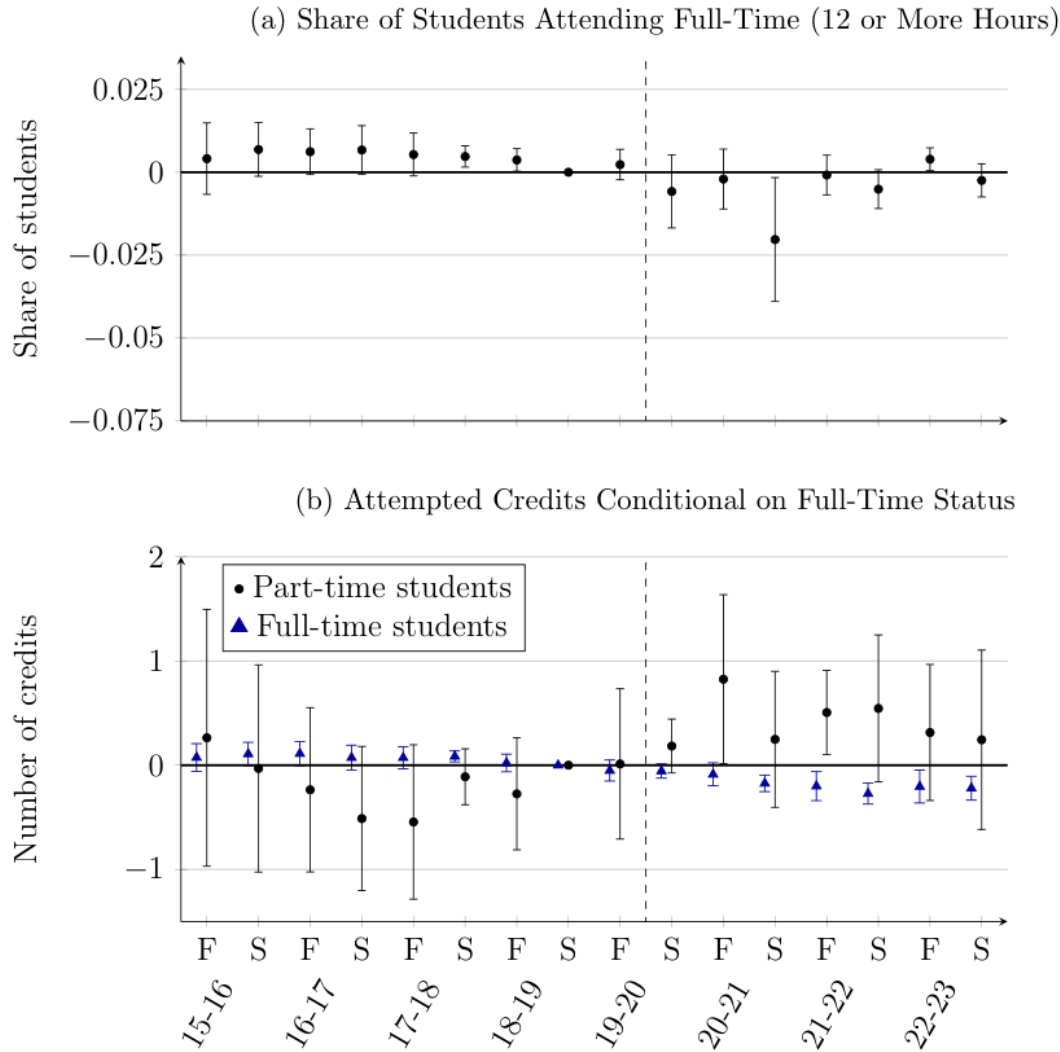
Note: The table shows means and standard deviations for the continuous variables (in parentheses).

Table B2: Post-Pandemic Enrollment Trends

	Cohort				
	2018	2019	2020	2021	2022
A. Share of High School Graduates Enrolling in Four-Year Institutions					
Females	0.307	0.301	0.299	0.304	0.298
Males	0.223	0.213	0.203	0.210	0.209
Economically disadvantaged	0.173	0.166	0.163	0.171	0.164
Not economically disadvantaged	0.404	0.401	0.392	0.388	0.381
English language learners	0.095	0.129	0.136	0.130	0.12
Non-ELL	0.282	0.276	0.27	0.275	0.272
Students with disability	0.087	0.091	0.085	0.102	0.097
Students without disability	0.293	0.286	0.28	0.283	0.28
Black	0.242	0.236	0.235	0.26	0.243
Hispanic	0.128	0.127	0.129	0.134	0.132
American Indian	0.213	0.228	0.205	0.228	0.239
Asian	0.464	0.460	0.470	0.477	0.499
White	0.302	0.294	0.287	0.284	0.283
High school GPA below median	0.085	0.089	0.087	0.1	0.091
High school GPA above median	0.500	0.485	0.479	0.47	0.477
High school GPA in top quartile	0.612	0.592	0.586	0.572	0.579
B. Share of High School Graduates Enrolling in Two-Year Institutions					
Females	0.290	0.301	0.278	0.275	0.288
Males	0.249	0.250	0.224	0.231	0.241
Economically disadvantaged	0.252	0.263	0.231	0.231	0.243
Not economically disadvantaged	0.295	0.295	0.283	0.287	0.296
English language learners	0.286	0.302	0.255	0.248	0.269
Non-ELL	0.268	0.272	0.25	0.254	0.264
Students with disability	0.242	0.260	0.222	0.227	0.241
Students without disability	0.274	0.278	0.256	0.258	0.269
Black	0.209	0.216	0.189	0.184	0.205
Hispanic	0.277	0.286	0.246	0.25	0.267
American Indian	0.268	0.279	0.258	0.247	0.228
Asian	0.247	0.251	0.237	0.247	0.260
White	0.300	0.304	0.285	0.29	0.295
High school GPA below median	0.277	0.286	0.253	0.242	0.259
High school GPA above median	0.263	0.265	0.253	0.27	0.275
High school GPA in top quartile	0.194	0.205	0.200	0.224	0.238

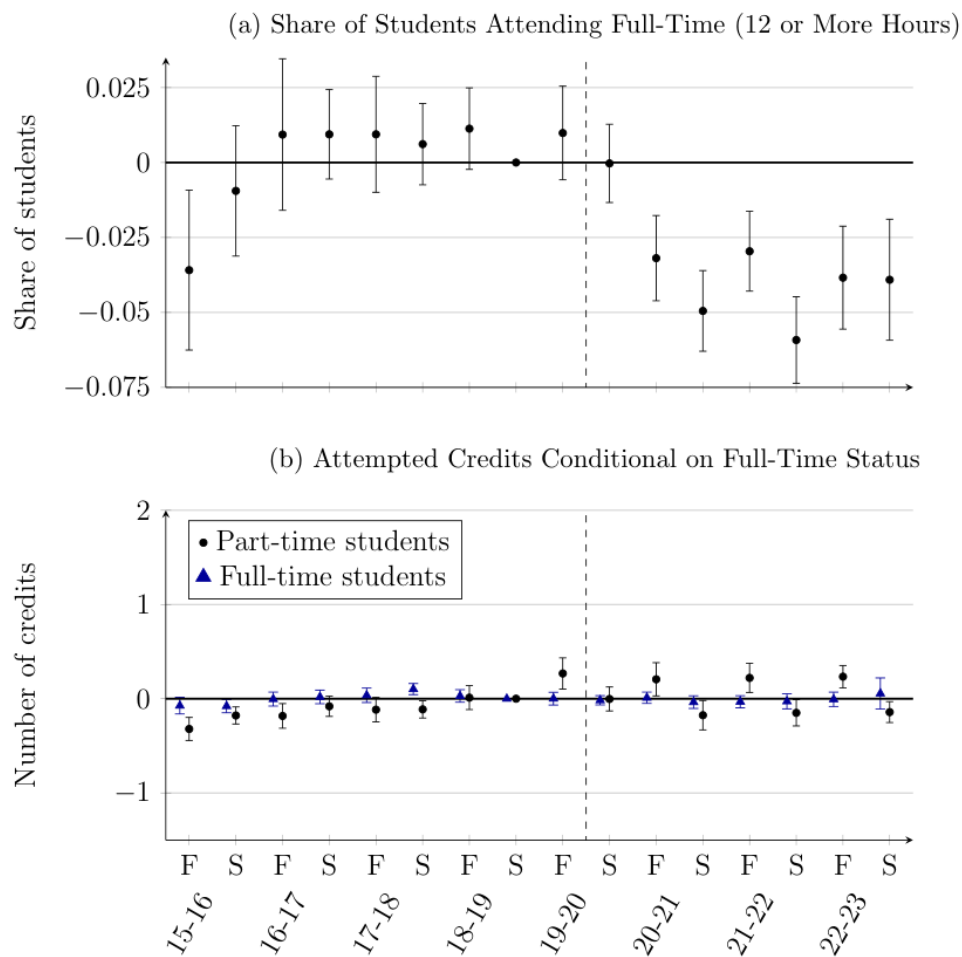
Note: The table shows the share of students from each group enrolling in a four-year (Panel A) or two-year (Panel B) institution in the year after their high school graduation. Students who transferred between the two types of institutions during their first year are counted in both panels.

