Divergent Pathways: The Impact of Alternative Pathways to HS Graduation on Student Outcomes

Karen X. Ni *
Harvard Kennedy School

November 15, 2025

Click here for the latest version

Abstract

Over the past decade, many U.S. states have moved away from high-stakes exit exams toward more flexible graduation requirements. In Ohio, this shift includes new career-technical pathways that allow students to demonstrate competency beyond standardized testing. This paper examines how such career-focused alternative graduation pathways affect students who struggle to meet exam standards. Using a regression discontinuity design around the pass/fail cutoff for Ohio's end-of-course (EOC) math exams, I find that passing the Math EOC does not affect high school graduation rates but significantly alters college enrollment patterns: students who barely pass are more likely to attend four-year colleges and about equally less likely to attend two-year colleges. These effects appear to stem from gendered behavioral responses to exam performance and from students' usage of career-technical pathways after failing the exam for the first time. While these initial pathways have broadened access to the diploma, they have not improved persistence in post-secondary education, suggesting that flexibility in graduation requirements may reduce barriers to completion without strengthening college readiness.

*Email: *kni@g.harvard.edu*. I am grateful for the support and guidance of my dissertation committee: Chris Avery, Michela Carlana, and Tom Kane. I also thank Mark Shepard, Luis Armona, Eric Taylor, Larry Katz, Raj Chetty, Amanda Pallais, Ben Hyman, Kyung Park and the seminar participants at Harvard for their helpful feedback and insights. This project would not be possible without the support of Columbus City Schools, especially Russell Brown, Elizabeth McNally, Rosalind Ray, Janet Ligon and the EMIS data team. Funding for this project is generously provided by the Institution of Education Sciences, U.S. Department of Education, through grant R305B150012 to Harvard University.

1 Introduction

Education policy has long reflected a tension between competing objectives: maintaining academic standards for accountability versus providing flexibility to meet diverse student needs. This tension is most clearly reflected in the evolution of high school graduation policies over the last four decades. Between 1980 and the mid-2000s, many states adopted exit exams[1] to enforce accountability and ensure that the high school diploma is attached to an appropriate level of academic proficiency (Dee and Jacob, 2006; McIntosh, 2012). Over time, growing concerns mounted over the negative equity impacts of these rigid high-stakes exams, with evidence that exit exams can increase high school drop out rates among disadvantaged student groups (Dee and Jacob, 2006; Hemelt and Marcotte, 2013; Ou, 2010; Papay et al., 2010), without improving average levels of educational achievement or attainment for the overall student population (Holme et al., 2010; Poquette and Butler, 2018).

In response, most states have since moved away from these exam-centric requirements, and towards more flexible policy structures which allow students to demonstrate competency through multiple channels. By 2025, only six U.S. states still require a formal exit exam, while nearly half of the states now offer multiple graduation pathways, with criteria including career technical coursework, college-readiness benchmarks, and military enlistment (Erwin et al., 2023). Besides lowering the stakes that were formerly attached to exit exams, these pathway reforms also reflect a broader policy movement towards personalizing the high school experience to better align with a diverse set of post-secondary goals. This is especially evident as Career Technical Education (CTE) pathways have gained popularity across the country, allowing high school students to earn industry-recognized credentials and transferrable technical credits for a wide array of college programs (Kistler and Dougherty, 2025). Despite this national shift in trends, it remains unclear how these flexible policies actually affect students' high school and post-secondary success. Does increasing flexibility improve equity in high school outcomes for disadvantaged student groups, or does it simply lower the bar for the diploma without adequately preparing students for post-secondary success?

In this paper, I contribute new evidence on how flexible graduation policies influence students' high school and post-secondary outcomes through the lenses of Ohio's transition into a pathways-based graduation system. In 2014, Ohio shifted from a high-stakes exit exam system, the Ohio Graduation Tests (OGTs), to a more flexible system which combined high school End-of-Course (EOC) exams with alternative graduation pathways. Under the former OGT regime, Ohio students were required to pass a set of comprehensive exit exams to receive a high school diploma, with essentially no alternative avenues beyond earning

[1] Standardized tests which students must pass in order to earn a high school diploma.

the prerequisite scores. The newer EOC system retained the mandatory graduation testing channel, but granted students the flexibility to demonstrate competency through alternative graduation pathways rather than being forced to repeatedly retake exams when they fail.

Using an administrative student-level dataset from Columbus City Schools, Ohio's largest school district, I implement a regression discontinuity design (RDD) around the pass/fail cutoff of the Math EOC to estimate the causal effects of passing the exam requirement on subsequent exposure to career-technical alternative pathways, high school completion, and college enrollment/persistence. I find that marginally passing the Math EOC had no impact on high school persistence or graduation, contrasting with analogous effects from the OGT regime, where exam performance served as a more binding barrier to the diploma. While graduation outcomes were unaffected, marginally passing the Math EOC did significantly influence students' college enrollment choices. During the initial years of the EOC policy implementation, students who barely passed the Math exams were about 9 percentage points more likely to enroll in 4-year college and 12 percentage points less likely to enroll in 2-year college, with no difference in the overall college enrollment rates. These effects were largely driven by female students, who exhibited greater sensitivity to their initial Math EOC results in deciding between 4- and 2-year college enrollment.

Students who struggled to pass the state's EOC requirements were more likely to utilize CTE alternatives than to successfully retake failed exams or select non-CTE pathway options. This pattern holds even among students who barely missed the Math EOC cutoff, as I find that marginally failing the exams on the first try significantly increases the likelihood of completing some form of career-focused pathway activity during subsequent years. These results suggest that students viewed CTE options as viable alternatives to meeting the graduation requirements without repeated testing. Despite the higher overall take up rates of career technical activities, students' average engagement levels with CTE remained fairly low. Very few students completed the workforce-readiness pathway requirements of earning 12 points of industry-recognized credentials, with most opting instead for lower-valued credentials or other minimally engaging options. This variation in the rigor of CTE pathway options was due to early implementation challenges of the EOC system, where lawmakers supplemented the original pathways with two temporary alternatives to help ease the transition towards the new standards. While these additional pathway options helped struggling students earn their diplomas, they diluted the overall rigor and consistency of CTE requirements within the menu of alternatives, leaving many students underprepared for the college programs they subsequently entered. This is especially evident as marginally failing students experienced worse college persistence and completion rates for both 4- and 2-year colleges, in comparison to their peers who narrowly passed. Overall, while early pathway options re-

duced barriers to high school graduation, their inconsistent rigor weakened the link between high school completion and post-secondary success.

To better understand the role of pathway rigor on student outcomes, I compare these initial results with those of later student cohorts who experienced a revised EOC policy with reduced testing burdens and a more rigorously structured CTE pathway. Under the revised system, marginally passing the Math EOC continued to have no effect on high school graduation, but the dynamics of college sorting changed, reflecting broader college access rather than redistribution across college types. Marginally failing students were *more likely* to enroll in college, particularly in 2-year programs, with no change in 4-year enrollment. These students also showed higher levels of engagement with career-technical pathway activities, consistent with the revised policy's emphasis on making pathway options more rigorously structured. Preliminary evidence further suggests that marginally failing students were less likely to drop out of college compared to marginally passing students, reflecting a reversal of trends from the early EOC policy era. Collectively, these results demonstrate that the revised policy maintained lower barriers to graduation while enhancing the CTE pathway to be better aligned with 2-year college trajectories, creating net positive gains for students who pursued those alternatives upon failing the Math EOCs.

This paper contributes to a policy-relevant literature which assesses the implications of alternative graduation pathways on marginal student groups. While many prior studies have documented the impacts of high-stakes exit exams on student's high school completion and college enrollment rates (Dee and Jacob, 2006; Martorell, 2005; Ou, 2010; Papay et al., 2010; Reardon et al., 2010), relatively little is known on the mitigating effects that alternative pathways have on these outcomes. Two notable studies have began to explore the topic of flexible pathways. Hemelt and Marcotte (2013) conduct a national study and provide descriptive evidence that non-test based alternative pathways can help mitigate dropout risks induced by strict exit exam regimes. Cortes et al. (2022) examine the impacts of Maryland's Bridge Program, a project-based alternative pathway offered to students who failed the Maryland High School Assessments. They find that Bridge students were more likely to graduate and be employed than similar matched students, but can also be less likely to attend college. These studies highlight the potential of non-test pathways to lower barriers to graduation but raise new questions on how pathways may induce unintentional consequences on post-secondary sorting. Drawing evidence from three graduation policy regimes in Ohio, this paper provides novel causal evidence on how policy design, particularly the rigor and structure of pathway options, shapes student behavior at the margins.

This paper also bridges together the graduation policy literature and the career-technical education literature by examining the potential tracking implications of CTE-based gradua-

tion pathways. Historically, vocational pathways were tied to exclusionary tracking practices which reinforced existing inequalities by diverting disadvantaged students away from college and towards low-wage work trajectories (Oakes, 1983; Rosenbaum, 1976; Tyack, 1974). Modern day CTE programs seek to reform these inequitable systems by integrating career technical training into mainstream high school curricula to augment student preparation for both college and career paths. Prior studies have documented evidence that contemporary CTE participation is associated with higher on-time graduation rates (Dougherty, 2018; Gable, 2024; Gottfried and Plasman, 2018; Hemelt et al., 2019) and better labor market outcomes (Bishop and Mane, 2004; Brunner et al., 2023). I contribute to this growing literature by assessing how students interact with CTE options when it is offered as an alternative to exit exam requirements, and how this exposure to CTE impacts post-secondary decisions.

Finally, my findings speak to a broader policy question of when and how to loosen "gate-keeping" structures in education. Although this paper is centered on high school graduation, similar tensions between standardized assessments and flexibility are present in other settings. In college admissions, debates over test-optional policies weigh the informational value of the SATs/ACTs against concerns that rigid exam requirements disadvantage low-SES and minority students (Leonhardt, 2024). So far, there has been mixed evidence on whether removing exam requirements expand or constrain college access for disadvantaged student groups (Chetty et al., 2025; Rosinger et al., 2024; Sacerdote et al., 2025). A related dynamic exists in higher education, where "weed-out" courses in STEM curricula, intended to assess academic preparedness, often serve as rigid gate-keeping mechanisms that disproportionately push female, low-SES, and racial minority students out of the STEM major (Hatfield et al., 2022; Thompson, 2021). The findings of this paper contribute to these broader debates by showing that reducing the weight of standardized assessments can reduce inequities for students at the margins, while underscoring that flexibility must be paired with rigor in order to ensure that improvements in equity are attached to meaningful educational gains.

This paper will be structured as follows: Section 2 presents the policy background for Ohio's previous and current graduation policies. Sections 3 and 4 discuss the data and empirical strategy. Section 5 presents the results for the early EOC policy period, with robustness checks detailed in Section 5.6 and discussions in Section 5.7. Section 6 presents comparative results for the later EOC policy period. Section 7 concludes.

2 Background of OH's Graduation Policies

Within the last two decades, Ohio has undergone three distinct high school graduation policies, outlined in detail in Appendix A.1. The Ohio Graduation Test (OGT) system

covered much of the first decade, affecting students in the graduation cohorts of 2007 through 2017. The OGT was a comprehensive exit exam system, testing students' cumulative K-10 knowledge across five subject areas: Math, English, Writing, Science, and Social Studies. These exams were taken by all Ohio public and charter school students during the spring of their 10th grade year[2]. In order to earn their diplomas, students must score above a common cutscore in each of the five subjects, with no alternative pathways[3]. Students who failed any subject area of the OGTs had the chance to retake those exams during one of the subsequent semesters before graduation. Performance on the OGTs was thus a binding barrier to high school graduation, as a student's testing performance directly determined whether they are eligible to receive a diploma.

The early transitional policy into the EOC system (henceforth the "Early EOC" policy) was implemented for students in the graduating cohorts of 2018 through 2020. The policy objective of the new system was to raise the academic standards tested within the state's graduation exams, while also offering students flexibility to demonstrate alternative measures of competency in workforce or college readiness. The first major change was to shift the state's exit exam component from a comprehensive structure to an end-of-course structure, where EOCs were aligned with specific high school level courses in Math, English, Science and Social Studies[4], rather than testing broad comprehensive knowledge in those subjects. Students in the early EOC cohorts were required to sit for seven EOC exams upon completion of the relevant coursework, typically taking place during the spring of their 9th and 10th grade years[5]. For test scoring, the new system introduced a "mix-and-match" point system. Students were no longer subject a common cutscore on each exam, but instead were evaluated on the basis of their aggregate scores across exam subjects[6]. Under the early EOC requirements, students had to earn a minimum of 18/35 points across the seven EOC exams, with subject-specific minimums for Math, English and Science/Social Studies[7]. Due to this

[2]Special education students with individual education plans (IEPs) were usually required to sit for these exams, but were not always subject to the same cutscore requirements for passing/failing.

[3]There was one exception which was granted on a case-by-case basis to students who passed all but one exam, and were very close to passing the failed exam. Students would need to commit to an academic intervention program, hold near perfect attendance for each year of high school, earn a GPA of 2.5 in the area of the failed subject test and receive several letters of recommendations from their high school teachers and principal.

[4]These courses included Algebra (or Integrated Mathematics I), Geometry (or Integrated Mathematics II), English I, English II, Biology, American Government, and American History

[5]Similar to the OGTs, special education students were still required to sit for these exams, but may face different cutscore requirements to determine passing/failing status

[6]EOC point scores correspond to proficiency categories on a scale of 1 to 5 points, which maps onto a more granular scale score range between 590 and 810.

[7]Students needed to earn at least 4 points across the two Math EOCs, 4 points across the two English EOCs, and 6 points across the three Science and Social studies EOCs. It is worth noting that meeting these subject minimums alone is insufficient to reach the 18 point aggregate threshold, as students needed to have

scoring structure, there was some flexibility to compensate for a lower score in one exam with a higher score in another, as long as the overall point score requirements were met.

Students who met the minimum scoring requirements were considered to be in fulfillment of the Ohio State Testing pathway and were thus on track to graduate. Students who failed to meet these EOC exam requirements could choose to retake exams and earn higher scores or utilize one of the new alternative graduation pathways. The original EOC policy included only two alternative pathways—the workforce readiness pathway (earning a 12-point industry recognized credential (IRC) and passing a workforce readiness exam) and the college readiness pathway (earning remediation-free scores in the Math and English sections of the SATs or ACTs)—however the state ended up adding two additional temporary pathways to help ease adjustment frictions from the new policy. As the first EOC cohort (the class of 2018) finished 11th grade, Ohio faced a projected graduation crisis as students struggled to adjust to the complex requirements of the new testing system and alternative pathways. To prevent a catastrophic drop in high school graduation rates, the state adopted two temporary emergency pathways for the students of the 2018-2020 cohorts, which were referred to as the "Option 1" and "Option 2" pathways. "Option 1" (henceforth the "Flexible Competency Pathway") required that students pass all courses within the state's curriculum requirements, and retake any failed Math or English EOCs[8] at least one time. Upon completion of these baseline requirements, students may then choose two criteria within a menu of flexible options, including earning good senior year attendance and GPA records, completing capstone and community service projects, and earning 3 points in IRCs or passing a workforce readiness exam. "Option 2" (henceforth the "CTE Coursework Pathway") allowed CTE concentrator students to fulfill their graduation requirements by completing their career technical curriculum and passing all associated CTE exams. These temporary options, particularly "Option 1", were popular among students who were scrambling to fulfill their graduation requirements in the last hour, but were also highly criticized for being too "soft" in comparison to the level of rigor required from the original three pathways (Aldis, 2018)[9]. While CTE was prevalently featured across the different alternative graduation options, the inclusion of the two emergency pathways created high variability in the degree of rigor and consistency of CTE exposure for students who elected to use these pathways.

To address the problems that came up with the initial EOC policy transition, lawmakers

an additional 4 points.

[8]Failing the EOCs in this context means earning a score of 1 or 2 which are below the state's "Proficient" score for the exams

[9]For instance, under the original Workforce Readiness pathway, students needed to earn 12 points in IRCs within a single career pathway, while under the Flexible Competency Pathway, students just needed to earn 3 points

once again modified the graduation policy in 2019, this time setting long-term standards for future student cohorts (henceforth the "Late EOC" policy). The long-term policy reduced the number of EOCs used for graduation assessment from seven to two (Algebra and English II), and reverted the scoring process back to a common cutscore requirement for each exam. The alternative pathways were also restructured to require higher levels of rigor and commitment from students who elected to utilize them. The new menu of options includes participating in a focused career-technical course of study, earning remediation-free scores on college admissions exams, earning college credit through Ohio's dual enrollment program (College Credit Plus), and enlisting in the military. Although the long-term policy was officially mandatory starting with the class of 2023, students in the 2021-2022[10] cohorts were able to opt into these standards in lieu of the early EOC requirements. With the temporary "Option 1" and "Option 2" pathways no longer available, most students in these cohorts did indeed opt into the long-term policy as it greatly reduced the testing burdens linked to graduation, while offering a streamlined set of alternative pathway options.

The evolution across these three policy periods provides three unique perspectives into understanding how graduation pathways shape student outcomes. The movement from the OGTs to the early EOCs represents a change in the stakes of the exams themselves, as the presence of alternative pathways provided measures of competency beyond test scores. The transition between the early EOC policy to the late EOC policy represents a shift towards more consistent pathway rigor, as the revisions to the alternative pathways during the late EOC period eliminated lower rigor options and provided a more structured career-technical pathway. In this paper, I will focus on students from the early EOC policy as the central case, while referencing marginal students from the OGT and late EOC periods as points of contrast to illustrate how pathway design had differential impacts on the academic choices and outcomes of marginal students across policy eras.

3 Data

3.1 Sample Selection

This study draws upon an administrative, student-level panel from Columbus City Schools, the largest school district in Ohio. The student panel data comprises of K-12 educational records reported by Ohio's Education Management and Information System (EMIS) and college enrollment data reported by the National Student Clearinghouse (NSC). The data includes student-level demographics, test scores, course transcripts, high school graduation,

[10] Juniors and sophomores when the long-term policy was rolled out

and college enrollment details. The primary analytical sample includes students from the graduation cohorts of 2019 and 2020 ("EOC Early Sample"), who were subject to the initial version of the EOC graduation policy. I also reference students from the 2009-2017 cohorts ("OGT Sample") as well as the 2021-2024 cohorts ("EOC Late Sample") to illustrate differences in policy structure.

In all three samples, I only include students who: (1) have valid scores on mathematics state exam(s) required for graduation and, (2) have attempted to take all mandatory exams in accordance to the prevailing graduation policy of their cohort per state law[11]. This sample selection process filters out students for whom the state tests were not required or binding as well as students with incomplete testing records due to transferring across school districts or non-compliance. For the EOC cohorts, I further limit the analysis sample to students who were present in the data for both 9th and 10th grade, which are the typical key years of EOC coursework and exams.

The classes of 2018 and 2023 are excluded from the respective early and late EOC samples due to unexpected testing interruptions faced by these two cohorts. The class of 2018 was the first cohort subject to the early EOC policy, but faced a transitional testing system in which their 9th and 10th grade exams were administered by two different testing vendors[12], making it difficult to compare their exam performance consistently with those of students from later cohorts. The class of 2023 would have been a part of the EOC late sample, but were missing critical 9th grade Math test scores due to the COVID-19 shutdown during the spring of 2020[13].

The final sample selection results in 4,778 students in the early EOC sample (2 cohorts), with an additional 29,313 total students in the OGT sample (9 cohorts), and 7,313 students in the late EOC sample (3 cohorts).

3.2 Outcomes

I estimate the effects of passing the Ohio Math exit exam requirements on four broad outcome categories: graduation pathway activities, high school academic achievement, high

[11] Although the state required 7 EOCs during the early EOC policy period, students were not required to sit for the American history or American government EOCs if they elect to take a substitute exam through the College Credit Plus Program or AP/IB coursework. For the OGTs, the Writing exam was phased out for the class of 2014 and beyond

[12] Ohio had joined the PARCC Common Core testing consortium during the 2014-2015 school year, but ended up dropping out after only one year due to severe push-back from schools, educators, and families across the state. The PARCC tests were replaced by the AIR tests starting from the 2015-2016 school year, which covered all standardized tests in grades 3-12.

[13] For the 2019-2020 school year, the state allowed for final course grades in relevant courses to be substituted for EOC exam scores

school persistence and graduation, and college outcomes.

The available administrative data did not record the specific graduation pathway(s) that a student utilizes to fulfill their requirements. To back out a student's take up of alternative pathways, I reconstruct the different policy eras' pathway options to the best extent possible using student assessment records (inclusive of all state-sponsored standardized tests, CTE exams, industry credentialing exams, and college admissions exams) and student transcript records (inclusive of CTE and college cross-registered coursework). The combination of transcript and assessments data allows me to fully observe pathway take up for the College Credit Plus and ACT/SAT pathways, and partially observe take up of the various career-focused pathways[14]. The take up rates of the career-focused pathways should thus be viewed as a lower bound estimate. There is no data available for military enlistment, a pathway option for the late EOC cohorts, and will not be included in this paper's analysis.

High school achievement outcomes, including post-EOC GPA and coursework, are extracted from student transcripts. Student GPA and attendance rates are calculated as unweighted averages for all semesters after a student completes their first attempt of the Math exit exam(s). For coursework, I create a series of indicator variables signifying whether a student has taken specific courses, how many credits were earned, and whether they passed.[15]

Finally, outcomes on high school graduation and college come directly from EMIS student graduation lists and student ID-linked NSC records up through May 2025. I cannot directly observe high school drop outs in this data as students may leave the sample due to dropping out of high school or transferring out of the school district. To proxy for high school persistence, I follow Reardon et al. (2010)'s approach by constructing indicators for having positive attendance records during a student's expected 11th and 12th grade years. The NSC data provides detailed information on all post-secondary college enrollment activities for students recorded as high school graduates by the school district, including the program type, institution name, length of enrollment, and degrees earned. Transfers across institutions and college drop outs are also not directly flagged in these records, but can be inferred from a student's college enrollment sequence on record. For this study, I flag college transfers as instances where a student was recorded to have enrolled in a secondary institution without having completed a degree in the first. College dropouts are flagged as students whose college enrollment abruptly ended without record of a degree or re-enrollment in any institution for over one calendar year. College transfers and dropouts are not mutually exclusive.

[14] Notably, I cannot observe students' participation in work study, internships, and pre-apprenticeships. I also cannot observe whether a student completed a senior capstone project

[15] "Passing" means earning at or above a C- letter grade equivalent in a course.

3.3 Descriptive Statistics

Table 1 shows the descriptive statistics for students in the main analytic sample within the early EOC cohorts (2019-2020)[16]. More than two-thirds of students in the district were non-White and about a quarter have been classified as special education or English language learners. Over 90% of these students were ever flagged as "economically disadvantaged"[17], while 15% have experienced homelessness. For academic baselines, less than 40% of students scored at or above "Proficient" level on the 8th grade Ohio State Tests. Overall, the district serves a high-needs, predominantly low-income student population which is broadly representative of other urban school districts across the state. This demographic context provides an especially relevant setting for studying the effects of graduation exam policies, as prior research suggests that lower-SES and racial minority students are disproportionately affected by state testing requirements around the margins (Papay et al., 2022, 2010).

Students in these initial EOC cohorts are largely taking the seven required subject EOCs at least once during high school. The pass rates vary across subject, with Math having the lowest rates (just below 50%), and English and Science/Social Studies having higher pass rates around 66-70%. Most students who fail to meet the EOC graduation testing requirements are therefore "gated" by low scores on the Math portion. Only 36% of students ever meet the state's full set of EOC exam requirements for graduation. Despite the low overall pass rates on the EOC exams, 80% of students in this sample end up graduating high school. These statistics stand in contrast against those of the previous OGT cohorts detailed in Appendix Table A.1, where approximately 64% of students end up passing all OGT exam requirements and 69% graduate. These statistics suggest that although students are less likely to pass the new EOC exams, they are not necessarily gatekept by their lower scores on the exit exams in the same way as OGT students who had no alternative pathways.

Beyond high school, 40% of these students end up enrolling in college after graduating, with about half of them attending 4-year college and the other half attending 2-year college. Although high school graduation rates have risen dramatically from the OGT to the EOC eras, college enrollment has been relatively flat over time.

The gender split of the early EOC sample shows female students being higher-achieving than male students, scoring about 0.15-0.28 standard deviations higher on the 8th grade Ohio State Tests for both subjects. Female students are also more likely to pass the EOCs, graduate from high school, and enroll in college (particularly 4-year college) after high school.

[16] See Appendix A.1 for summary statistics all all three cohorts

[17] Economically Disadvantaged is flagged for students who are eligible for free/reduced-price lunch, has a family member eligible for free/reduced-price lunch, are receiving public assistance, or have completed a Title I application.