Figure B1: Full-Time Versus Part-Time Status at Four-Year Institutions



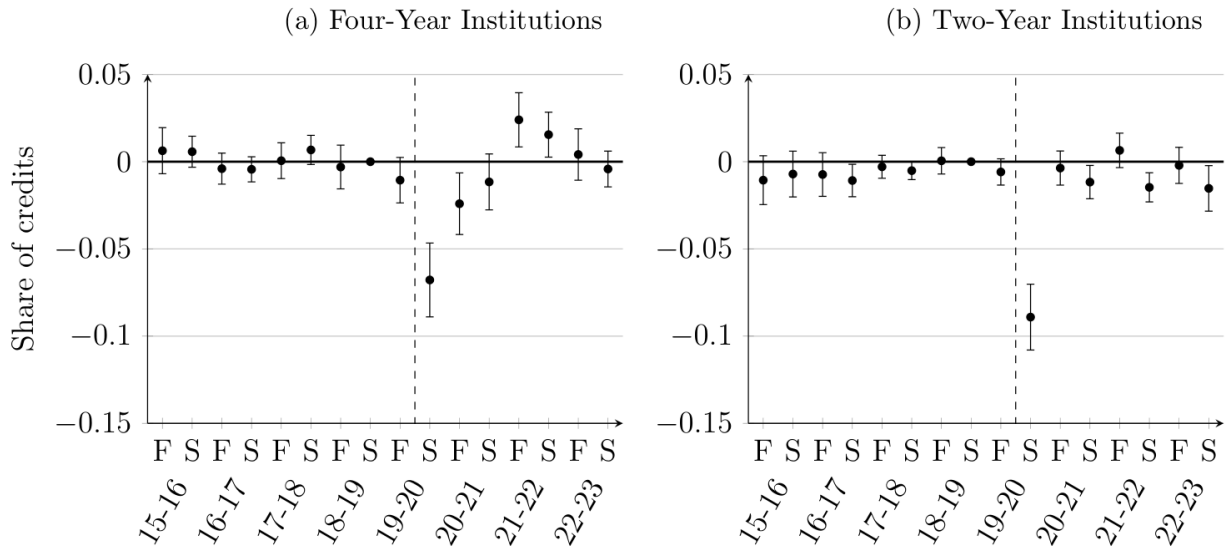
Note: Coefficient estimates and 95% confidence intervals for the model in equation (1) representing the covariate-adjusted difference in the outcome relative to the Spring 2019 semester. Each set of coefficient estimates in panel (b) comes from a separate regression. The dependent variables are adjusted for underlying pre-pandemic differences between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B2: Full-Time Versus Part-Time Status at Two-Year Institutions



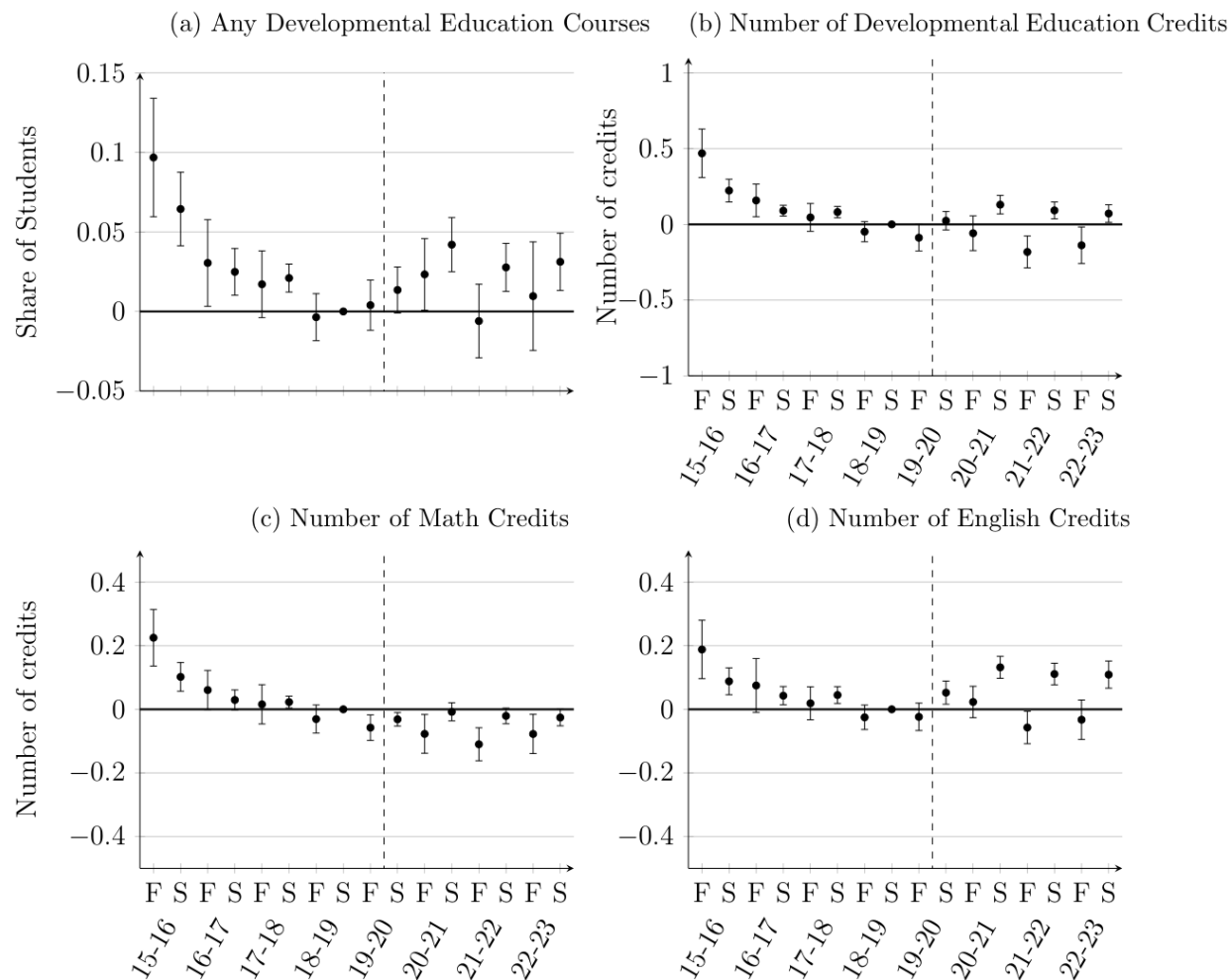
Note: Coefficient estimates and 95% confidence intervals for the model in equation (1) representing the covariate-adjusted difference in the outcome relative to the Spring 2019 semester. Each set of coefficient estimates in panel (b) comes from a separate regression. The dependent variables are adjusted for underlying pre-pandemic differences between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B3: Share of Classes Completed with D or F