Table 1: Baseline Summary Statistics of Students in Early EOC Cohorts (2019-2020)

	Pooled Sample		Female		Male		Female - Male	
	Mean/SD	# Students	Mean/SD	# Students	Mean/SD	# Students	Δ/SE	% Diff
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Demographics								
Black	0.60	4,778	0.61	2,457	0.58	2,321	0.039***	6.28
	[0.49]		[0.49]		[0.49]		(0.014)	
Hispanic	0.098	4,778	0.093	2,457	0.10	2,321	-0.010	-10.9
	[0.30]		[0.29]		[0.30]		(0.0086)	
White	0.17	4,778	0.16	2,457	0.19	2,321	-0.025**	-15.5
	[0.38]		[0.37]		[0.39]		(0.011)	
Asian	0.051	4,778	0.049	2,457	0.053	2,321	-0.0033	-6.73
	[0.22]		[0.22]		[0.22]		(0.0064)	
Ever English Learner	0.24	4,778	0.23	2,457	0.26	2,321	-0.034***	-15.1
	[0.43]		[0.42]		[0.44]		(0.012)	
Ever Special Education	0.20	4,778	0.15	2,457	0.26	2,321	-0.11***	-74.4
	[0.40]		[0.35]		[0.44]		(0.012)	
Ever Gifted Status	0.13	4,778	0.14	2,457	0.12	2,321	0.024**	17.2
	[0.33]		[0.35]		[0.32]		(0.0097)	
Ever Homeless	0.15	4,778	0.16	2,457	0.14	2,321	0.025**	15.3
	[0.36]		[0.37]		[0.34]		(0.010)	
Ever Economically Disadvantaged	0.92	4,778	0.93	2,457	0.92	2,321	0.0065	0.71
	[0.27]		[0.26]		[0.27]		(0.0078)	
B. Educational Baseline								
Grade 8 Math (z-score)	0.18	3,303	0.25	1,705	0.10	1,598	0.15***	59.6
	[0.78]		[0.76]		[0.81]		(0.027)	
Grade 8 ELA (z-score)	0.14	3,445	0.28	1,771	0.0019	1,674	0.28***	99.3
	[0.79]		[0.76]		[0.80]		(0.027)	
Grade 8 OST Math Proficient	0.33	3,309	0.35	1,712	0.30	1,597	0.051***	14.5
	[0.47]		[0.48]		[0.46]		(0.016)	
Grade 8 OST ELA Proficient	0.39	3,447	0.45	1,777	0.32	1,670	0.13***	28.9
	[0.49]		[0.50]		[0.47]		(0.016)	
C. Ohio Exit Exam Performance								
Total Exit Exam Subjects Taken	6.82	4,778	6.82	2,457	6.82	2,321	0.00090	0.013
	[0.44]		[0.43]		[0.45]		(0.013)	
Ever Passed Math Exit Exam(s)	0.48	4,778	0.50	2,457	0.45	2,321	0.050***	10.1
	[0.50]		[0.50]		[0.50]		(0.014)	
Ever Passed ELA Exit Exam(s)	0.66	4,778	0.72	2,457	0.61	2,321	0.11***	14.9
	[0.47]		[0.45]		[0.49]		(0.014)	
Ever Passed Sci/SS Exit Exam(s)	0.69	4,778	0.72	2,457	0.65	2,321	0.062***	8.70
	[0.46]		[0.45]		[0.48]		(0.013)	
Ever Passed all Exit Exam Requirements	0.36	4,778	0.39	2,457	0.33	2,321	0.056***	14.4
	[0.48]		[0.49]		[0.47]		(0.014)	
C. Outcomes								
Graduated HS	0.80	4,778	0.83	2,457	0.77	2,321	0.058***	7.02
	[0.40]		[0.38]		[0.42]		(0.012)	
Enrolled in Any College	0.40	4,778	0.45	2,457	0.34	2,321	0.11***	24.5
	[0.49]		[0.50]		[0.47]		(0.014)	
Enrolled in 4-year College	0.21	4,778	0.25	2,457	0.16	2,321	0.091***	35.6
	[0.41]		[0.44]		[0.37]		(0.012)	
Enrolled in 2-year College	0.19	4,778	0.20	2,457	0.18	2,321	0.020*	10.3
	[0.39]		[0.40]		[0.38]		(0.011)	

Notes: This table shows the summary characteristics of all students who meet sample selection criteria in the early EOC cohorts (2019-2020). The standard deviations of means are shown in brackets below each mean value for the pooled sample, male students and female students in (1), (3), and (5). The numbers of student observations included in each statistic are listed in (2), (4), and (6). Columns (7) and (8) provide results from t-test difference of means, with heteroskedasticity-robust standard errors reported in parentheses.
*** Significant at the 1% level ** 5% level * 10% level

4 Empirical Strategy

To measure the impacts of passing the Ohio exit exam on student outcomes, I use a regression discontinuity (RD) design centered around the state pass/fail thresholds of the Math subject exit exam(s) across the different policy eras. Although a student's eligibility for graduation is determined by more than just the Math portion of the exams, I center my analysis around the Math exam requirements because they tend to be the most binding for students close to the margins. Among students who failed at least one EOC subject on the first attempt, about 70% scored the lowest in Math[18]. Table 1 shows that students who are captured around the margins of passing the Math exam requirements are also fairly representative of the median student in the selected district sample.

The RDD model is as follows:

$$Y_{ic} = \beta_0 + \beta_1(Pass_{ic}^{Math}) + \beta_2(Dist_{ic}^{Math}) + \beta_3(Pass_{ic}^{Math} * Dist_{ic}^{Math}) + \delta_c + \epsilon_{ic} \quad (1)$$

Equation 1 estimates the impact of marginally passing the Math EOC requirement for student i in cohort c, where the coefficient of interest is captured by β_1. To adjust for cohort-wide shocks, I include cohort fixed effects (δ_c), where cohorts are defined as a student's projected high school graduation year based on the year they first entered 9th grade in the panel[19].

To assess heterogeneity in the "treatment" effect of passing the Math EOC by groups (such as gender), I fit the RDD model with a full set of interactions between $Dist_{ic}^{Math}$, $Pass_{ic}^{Math}$ and an indicator for group identity, e.g. $Female_{ic}$:

$$\begin{aligned} Y_{ic} = \alpha_0 + \alpha_1(Pass_{ic}^{Math}) + \alpha_2(Dist_{ic}^{Math}) + \alpha_3(Pass_{ic}^{Math} * Dist_{ic}^{Math}) \\ +\alpha_4(Female_{ic}) + \alpha_5(Female_{ic} * Pass_{ic}^{Math}) + \alpha_6(Female_{ic} * Dist_{ic}^{Math}) \\ +\alpha_7(Female_{ic} * Pass_{ic}^{Math} * Dist_{ic}^{Math}) + \delta_c + \epsilon_{ic} \end{aligned} \quad (2)$$

Equation 2 estimates the impact of marginally passing the Math EOC separately for students in the omitted group, captured by α_1, and in the indicated group, captured by $\alpha_1 + \alpha_5$ (the between-group difference is given by α_5).

The key running variable in Eq. 1 is $Dist_{ic}^{Math}$, which captures the student's distance away from the Math pass/fail exam threshold based on their first attempt of the exam(s).

[18] See Appendix Figure A.2 for breakdown of binding test subjects by cohort

[19] This cohort definition is used by the state to determine which graduation policy a student is subject to.

For students in the early EOC sample, this calculation takes into account the two exams (Math 1 and Math 2) which factor into their Math point score total. To identify students around the margins of passing, I define this running variable by first identifying students along the border of the 4-point minimum (e.g. students who earned a total of 3 points vs. 4 points across the two Math EOC exams). Next, I compare the scale scores earned on the two respective Math EOCs to calculate the *minimum distance* from the threshold. This effectively collapses the two test scores into a one-dimensional running variable for $Dist_{ic}^{Math}$ which can be interpreted as the student's scale score distance from the Math EOC pass/fail threshold on the exam where they were closest to meeting it. For students in the OGT and EOC late samples, the running variable is calculated as the simple difference between the student's OGT Math or EOC Algebra scale score minus the minimum state cutscore. Negative values of the running variable indicate failure status while positive values indicate passing status on the Math testing component.

In order for the RD specification to yield causal estimates, the exam requirement cutoff must be exogenously assigned such that the potential outcomes of students are smooth at the pass/fail threshold, making students "as-good-as-randomly assigned" to either side. If these assumptions hold, then any estimated difference in outcomes between students who pass and students who fail is an unbiased estimate of the causal effect of passing the state's exam requirement. To assess the validity of this assumption, I perform the standard RD checks of the running variable in the Appendix. I first check for smoothness of pre-determined student characteristics across the Math exit exam cutoffs in Appendix A.6-A.8, and find no significant evidence of discontinuous characteristics at the Math testing thresholds of the EOC policy regimes[20].

I also examine the distributions of the recentered scaled scores to assess for manipulation of the running variables in Appendix Figure A.4. Due to sparsity across certain uncommon or impossible scale scores and the smaller sample sizes, there is some visual and statistical evidence of bunching around the thresholds of the Math exam for the early EOC cohorts. Ordinarily this would be a red flag of possible non-random manipulation of the running variable close to the threshold, which would violate the identification assumption of the RDD. I argue that this bunching is more likely to be an anomaly in statistical sampling rather than direct manipulation, and demonstrate that the main results of the paper are robust to alternative specifications. First, the EOC exams are administered through a secure online testing system[21] provided by the state's test contractor, where all student responses

[20]The one exception is for the OGT baseline 8th grade Math scores, for which there is a jump of about 9.6 standard deviations at the threshold

[21]Most school districts in Ohio use the online format, with some exceptional cases where paper format testing can be requested

are scored by the test contractors, rather than by any personnel at a student's own school. Testing administrators should also have limited access to student responses as they are immediately transmitted to the state's test vendor at the conclusion of the exam period (AIR and Ohio Dept. of Education, 2017). Furthermore, although the scaled scores corresponding with critical proficiency thresholds tend to be about the same from year to year, the exact mapping of raw student response scores to the final scaled score will change each year based on variations in the state-level performance distribution, making it nearly impossible to precisely manipulate a student's final scaled score based on their test item responses ex-ante (AIR and Ohio Dept. of Education, 2017). Finally, to empirically show that the findings of this paper are unlikely to be biased from potential non-random sorting at the threshold, I show in Section 5.6 that the main results remain stable when I omit ultra-local scores near the testing threshold (through a "Donut" RD specification), and when I re-estimate the model using a subsample of the data where the distribution of the running variable displays no evidence of bunching.

Because the two math EOCs are typically taken one year apart, there may be additional concerns that student test score performance on the 9th grade exam, Math 1, will endogenously impact their test scores for the 10th grade exams, especially if students are changing the amount of effort put into the second exam based on how well they performed on the first. To rule out this possibility, I examine the relationship between student scores in Math 1 and Math 2, located around key EOC point score thresholds on the Math 1 exam (which is typically taken first). Appendix Figure A.3 shows that there is no evidence of a discontinuity between Math 1 and 2 scores between the Limited $\rightarrow$ Basic or between the Basic $\rightarrow$ Proficient Math 1 thresholds, with Math 2 scaled scores being continuous across the distribution of Math 1 scores[22].

For my main specification, I estimate the regression discontinuity model using a local linear regression, localized around a bandwidth of h^* =10 scale score points above and below the pass/fail cutoff. The choice of 10 scale score points ensures that the RD analysis is restricted to students local to the threshold of the Math graduation requirement and does not pick up other threshold effects. Appendix Figure A.9 highlights the subset of EOC students who are included in the preferred local linear regression model, with regards to their two Math EOC scores. I conduct a sensitivity analysis of my main results to the choice of bandwidth and present those results in Appendix Tables A.8—A.12. Finally, following Lee and Card (2008)'s recommendation for RDs with discrete running variables, I cluster standard errors by the 21 discrete Math distance score values local to the cutoff.

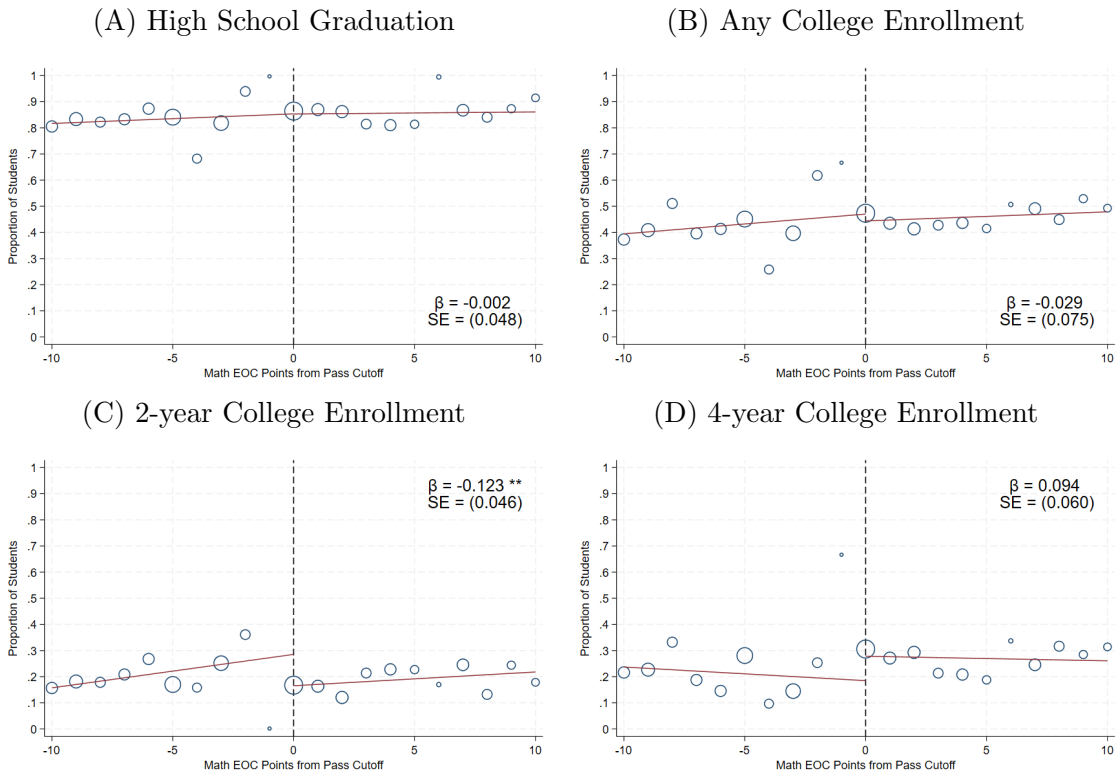
[22]Other thresholds beyond the "Proficient" threshold will no longer pick up students local to the state's cutoff requirements for graduation, but also exhibit no discontinuities

5 Impacts of Early EOC Policy on Student Outcomes

5.1 High School Graduation and College Enrollment

Passing the Math EOCs on the first try does not have any impact on high school graduation or general college enrollment rates, but influences sorting patterns into 2- or 4-year colleges after high school. Figure 1 panels (C) and (D) show that students who barely passed the Math EOCs are about 12 percentage points less likely to enroll in 2-year college and about 9 percentage points more likely to enroll in 4-year college. Although the pooled 4-year enrollment estimates are not quite statistically significant, the symmetry in the magnitudes suggests that passing the Math EOC induces students to sort along the intensive margin towards different college types. This is supported by the absence of a discontinuity in the overall college enrollment rates, signifying that passing the Math EOCs does not make a student more likely to attend college, but affects the type of college program they choose.

Figure 1: Impact of Passing Math EOC on HS Graduation and College Enrollment



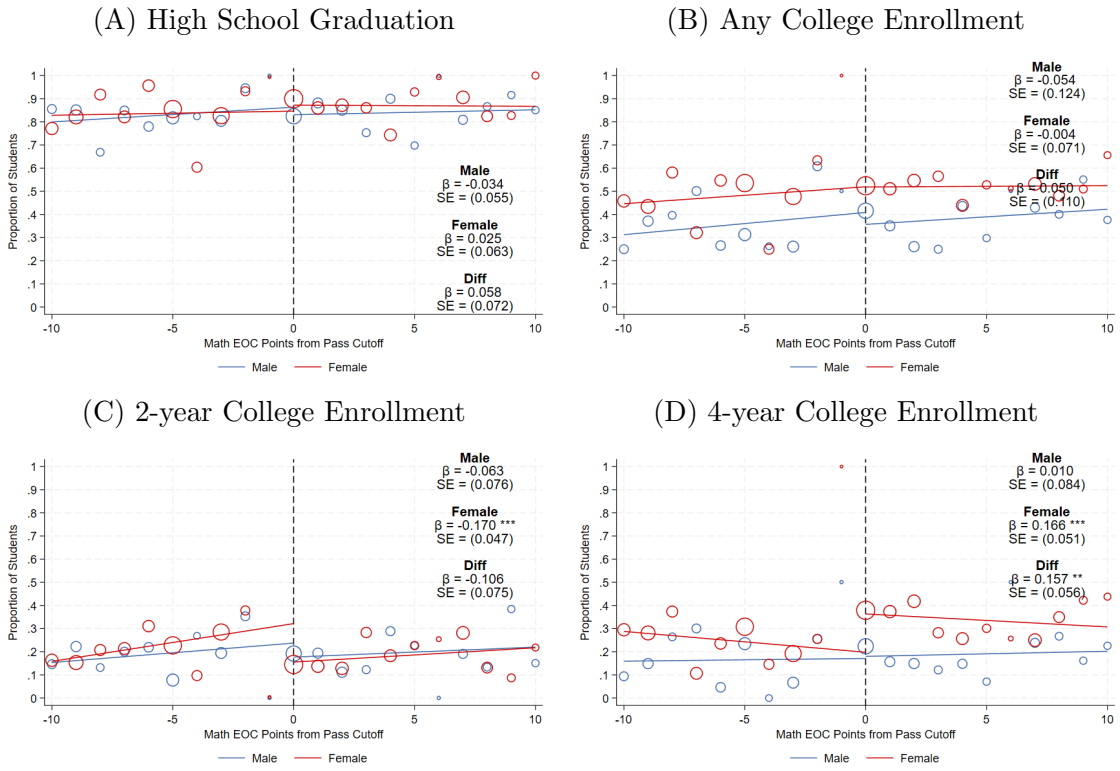
Notes: Each circle represents the average high school graduation or college enrollment rates for across each of the 21 unique EOC (early sample) combined Math EOC score values around the state's pass cutoff (0). 2- and 4-year college enrollment rates are measured for the first college that a student enrolls in after high school. The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level.

These sorting patterns remain intact even when I consider all college enrollment that a student has within 5-6 years after graduating high school. Appendix Figure A.10 shows that marginally passing students are more likely to ever enroll in 4-year college while marginally failing students are more likely to ever enroll in 2-year college, with similar magnitudes. Given that the baseline 4- and 2-year college enrollment rates in this marginal sample hovers around 20-30% near the cutoff, a 10 percentage point difference represents a very large shift in students' college-going behavior.

Figure 2 shows that college sorting is largely driven by female students. Passing the Math EOC has no effect on high school graduation or overall college enrollment rates for either gender group[23]. However, disaggregating by college type reveals clear gender differences in college sorting. Figure 2 panel (D) shows that female students who pass the Math EOC are about 16.6 percentage points more likely to enroll in 4-year college right after high school, while male students show virtually no change. Conversely, panel (C) shows that these same female students are roughly 17 percentage points less likely to enroll in 2-year colleges, compared to a smaller shift of about 6.3 percentage points among male students below the cutoff. Analogous heterogeneity analyses by race show no meaningful differences (Appendix A.11). Overall, these results reveal a pronounced gender asymmetry in how students respond to Math EOC outcomes, with female students appearing to be far more responsive to pass/fail signals in shaping their post-secondary destinations.

[23]The baseline high school graduation rates for both gender groups are similar around 85%, however female students have a baseline college enrollment rate that is about 10 percentage points higher than male students.

Figure 2: Impact of Passing Math EOC on HS Graduation and College Enrollment by Gender



Notes: Each circle represents the average high school graduation or college enrollment rates for across each of the 21 unique EOC (early sample) combined Math EOC score values around the state's pass cutoff (0). 2- and 4-year college enrollment rates are measured for the first college that a student enrolls in after high school. The estimated model includes a full set of interaction terms between Math EOC scores, indicator for passing the Math EOCs, and an indicator for female student. The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, estimated separately by gender, as well as the difference in discontinuities across genders, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level.

5.2 How binding are the EOC exams on graduation?

While failing the Math EOCs on the first try does not alter high school graduation or persistence, the consequences of failing may grow over time as students exhaust their retake opportunities. Martorell (2005), for instance, finds that failing early attempts has no significant impact on high school graduation, but failing a "last chance" exam near the end of high school sharply reduces a student's likelihood of graduating.

To assess whether a similar pattern holds in this context, I estimate the RD effects on graduation across successive retake opportunities of the Math EOCs among students who failed on the first try. These samples comprise of students who have not yet met the Math testing requirements by their 11th or 12th grade years. The "last chance" exams in my

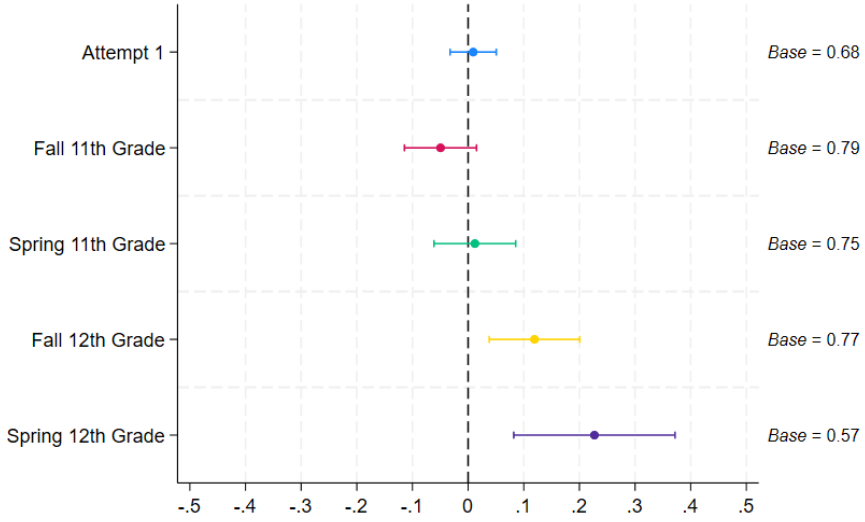
sample most commonly refer to the fall testing opportunity during a student's 12th grade year[24]. Although students who retake the exams represent a nonrandom subset of test-takers, this exercise highlights the rising costs of failing during the final semesters of high school, when the stakes are highest. To benchmark these results, I conduct an analogous exercise for the OGT student cohorts, who faced the prior graduation policy under which there was a single exit exam pathway and no alternatives. In Figure 3 I show the point estimates of the RD discontinuities across test attempts for the OGT vs. the early EOC samples.

Under the OGT system, the estimated discontinuity in graduation is negligible for all attempts in the 11th grade but sharply widens in senior year. Students who fail the "last chance" test in spring of 12th grade are about 18 percentage points less likely to graduate than those who passed. These results mirror the findings of Martorell (2005) and reflect the escalating stakes attached to the OGTs for students nearing graduation. In contrast, the same analysis under the early EOC policy reveals no comparable widening patterns. Despite being more difficult assessments, the EOCs were far less binding for graduation, as students could satisfy requirements through alternative pathways. Consequently, most EOC students who chose to retake exams did so by the end of 11th grade, with few still testing in their senior year. Taken together, these results suggest that the flexibility in graduation requirements can help diffuse the high stakes traditionally attached to exit exams by offering alternative routes. The next section examines how students interact with these alternative pathways when they fail the Math EOCs, and their level of exposure to career-technical pathway options.