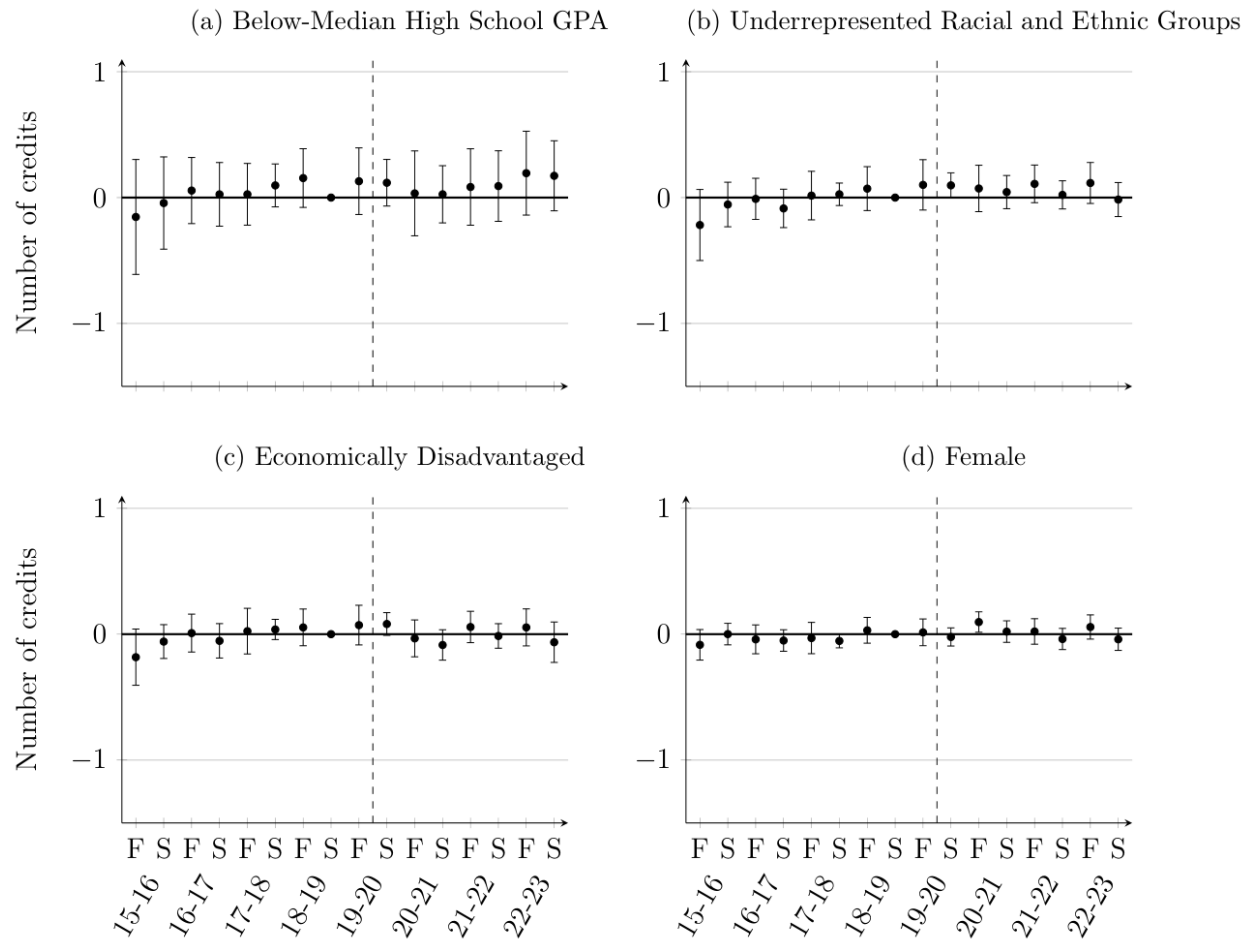
Note: Coefficient estimates and 95% confidence intervals for the model in equation (1) representing the covariate-adjusted difference in the outcome relative to the Spring 2019 semester. The dependent variables are adjusted for underlying pre-pandemic differences between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B4: Attempted Developmental Education Credits at Two-Year Institutions



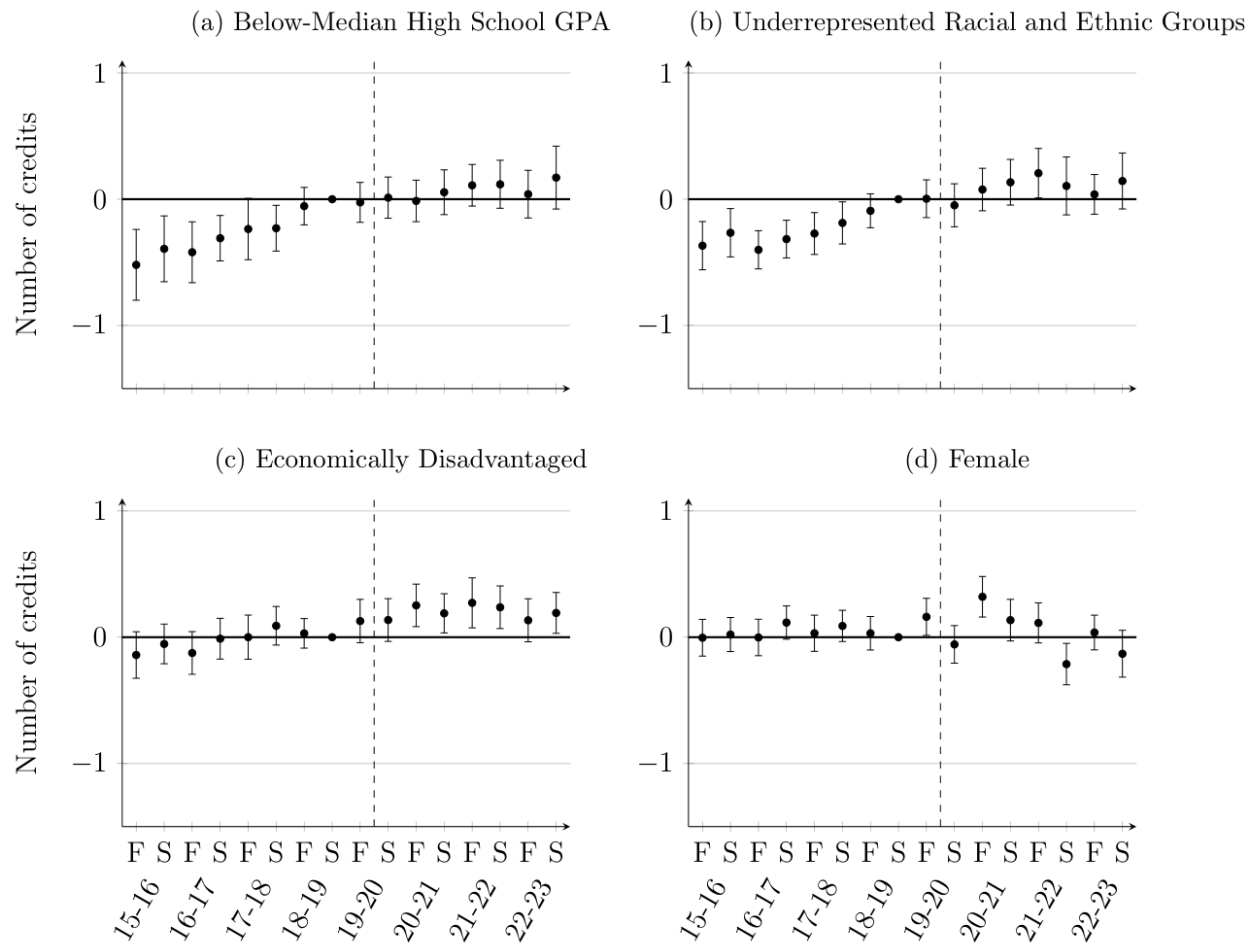
Note: Coefficient estimates and 95% confidence intervals for the model in equation (1) representing the covariate-adjusted difference in the outcome relative to the Spring 2019 semester. Students enrolled only in developmental education courses, who account for 0.23% of the population we study, are excluded from the sample. The dependent variables are adjusted for underlying pre-pandemic differences between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B5: Attempted Credits by Subgroup: Four-Year Institutions



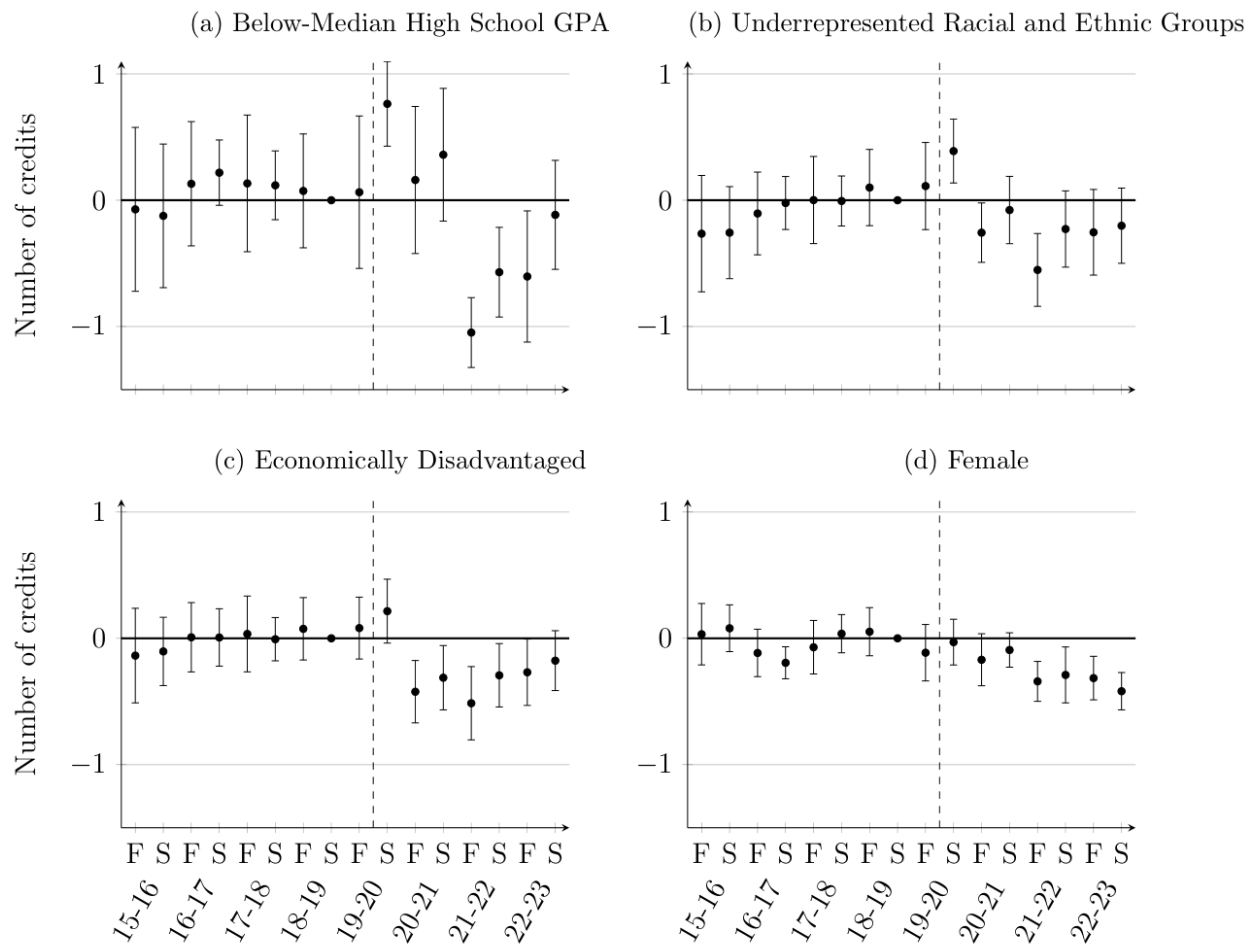
Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its Spring 2019 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B6: Attempted Credits by Subgroup: Two-Year Institutions



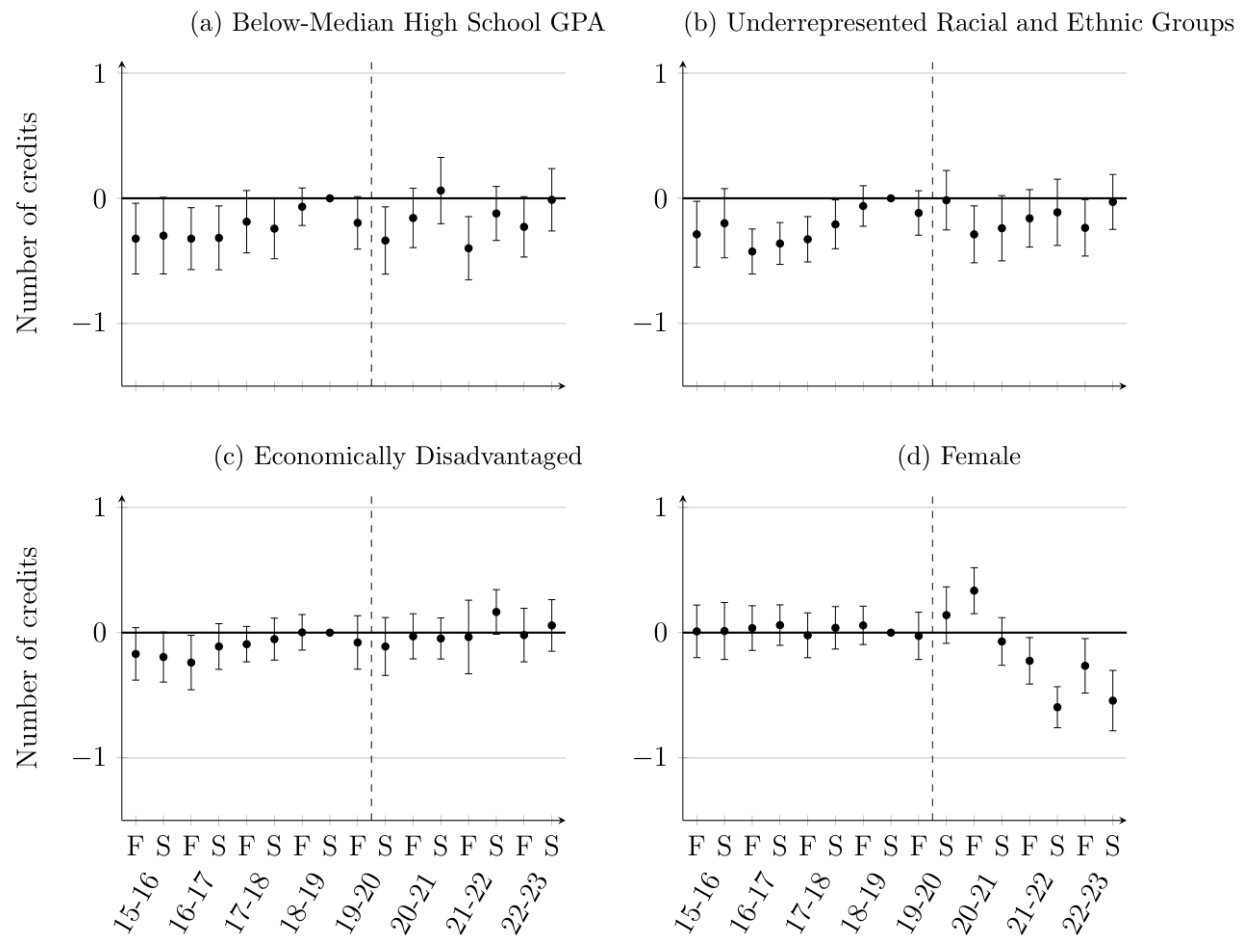
Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its Spring 2019 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B7: Earned Credits by Subgroup: Four-Year Institutions