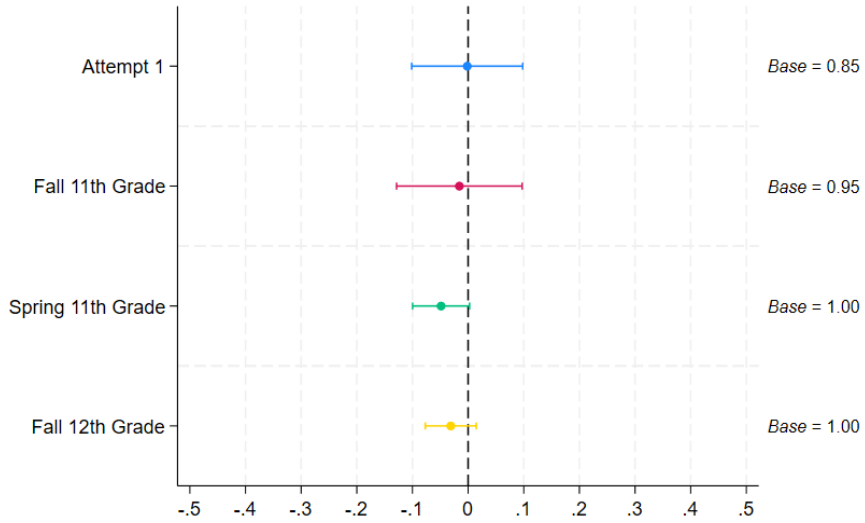
[24] As was the case for Martorell's study in Texas, these "last chance" exams are not literally the final opportunity that a student has to pass the exam, but rather the last chance to graduate on time with one's cohort

Figure 3: Impact of Passing Math Exam on High School Graduation Over Retake Attempts

(A) OGT Sample (2009-2017)



(B) Early EOC Sample (2019-2020)



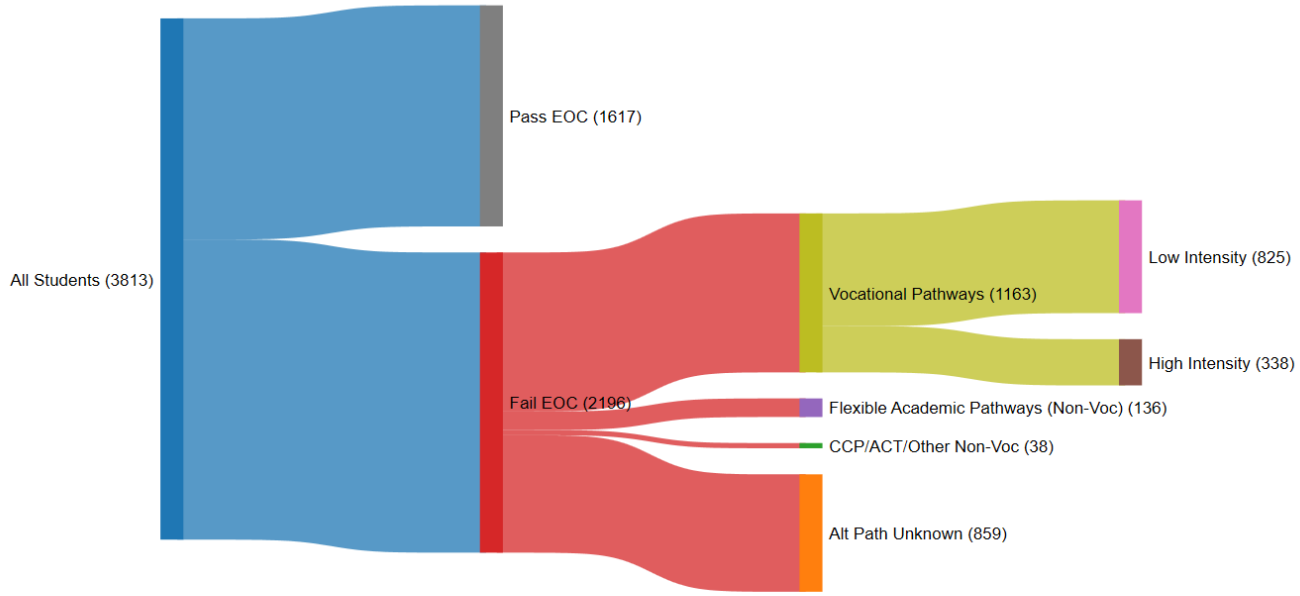
Notes: These graphs depict the RD coefficient values β_1 and 95% confidence intervals for the difference in high school graduation rates at the Math OGT or EOC pass/fail cutoffs. Each test attempt regression sample comprises of students within 10 scale score points of the Math exam cutoff who have not yet passed the Math requirement at that point. Baseline means for high school graduation rates are listed on the right side of each graph. There are no coefficient values presented for the EOC early sample in Spring 12th Grade due to insufficient observations. All standard errors are clustered at the Math EOC score level.

5.3 Alternative Pathway Takeup

Descriptively, students who fail to meet one or more EOC exam requirement are far more likely to participate in a career-focused alternative than any of the other observable pathway

options. Among the 3,813 student graduates in the early EOC analytical sample, about 42% ultimately pass the state's comprehensive EOC testing requirements by the time of graduation. Of those who never pass, roughly half of them fulfilled graduation criteria through a qualifying career-focused activity, most commonly through lower-intensity options offered through the temporary Flexible Competency pathway. This far exceeds the shares of students who pursued non-career based options such as earning college credits or attaining a remediation-free score on the ACT. Approximately 22% of graduating students are not linked to any observable pathway options in the EMIS administrative data. These cases likely reflect unobserved completion of activities such as capstone projects, community service, or other diploma seals not captured in the available data[25]. Figure 4 illustrates student flows into different graduation pathway options.

Figure 4: Graduation Pathway Flows: Early EOC (2019-2020)

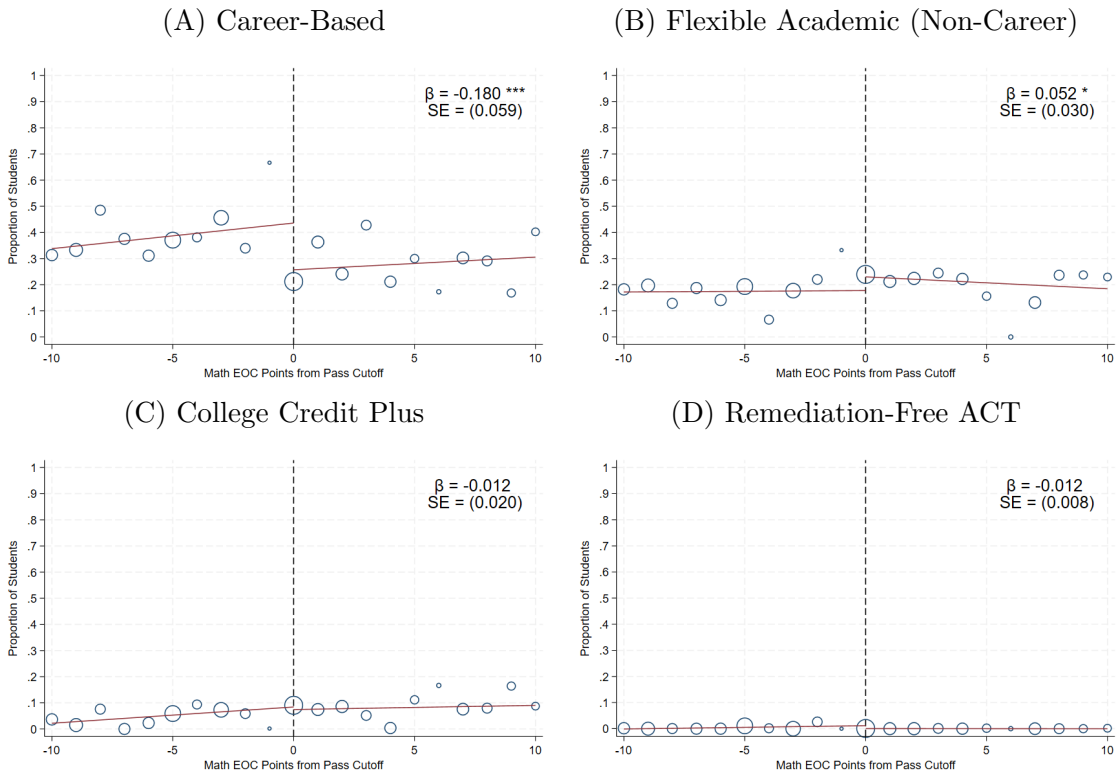


Although the take up rates of career-based pathway options is high among students who fail the EOCs, this could be reflecting general trends of lower-achieving students self-selecting into non-academic tracks rather than the causal effects of failing the EOCs themselves. To measure the causal impacts that passing/failing the Math EOC has on students' subsequent

[25]Non-test and non-coursework pathways such as capstone projects, community service, earning a state career-readiness diploma seal, or work-based learning are not documented in the EMIS administrative data but may appear in school-level records

take up of different alternative pathway options, I estimate the regression discontinuity model on pathway activities that occur *after* a student receives their first Math EOC scores.

Figure 5: Impact of Passing Math EOC on Graduation Pathway Activities



Notes: Each circle represents the percentage of students who take up each alternative pathway option (after the first attempt of the Math EOCs) at each of the 21 unique EOC (early sample) test score values around the state's pass cutoff (0). The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level.

Figure 5 shows that upon failing the first attempt of the Math EOC, students are about 18 percentage points more likely to take up a career-based pathway option compared to students who barely passed. Students who passed are slightly more likely to utilize the flexible academic options (introduced in "Option 1"), but there are no discernible discontinuities for any of the other non-CTE pathway options. Appendix Figure A.12 shows that these pooled results are mostly consistent when separating by student gender.

To examine differences in student engagement with career-technical options of varying levels of rigor, I estimate the RD regressions using distinct career-focused pathway activities as the outcomes of interest: Industry Recognized Credentials (IRCs), CTE Coursework, and the WorkKeys Exams[26]. Following the approach in Figure 5, I focus on activities that

[26]The ACT WorkKeys Career Assessments are a series of standardized exams measuring foundational

occur *after* a student completes their first attempt of both Math EOC exams to capture the students' behavioral responses to their initial exam results.

Table 2 shows that students who narrowly failed the Math EOCs on the first try are significantly more likely to complete a state-recognized industry credential exam (10.5 ppts) and modestly more likely to become CTE concentrators[27] (6.2 ppts) compared to their peers who passed. While both male and female students have increased participation in career-focused pathways after failing the Math EOCs, they diverge in the specific activities pursued. Female students are more likely to earn at least one IRC or to pass the WorkKeys exam, which are consistent with the low-intensity career-based options from the "Option 1" Flexible Competency pathway. In contrast, male students are significantly more likely to become CTE concentrators and to complete a full CTE program of study after failing the Math EOCs, aligning with the "Option 2" CTE pathway. Neither student group appears to be driven towards the more rigorous workforce readiness pathway, which requires completion of a heavier 12-point industry credential sequence.

skills required for general workplace success. See more details here.

[27]Under Perkins V, any student who completes at least two CTE courses under a single career program is classified as a CTE concentrator.

Table 2: Career Pathway Activities After First Math EOCs

	Industry-Recognized Credentials			**WorkKeys Exam**		**CTE Coursework**		
	Took IRC	Took 3+ IRC Pts	Took 12+ IRC Pts	Took WorkKeys Exam	Passed WorkKeys Exam	Took Any CTE Course	CTE Concentrator	Completed CTE Course Sequence
All Students	-0.105**	-0.051	-0.014	-0.015	-0.075*	0.013	-0.062*	-0.060**
	(0.042)	(0.042)	(0.016)	(0.084)	(0.044)	(0.030)	(0.036)	(0.029)
Male Students	-0.061	-0.027	-0.037	0.039	-0.050	-0.103	-0.151***	-0.079*
	(0.074)	(0.071)	(0.031)	(0.123)	(0.071)	(0.112)	(0.055)	(0.042)
Female Students	-0.137**	-0.072	0.002	-0.057	-0.096***	0.105*	0.014	-0.045
	(0.066)	(0.067)	(0.019)	(0.074)	(0.034)	(0.061)	(0.079)	(0.051)
Female - Male Diff	-0.076	-0.044	0.039	-0.096	-0.046	0.208	0.165	0.035
	(0.112)	(0.107)	(0.039)	(0.102)	(0.055)	(0.162)	(0.121)	(0.077)
N	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005
Baseline (Pooled)	0.376	0.226	0.034	0.387	0.143	0.433	0.350	0.188
Baseline (Male)	0.316	0.238	0.080	0.362	0.153	0.502	0.366	0.172
Baseline (Female)	0.422	0.215	0.000	0.404	0.134	0.381	0.339	0.203

Notes: This table reports the regression discontinuity estimates of student propensity to take various career-focused activities after their first attempt of the Math EOC (unit of measurement is proportion of students). RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

*** Significant at the 1% level ** 5% level * 10% level

Students near the exam cutoffs are generally participating in career-focused activities at relatively high rates: 38% earn at least one IRC and 58% complete at least one CTE course. These trends are consistent across gender groups and mirror overall participation rates in the early EOC cohorts. However, high participation rates do not necessarily reflect high levels of engagement with these CTE activities. This is most apparently seen in the distribution of IRC points earned by students. State-recognized IRCs are assigned point values (1-12) to reflect local employer demand for such credentials and the rigor of prerequisite training required. For instance, a CPR & First Aid Certification is worth only 1 point, while a Nursing Assistant certification is worth 12 points.

Although many marginal students earn IRCs during high school, the distribution of credential points earned is heavily concentrated at the lower end, with most students earning 1-2 point credentials. Appendix Table A.3 details the ten most common IRCs earned by marginal students in the 2019-2020 cohorts. CPR & First Aid (1 pt) alone accounts for nearly 30% of all credentials earned. Other popular low point credentials include the OSHA 10-hour Safety training, the National Restaurant Association ServSafe certification, and the OSHA Forklift and Manlift Operator Licenses. Slightly higher-valued credentials, including Microsoft Office Specialists (Word and Powerpoint, 15%) and the NCCER Core (a foundational construction and industrial trade certification, 7%) appear less frequently. Notably, none of the highest-valued credentials (8-12 points) are represented on this list.

There is also a steep drop off in the aggregate point total of credentials earned by students. The two alternative pathways which allow the use of IRCs require either earning at least 3 points ("Option 1" Flexible Competency Pathway) or 12 points (original Workforce Readiness pathway). Although about 38% of marginal students earn at least one IRC, only about 23% earn at least 3 points total to meet minimum requirements for the Flexible Competency option, and less than 5% earn at least 12 points to meet minimum requirements for the rigorous workforce readiness pathway.

These results suggest that although career-focused alternative pathway options are widely used by students near the Math EOC threshold, the rigor and substance of options pursued varied considerably. Participating in career-technical activities appears to steer many students towards 2-year colleges, possibly reflecting the fact that IRCs and CTE credits taken in high school can be transferred for credits at Ohio community colleges. However, the low intensity of the credentials earned raises concerns that these pathways provide access to college without meaningfully equipping students with the prerequisite skills to succeed once they arrive.

5.4 Post-EOC Academic Coursework

For students pursuing alternative pathway options, there is the possibility that these pathways will affect the type and quality of their other high school academic coursework. For instance, CTE students are permitted by Ohio state law to substitute the Algebra II math requirement with an approved CTE math course[28]. Students may also reduce their elective courseload in academic subject areas (Math, ELA, Science, Social Studies, Foreign Languages) or non-academic areas to accommodate CTE coursework in their schedule. Such adjustments could have implications for college readiness, particularly for students considering 4-year college.

Table 3 examines whether marginally passing students shifted their coursework in response to their first Math EOC test results. Positive coefficient values indicate that marginally passing students were more likely to take courses in those subject categories, while negative values indicate that marginally failing students were more likely to take such courses. Across core academic subjects, there are no significant differences in the total number of courses taken, except that female marginal passers completed slightly more social studies courses. The largest substitutions occur among electives: students who pass the Math EOC took more non-CTE elective courses (about 0.86 more courses), especially in the Arts. Because CTE coursework counts towards the elective credits requirement, these results indicate that students are reallocating time spent in their other elective courses rather than taking fewer core academic courses.

Importantly, students who narrowly failed the Math EOCs are no less likely to take Algebra II than students who passed the Math EOCs. Algebra II is a particularly important outcome as it is the only required math course under Ohio's graduation standards of the time, and is also required for admissions into most 4-year college programs. Students enrolled in a CTE program are permitted to substitute Algebra II for a CTE equivalent, yet there is no evidence that such substitution is occurring, with about 80% of marginal students in this sample taking the traditional Algebra curriculum and no significant discontinuity across the pass/fail threshold.

[28]State law (ORC 3313.603 (C) (3)) allowed all students who entered 9th grade in the Fall of 2015 and beyond who were also enrolled in a CTE pathway to make this substitution.

Table 3: High School Coursework Taken After First Math EOCs

	Core Academic Courses					**Elective Courses**							**Other Courses**
	Math (All)	Math (Algebra II)	ELA	SS	Science	All Electives	Non-CTE Electives	Foreign Language	Arts	Business	Technology	CTE	PE& Health
All Students	0.060	0.031	0.052	0.228	-0.020	0.769**	0.864**	0.085	0.781***	0.042	-0.044	-0.095	0.250**
	(0.079)	(0.067)	(0.098)	(0.150)	(0.116)	(0.347)	(0.340)	(0.063)	(0.207)	(0.066)	(0.107)	(0.171)	(0.110)
Male Students	0.072	0.045	0.048	0.052	0.089	0.510	1.052***	0.063	0.847***	0.091	0.051	-0.542*	0.414**
	(0.124)	(0.148)	(0.112)	(0.195)	(0.139)	(0.449)	(0.300)	(0.101)	(0.203)	(0.083)	(0.108)	(0.327)	(0.162)
Female Students	0.045	0.018	0.045	0.365**	-0.106	0.971***	0.714*	0.099	0.726***	0.004	-0.114	0.256	0.120
	(0.090)	(0.081)	(0.113)	(0.169)	(0.133)	(0.370)	(0.432)	(0.080)	(0.264)	(0.081)	(0.134)	(0.282)	(0.167)
Female - Male Diff	-0.027	-0.027	-0.003	0.313	-0.195	0.461	-0.337	0.036	-0.120	-0.087	-0.166	0.798	-0.294
	(0.145)	(0.186)	(0.089)	(0.202)	(0.133)	(0.378)	(0.342)	(0.125)	(0.253)	(0.095)	(0.128)	(0.488)	(0.241)
N	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005
Baseline (Pooled)	1.724	0.798	1.602	1.723	1.455	5.578	4.283	0.511	3.114	0.179	0.479	1.295	0.543
Baseline (Male)	1.743	0.802	1.718	1.883	1.386	5.874	4.302	0.522	3.218	0.160	0.403	1.572	0.370
Baseline (Female)	1.709	0.793	1.511	1.602	1.507	5.345	4.257	0.505	3.026	0.191	0.535	1.088	0.676

Notes: This table reports the regression discontinuity estimates of total number of high school courses taken in each subject category (unit of measurement is number of courses). RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

*** Significant at the 1% level ** 5% level * 10% level

Beyond the basic high school coursework requirements, there are additional ways that students can demonstrate "college-readiness", including earning a higher 11th and 12th grade GPA and attendance record, taking AP courses or dual-enrolling in the College Credit Plus program, and performing well on college admissions testing. Table 4 shows that post-EOC GPA (both weighted and unweighted), attendance rates, and CCP coursework are largely the same across the Math EOC pass/fail threshold. The one outcome that diverges in direction from expectations is AP coursework, where marginally failing students are more likely to earn AP credits.

Students who marginally pass the Math EOC are about 11 percentage points more likely to sit for the state-sponsored ACT exam administered in 11th grade[29], with most of this effect driven by female students. Given that this test is state-funded and administered during regular school hours, the cost of participation should be minimal for most students. The positive discontinuity shows that even when the exam is subsidized and made accessible for all students, marginal passers of the Math EOCs are much more likely to participate in college admissions testing. This pattern could reflect a stronger commitment among marginally passing female students towards applying for 4-year college, aligning with the earlier result showing higher 4-year enrollment within this group.

When comparing the actual test scores of students who sat for the 11th grade ACTs, it is not clear that students who marginally pass performed significantly better on these exams compared to their peers who marginally failed the Math EOCs. In fact, the signs for many of these ACT test scores, standardized to Z-score values, are negative. This suggests that if anything, marginally failing students who took the 11th grade ACTs are doing slightly better than their peers who passed. Since ACT scores are only available for those who participated in this particular testing session, the test score results should cautiously interpreted as they may reflect some selection bias. With marginally failing students being less likely to take the 11th grade ACTs, if we were to assume that those who opted out were of lower ability and had lower interests in applying to 4-year college, selection bias may cause the average scores for marginally failing students to be inflated, which would understate the size of the discontinuity. However, the results for all ACT exams taken during the latter years of high school exhibit a similar pattern: marginally passing students (particularly female students) are more likely to take the ACTs, but there are no significant differences in the actual scores earned by marginally passing and failing students (see Appendix Table A.4).

[29]The state of Ohio required by law at the time that every Ohio high school junior take the ACT or SAT as part of the graduation requirements (of Education and Workforce, 2025). The state subsized one in-school administration of the ACT or SAT during the junior year, while additional attempts were optional and are student-initiated. For the school district and cohorts captured in this paper, students would take this free ACT test around March of 11th grade.

Table 4: High School College Readiness Outcomes After First Math EOCs

	GPA/Attendance			**College Credit Coursework**				**11^{th} Grade State-Sponsored ACTs**				
	GPA (Weighted)	GPA (Unweighted)	Attendance Rate	Took AP Course	Earned AP credit	Took CCP Course	Earned CCP credit	Took 11th Grade ACTs	Standardized ACT Composite	Standardized ACT Math	Standardized ACT Reading	Standardized ACT English
All Students	-0.040	-0.020	-0.003	-0.076	-0.084**	0.002	0.008	0.112*	-0.135*	0.026	-0.155	-0.113
	(0.074)	(0.078)	(0.024)	(0.050)	(0.042)	(0.043)	(0.038)	(0.058)	(0.080)	(0.060)	(0.130)	(0.106)
Male Students	-0.045	-0.033	-0.069*	-0.113	-0.132*	0.012	-0.027	0.007	-0.005	0.200	-0.042	-0.053
	(0.124)	(0.112)	(0.039)	(0.073)	(0.071)	(0.079)	(0.077)	(0.072)	(0.058)	(0.152)	(0.108)	(0.085)
Female Students	-0.032	-0.005	0.051	-0.039	-0.038	-0.003	0.038	0.200***	-0.240*	-0.105	-0.247	-0.167
	(0.157)	(0.155)	(0.032)	(0.060)	(0.045)	(0.048)	(0.045)	(0.073)	(0.126)	(0.083)	(0.169)	(0.176)
Female - Male Diff	0.013	0.027	0.120**	0.074	0.094	-0.016	0.065	0.193**	-0.235*	-0.306	-0.204	-0.115
	(0.249)	(0.234)	(0.053)	(0.081)	(0.072)	(0.085)	(0.092)	(0.086)	(0.132)	(0.208)	(0.135)	(0.186)
N	895	895	984	1,005	1,005	1,005	1,005	1,005	716	718	717	718
Baseline (Pooled)	2.577	2.504	0.715	0.325	0.285	0.148	0.127	0.650	0.049	-0.184	0.110	0.073
Baseline (Male)	2.304	2.263	0.757	0.293	0.244	0.107	0.114	0.703	-0.115	-0.322	-0.056	-0.069
Baseline (Female)	2.801	2.702	0.683	0.351	0.317	0.179	0.138	0.610	0.182	-0.078	0.244	0.190

Notes: This table reports the regression discontinuity estimates of high school GPA (on a scale of 0-5 weighted; 0-4 unweighted), attendance rate, AP and College Credit Plus coursework, and ACT outcomes from the state-sponsored 11th grade ACT exam, occurring after the first Math EOC attempt. ACT scores are standardized into Z-scores, where original scores (on a scale of 1-36) are re-centered on the mean and scaled by the standard deviation within cohort groups. RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

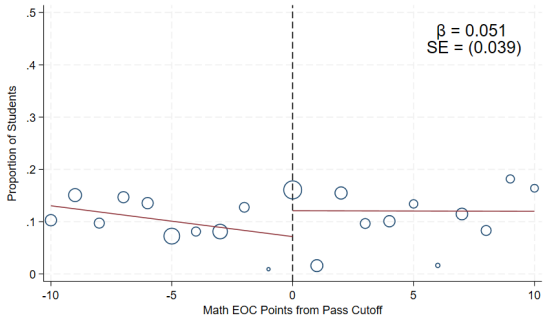
*** Significant at the 1% level ** 5% level * 10% level

5.5 College Persistence

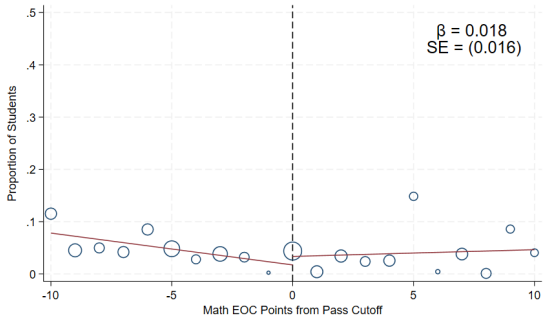
Figure 6 shows that shows that marginally passing students were about 5.5 percentage points more likely to graduate from 4-year college (not statistically significant), while having virtually identical 2-year college graduation rates as their peers who marginally failed. Although marginally failing students are more likely to have pursued a career-focused alternative pathway and enrolled in 2-year college programs straight after high school, these students do not appear to be more successful in earning 2-year degrees. Appendix Figure A.13 shows similar patterns when the effects are separately estimated by gender.

Figure 6: Impact of Passing Math EOC on College Graduation

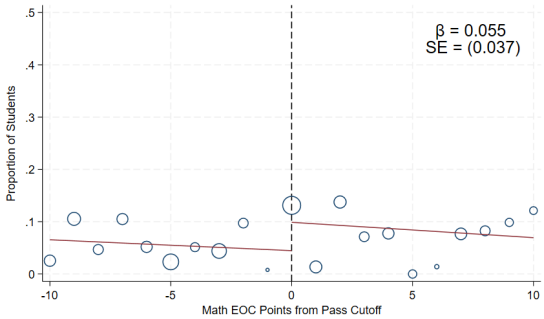
(A) Ever Graduate from Any College



(B) Ever Graduate from 2-year College



(C) Ever Graduate from 4-year College



Notes: Each circle represents the average college graduation, transfer and drop out rates at each of the 21 unique EOC (early sample) test score values around the state's pass cutoff (0). The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level

*** Significant at the 1% level ** 5% level * 10% level.

To further assess college persistence, I estimate the impact of passing the Math EOC on the likelihood of leaving college without a degree. Table 5 shows that students who marginally fail are about 4.1 percentage points more likely to drop out within the first year, 6.2 percentage points more likely to drop out within the second year, and 7.6 percentage

points more likely to ever withdraw from college[30]. National benchmarks from the National Student Clearinghouse (Ibrahim et al., 2025; Lee et al., 2024) indicate that about 38% of students fail to earn a college degree 6 years after initial enrollment, with almost two-thirds having already dropped out by the fall of their second year. Against this backdrop, the 4-7 percentage point reduction in college dropouts associated with passing the Math EOC represents both an economically and statistically meaningful improvement in college persistence. These effects are notably concentrated among marginally failing students dropping out of 2-year college specifically, with stronger effects among female students.

Overall, these findings show that marginally passing the Math EOC not only increases enrollment in 4-year colleges, but also improves college persistence once enrolled. By contrast, students who narrowly fail are not any more likely to graduate from 2-year colleges nor to remain enrolled, suggesting that the career-focused pathway options utilized by these students may help them cross the finish line of high school, but fails to sufficiently prepare them for success in their chosen pathway beyond high school.

[30]College drop outs are defined as students who have been out of college for more than 1 calendar year without having earned a college degree and without having transferred to another school.

Table 5: Impact of Passing Math EOC on College Drop Outs

	Drop Out (Within 1 Year)			**Drop Out (Within 2 Years)**			**Drop Out (Ever)**		
	Overall	2-Year College	4-Year College	Overall	2-Year College	4-Year College	Overall	2-year College	4-Year College
All Students	-0.041*	-0.034	-0.007	-0.062**	-0.093***	0.031	-0.076	-0.112***	0.036
	(0.021)	(0.024)	(0.028)	(0.030)	(0.024)	(0.028)	(0.050)	(0.042)	(0.031)
Male Students	-0.068	-0.024	-0.044	-0.064	-0.050	-0.014	-0.106	-0.099	-0.006
	(0.060)	(0.051)	(0.043)	(0.065)	(0.050)	(0.050)	(0.107)	(0.085)	(0.054)
Female Students	-0.020	-0.044	0.023	-0.059	-0.128***	0.069**	-0.053	-0.124***	0.071***
	(0.037)	(0.030)	(0.026)	(0.047)	(0.026)	(0.028)	(0.042)	(0.031)	(0.027)
Female - Male Diff	0.048	-0.019	0.067	0.005	-0.078	0.083	0.052	-0.025	0.077
	(0.088)	(0.066)	(0.041)	(0.091)	(0.060)	(0.056)	(0.120)	(0.089)	(0.056)
N	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005
Baseline (Pooled)	0.140	0.098	0.042	0.202	0.164	0.039	0.238	0.190	0.048
Baseline (Male)	0.161	0.104	0.057	0.194	0.138	0.056	0.263	0.196	0.067
Baseline (Female)	0.125	0.093	0.032	0.209	0.183	0.027	0.219	0.186	0.033

Notes: This table reports the regression discontinuity estimates of college drop out outcomes in general, from 2-year, and from 4-year college. RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

*** Significant at the 1% level ** 5% level * 10% level

5.6 Robustness Tests

To address potential identification concerns with regards to the density of the running variable for Math EOC scores near the threshold, I conduct a series of robustness checks. First, I examine the distributions of the recentered EOC Math scores separately by cohort within the early EOC sample. I show in Figure A.5 that the visual bunching just above the Math EOC passing threshold in the overall density plot is largely concentrated within the 2019 cohort sample, and is not visually present in the 2020 cohort sample. I confirm this statistically by conducting a density test for manipulation of discrete running variables as proposed by Frandsen (2017). Frandsen's density test adapts the framework of the conventional McCrary (2008) density test for cases of discrete running variables through specifying a bound coefficient, k, that represents the maximum degree of nonlinearity in the probability mass function that is compatible with zero manipulation. With 26 support points within one standard deviation of the math EOC cutoff, I use a conservative k-value of 0.001, to find a p-value of about 0 and 0.16 for the 2019 and 2020 cohort density distributions respectively. This would imply statistical evidence of a break in the distribution for the 2019 cohort, but insufficient evidence of bunching for the 2020 cohort.

I then estimate the regression discontinuity results for high school graduation, college enrollment, pathway usage, and college persistence outcomes separately by the two cohort groups. If the bunching apparent in the 2019 distribution is indeed reflecting meaningful nonrandom sorting close to the passing margins, then one should expect to see the key RD estimates being driven by the 2019 sample. Yet, in Appendix Tables A.18–A.20, I find no evidence of the RD estimates differing in statistical or practical significance when estimated separately by cohort years. Notably the high school graduation and initial college enrollment outcomes appear to be in line across cohorts in both magnitude and statistical significance for the two cohort years. There is some divergence in the the take up rate of career-based pathway options, where the 2020 cohort appears to be more likely to pursue these alternatives upon failure of the Math EOC (which would imply that any non-randomness in the 2019 cohort is actually *understating* the magnitudes of true effects), however both RD estimates share a negative sign and the difference is not statistically significant. The other area of divergence is in college graduation outcomes, where passing students from the 2019 cohort are much more likely to graduate from college than their peers who failed the Math EOCs. This difference may be mechanically reflecting the fact that the 2019 cohort students have had a longer amount of time to complete college compared to their classmates who graduated a year later.

Next, I test the robustness of the main estimates by using a "Donut" Regression Discontinuity design, removing the middle four Math EOC score values at the threshold, which

would most likely be impacted should there be nonrandom bunching. I present these results in Appendix A.8–A.12, showing that the magnitudes and direction of the effects are consistent between the baseline and donut specifications, although in many cases, the donut estimates are no longer statistically significant due to there being a reduced N from an already small sample size. I also show that the results remain fairly robust (both pooled and split by gender) when including baseline test score controls and using different bandwidth specifications for h^*, suggesting that the overall findings are not dependent on the specific choice of bandwidth size.

5.7 Discussion of Early EOC Results

Taken together, these results show that under the early EOC policy, the exam component no longer acted as a gatekeeper for high school graduation, but instead served as a sorting mechanism which channeled students into different college trajectories based on Math EOC performance. Failing the Math EOC on the first try did not bar students from earning a diploma, but did shape their post-secondary enrollment: marginally passing students were more likely to attend 4-year programs, while marginally failing students were more likely to enter 2-year programs.

The mechanisms behind these college sorting patterns appear to be driven by gendered responses towards passing or failing the Math EOCs. The 4-year enrollment effect is entirely driven by female students, who respond strongly to passing the Math EOC, whereas male students show no significant change in behavior at the threshold. These findings are consistent with prior research showing that female students tend to be more sensitive towards academic feedback, especially in male-stereotyped domains (Goldin, 2013; McEwan et al., 2021; Rask and Tiefenthaler, 2008; Shastry et al., 2020). For female students, passing the Math EOC, a stereotyped "male" domain, may serve as a salient signal of ability and readiness for more selective college options. External influences from teachers, mentors, or school guidance counselors may also play a role. Carlana (2019) for instance, finds that exposure to implicit gender biases from math teachers can induce girls to sort into less demanding high school tracks. Carrell and Sacerdote (2017) show that college peer mentorship has significant positive impacts on female college enrollment, but much smaller impacts on male students, while Mulhern (2023) finds that school counselor effectiveness does not differ greatly across gender lines. Although this paper does not directly test these mechanisms, the evidence of gendered college sorting highlights an important direction for future work, as ability signals from exit exams may magnify existing gender differences in how students respond to academic feedback.

For the marginally failing students, the shift towards 2-year college is likely to be influenced by students' exposure to career technical graduation pathways. Although the shift is somewhat larger for female students, both male and female students are more likely to enroll in 2-year college programs when they fail the Math EOC. General engagement in career-focused pathways is similar across gender groups, however the types of activities pursued differs: male students are more likely to become CTE concentrators and complete the "Option 2" CTE pathway, while female students are more likely to pursue lower-intensity career-tech options through the "Option 1" Flexible Competency pathway. Neither male nor female students appear to be engaging with the original, more rigorous career-focused pathway option of earning 12 points in IRCs to signal workforce readiness.

Despite differences in how students fulfilled their graduation requirements, marginally failing students did not appear to be very academically different from their peers who passed. Both groups took similar academic coursework during the 11th and 12th grades, differing mostly in their choice of electives. There were also no meaningful differences in high school GPA, attendance rate, or college-preparatory coursework (AP and CCP) between marginally passing or failing students. The one exception is that marginally passing students, particularly female students, were more likely to take the ACTs, signaling a stronger intent to apply to 4-year colleges. Overall, while failing the Math EOC increased participation in career-technical pathways, these alternatives did not place students on fundamentally different high school academic trajectories relative to their peers who barely passed.

Following these students into college, I find that marginally passing the Math EOC improves persistence and retention through the first year of college. Students who passed the Math EOC were about 4-7 percentage points less likely to drop out of college, with the largest effects concentrated among those in 2-year programs. Given the minimal differences in high school academic coursework and grades between the passing and failing student groups, this raises the question of whether students who steered towards 2-year trajectories might have fared better by pursuing 4-year pathways instead. It also calls into question the extent to which the available career-focused graduation pathways effectively bridged the gap between high school and 2-year programs.

In sum, the career-based alternatives from the initial years of the EOC policy were more effective at helping students earn their high school diplomas than meaningfully preparing them for post-secondary success. This likely stems from the uneven rigor of early pathway options, particularly the temporary Flexible Competency pathway which allowed students to graduate under a lighter set of academic and career technical requirements than the original pathway options. Limited exposure to CTE activities may still have encouraged students to explore 2-year college options, especially since students can receive college credits for certain

IRCs or high school CTE courses at one of Ohio's public colleges or universities through the Career-Technical Assurance Guides (CTAG) program[31]. However, such exposure appears to be insufficiently preparing them to persist through full vocational college programs. This leads to the question of whether more structured and rigorous career-technical pathways could strengthen student engagement and post-secondary success, while maintaining the lowered rigidity in graduation testing. The next section examines preliminary evidence from later cohorts who faced a revised EOC policy that simplified testing requirements and laid out more rigorously-structured pathways.

6 Revised EOC Policy Impacts on Student Outcomes

Starting in the 2019-2020 school year, Ohio adopted a revised long-term EOC graduation policy, replacing the initial version which it had implemented five years earlier. The revised policy came in response to concerns brought up by educational leaders and school districts across the state, highlighting that the unfocused nature of the temporary pathway options and the complexity in the exam requirements imposed inconsistent graduation standards upon students. The revised policy, which was referred to as the long-term graduation policy, both simplified the graduation testing requirements of EOCs, and restructured the alternative pathways to be more focused towards the college or career goals they are aligned with. This policy change allows me to evaluate how restructuring the pathway options changes the ways in which marginal students interact with alternatives, and how these new pathways impact their post-secondary success. In the remainder of this section, I examine the impact of marginally passing the revised Math EOC Math requirement on students' high school graduation, pathway utilization, intensity of CTE exposure, and post-secondary outcomes.

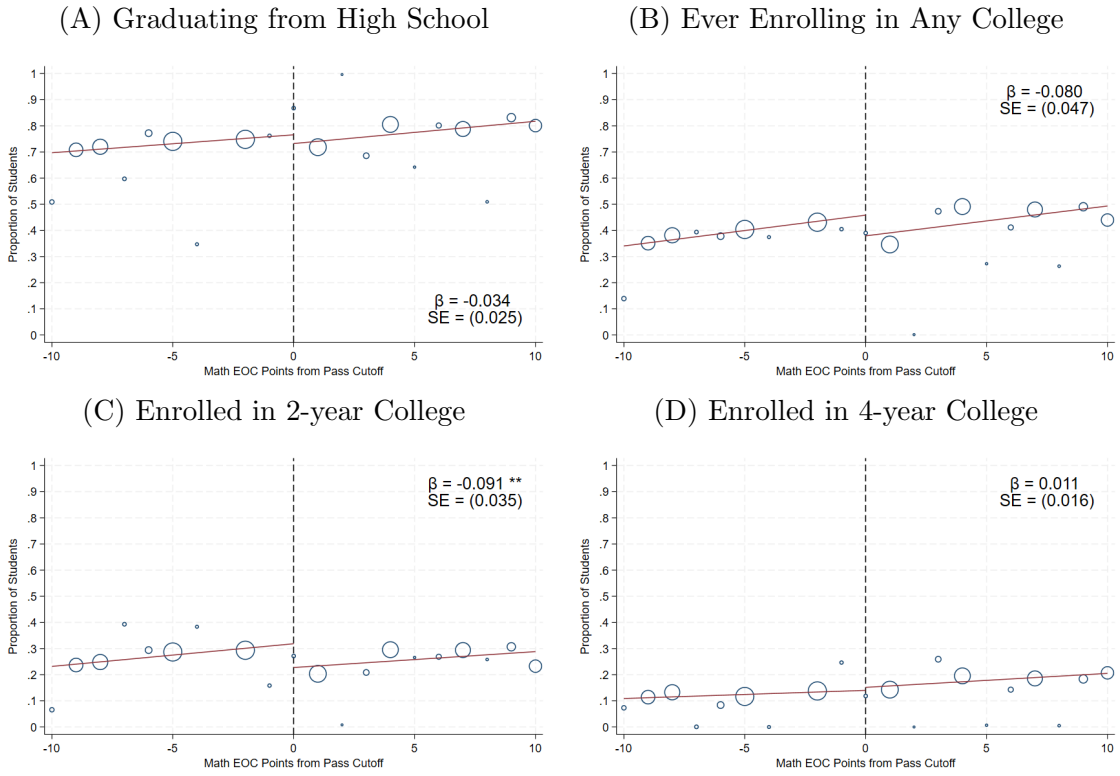
Because of changes in the testing cutoff under the revised EOC requirements, the marginal student population in the late EOC sample differs slightly from that which is picked up by the early EOC cohorts. Appendix Table A.2 summarizes these differences. Students near the cutoff in the later cohorts scored about 0.11 to 0.18 standard deviations lower on 8th grade Math and ELA exams, indicating a modest shift towards a lower-achieving group of students. They were also slightly more likely to have been an English Language Learner, slightly less likely to have been classified as "gifted", and slightly more likely to be Hispanic. These differences imply that the two student samples do not offer a direct counterfactual comparison across policy regimes, thus the focus of this analysis is to instead highlight how a revised policy regime shaped student behaviors differently around the margins.

[31] Credit transfer is contingent on there being an equivalent course available at the participating 2-year institution

6.1 High School Graduation and College Enrollment

Figure 7 shows that for students in the late EOC policy cohorts, passing the revised Math EOC continues to have no impact on high school graduation, consistent with earlier findings. In contrast to early EOC cohorts, however, passing the Math EOC affects overall college enrollment. Students just below the pass/fail threshold are approximately 8 percentage points more likely to attend any college, driven entirely by higher enrollment into 2-year college programs, while 4-year college enrollment remains unchanged. Appendix A.14 shows that there are no significant gender differences in these estimates. These results indicate that the revised policy expanded college access through the 2-year college channel, reflecting a shift from intensive margins to extensive margins sorting.

Figure 7: Impact of Passing Math EOC on HS and College Outcomes (2021-2024)

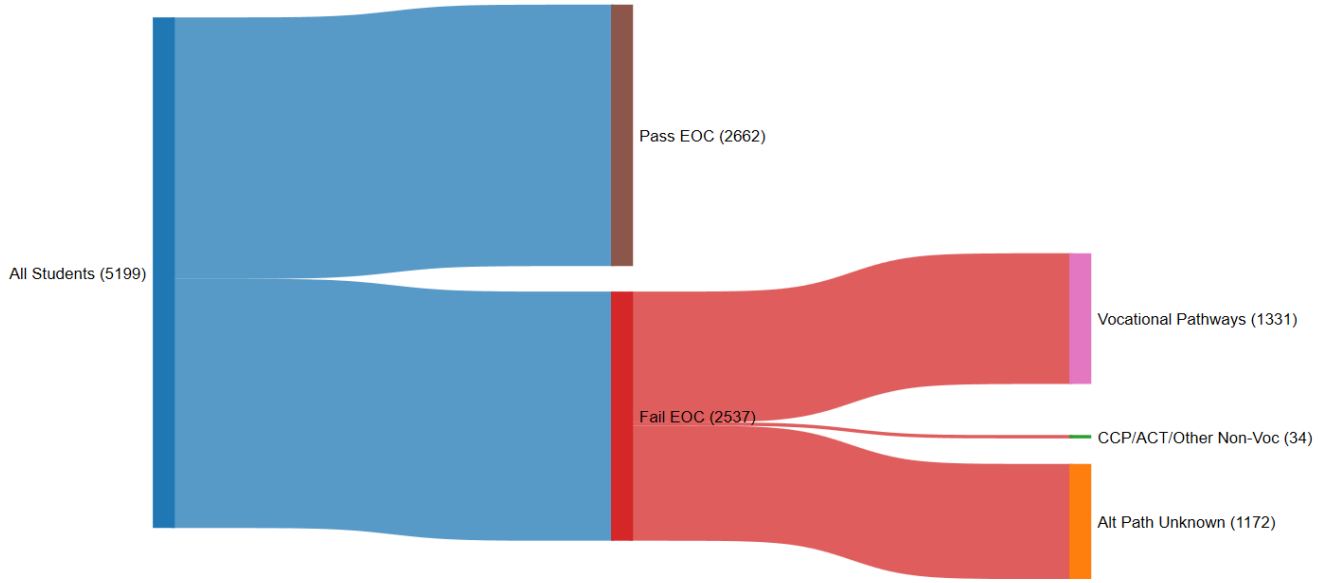


Notes: Each circle represents the average high school graduation or college enrollment rates for across each of the 21 unique EOC (late sample) combined Math EOC score values around the state's pass cutoff (0). 2- and 4-year college enrollment rates are measured for the first college that a student enrolls in after high school. The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level.

6.2 Alternative Pathway Takeup and Academic Outcomes

Although the career-focused pathway option was more rigorously structured under the revised EOC policy, students who failed the EOC still primarily interacted with this pathway over the other options[32]. Figure 8 shows the overall flows of the students in these late EOC cohorts into different graduation pathways. Approximately 51% of students are able to ever pass the exams, a moderate improvement from the 42% observed under the early EOC exam standards. Of the students who never passed the EOCs, 58% end up utilizing the career-based pathway option, which largely dominates as the main pathway of choice. Similar to the early EOC cohorts, very few students end up meeting the requirements for remediation free ACT scores, earning college credit, or a combination of those options. Approximately 20% of the overall sample are unaccounted for by any observable pathway option.

Figure 8: Graduation Pathway Flows: Late EOC (2021-2024)

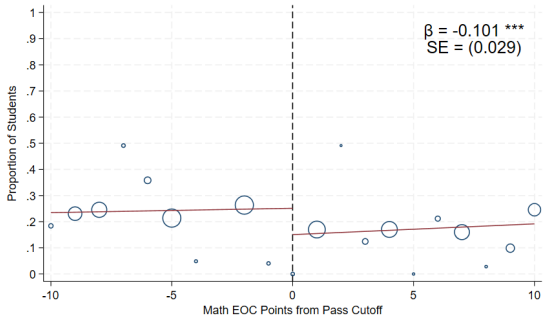


When assessing the post-EOC take up of different pathway options at the margins, I find that students who marginally fail are about 10.1 percentage points more likely to participate in the career-based pathway option compared to students who marginally passed. There are no significant differences for the other pathway options.

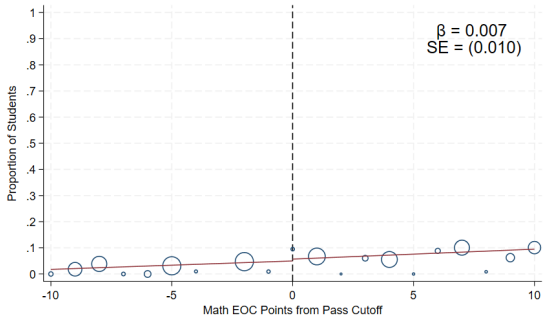
[32]Note that due to data limitations, I cannot observe whether a student enlists in the military

Figure 9: Impact of Passing Math EOC on Graduation Pathway Activities (2021-2024)

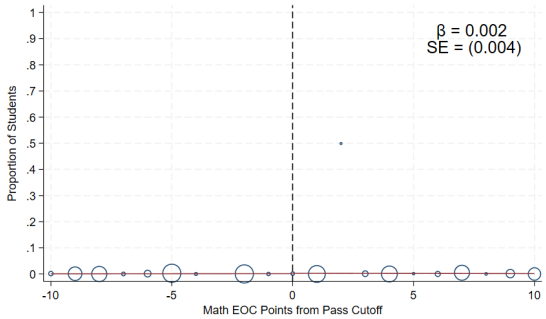
(A) Career-Based



(B) College Credit Plus



(C) Remediation-Free ACT



Notes: Each circle represents the percentage of students who take up each alternative pathway option (after the first attempt of the Math EOCs) at each of the 21 unique EOC (late sample) test score values around the state's pass cutoff (0). The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level.

Consistent with the pathway restructuring of career-focused options, students in the later EOC cohorts are taking up career tech activities in a much more intensive way. Table 6 shows that overall, students are exhibiting higher engagement with earning IRCs and CTE coursework. While the baseline rates of earning any IRC has not drastically changed across the early and late EOC policy eras, students in the late EOC cohorts are completing more IRC points in general[33]. Under the early EOC policy, less than 5% of students in the marginal sample completed the full 12 point credentialing sequence, compared to 11% of marginal students in these later cohorts. This is in line with state-wide trends which have been showing rapid growth in IRCs earned by students in Ohio over the last five years (Fordham Institute, 2025). Students who barely failed the revised Math EOC exam requirement are also about 5 percentage points more likely to complete the full 12 pt IRC sequence, with no significant gender differences. For CTE coursework, there is some evidence to suggest that male students are about 11 percentage points more likely to become CTE

[33]See Appendix Figure A.16 for a comparison of total IRC exams and points earned.

concentrators upon failing the Math EOCs, while female students do not see large gains in CTE concentrations. Overall, the evidence suggests that students in the late EOC cohorts respond to exam failure by investing more deeply in rigorous career and technical education activities.

Table 6: Career Pathway Activities After First Math EOCs (2021-2024)

	Industry-Recognized Credentials			**CTE Coursework**		
	Took IRC	Took 3+ IRC Pts	Took 12+ IRC Pts	Took Any CTE Course	CTE Concentrator	Completed CTE Course Sequence
All Students	-0.050	-0.053***	-0.054***	-0.009	-0.034	-0.035*
	(0.033)	(0.018)	(0.019)	(0.027)	(0.024)	(0.020)
Male Students	-0.010	-0.002	-0.079**	-0.005	-0.109***	-0.046
	(0.033)	(0.033)	(0.035)	(0.032)	(0.032)	(0.038)
Female Students	-0.082*	-0.090***	-0.035**	-0.012	0.019	-0.029
	(0.044)	(0.021)	(0.016)	(0.034)	(0.033)	(0.018)
Female - Male Diff	-0.072	-0.087**	0.043	-0.007	0.128***	0.017
	(0.046)	(0.035)	(0.035)	(0.038)	(0.046)	(0.040)
N	2,076	2,076	2,076	2,076	2,076	2,076
Baseline (Pooled)	0.291	0.223	0.115	0.438	0.381	0.143
Baseline (Male)	0.249	0.226	0.138	0.430	0.392	0.131
Baseline (Female)	0.325	0.222	0.097	0.444	0.373	0.153

Notes: This table reports the regression discontinuity estimates on specific career-technical pathway activities taken up by students after their first Math EOC attempt. RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The running variable is the distance of the student's scale score on the Math 1 EOC exam from the state defined cutscore (684). The sample is limited to 2021-2024 cohort students who took at least one attempt of the Math 1 EOC, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

*** Significant at the 1% level ** 5% level * 10% level

In terms of academic outcomes, Table 7 shows that there are no significant differences in the average GPAs, AP and CCP coursework, and college admissions testing rates for students across the pass/fail cutoff. If anything, marginally failing students (particularly female students) may be slightly more likely to take the state-sponsored 11th grade ACTs or SATs[34] than marginally passing students. These patterns hold even when considering all college admissions testing taken in the latter years of high school (see Appendix Figure A.6).

[34]For the class of 2024, the school district pivoted from administering the ACTs to the SATs for the 11th grade college admissions exam.