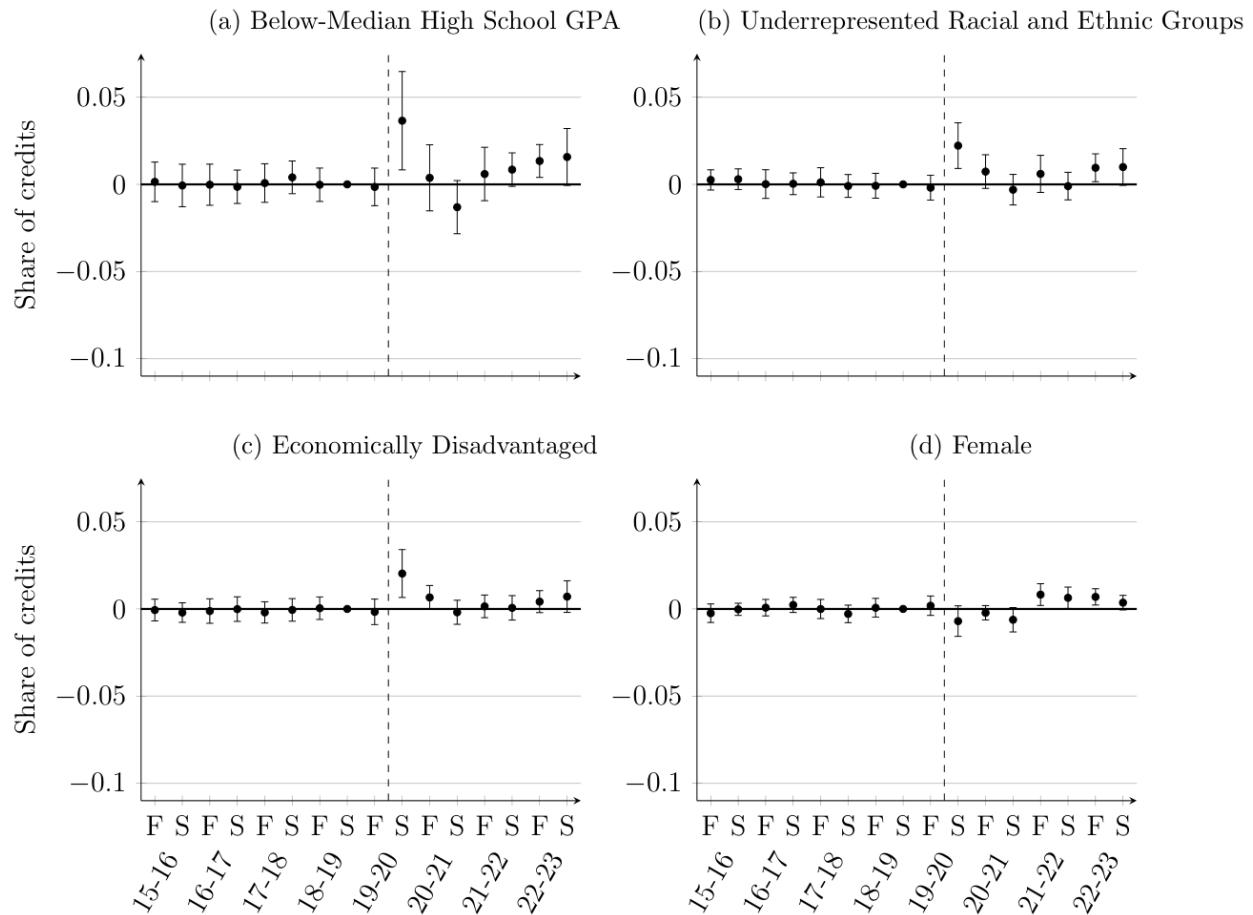


Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its Spring 2019 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its Spring 2019 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.



Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its Spring 2019 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.