Table 7: High School College Readiness Outcomes After First Math EOCs (2021-2024)

	GPA/Attendance			**College Credit Coursework**				**11^{th} Grade State-Sponsored ACTs/SATs**			
	GPA (Weighted)	GPA (Unweighted)	Attendance Rate	Took AP Course	Earned AP credit	Took CCP Course	Earned CCP credit	Took 11th Grade ACTs/SATs	Standardized ACT/SAT Composite	Standardized ACT/SAT Math	Standardized ACT/SAT Reading
All Students	0.027	0.021	-0.012	-0.004	-0.020	0.022	0.016	-0.049	-0.010	0.007	0.043
	(0.061)	(0.058)	(0.018)	(0.027)	(0.021)	(0.025)	(0.019)	(0.037)	(0.041)	(0.029)	(0.049)
Male Students	-0.012	-0.008	-0.011	0.028	0.005	0.030	0.015	-0.010	0.138*	0.087	0.302***
	(0.131)	(0.131)	(0.030)	(0.024)	(0.020)	(0.027)	(0.021)	(0.056)	(0.073)	(0.056)	(0.108)
Female Students	0.053	0.039	-0.012	-0.031	-0.040	0.014	0.013	-0.078**	-0.112***	-0.055	-0.138***
	(0.058)	(0.051)	(0.025)	(0.033)	(0.029)	(0.028)	(0.023)	(0.035)	(0.036)	(0.035)	(0.043)
Female - Male Diff	0.065	0.047	-0.001	-0.059**	-0.045	-0.015	-0.002	-0.068	-0.250***	-0.143**	-0.439***
	(0.139)	(0.138)	(0.040)	(0.025)	(0.027)	(0.012)	(0.013)	(0.053)	(0.067)	(0.064)	(0.118)
N	1,823	1,823	1,909	2,076	2,076	2,076	2,076	2,076	1,129	1,136	1,132
Baseline (Pooled)	2.556	2.524	0.637	0.181	0.170	0.112	0.101	0.565	-0.208	-0.255	-0.178
Baseline (Male)	2.383	2.362	0.648	0.125	0.125	0.069	0.055	0.544	-0.291	-0.298	-0.369
Baseline (Female)	2.692	2.651	0.628	0.227	0.207	0.147	0.138	0.582	-0.149	-0.227	-0.036

Notes: This table reports the regression discontinuity estimates of high school GPA (on a scale of 0-5 weighted; 0-4 unweighted), attendance rate, AP and College Credit Plus coursework, and ACT outcomes from the state-sponsored 11th grade ACT or SAT exam (2021-2023 cohorts took the ACTs, while the 2024 cohort took the SATs), occurring after the first Math EOC attempt. ACT and SAT scores are standardized into Z-scores, where original scores (ACT scale 1-36; SAT scale 400-1600 Composite/200-800 Subject) are re-centered on the mean and scaled by the standard deviation within cohort groups. RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The running variable is the distance of the student's scale score on the Math 1 EOC exam from the state defined cutscore (684). The sample is limited to 2021-2024 cohort students who took at least one attempt of the Math 1 EOC, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

*** Significant at the 1% level ** 5% level * 10% level

6.3 College Persistence

Since students in the later EOC cohorts are more recently graduated from high school, the data horizon to measure college graduation outcomes is limited. To assess measures of college persistence, I limit my analysis to outcomes of early withdrawals (dropping out of college within 1-2 years) for students in the classes of 2021-2022. Table 8 reveals a reversal in college persistence patterns from those of the earlier cohorts. Students who marginally pass the Math EOCs are about 8 percentage points more likely to drop out of college within the first year, and 6 percentage points more likely to drop out of college within the first two years. There is some evidence of gender heterogeneity in that the magnitudes of these effects are larger for male students than for female students. Unlike the early EOC cohorts, there is no stark difference in the early drop out effects from 2- versus 4-year colleges. Appendix Table A.7 shows that marginally failing students are slightly more likely to ever transfer to a different institution, but this effect is mostly driven by transfers from 4- to 2-year colleges. In other words, students on the left side of the Math EOC cutoff appear to be moving into 2-year colleges even after initial enrollment.

Overall, these college persistence results suggest that under the revised EOC policy, students who fail the Math EOC are not just enrolling in college at higher rates than students who barely passed, but also experience improvements in college persistence. This stands in contrast to the results from the earlier EOC cohorts, which finds that marginally failing students were less likely to persist through college (particularly 2-year college) than their peers who passed. This reversal in outcomes may reflect an improved alignment between the career-technical pathway that students make use of when they fail the EOCs, and 2-year college trajectories. Although it is still early to tell if these persistence results will continue through college completion, the preliminary findings are promising.

Table 8: Impact of Passing Math EOC on College Drop outs (2021-2022)

	Drop Out (Within 1 Year)			**Drop Out (Within 2 Years)**			**Drop Out (Ever)**		
	Overall	2-Year College	4-Year College	Overall	2-Year College	4-Year College	Overall	2-year College	4-Year College
All Students	0.081***	0.056***	0.025**	0.062***	0.028***	0.033**	0.048**	0.009	0.039***
	(0.016)	(0.007)	(0.012)	(0.023)	(0.010)	(0.015)	(0.023)	(0.010)	(0.014)
Male Students	0.134***	0.090***	0.044**	0.096***	0.050***	0.046**	0.098***	0.037***	0.061***
	(0.033)	(0.016)	(0.020)	(0.027)	(0.019)	(0.018)	(0.026)	(0.013)	(0.018)
Female Students	0.050***	0.034***	0.016	0.042	0.013	0.029	0.017	-0.011	0.029
	(0.013)	(0.009)	(0.011)	(0.032)	(0.015)	(0.020)	(0.034)	(0.017)	(0.021)
Female - Male Diff	-0.085**	-0.057***	-0.028	-0.054	-0.037	-0.017	-0.080*	-0.048**	-0.032
	(0.037)	(0.020)	(0.022)	(0.042)	(0.028)	(0.027)	(0.045)	(0.024)	(0.031)
N	1,396	1,396	1,396	1,396	1,396	1,396	1,396	1,396	1,396
Baseline (Pooled)	0.054	0.035	0.019	0.119	0.097	0.022	0.136	0.116	0.020
Baseline (Male)	0.076	0.031	0.044	0.138	0.082	0.056	0.146	0.093	0.053
Baseline (Female)	0.037	0.038	0.000	0.103	0.108	0.000	0.129	0.134	0.000

Notes: This table reports the regression discontinuity estimates of college drop out and transfer rates for students in the late EOC cohorts. RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The fourth row reports the difference in RD values between female students and male students. The running variable is the distance of the student's scale score on the Math 1 EOC exam from the state defined cutscore (684). The sample is limited to 2021-2022 cohort students who took at least one attempt of the Math 1 EOC, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

*** Significant at the 1% level ** 5% level * 10% level

7 Conclusion

This paper provides causal evidence on how graduation pathways shape students' high school and post-secondary outcomes. Leveraging Ohio's transition from a traditional exit exam system to one which combined End-of-Course (EOC) exams with alternative pathways, I estimate the causal impact of passing the state's Math exit exam on student outcomes. The shift from the OGT system to the early EOC policy lowered the test score barriers of high school graduation by offering students expanded options beyond test retakes. However, this flexibility also changed how student sorted into college programs: narrowly passing students were more likely to attend 4-year colleges, while narrowly failing students were more likely to attend 2-year colleges.

These college sorting patterns appear to stem from two key mechanisms. First, gendered responses to passing the Math EOC drove much of the increase in four-year enrollment, as female students were particularly responsive to signals of success in math. Second, students who narrowly failed the Math EOC increasingly relied on career-technical alternatives to fulfill graduation requirements.

Despite the higher overall take up rates of career-focused pathway options among marginally failing students, the level of student engagement with these CTE activities remained minimal. Most students pursued low-value credentials rather than intensive CTE coursework, reflecting the uneven rigor of the early EOC pathway options. While these expanded alternatives did help students earn their high school diplomas, their lack of rigor and focus provided limited skill development. As a result, college persistence and completion rates among marginally failing students was fairly low. These results raise concerns that the flexible alternative options reduced short-term barriers to high school graduation at the expense of meaningful preparation for longer-term post-secondary success.

In contrast, the revised long-term EOC policy simplified testing while strengthening the structure of career-focused alternative pathways. Students just below the revised Math EOC threshold became more likely to enroll in college, particularly 2-year college programs, and were engaging with career-technical pathway options in a more intensive way. This shift is reflective of a more coherent alignment between the pathway requirements and post-secondary opportunities. Consistent with this, these same students also experienced improvements in college persistence rates after high school. These findings suggest that as alternative pathways become more clearly defined and better aligned with post-secondary options, students respond by engaging more deeply, which may lead to better skill development for what comes after high school.

There are several areas where future work could meaningfully expand upon the findings

of this paper. First, extending the scope of this study to encompass all school districts across the state of Ohio would allow for a broader, more comprehensive evaluation of the graduation policy. This expanded analysis could further document the potential heterogeneous effects that the state-wide policy has on school districts with differing socioeconomic and demographic compositions. Further research should also explore the mechanisms driving the gendered responses to the earlier Math EOCs. In particular, distinguishing between internal factors, such as self-efficacy and confidence, and external influences, such as that of teachers and guidance counselors, can help inform policy that aims to reduce the gender disparities in the academic signaling of students' test performance. Finally, additional data extensions linking the impacts of graduation pathways to employment outcomes would be extremely informative as to how well CTE pathway options prepare students for the workforce. This is particularly important as more than half of the students in the selected district sample do not enroll in any college after high school. Understanding the employment prospects of such students would shed light on whether CTE programs of study can benefit students who elect to directly enter the workforce, and how such students fare in comparison to their peers who do enroll in college.

In sum, these findings underscore how flexible graduation systems can reduce inequalities in diploma attainment, with the caveat that their success depends largely on the structures of the alternatives. As states continue to reform or eliminate their exit exam requirements, the consideration of building flexible but effective graduation systems becomes increasingly important, especially when it comes to the impacts that such policies would have on disadvantaged students. Flexibility in graduation standards can indeed expand access to the diploma, but must be paired with rigor and clear alignment to post-secondary objectives in order to effectively prepare students for meaningful opportunities beyond high school.

References

AIR and Ohio Dept. of Education (2017). Annual technical report: Ohio's state tests in english language arts, mathematics, science, and social studies. Technical report, American Institutes for Research.

Aldis, C. L. (2018). Five ideas for resolving ohio's debate over graduation requirements.

Bishop, J. H. and F. Mane (2004). The impacts of career-technical education on high school labor market success. *Economics of Education Review 23*, 381–402.

Brunner, E. J., S. M. Dougherty, and S. L. Ross (2023). The effects of career and technical education: Evidence from the connecticut technical high school system. *The Review of Economics and Statistics 105*(4), 867–882.

Carlana, M. (2019). Implicit stereotypes: Evidence from teachers' gender bias. *The Quarterly Journal of Economics 134*(3), 1163–1224.

Carrell, S. and B. Sacerdote (2017). Why do college-going interventions work? *American Economic Journal: Applied Economics 9*(3), 124–151.

Cattaneo, M. D., M. Jansson, and X. Ma (2021). Local regression distribution estimators. *Journal of Econometrics*.

Chetty, R., D. J. Deming, and J. N. Friedman (2025). Diversifying society's leaders? the determinants and causal effects of admission to highly selective private colleges. Technical report, National Bureau of Economic Research.

Cortes, K., J. A. Lincove, and C. Mata (2022). A bridge to graduation: Post-secondary effects of an alternative pathway for students who fail high school exit exams. Technical report, National Bureau of Economic Research.

Dee, T. S. and B. A. Jacob (2006). Do high school exit exams influence educational attainment or labor market performance? Technical report, National Bureau of Economic Research.

Dougherty, S. M. (2018). The effect of career and technical education on human capital accumulation: Causal evidence from massachusetts. *Education Finance and Policy 13*(2), 119–148.

Erwin, B., D. Brown, and S. Mann (2023). 50-state comparison: High school graduation requirements. Technical report, Education Commission of the States.

Fordham Institute, a. (2025). Ohio education by the numbers. Technical report, Thomas B. Fordham Institute.

Frandsen, B. R. (2017). *Party Bias in Union Representation Elections: Testing for Manipulation in the Regression Discontinuity Design when the Running Variable is Discrete*. Emerald Publishing.

Gable, A. (2024). Career technical education access, course-taking, and outcomes: Evidence from ohio. Technical report, Working Paper.

Goldin, C. (2013). Notes on women and the undergraduate economics major. *CSWEP Newsletter*, 4–6, 15.

Gottfried, M. A. and J. S. Plasman (2018). Linking the timing of career and technical education coursetaking with high school dropout and college-going behavior. *American Educational Research Journal 55*(2), 325–361.

Hatfield, N., N. Brown, and C. M. Topaz (2022). Do introductory courses disproportionately drive minoritized students out of stem pathways? *PNAS Nexus 1*.

Hemelt, S. W., M. A. Lenard, and C. G. Paeplow (2019). Building bridges to life after high school: Contemporary career academies and student outcomes. *Economics of Education Review 68*, 161–178.

Hemelt, S. W. and D. E. Marcotte (2013). High school exit exams and dropout in an era of increased accountability. *Journal of Policy Analysis and Management 32*(2), 323–349.

Holme, J. J., P. Richards, Meredith, J. B. Jimerson, and R. W. Cohen (2010). Assessing the effects of high school examinations. *Review of Educational Research*.

Ibrahim, M., M. A. Holsapple, and D. Shapiro (2025). Persistence and retention fall 2023 beginning postsecondary student cohort. Technical report, National Student Clearinghouse Research Center.

Kistler, H. C. and S. M. Dougherty (2025). Evidence-based approaches to redesigning effective career and technical education programs. Technical report, EdResearch for Action.

Lee, D. S. and D. Card (2008). Regression discontinuity inference with specification error. *Journal of Econometrics*, 655–674.

Lee, S., B. Berg, A. Gardner, M. A. Holsapple, and D. Shapiro (2024). Yearly progress and completion. Technical report, National Student Clearinghouse Research Center.

Leonhardt, D. (2024). The misguided war on the sat. *The New York Times*.

Martorell, F. (2005). Do high school graduation exams matter? evaluating the effects of exit exam performance on student outcome. Technical report, National Bureau of Economic Research.

McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of Econometrics*, 698–714.

McEwan, P. J., S. Rogers, and A. Weerapana (2021). Grade sensitivity and the economics major at a women's college. *AEA Papers and Proceedings 111*, 102–106.

McIntosh, S. (2012). State high school exit exams: A policy in transition. Technical report, Center on Education Policy.

Mulhern, C. (2023). Beyond teachers: Estimating individual school counselors' effects on educational attainment. *American Economic Review 113*(11), 2846—-2893.

Oakes, J. (1983). Limiting opportunity: Student race and curricular differences in secondary vocational education. *American Journal of Education 91*(3), 328–355.

of Education, O. D. and Workforce (2025). State-funded act tests.

Ou, D. (2010). To leave or not to leave? a regression discontinuity analysis of the impact of failing the high school exit exam. *Economics of Education Review*, 171–186.

Papay, J. P., A. Mantil, and R. J. Murnane (2022). On the threshold: Impacts of barely passing high-school exit exams on post-secondary enrollment and completion. *Educational Evaluation and Policy Analysis*, 717–733.

Papay, J. P., R. J. Murnane, and J. B. Willett (2010). The consequences of high school exit examinations for low-performing urban students: Evidence from massachusetts. *Educational Evaluation and Policy Analysis*, 5–23.

Poquette, H. and A. Butler (2018). Understanding the policy context of high school exit exams: A review of the literature from 2006 to 2018. Technical report, Kentucky Department of Education.

Rask, K. and J. Tiefenthaler (2008). The role of grade sensitivity in explaining the gender imbalance in undergraduate economics. *Economics of Education Review 27*(6), 676–687.

Reardon, S. F., N. Arshan, A. Atteberry, and M. Kurlaender (2010). Effects of failing a high school exit exam on ourse taking, achievement, persistence and graduation. *Educational Evaluation and Policy Analysis 32*(4), 498–520.

Rosenbaum, J. E. (1976). *Making inequality: The hidden curriculum of high school tracking.* John Wiley.

Rosinger, K., D. J. Baker, J. Sturm, W. Yu, J. J. Park, O. Poon, B. H. Kim, and S. Breen (2024). Exploring the relationship between test-optional admissions and selectivity and enrollment outcomes during the pandemic. Technical report, Annenberg Institute.

Sacerdote, B., D. O. Staiger, and M. Tine (2025). How test optional policies in college admissions disproportionately harm high achieving applicants from disadvantaged backgrounds. Technical report, National Bureau of Economic Research.

Shastry, G. K., O. Shurchkov, and L. L. Xia (2020). Luck or skill: How women and men react to noisy feedback. *Journal of Behavioral and Experimental Economics 88*(3), 1011–1054.

Thompson, M. E. (2021). Grade expectations: The role of first-year grades in predicting the pursuit of stem majors for first- and continuing-generation students. *The Journal of Higher Education 92*, 961–985.

Tyack, D. (1974). *The one best system: A history of American urban education.* Harvard University Press.

A Appendix

Figure A.1: Overview of Graduation Policies: OGT, EOC Early, EOC Late

Policy Era	**OGT Era** (Cohorts 2007-2017)	**EOC Early Era** (Cohorts 2018-2020)	**EOC Late Era** (Cohorts 2021-Present)
Required Exams	5 subject OGTs: Math, English, Writing, Science, Social Studies	7 subject EOCs: Math 1 (Algebra), Math 2 (Geometry), English 1, English 2, Biology, Government, U.S. History	2 subject EOCs: Math 1 (Algebra) and English 2
Graduation Scoring Criteria	Score above fixed cut-score (400) on each OGT	Earn at least 18/35 EOC proficiency points with subject specific minimums: • Math: 4 pts • Eng: 4 pts • Science/SS: 6 pts	Score above fixed cut-score (684) on Math 1 and Eng 2 EOCs
Alternative Pathway Options	Exception granted for students who meet all 7 of the below criteria: 1. Pass 4/5 OGTs and miss passing one OGT by <10 points 2. 97% attendance rate for all HS yrs 3. No expulsions 4. 2.5/4.0 GPA in subject area of failed OGT 5. Complete HS curricular requirements in subject area of failed OGT 6. Complete academic intervention program 7. Receive letter of recs from HS teachers and principal	Original: **Industry Credential:** • Earn 12 points in IRCs *and* • Earn passing score in WorkKeys Exam **ACT/SAT:** • Earn remediation free scores in Math and English sections Temporary (*added 2017*): **Flexible Competency:** *Pick 2* • 93% attendance rate in 12th grade • 2.5/4.0 GPA in 12th grade courses • 12th grade capstone project • 12th grade work study or community service (120 hrs) • Earn 3+ college credit plus credits • Earn credit and pass AP/IB exam • Pass WorkKeys exam • Earn 3 points in IRC • Meet OhioMeetsJobs Readiness Seal **CTE:** Complete 4-course CTE curriculum and choose 1 • Earn proficient WebXam scores • Earn 12 point industry Credential • 250 hour work study	**Career Readiness:** *Choose 2* Foundational: • Earn proficient scores on 3+ WebXams in single career pathway • Complete 12 pts in IRCs within single field • Pre-apprenticeship • Earn OH state professional license Supporting: • 250-hour work-based learning • National Career Readiness Silver Level on WorkKeys • OhioMeansJobs Readiness Seal **ACT/SAT:** • Earn remediation free scores in Math and English sections **College Credit Plus:** • Earn credit in non-remedial Math or English course for subject area not passed **Military Enlistment**

Table A.1: Summary Statistics of Students across Cohort Samples

	EOC Early (2019-2020)	OGT (2009-2017)	EOC Late (2021-2024)	EOC Early - OGT		EOC Early - Late		EOC Late - OGT	
				Δ/SE	% Diff	Δ/SE	% Diff	Δ/SE	% Diff
A. Demographics									
Female	0.51	0.51	0.51	0.0017	0.32	0.0034	0.66	-0.0017	-0.33
	[0.50]	[0.50]	[0.50]	(0.0078)		(0.0093)		(0.0065)	
Black	0.60	0.66	0.56	-0.064***	-11.4	0.034***	5.97	-0.098***	-17.4
	[0.49]	[0.47]	[0.50]	(0.0076)		(0.0092)		(0.0064)	
Hispanic	0.098	0.051	0.12	0.047***	39.1	-0.023***	-19.1	0.071***	58.2
	[0.30]	[0.22]	[0.33]	(0.0045)		(0.0058)		(0.0040)	
White	0.17	0.23	0.18	-0.055***	-30.5	-0.0078	-4.30	-0.047***	-26.3
	[0.38]	[0.42]	[0.38]	(0.0060)		(0.0071)		(0.0051)	
Asian	0.051	0.029	0.045	0.022***	49.8	0.0061	13.7	0.016***	36.1
	[0.22]	[0.17]	[0.21]	(0.0033)		(0.0040)		(0.0026)	
Ever English Learner	0.24	0.12	0.25	0.12***	47.7	-0.0097	-3.81	0.13***	51.5
	[0.43]	[0.33]	[0.44]	(0.0065)		(0.0080)		(0.0054)	
Ever Special Education	0.20	0.16	0.21	0.037***	17.6	-0.011	-5.17	0.048***	22.8
	[0.40]	[0.37]	[0.41]	(0.0062)		(0.0075)		(0.0052)	
Ever Gifted Status	0.13	0.28	0.12	-0.15***	-127.8	0.012**	10.5	-0.16***	-138.3
	[0.33]	[0.45]	[0.32]	(0.0055)		(0.0061)		(0.0046)	
Ever Homeless	0.15	0.081	0.16	0.068***	41.6	-0.015**	-9.01	0.083***	50.6
	[0.36]	[0.27]	[0.37]	(0.0054)		(0.0067)		(0.0046)	
Ever Economically Disadvantaged	0.92	0.97	0.90	-0.049***	-5.47	0.024***	2.64	-0.073***	-8.10
	[0.27]	[0.17]	[0.30]	(0.0040)		(0.0053)		(0.0037)	
B. Educational Baseline									
Grade 8 Math (z-score)	0.18	0.13	0.12	0.048***	38.7	0.054***	43.7	-0.0061	-4.99
	[0.78]	[1.00]	[0.56]	(0.016)		(0.016)		(0.012)	
Grade 8 ELA (z-score)	0.14	0.13	0.17	0.017	10.00	-0.029*	-16.6	0.046***	26.6
	[0.79]	[0.98]	[0.67]	(0.015)		(0.017)		(0.013)	
C. Ohio Exit Exam Performance									
Total Exit Exam Subjects Taken	6.82	4.99	4.72	1.83***	38.9	2.11***	44.7	-0.27***	-5.81
	[0.44]	[0.099]	[1.62]	(0.0064)		(0.020)		(0.019)	
Ever Passed Math Exit Exam(s)	0.48	0.77	0.49	-0.30***	-60.5	-0.013	-2.71	-0.28***	-57.8
	[0.50]	[0.42]	[0.50]	(0.0076)		(0.0093)		(0.0063)	
Ever Passed ELA Exit Exam(s)	0.66	0.84	0.61	-0.18***	-29.3	0.057***	9.44	-0.23***	-38.7
	[0.47]	[0.37]	[0.49]	(0.0072)		(0.0089)		(0.0061)	
Ever Passed all Exam Requirements	0.36	0.64	0.41	-0.28***	-67.7	-0.051***	-12.5	-0.23***	-55.2
	[0.48]	[0.48]	[0.49]	(0.0075)		(0.0090)		(0.0064)	
D. Outcomes									
Graduated HS	0.80	0.69	0.71	0.10***	14.6	0.085***	12.0	0.018***	2.58
	[0.40]	[0.46]	[0.45]	(0.0064)		(0.0079)		(0.0059)	
Enrolled in Any College	0.40	0.46	0.37	-0.063***	-16.9	0.024***	6.53	-0.088***	-23.4
	[0.49]	[0.50]	[0.48]	(0.0077)		(0.0091)		(0.0064)	
Enrolled in 4-year College	0.21	0.26	0.15	-0.049***	-31.8	0.057***	37.1	-0.11***	-68.9
	[0.41]	[0.44]	[0.36]	(0.0064)		(0.0072)		(0.0049)	
Enrolled in 2-year College	0.19	0.20	0.22	-0.013**	-5.80	-0.032***	-14.7	0.020***	8.94
	[0.39]	[0.40]	[0.41]	(0.0061)		(0.0074)		(0.0054)	
Observations	4,778	29,313	7,313						

Notes: This table shows the summary characteristics of the selected sample of students within each of the three graduation policy periods: OGT, EOC early, and EOC late. The standard deviations of means are shown in parentheses under each mean value. T-test difference of means are reported in the final three columns, with standard errors reported in parentheses below each difference (adjusted for unequal variances between groups)

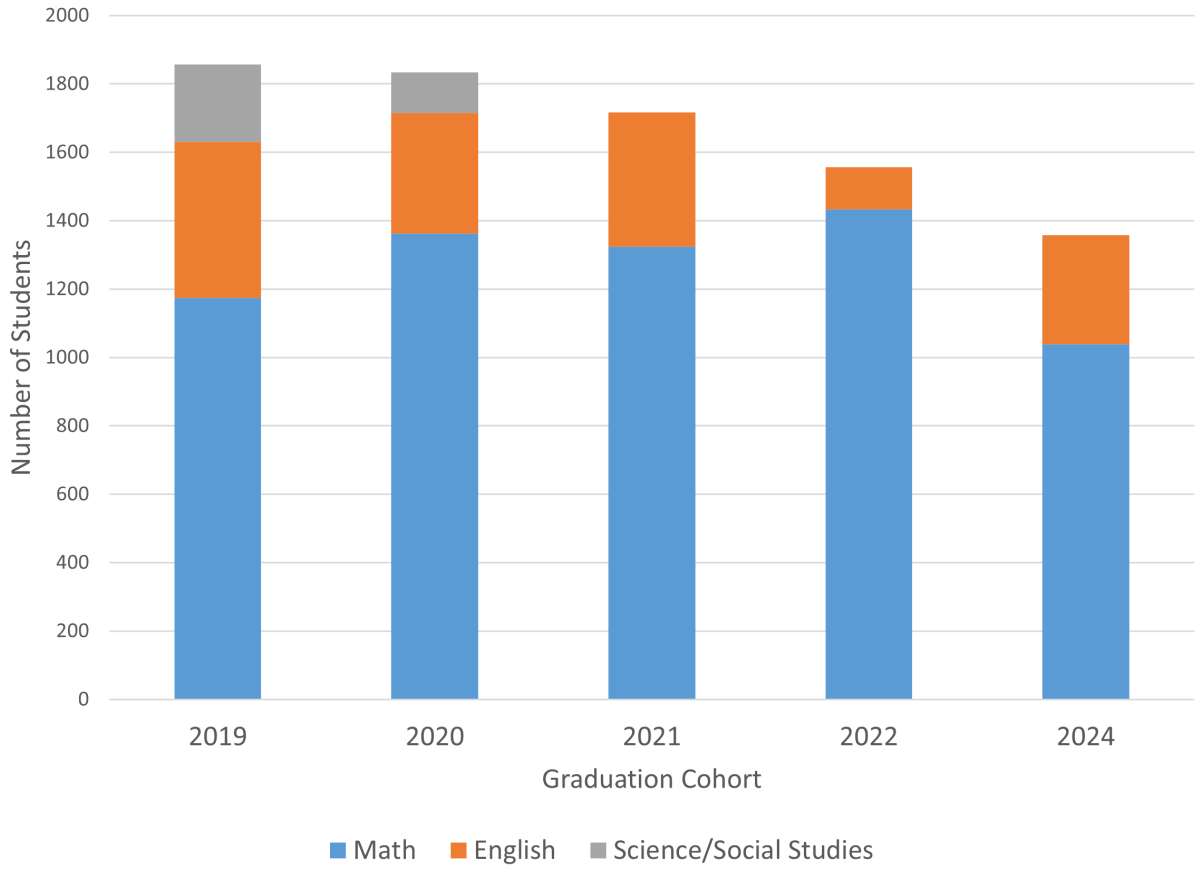
*** Significant at the 1% level ** 5% level * 10% level

Table A.2: Baseline Statistics of Marginal Students across Cohort Samples

	EOC Early (2019-2020)	OGT (2009-2017)	EOC Late (2021-2024)	EOC Early - OGT		EOC Early - Late		EOC Late - OGT	
				Δ/SE	% Diff	Δ/SE	% Diff	Δ/SE	% Diff
A. Demographics									
Female	0.57	0.53	0.57	0.033**	5.77	-0.0017	-0.31	0.035***	6.08
	[0.50]	[0.50]	[0.50]	(0.017)		(0.019)		(0.012)	
Black	0.61	0.73	0.59	-0.11***	-19.2	0.027	4.64	-0.14***	-23.8
	[0.49]	[0.45]	[0.49]	(0.016)		(0.019)		(0.012)	
Hispanic	0.090	0.053	0.13	0.037***	28.2	-0.041***	-31.1	0.077***	59.3
	[0.29]	[0.22]	[0.34]	(0.0094)		(0.012)		(0.0078)	
White	0.17	0.17	0.15	-0.0013	-0.85	0.016	10.4	-0.017*	-11.3
	[0.38]	[0.38]	[0.36]	(0.013)		(0.014)		(0.0090)	
Asian	0.031	0.023	0.039	0.0074	19.3	-0.0077	-20.0	0.015***	39.3
	[0.17]	[0.15]	[0.19]	(0.0057)		(0.0069)		(0.0046)	
Ever English Learner	0.19	0.13	0.24	0.055***	22.7	-0.054***	-22.3	0.11***	45.0
	[0.39]	[0.34]	[0.43]	(0.013)		(0.015)		(0.010)	
Ever Special Education	0.12	0.13	0.13	-0.0071	-5.45	-0.010	-7.85	0.0031	2.40
	[0.32]	[0.33]	[0.34]	(0.011)		(0.013)		(0.0083)	
Ever Gifted Status	0.10	0.18	0.070	-0.078***	-111.3	0.034***	48.2	-0.11***	-159.5
	[0.30]	[0.39]	[0.25]	(0.011)		(0.011)		(0.0071)	
Ever Homeless	0.15	0.084	0.16	0.065***	39.3	-0.016	-10.0	0.081***	49.3
	[0.36]	[0.28]	[0.37]	(0.012)		(0.014)		(0.0087)	
Ever Economically Disadvantaged	0.93	0.97	0.90	-0.042***	-4.70	0.033***	3.73	-0.076***	-8.43
	[0.25]	[0.16]	[0.30]	(0.0081)		(0.010)		(0.0069)	
B. Educational Baseline									
Grade 8 Math (z-score)	0.40	-0.30	0.22	0.70***	320.4	0.18***	81.8	0.52***	238.6
	[0.52]	[0.57]	[0.31]	(0.021)		(0.021)		(0.013)	
Grade 8 ELA (z-score)	0.34	-0.14	0.23	0.49***	216.4	0.12***	52.3	0.37***	164.1
	[0.58]	[0.70]	[0.46]	(0.024)		(0.026)		(0.018)	
C. Ohio Exit Exam Performance									
Total Exit Exam Subjects Taken	6.84	4.99	4.75	1.85***	39.0	2.09***	44.1	-0.24***	-5.01
	[0.40]	[0.10]	[1.60]	(0.013)		(0.037)		(0.035)	
Ever Passed Math Exit Exam(s)	0.81	0.84	0.67	-0.031**	-4.65	0.14***	20.5	-0.17***	-25.1
	[0.39]	[0.37]	[0.47]	(0.013)		(0.016)		(0.011)	
Ever Passed ELA Exit Exam(s)	0.89	0.89	0.72	0.0028	0.38	0.17***	23.9	-0.17***	-23.5
	[0.31]	[0.31]	[0.45]	(0.010)		(0.014)		(0.010)	
Ever Passed all Exam Requirements	0.51	0.58	0.54	-0.076***	-14.2	-0.028	-5.26	-0.048***	-8.90
	[0.50]	[0.49]	[0.50]	(0.017)		(0.019)		(0.012)	
D. Outcomes									
Graduated HS	0.84	0.66	0.75	0.18***	24.3	0.093***	12.4	0.089***	11.8
	[0.36]	[0.47]	[0.43]	(0.013)		(0.015)		(0.011)	
Enrolled in Any College	0.44	0.42	0.41	0.025	6.11	0.027	6.41	-0.0012	-0.30
	[0.50]	[0.49]	[0.49]	(0.017)		(0.019)		(0.012)	
Enrolled in 4-year College	0.24	0.20	0.15	0.046***	31.0	0.094***	63.3	-0.048***	-32.2
	[0.43]	[0.40]	[0.36]	(0.014)		(0.016)		(0.0091)	
Enrolled in 2-year College	0.20	0.22	0.26	-0.019	-7.14	-0.068***	-25.6	0.049***	18.5
	[0.40]	[0.41]	[0.44]	(0.013)		(0.016)		(0.011)	
Observations	1,005	7,520	2,076						

Notes: This table shows the summary characteristics of the selected marginal sample of students within each of the three graduation policy periods: OGT, EOC early, and EOC late. Marginal students are identified as being 10 scale score points away from the pass/fail Math OGT or EOC cutoff to be in partial fulfillment of the state's testing requirements for graduation. The standard deviations of means are shown in brackets under each mean value. T-test difference of means are reported in the final three columns, with standard errors reported in parentheses below each difference (adjusted for unequal variances between groups)
*** Significant at the 1% level ** 5% level * 10% level

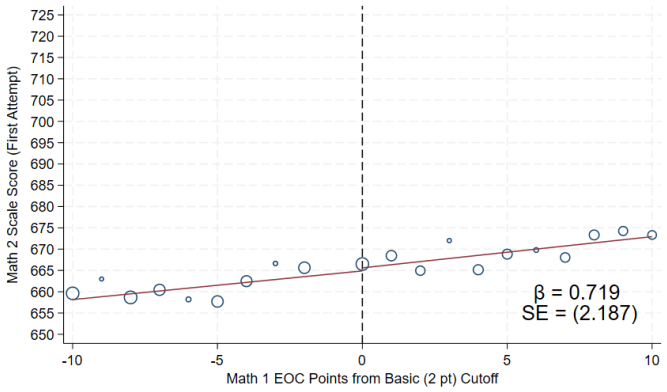
Figure A.2: Binding EOC Score by Cohort



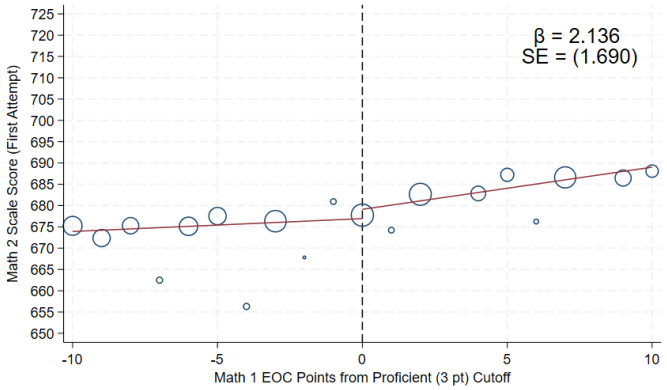
Notes: Each bar represents the shares of binding EOC subject categories for students by cohort year within the main analytic samples who failed at least one EOC subject area on the first attempt. "Binding" is defined having the lowest score across all EOC exams taken on the first attempt. The subject categories are not mutually exclusive; for rare instances where a student has ties in scores, they will be included in multiple subject groups. Cohorts of 2018 and 2023 are excluded for reasons described in Section 3.1.

Figure A.3: EOC Math 1 vs. Math 2 Test Scores Across EOC Proficiency Thresholds

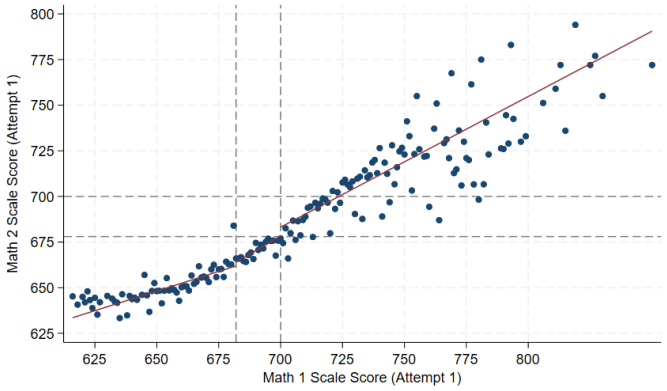
(A) Math 1 Limited (1 pt) vs. Basic (2 pts) Threshold



(B) Math 1 Basic (2 pts) vs. Proficient (3 pts) Threshold



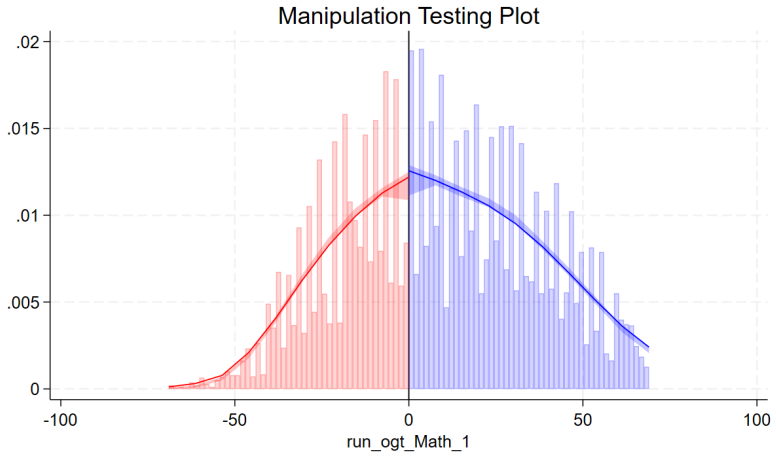
(C) Math 1 vs. Math 2 Full Scoring Distribution



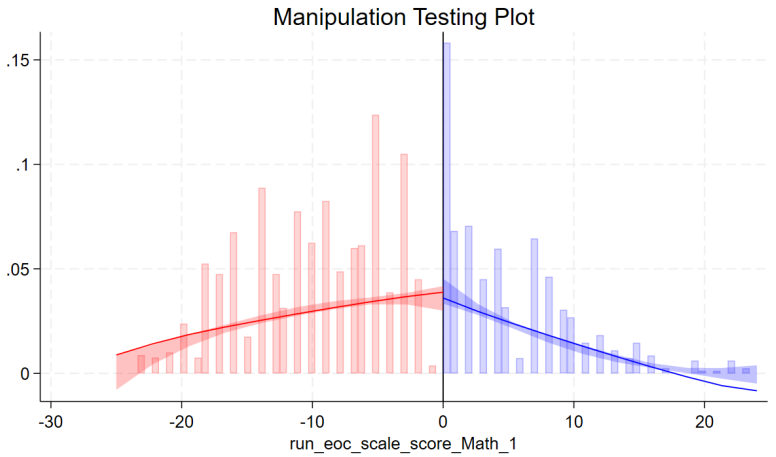
Notes: These graphs depict the relationships between student's test score performance on the Math 1 and Math 2 EOC exams across key EOC proficiency point thresholds. The smoothness of test scores across the EOC point score cutoffs indicates that students are unlikely to be changing test-taking efforts on Math 2 in response to their Math 1 scores. Each circle represents the average student test score value at each of the 21 unique test score values around the threshold, where the size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, with standard errors listed in parentheses below. All standard errors are clustered at the Math 1 EOC score level.

Figure A.4: Density Checks of Math Score Running Variables

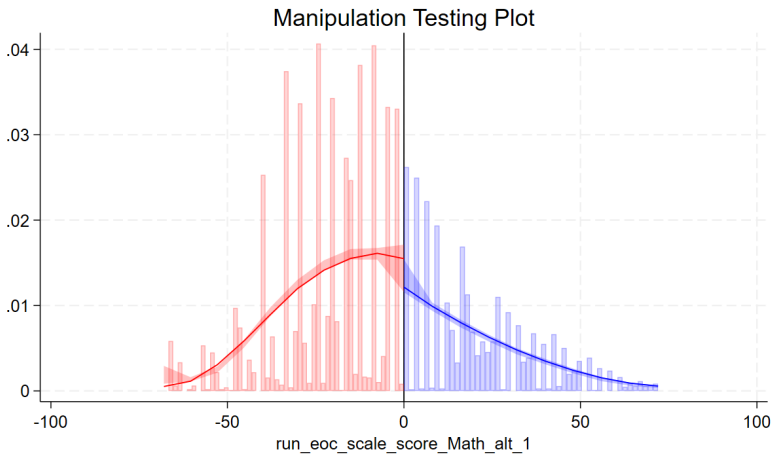
(A) OGT (Math Only)



(B) EOC Early (Math 1 and Math 2 Combined)



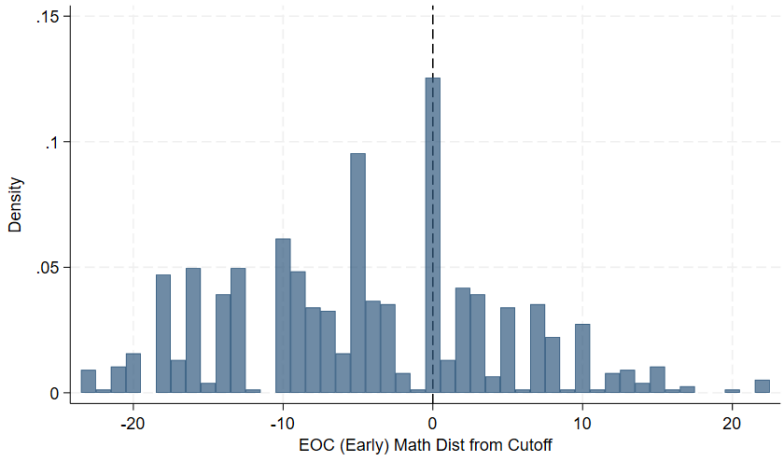
(C) EOC Late (Math 1 Only)



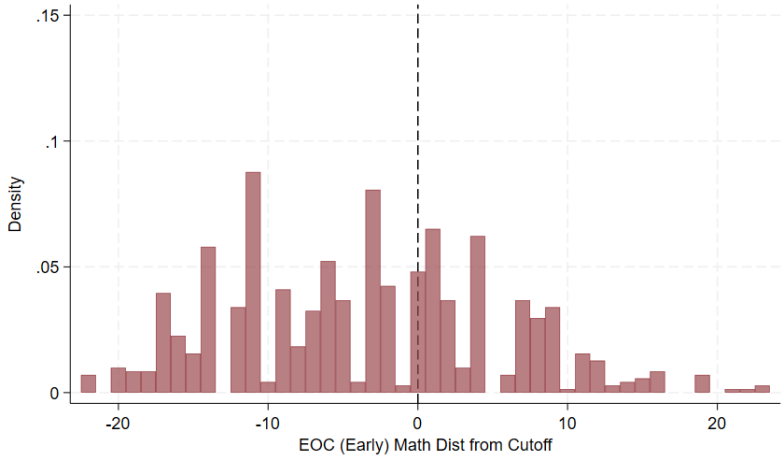
Notes: These graphs plot the densities of scale scores (recentered around 0) used as the running variables for each of the three graduation policy eras. Each bar represents a bin width of 1, capturing each discrete scale score distance from the state's exam cutoff. confidence bands are estimated using local polynomial density estimation to test for manipulation of the running variable around the cutoff, following the procedures described in Cattaneo et al. (2021).

Figure A.5: Density Distributions of EOC Early by Cohort (2019-2020)

(A) 2019 Cohort

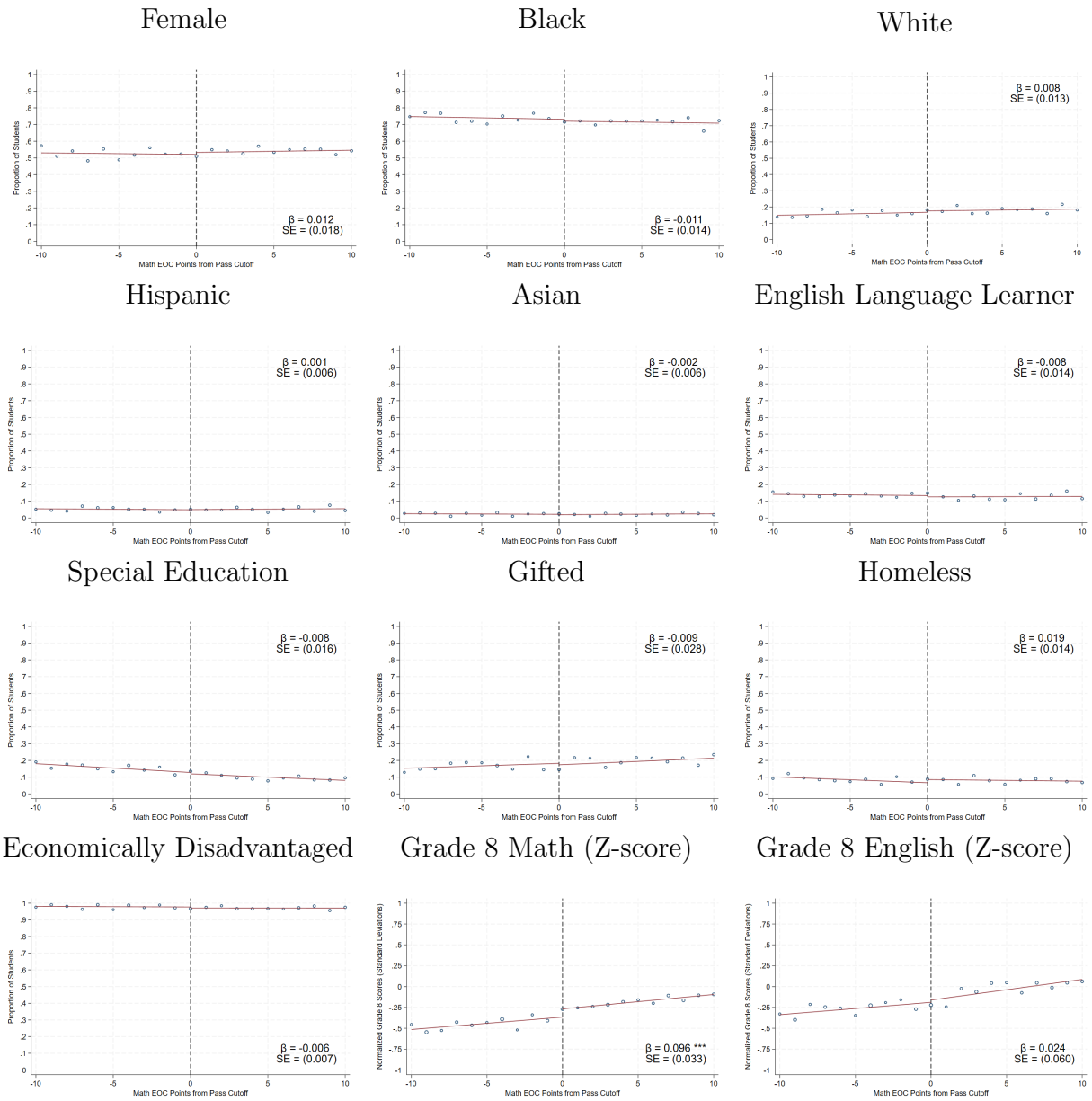


(B) 2020 Cohort



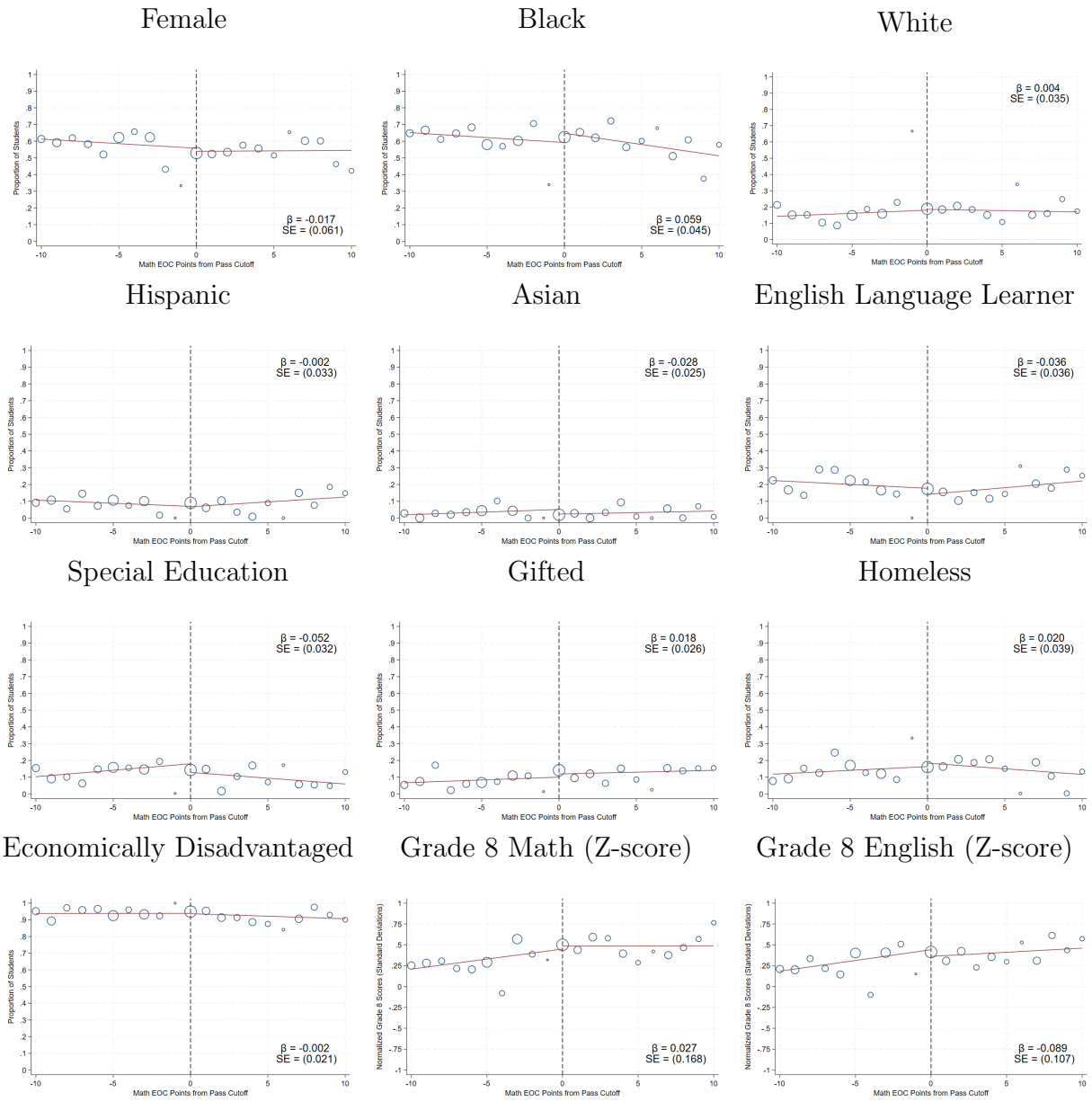
Notes: This graph plots the density distributions of the Math EOC running variable for the EOC early cohorts (2019-2020), separated by cohorts. Each bar represents a bin width of 1, capturing each discrete scale score distance from the state's exam cutoff. These figures show that the bunching in the overall density distribution of the running variable is primarily driven by the 2019 cohort, but is not present in the 2020 cohort.