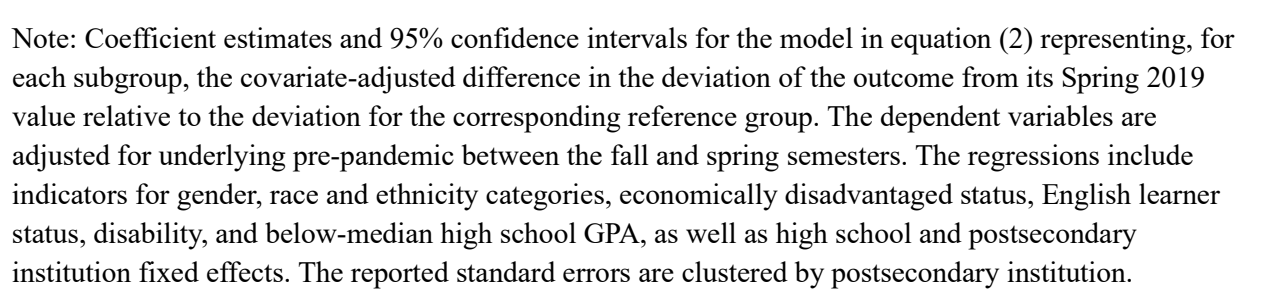
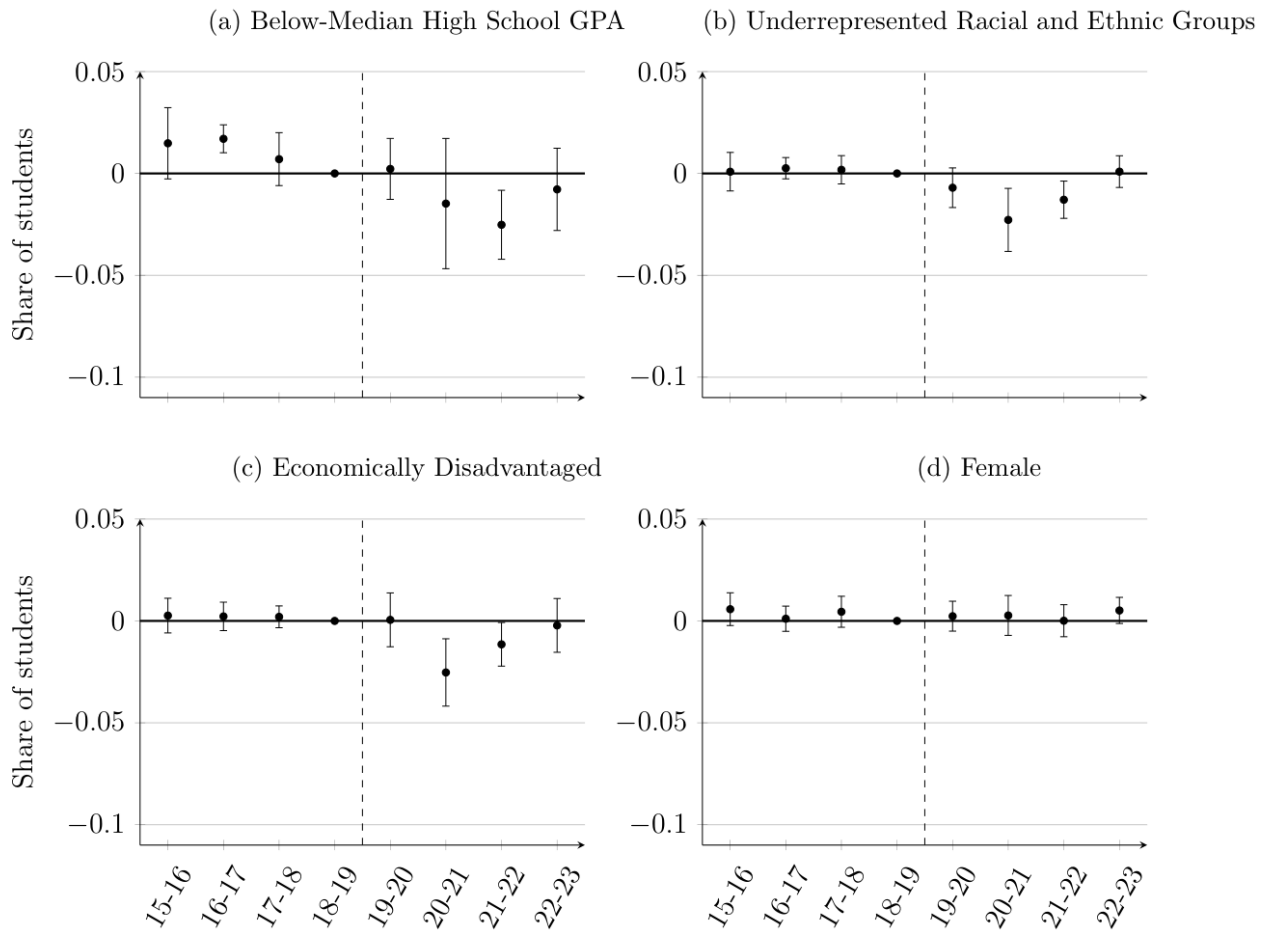
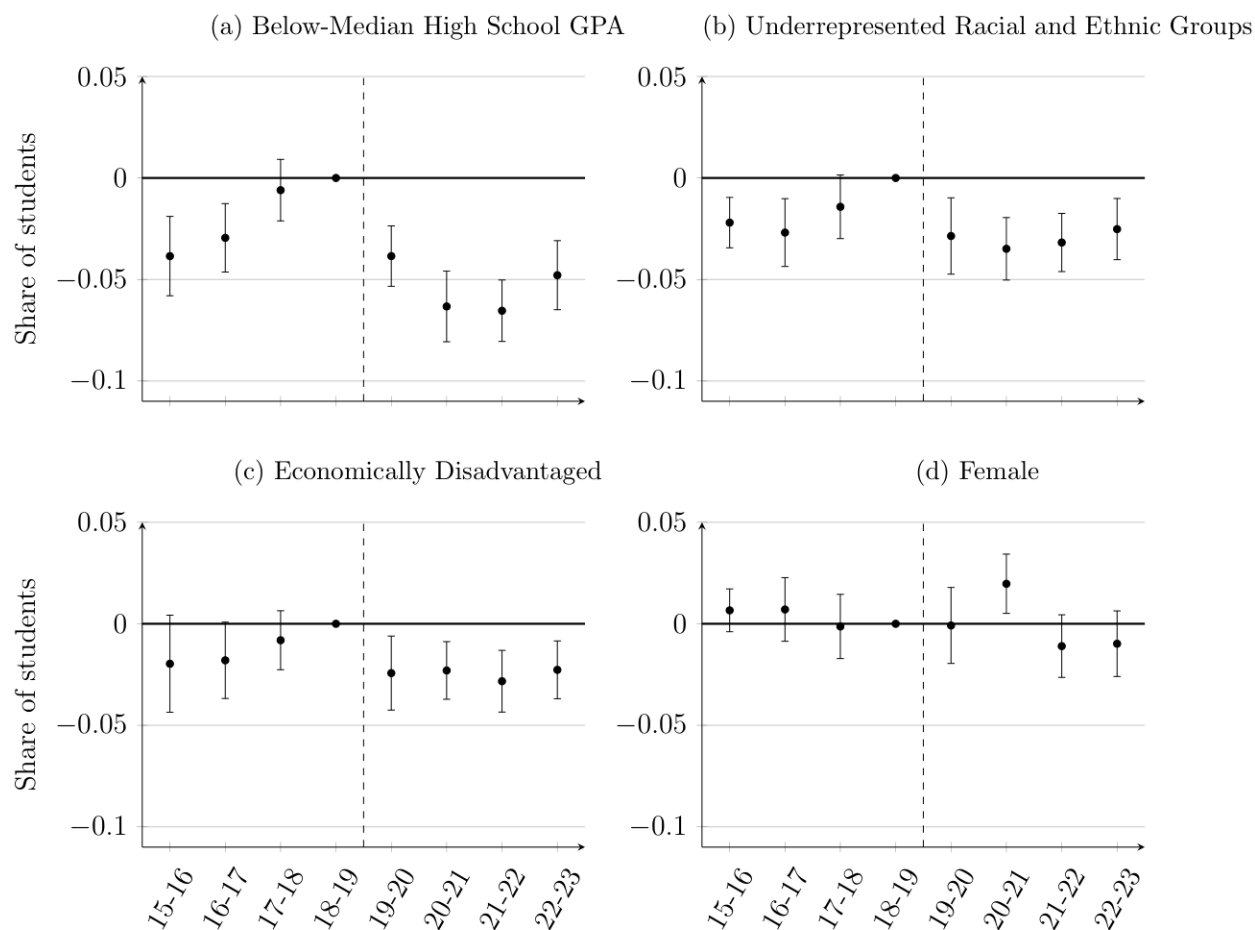


Figure B11: Fall-to-Spring Persistence by Subgroup: Four-Year Institutions



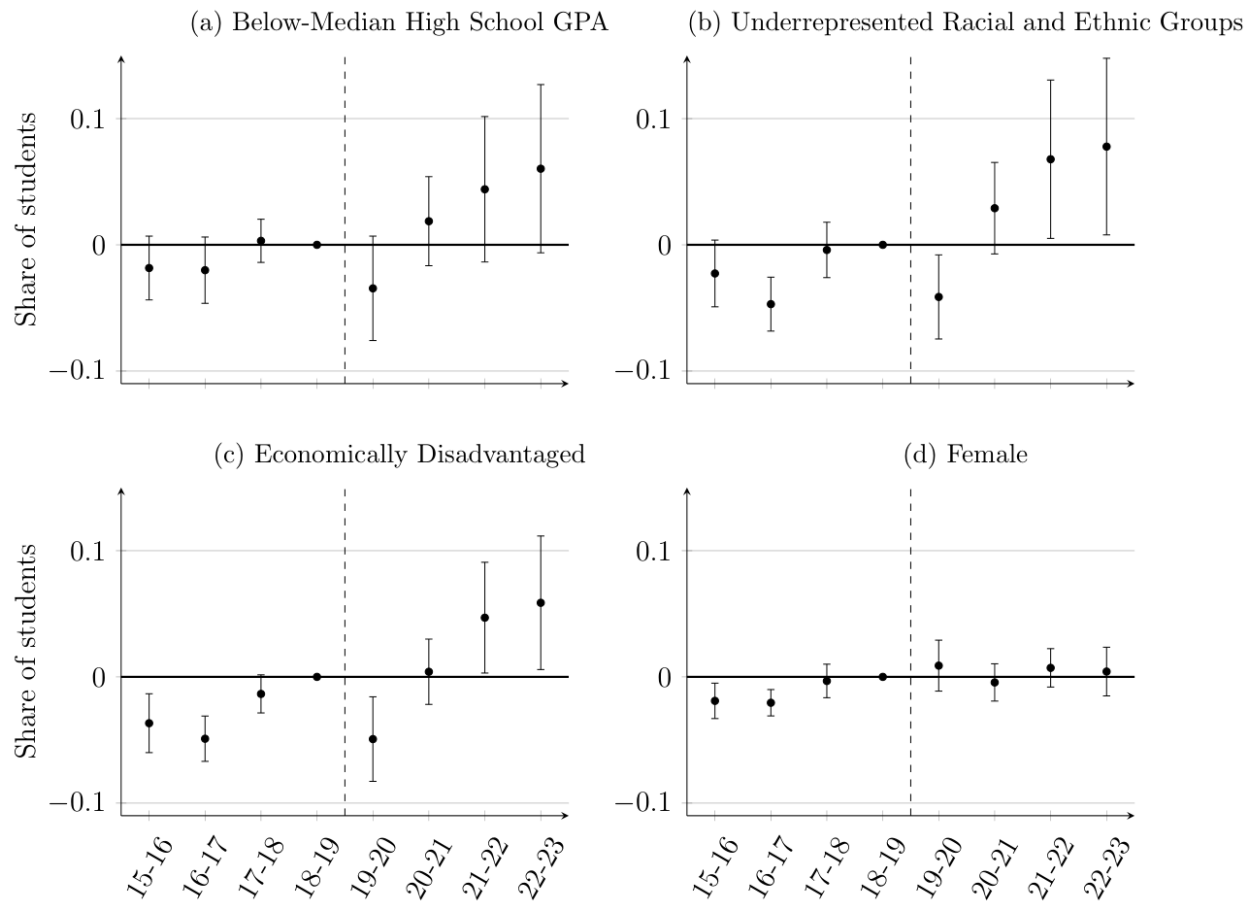
Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its 2018-19 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B12: Fall-to-Spring Persistence by Subgroup: Two-Year Institutions



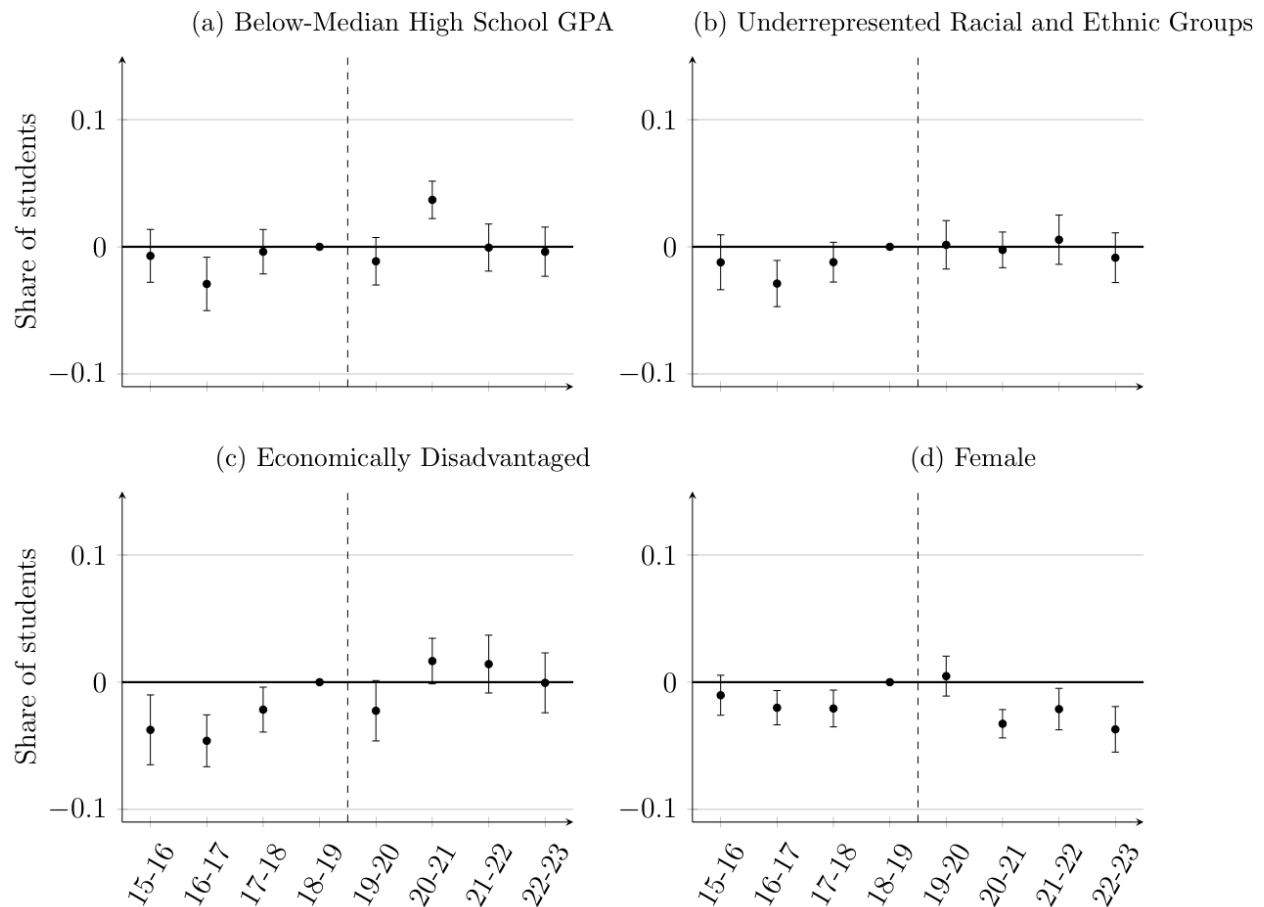
Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its 2018-19 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B13: Summer Coursetaking by Subgroup: Four-Year Institutions