Figure A.6: Balance Tables of Student Characteristics: OGT Era (2009-2017)



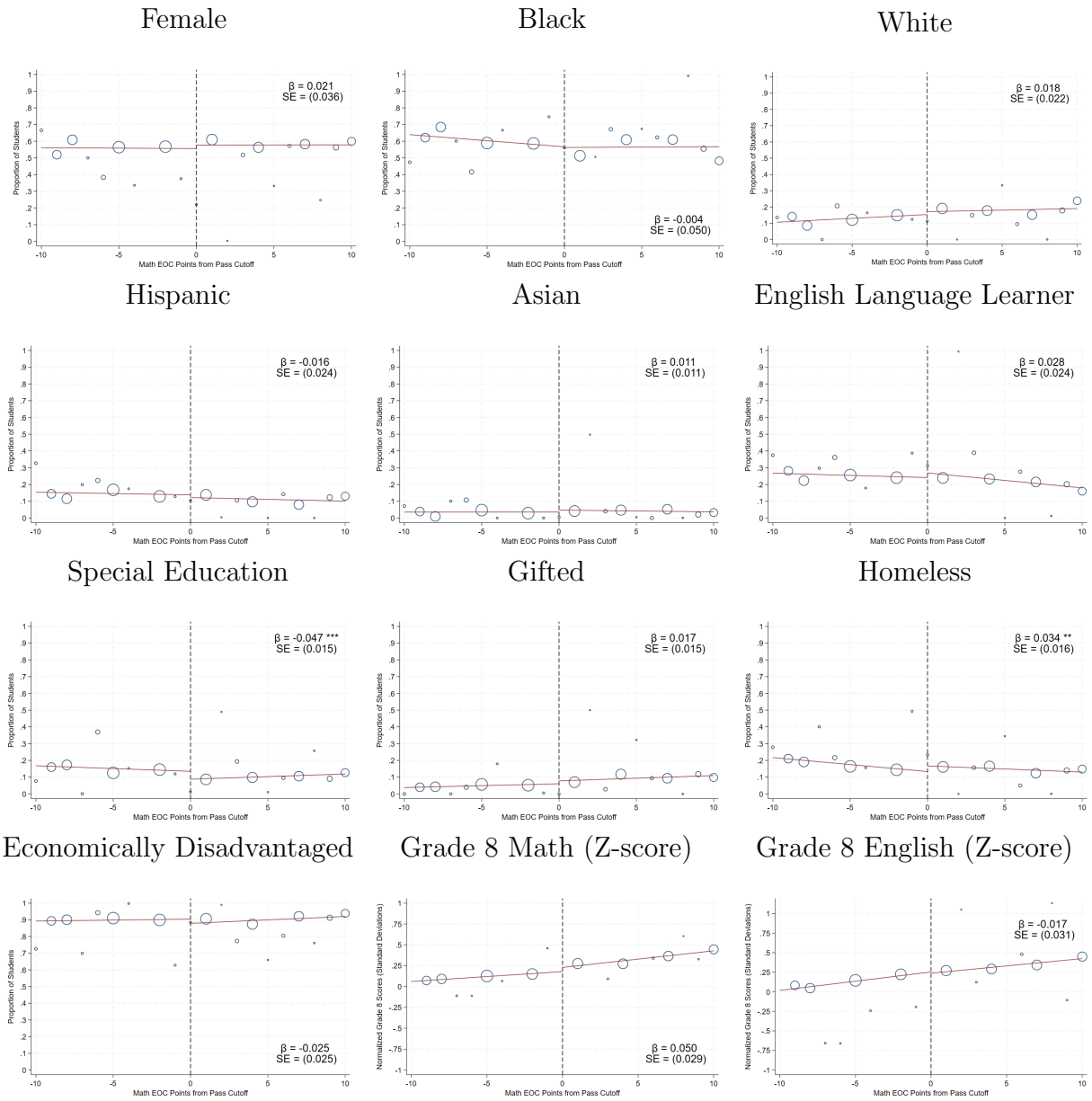
Notes: These graphs depict averages of baseline student characteristics across the OGT Math testing threshold. Each circle represents the average student characteristic value at each of the 21 unique test score values around the threshold, where the size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, with standard errors listed in parentheses below. All standard errors are clustered at the Math OGT score level.

Figure A.7: Balance Tables of Student Characteristics: EOC Early Era (2019-2020)



Notes: These graphs depict averages of baseline student characteristics across the EOC (Early sample) Math testing threshold, where math scores represent the minimum distance to the passing cutoff. Each circle represents the average student characteristic value at each of the 21 unique test score values around the threshold, where the size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level.

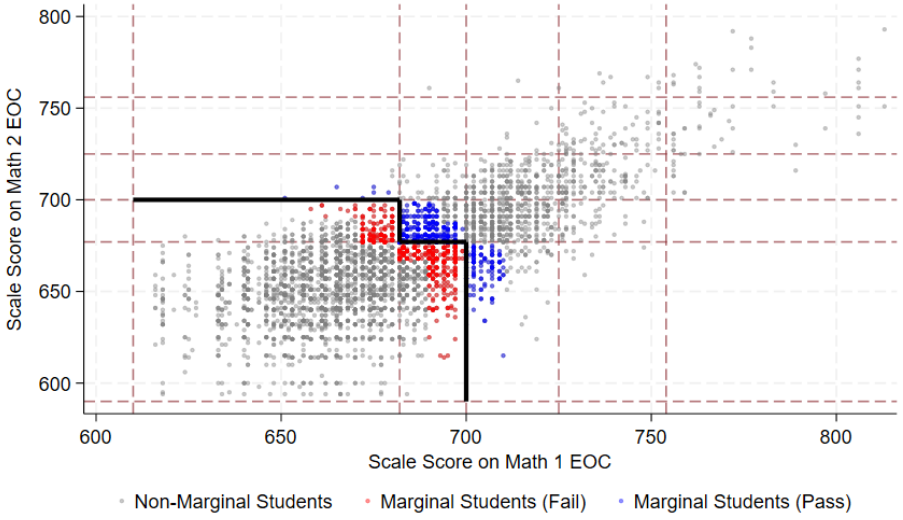
Figure A.8: Balance Tables of Student Characteristics: EOC Late Era (2021-2024)



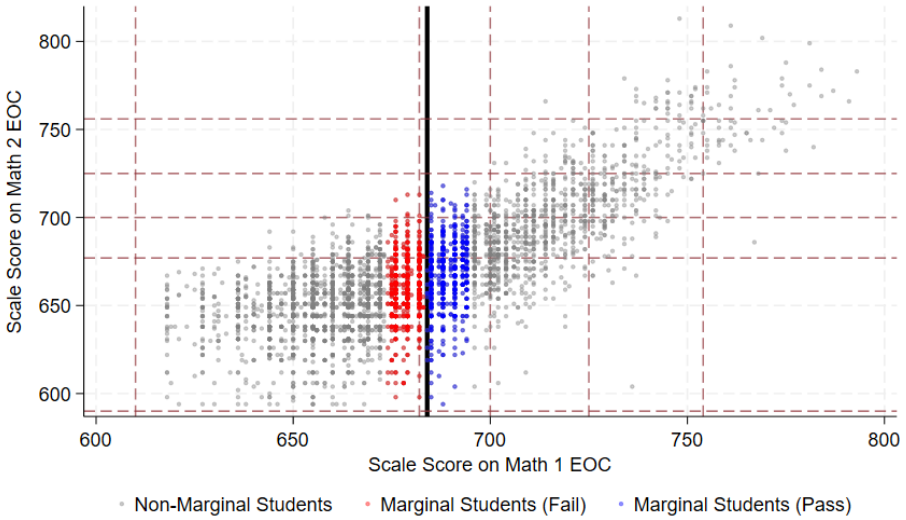
Notes: These graphs depict averages of baseline student characteristics across the EOC (Late sample) Math testing threshold, where math scores represent the minimum distance to the passing cutoff. Each circle represents the average student characteristic value at each of the 21 unique test score values around the threshold, where the size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level.

Figure A.9: Math EOC Performance for EOC Marginal Students

(A) EOC Early Sample



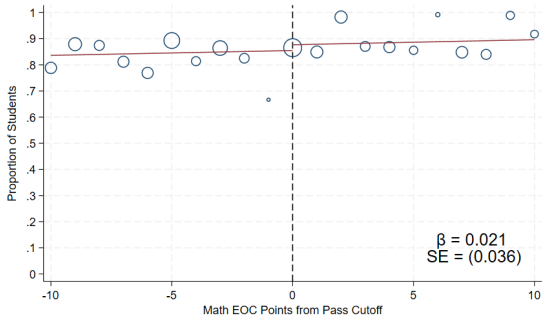
(B) EOC Late Sample



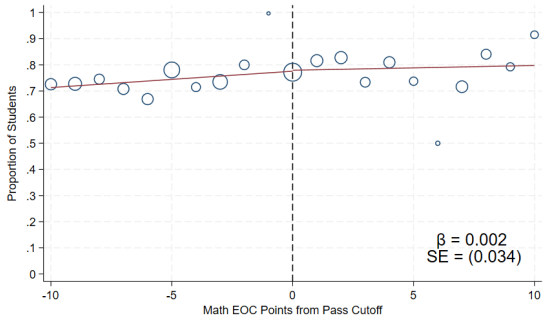
Notes: These graphs depict the Math 1 and 2 scores (first attempt) that students earned across the two EOC samples, highlighting the marginal students included in the main RD specifications in color. In both graphs, the light dashed lines represent the scale score cutoffs for each EOC point score (ranging from 1-5). Scatter points highlighted in red represent marginally failing students while scatter points highlighted in blue represent marginally passing students. The top panel depicts the set of marginal students for the EOC early sample, for whom the Math EOC requirement requires the combination of both Math test scores. The bottom panel depicts the set of marginal studetns for the EOC late sample, for whom only the Math 1 scale score is relevant for assessing graduation eligibility.

Figure A.10: Pooled Impact of Passing Math EOC on Additional HS and College Outcomes (2019-2020)

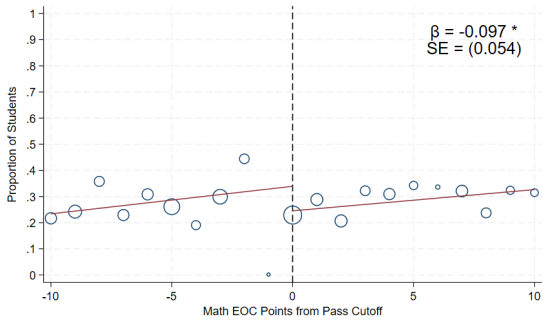
(A) Enrolled in 11th Grade



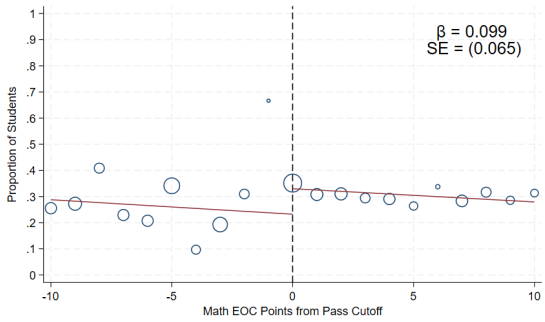
(B) Enrolled in 12th Grade



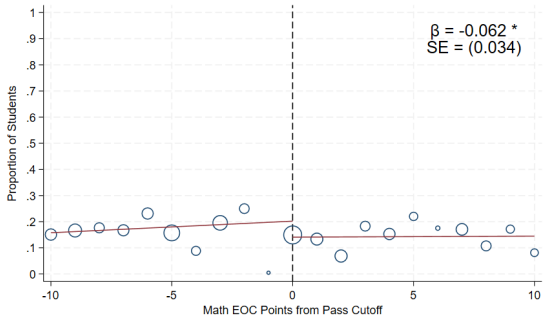
(C) Ever 2-year College Enrolled



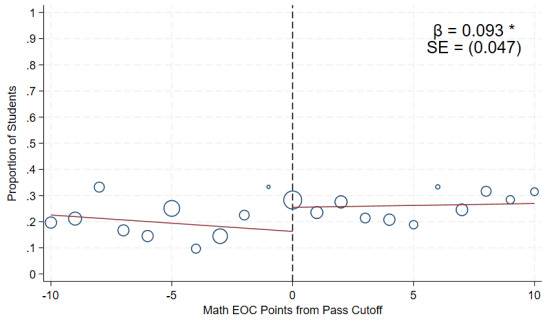
(D) Ever 4-year College Enrolled



(E) Immediate 2-year College Enrolled

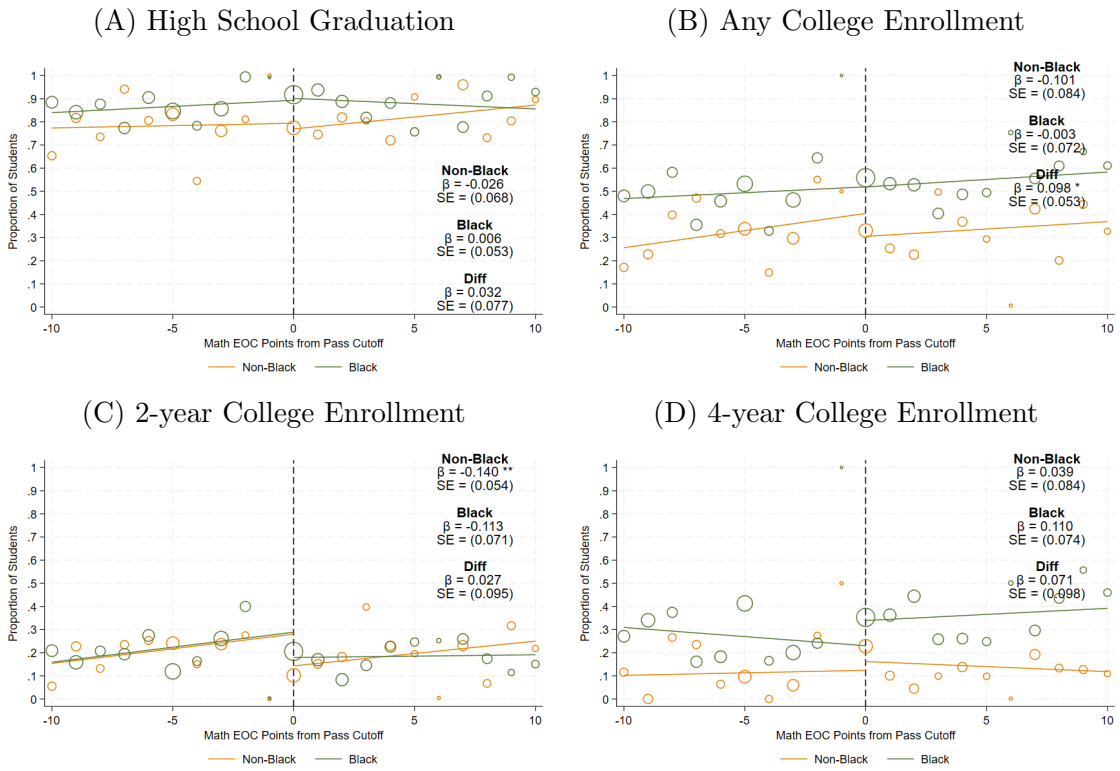


(F) Immediate 4-year College Enrolled



Notes: Each circle represents the average high school college enrollment rates for across each of the 21 unique EOC (early sample) combined Math EOC score values around the state's pass cutoff (0). Enrolled in 11th and 12th grade indicates that a student has positive attendance records during those respective school years. 2- and 4-year "ever enrolled" college rates reflect whether a student has been enrolled in either college type between time of high school graduation and Spring 2025. "Immediate" enrollment rates reflect whether a student has been enrolled in either college type within 1 year of graduating high school. The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level.

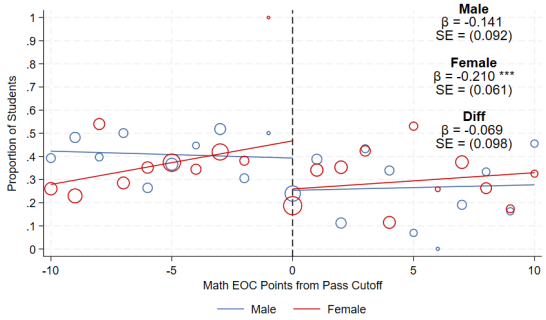
Figure A.11: Impact of Passing Math EOC on HS Graduation and College Enrollment (Black vs. Non-Black Students)



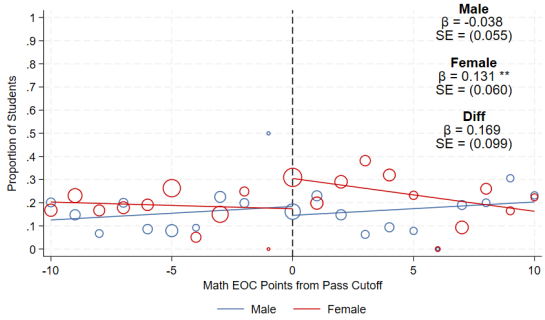
Notes: Each circle represents the average high school graduation or college enrollment rates for across each of the 21 unique EOC (early sample) combined Math EOC score values around the state's pass cutoff (0). 2- and 4-year college enrollment rates are measured for the first college that a student enrolls in after high school. The estimated model includes a full set of interaction terms between Math EOC scores, indicator for passing the Math EOCs, and an indicator for Black student. The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, estimated separately by racial groups, as well as the difference in discontinuities across racial groups, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level.

Figure A.12: Graduation Pathway Flows (Cohorts 2019-2020) By Gender

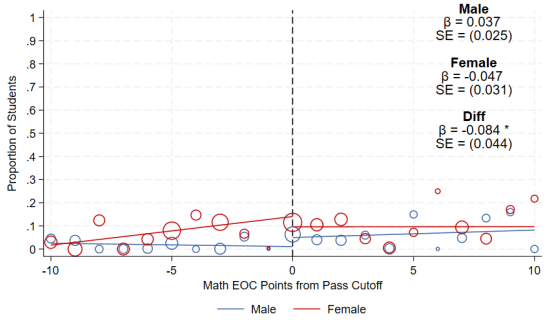
(A) Career-Based



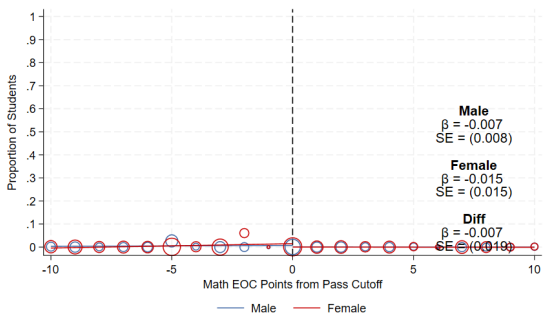
(B) Flexible Academic (Non-Career)



(C) College Credit Plus



(D) Remediation-Free ACT



Notes: Each circle represents the percentage of students who take up each alternative pathway option (after the first attempt of the Math EOCs) at each of the 21 unique EOC (early sample) test score values around the state's pass cutoff (0). The estimated model includes a full set of interaction terms between Math EOC scores, indicator for passing the Math EOCs, and an indicator for female student. The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, estimated separately by gender, as well as the difference in discontinuities across genders, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level.

Table A.3: Post EOC Academic Coursework and Performance

Ranking	IRC Name	Point Value	% of IRCs Earned by Marginal Students	% of IRCs Earned by All Students
1	CPR & First Aid	1	28.70%	26.20%
2	Microsoft Word Specialist	3	10.90%	8.80%
3	OSHA 10-Hour Training	1	8.90%	7.50%
4	NCCER Core	6	7.30%	8.70%
5	National Incident Management System 100	4	5.60%	5.50%
6	Microsoft PowerPoint Specialist	3	5.00%	4.40%
7	National Restaurant Association ServSafe	1	4.10%	3.60%
8	OSHA Forklift Operator License	2	3.90%	4.60%
9	OSHA Manlift Operator License	2	3.30%	4.50%
10	National Incident Management System 700	4	2.70%	2.70%

Notes: This table details the top 10 industry-recognized credentials (IRCs) earned by students in the 2019-2020 graduation cohorts. The rankings are based on the percentage of IRCs earned by students in the marginal RD sample, meaning they are within 10 points of the Math EOC cutoff. Point values denote the points assigned to each IRC by the state of Ohio, corresponding to employer demand and/or state regulations pertaining to that credential.

Table A.4: Impact of Passing Math EOC on Subsequent ACT Scores

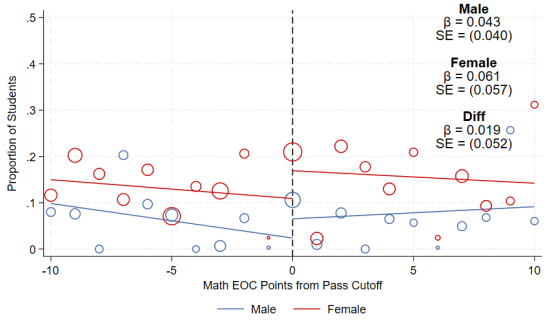
	Took ACTs	Standardized ACT Composite	Standardized ACT Math	Standardized ACT Reading	Standardized ACT English
All Students	0.047	-0.016	-0.001	-0.096	-0.140
	(0.080)	(0.108)	(0.032)	(0.161)	(0.104)
Male Students	-0.035	0.095	0.109	-0.050	-0.043
	(0.096)	(0.080)	(0.100)	(0.131)	(0.072)
Female Students	0.113	-0.111	-0.091	-0.141	-0.232
	(0.090)	(0.162)	(0.105)	(0.225)	(0.195)
Female - Male Diff	0.148*	-0.206	-0.200	-0.091	-0.189
	(0.082)	(0.144)	(0.196)	(0.179)	(0.202)
N	1,005	810	810	810	810
Baseline (Pooled)	0.742	0.077	-0.095	0.131	0.168
Baseline (Male)	0.793	-0.011	-0.180	0.020	-0.014
Baseline (Female)	0.704	0.152	-0.023	0.227	0.327

Notes: This table reports the regression discontinuity estimates of the maximum ACT scores earned by students, across all test attempts occurring after the first Math EOC attempt. ACT scores are standardized into Z-scores, where original scores (on a scale of 1-36) are re-centered around the mean and scaled by the standard deviation, within cohort groups. RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

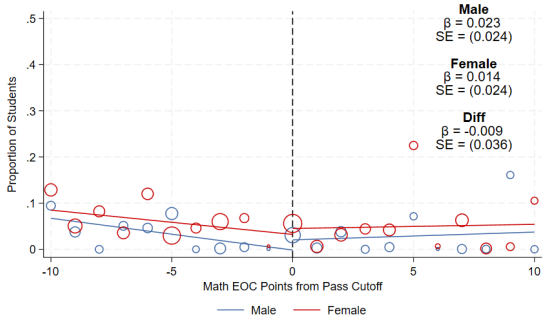
*** Significant at the 1% level ** 5% level * 10% level

Figure A.13: By Gender Impact of Passing Math EOC on College Graduation

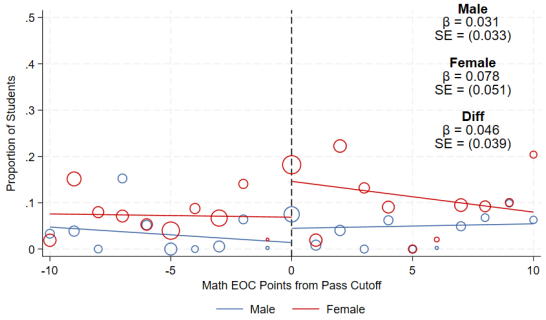
(A) Ever Graduate from Any College



(B) Ever Graduate from 2-year College



(C) Ever Graduate from 4-year College



Notes: Each circle represents the average college graduation rates at each of the 21 unique EOC (early sample) test score values around the state's pass cutoff (0). The estimated model includes a full set of interaction terms between Math EOC scores, indicator for passing the Math EOCs, and an indicator for female student. The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, estimated separately by gender, as well as the difference in discontinuities across genders, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level

*** Significant at the 1% level ** 5% level * 10% level.

Table A.5: Impact of Passing Math EOC on College Transfers (2019-2020)