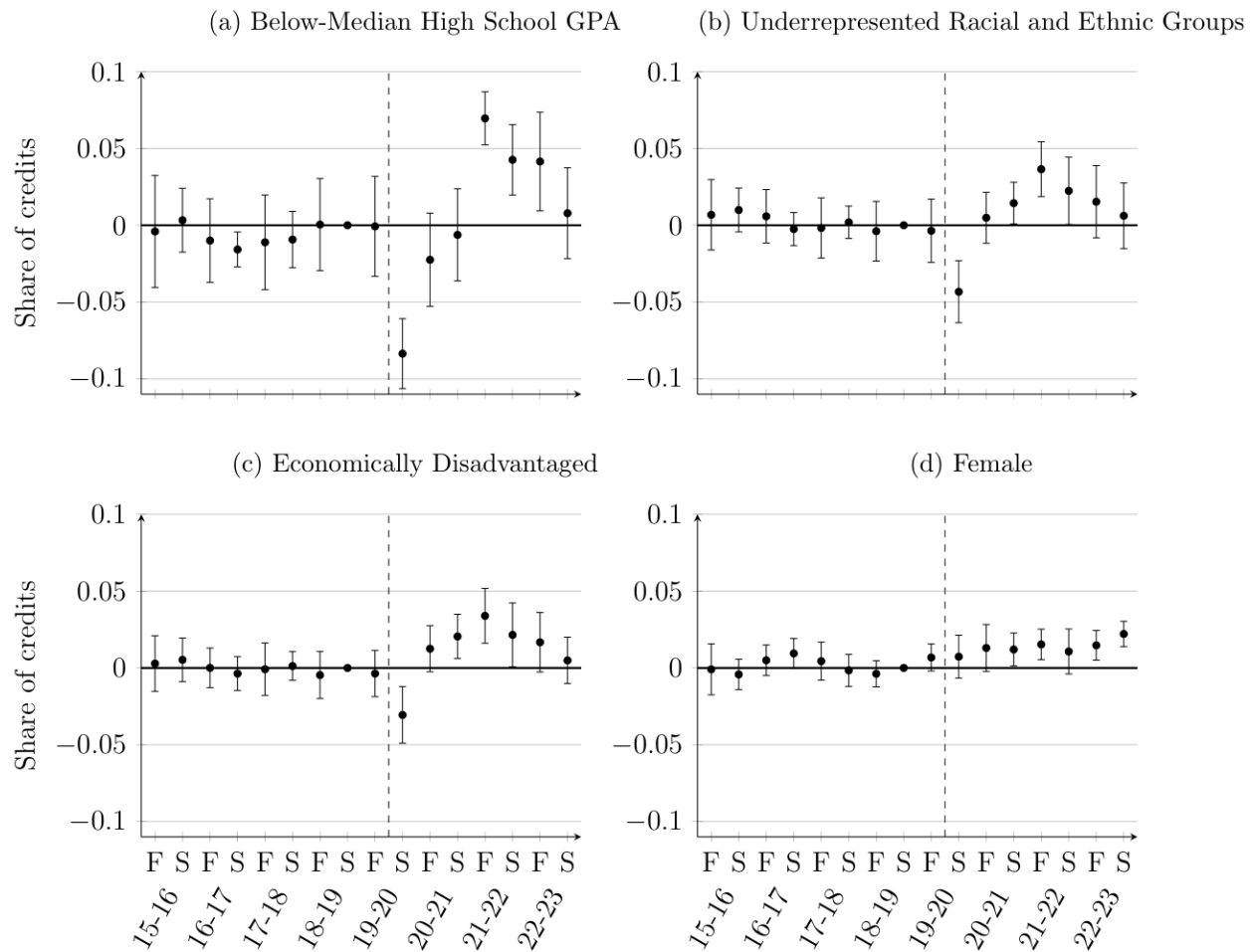
Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its 2018-19 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B14: Summer Coursetaking by Subgroup: Two-Year Institutions



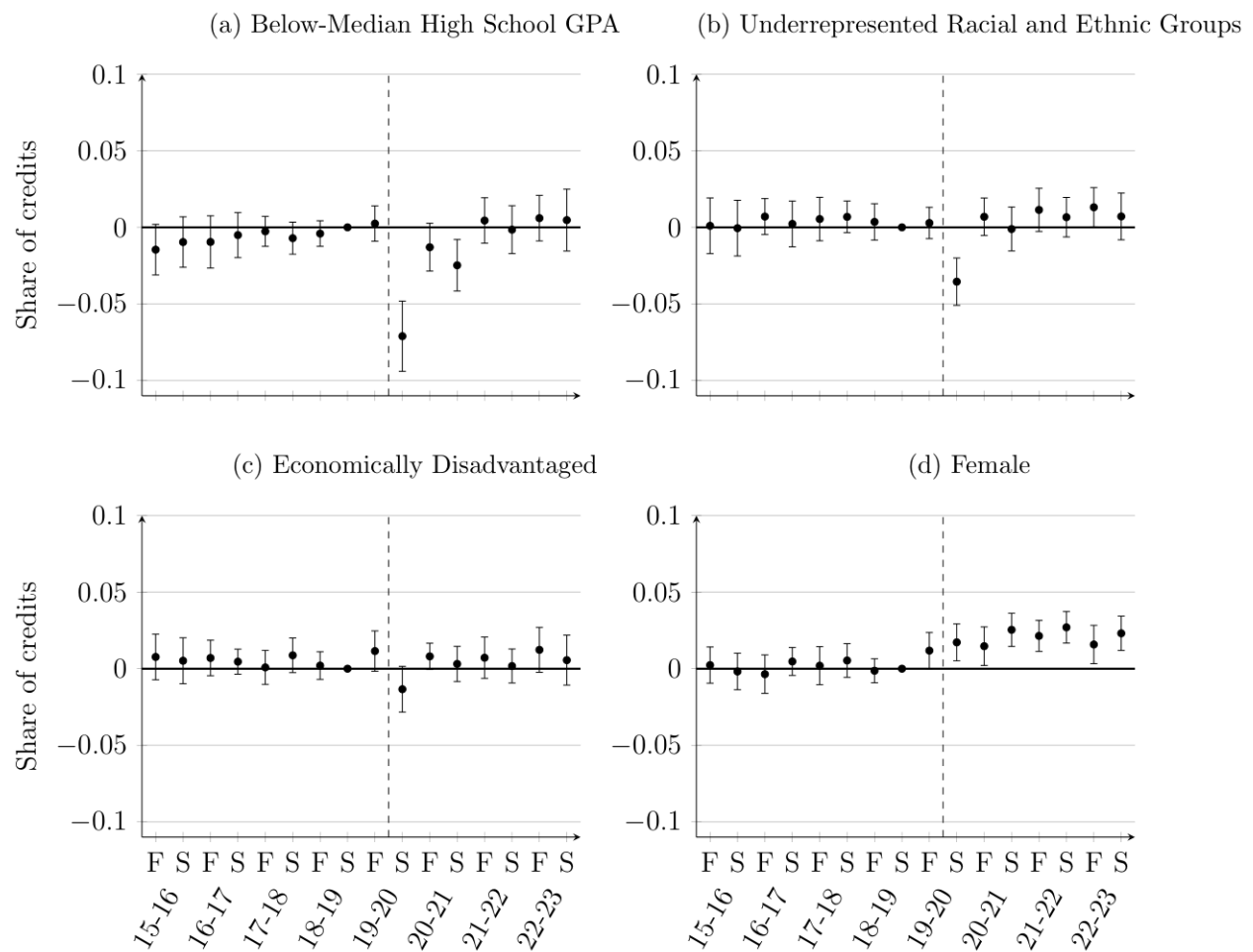
Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its 2018-19 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B15: *D's and F's by Subgroup: Four-Year Institutions*



Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its 2018-19 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.

Figure B16: *D's and F's by Subgroup: Two-Year Institutions*



Note: Coefficient estimates and 95% confidence intervals for the model in equation (2) representing, for each subgroup, the covariate-adjusted difference in the deviation of the outcome from its 2018-19 value relative to the deviation for the corresponding reference group. The dependent variables are adjusted for underlying pre-pandemic between the fall and spring semesters. The regressions include indicators for gender, race and ethnicity categories, economically disadvantaged status, English learner status, disability, and below-median high school GPA, as well as high school and postsecondary institution fixed effects. The reported standard errors are clustered by postsecondary institution.