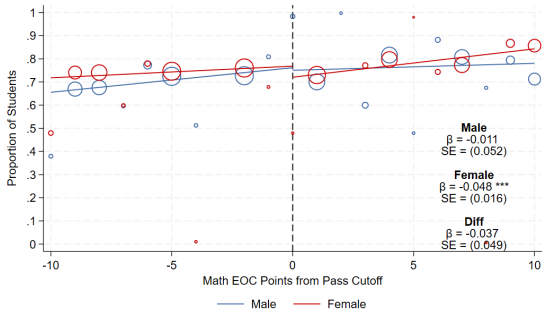
	Transfer within 1 Year	Ever Transfer	4- to 2-year	Horizontal Transfer	2- to 4-year
All Students	-0.022**	0.034	0.050*	0.004	-0.019
	(0.011)	(0.045)	(0.028)	(0.027)	(0.018)
Male Students	-0.007	0.028	0.033	0.003	-0.008
	(0.011)	(0.046)	(0.022)	(0.023)	(0.021)
Female Students	-0.034**	0.047	0.065	0.008	-0.026
	(0.015)	(0.068)	(0.047)	(0.045)	(0.025)
Female - Male Diff	-0.028	0.019	0.032	0.005	-0.018
	(0.018)	(0.079)	(0.054)	(0.051)	(0.030)
N	1,005	1,005	1,005	1,005	1,005
Baseline (Pooled)	0.023	0.095	0.015	0.033	0.047
Baseline (Male)	0.010	0.034	0.001	0.008	0.025
Baseline (Female)	0.033	0.143	0.027	0.052	0.064

Notes: This table reports the regression discontinuity estimates of college transfer outcomes. RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

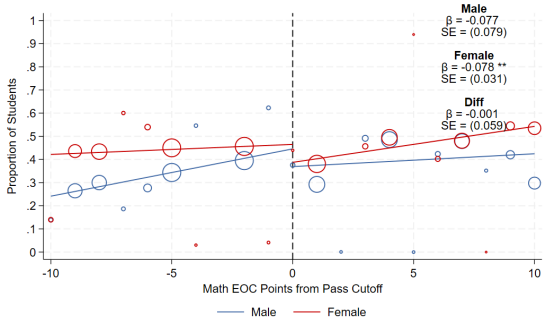
*** Significant at the 1% level ** 5% level * 10% level

Figure A.14: Impact of Passing Math EOC High School and College Outcomes (Cohorts 2021-2024) By Gender

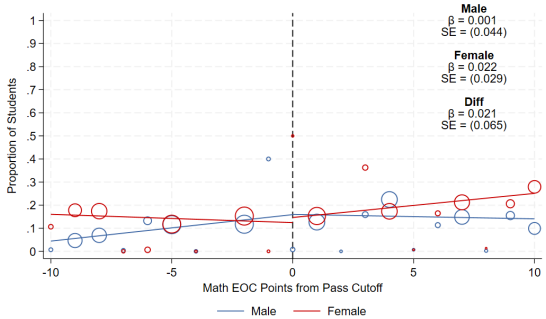
(A) Graduating from High School



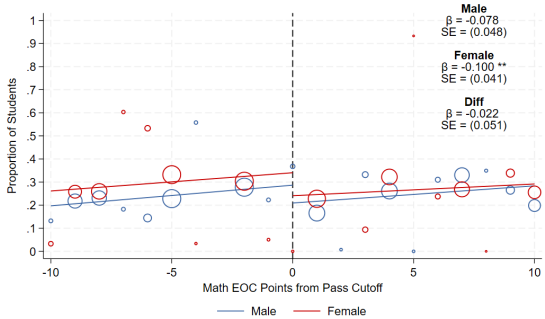
(B) Ever Enrolling in Any College



(C) Enrolled in 4-year College



(D) Enrolled in 2-year College

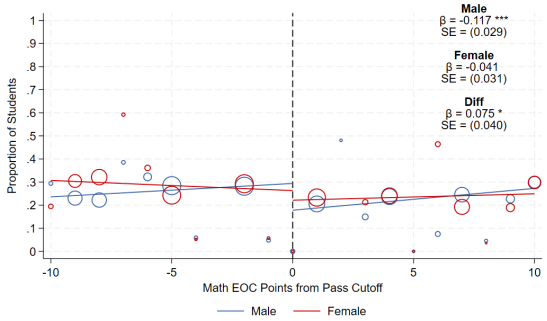


Notes: Each circle represents the average high school graduation or college enrollment rates for across each of the 21 unique EOC (late sample) combined Math EOC score values around the state's pass cutoff (0). 2- and 4-year college enrollment rates are measured for the first college that a student enrolls in after high school. The estimated model includes a full set of interaction terms between Math EOC scores, indicator for passing the Math EOCs, and an indicator for female student. The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, estimated separately by gender, as well as the difference in discontinuities across genders, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level

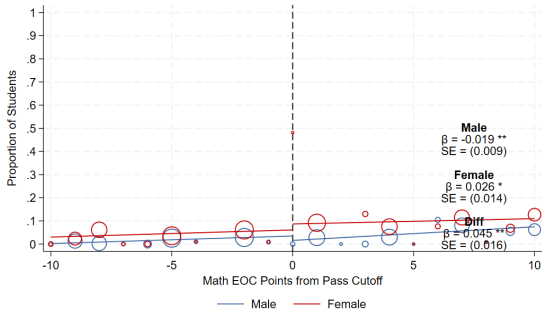
*** Significant at the 1% level ** 5% level * 10% level.

Figure A.15: Graduation Pathway Flows (Cohorts 2021-2024) By Gender

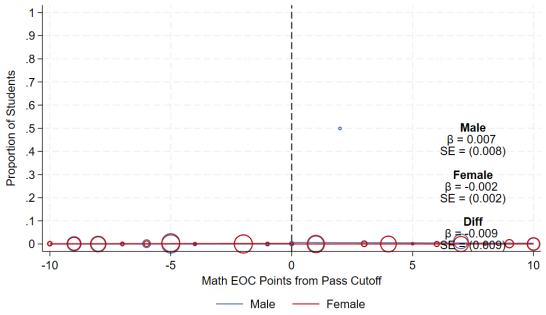
(A) Career-Based



(B) College Credit Plus



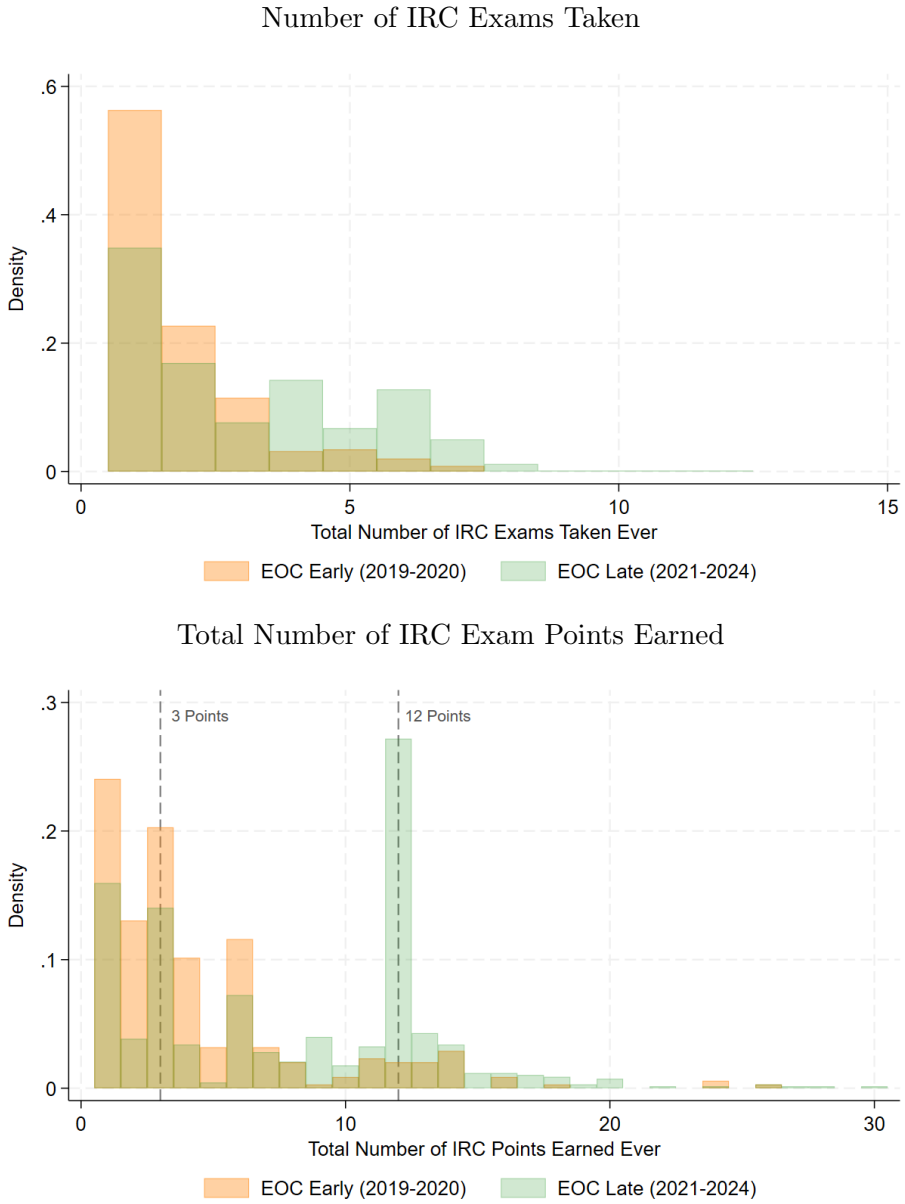
(C) Remediation-Free ACT



Notes: Each circle represents the percentage of students who take up each alternative pathway option (after the first attempt of the Math EOCs) at each of the 21 unique EOC (late sample) test score values around the state's pass cutoff (0). The estimated model includes a full set of interaction terms between Math EOC scores, indicator for passing the Math EOCs, and an indicator for female student. The size of the circles correspond to the proportion of students within each test score bin. The β values detail the RD coefficient for the size of the discontinuity at the threshold, estimated separately by gender, as well as the difference in discontinuities across genders, with standard errors listed in parentheses below. All standard errors are clustered at the Math EOC score level

*** Significant at the 1% level ** 5% level * 10% level.

Figure A.16: Distributional Comparisons of IRC Point/Exam totals across EOC Policies



Notes: These graphs depict the distributions of the total number of industry-recognized credentialing exams and points earned by students in the early EOC (2019-2020) and later EOC (2021-2024) samples, among students who took at least one IRC.

Table A.6: Impact of Passing Math EOC on Subsequent ACT Scores (2021-2024)

	Took ACTs/SATs	Standardized ACT/SAT Composite	Standardized ACT/SAT Math	Standardized ACT/SAT Reading
All Students	-0.059	-0.019	-0.002	0.016
	(0.048)	(0.039)	(0.036)	(0.031)
Male Students	-0.056	0.188***	0.085*	0.237**
	(0.075)	(0.051)	(0.046)	(0.098)
Female Students	-0.063	-0.160***	-0.057*	-0.134**
	(0.046)	(0.060)	(0.035)	(0.057)
Female - Male Diff	-0.007	-0.348***	-0.142***	-0.371***
	(0.073)	(0.084)	(0.044)	(0.141)
N	2,076	1,306	1,306	1,302
Baseline (Pooled)	0.637	-0.152	-0.237	-0.117
Baseline (Male)	0.620	-0.299	-0.267	-0.292
Baseline (Female)	0.652	-0.046	-0.222	0.011

Notes: This table reports the regression discontinuity estimates of the maximum ACT scores earned by students (2021-2023 cohorts took the ACTs, while the 2024 cohort took the SATs), across all test attempts occurring after the first Math EOC attempt. ACT and SAT scores are standardized into Z-scores, where original scores (ACT scale 1-36; SAT scale 400-1600 Composite/200-800 Subject) are re-centered on the mean and scaled by the standard deviation within cohort groups. RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2021-2024 cohort students who took at least one attempt of the Math 1 EOC, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

*** Significant at the 1% level ** 5% level * 10% level

Table A.7: Impact of Passing Math EOC on College Transfers (2021-2024)

	Transfer within 1 Year	Ever Transfer	4- to 2-year	Horizontal Transfer	2- to 4-year
All Students	-0.003	-0.045***	-0.031***	-0.008	-0.006
	(0.003)	(0.010)	(0.011)	(0.008)	(0.011)
Male Students	0.000	-0.066***	-0.032***	-0.010	-0.024***
	(0.008)	(0.014)	(0.006)	(0.012)	(0.009)
Female Students	-0.006	-0.030*	-0.030	-0.008	0.008
	(0.004)	(0.018)	(0.019)	(0.008)	(0.014)
Female - Male Diff	-0.006	0.036	0.002	0.002	0.032***
	(0.011)	(0.026)	(0.019)	(0.011)	(0.011)
N	2,076	2,076	2,076	2,076	2,076
Baseline (Pooled)	0.010	0.089	0.048	0.022	0.019
Baseline (Male)	0.007	0.083	0.038	0.015	0.030
Baseline (Female)	0.011	0.094	0.055	0.028	0.011

Notes: This table reports the regression discontinuity estimates of college transfer outcomes. RD estimates for all students are reported in the first row, while estimates for Male and Female students are reported in the second and third rows. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2021-2024 cohort students who took at least one attempt of the Math 1 EOC, and who were in the district's administrative sample for at least 9th and 10th grade of high school. Estimates are limited to observations within a bandwidth of $h* = 10$ points away from the cutoff. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores. Baseline values reflect the predicted mean outcome value just below the Math EOC cutoff.

*** Significant at the 1% level ** 5% level * 10% level

Table A.8: Specification Robustness of HS and College Outcomes: Early EOC (2019-2020)

	Graduated HS	Ever College Enroll	First 4-year College Enroll	First 2-year College Enroll
A. Pooled Sample				
$h^* = 10$ (Baseline)	-0.002	-0.029	0.094	-0.123***
	(0.048)	(0.075)	(0.060)	(0.046)
$h^* = 10$ (Donut)	0.007	-0.001	0.083	-0.084
	(0.047)	(0.055)	(0.075)	(0.057)
$h^* = 10$ (w/Controls)	-0.043	0.010	0.154**	-0.143***
	(0.045)	(0.080)	(0.067)	(0.043)
$h^* = 5$	-0.042	-0.102	0.161	-0.263***
	(0.081)	(0.131)	(0.105)	(0.073)
$h^* = 20$	0.015	-0.023	0.051	-0.074**
	(0.029)	(0.046)	(0.046)	(0.035)
B. Male Students				
$h^* = 10$ (Baseline)	-0.034	-0.054	0.010	-0.063
	(0.055)	(0.124)	(0.084)	(0.076)
$h^* = 10$ (Donut)	0.014	-0.022	0.013	-0.036
	(0.053)	(0.077)	(0.090)	(0.086)
$h^* = 10$ (w/Controls)	-0.057	-0.009	0.052	-0.061
	(0.036)	(0.106)	(0.093)	(0.076)
$h^* = 5$	-0.113	-0.210	0.053	-0.263***
	(0.077)	(0.183)	(0.138)	(0.097)
$h^* = 20$	-0.033	-0.058	-0.012	-0.046
	(0.037)	(0.082)	(0.061)	(0.055)
C. Female Students				
$h^* = 10$ (Baseline)	0.025	-0.004	0.166***	-0.170***
	(0.063)	(0.071)	(0.051)	(0.047)
$h^* = 10$ (Donut)	0.003	0.044	0.148	-0.104
	(0.082)	(0.087)	(0.091)	(0.077)
$h^* = 10$ (w/Controls)	-0.029	0.029	0.237***	-0.207***
	(0.070)	(0.094)	(0.059)	(0.054)
$h^* = 5$	0.024	-0.033	0.239***	-0.272***
	(0.088)	(0.110)	(0.088)	(0.068)
$h^* = 20$	0.058	0.023	0.115**	-0.092**
	(0.043)	(0.051)	(0.048)	(0.040)

Notes: This table reports the regression discontinuity estimates of students' high school graduation and college enrollment rates, under different bandwidths and regression specifications. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.9: Specification Robustness of Alternative Pathways: Early EOC (2019-2020)

	Career-Based Pathway			Flexible Competency (Non-Career)	ACT/SAT
	All	Low-Intensity	High-Intensity		
A. Pooled					
$h^* = 10$ (Baseline)	-0.180***	-0.120**	-0.052*	0.052*	-0.012
	(0.059)	(0.061)	(0.029)	(0.030)	(0.008)
$h^* = 10$ (Donut)	-0.190**	-0.121	-0.002	0.068*	-0.005
	(0.075)	(0.077)	(0.072)	(0.040)	(0.005)
$h^* = 10$ (w/Controls)	-0.197***	-0.100*	-0.069	0.053**	-0.015
	(0.063)	(0.057)	(0.044)	(0.024)	(0.011)
$h^* = 5$	-0.199*	-0.202*	-0.008	0.014	-0.007
	(0.110)	(0.119)	(0.035)	(0.036)	(0.019)
$h^* = 20$	-0.172***	-0.128***	-0.042	0.035	-0.007*
	(0.050)	(0.049)	(0.031)	(0.022)	(0.004)
B. Male Students					
$h^* = 10$ (Baseline)	-0.141	-0.067	-0.046	-0.038	-0.007
	(0.092)	(0.098)	(0.036)	(0.055)	(0.008)
$h^* = 10$ (Donut)	-0.270*	-0.158	-0.049	-0.095	-0.013
	(0.143)	(0.132)	(0.069)	(0.098)	(0.014)
$h^* = 10$ (w/Controls)	-0.158	-0.082	-0.027	-0.047	-0.010
	(0.114)	(0.115)	(0.032)	(0.057)	(0.011)
$h^* = 5$	-0.166	-0.128	-0.093**	-0.195***	0.027***
	(0.158)	(0.186)	(0.039)	(0.068)	(0.008)
$h^* = 20$	-0.234***	-0.180**	-0.046	-0.031	-0.007
	(0.068)	(0.070)	(0.029)	(0.040)	(0.007)
C. Female Students					
$h^* = 10$ (Baseline)	-0.210***	-0.164***	-0.058	0.131**	-0.015
	(0.061)	(0.055)	(0.055)	(0.060)	(0.015)
$h^* = 10$ (Donut)	-0.121	-0.099	0.048	0.213***	0.001
	(0.088)	(0.070)	(0.101)	(0.077)	(0.001)
$h^* = 10$ (w/Controls)	-0.231***	-0.120***	-0.103	0.139**	-0.020
	(0.052)	(0.036)	(0.070)	(0.063)	(0.021)
$h^* = 5$	-0.230**	-0.256***	0.054	0.191*	-0.039
	(0.094)	(0.093)	(0.042)	(0.101)	(0.036)
$h^* = 20$	-0.122**	-0.097*	-0.028	0.100**	-0.008
	(0.062)	(0.051)	(0.052)	(0.047)	(0.007)

Notes: This table reports the regression discontinuity estimates of students' take up rates of different alternative graduation pathway options after their first attempt of the Math EOC, under different bandwidths and regression specifications. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.10: Specification Robustness of Career Pathway Activities: Early EOC (2019-2020)

	Industry-Recognized Credentials			WorkKeys Exam		CTE Coursework		
	Took IRC	Took 3+ IRC Pts	Took 12+ IRC Pts	Took WorkKeys Exam	Passed WorkKeys Exam	Took Any CTE Course	CTE Concentrator	Completed CTE Course Sequence
A. Pooled								
$h^* = 10$ (Baseline)	-0.105**	-0.051	-0.014	-0.015	-0.075*	0.013	-0.062*	-0.060**
	(0.042)	(0.042)	(0.016)	(0.084)	(0.044)	(0.030)	(0.036)	(0.029)
$h^* = 10$ (Donut)	-0.031	0.001	-0.010	-0.020	-0.095	0.004	0.028	-0.020
	(0.076)	(0.062)	(0.022)	(0.082)	(0.058)	(0.047)	(0.051)	(0.064)
$h^* = 10$ (w/Controls)	-0.098	-0.036	-0.008	-0.017	-0.089*	-0.064	-0.100	-0.085**
	(0.060)	(0.031)	(0.022)	(0.091)	(0.054)	(0.040)	(0.066)	(0.037)
$h^* = 5$	-0.069	-0.093	-0.005	-0.110	-0.105	0.150***	-0.045	-0.022
	(0.053)	(0.065)	(0.022)	(0.190)	(0.090)	(0.053)	(0.062)	(0.035)
$h^* = 20$	-0.098**	-0.064*	-0.001	-0.095*	-0.065**	-0.010	-0.053	-0.051*
	(0.045)	(0.038)	(0.012)	(0.057)	(0.030)	(0.031)	(0.040)	(0.030)
B. Male Students								
$h^* = 10$ (Baseline)	-0.061	-0.027	-0.037	0.039	-0.050	-0.103	-0.151***	-0.079*
	(0.074)	(0.071)	(0.031)	(0.123)	(0.071)	(0.112)	(0.055)	(0.042)
$h^* = 10$ (Donut)	-0.137	-0.068	-0.016	0.036	-0.087	-0.227**	-0.125	-0.098
	(0.116)	(0.094)	(0.048)	(0.096)	(0.072)	(0.113)	(0.105)	(0.067)
$h^* = 10$ (w/Controls)	-0.074	-0.055	-0.035	0.107	-0.077	-0.168	-0.214***	-0.071*
	(0.103)	(0.074)	(0.053)	(0.162)	(0.095)	(0.144)	(0.041)	(0.040)
$h^* = 5$	0.069	0.073	0.024	0.036	-0.080	0.089	-0.233***	-0.131***
	(0.105)	(0.107)	(0.031)	(0.253)	(0.141)	(0.175)	(0.068)	(0.050)
$h^* = 20$	-0.187***	-0.115**	-0.009	-0.106	-0.117**	-0.185***	-0.157***	-0.078**
	(0.058)	(0.050)	(0.022)	(0.083)	(0.049)	(0.071)	(0.044)	(0.033)
C. Female Students								
$h^* = 10$ (Baseline)	-0.137**	-0.072	0.002	-0.057	-0.096***	0.105*	0.014	-0.045
	(0.066)	(0.067)	(0.019)	(0.074)	(0.034)	(0.061)	(0.079)	(0.051)
$h^* = 10$ (Donut)	0.053	0.037	-0.019	-0.072	-0.109*	0.154	0.156*	0.050
	(0.069)	(0.070)	(0.033)	(0.118)	(0.062)	(0.094)	(0.084)	(0.098)
$h^* = 10$ (w/Controls)	-0.122**	-0.023	0.015	-0.115**	-0.099***	0.022	-0.002	-0.097
	(0.057)	(0.040)	(0.017)	(0.053)	(0.033)	(0.113)	(0.129)	(0.063)
$h^* = 5$	-0.199*	-0.229**	-0.022	-0.234*	-0.115*	0.214	0.118	0.064
	(0.102)	(0.109)	(0.022)	(0.131)	(0.062)	(0.143)	(0.154)	(0.039)
$h^* = 20$	-0.023	-0.031	0.002	-0.090	-0.032	0.135***	0.049	-0.019
	(0.068)	(0.057)	(0.015)	(0.064)	(0.030)	(0.047)	(0.067)	(0.050)

Notes: This table reports the regression discontinuity estimates of students' take up rates of various career-focused activities after their first attempt of the Math EOC, under different bandwidths and regression specifications. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.11: Specification Robustness of College Graduation Outcomes: Early EOC (2019-2020)

	Ever Graduated Any College	Ever Graduated 2-year College	Ever Graduated 4-year College
A. Pooled			
$h^* = 10$ (Baseline)	0.051	0.018	0.055
	(0.039)	(0.016)	(0.037)
$h^* = 10$ (Donut)	0.068**	0.022	0.072*
	(0.033)	(0.024)	(0.042)
$h^* = 10$ (w/Controls)	0.062	0.019	0.065
	(0.046)	(0.019)	(0.045)
$h^* = 5$	-0.000	0.002	0.010
	(0.050)	(0.019)	(0.042)
$h^* = 20$	-0.010	-0.018	0.016
	(0.038)	(0.014)	(0.033)
B. Male Students			
$h^* = 10$ (Baseline)	0.043	0.023	0.031
	(0.040)	(0.024)	(0.033)
$h^* = 10$ (Donut)	0.015	0.011	0.022
	(0.052)	(0.044)	(0.027)
$h^* = 10$ (w/Controls)	0.021	-0.004	0.023
	(0.054)	(0.026)	(0.042)
$h^* = 5$	0.068	0.079***	-0.012
	(0.061)	(0.030)	(0.039)
$h^* = 20$	-0.023	-0.019	-0.007
	(0.041)	(0.022)	(0.032)
C. Female Students			
$h^* = 10$ (Baseline)	0.061	0.014	0.078
	(0.057)	(0.024)	(0.051)
$h^* = 10$ (Donut)	0.121**	0.033	0.121*
	(0.058)	(0.036)	(0.068)
$h^* = 10$ (w/Controls)	0.097	0.039	0.100*
	(0.064)	(0.030)	(0.059)
$h^* = 5$	-0.082	-0.074***	0.016
	(0.065)	(0.026)	(0.059)
$h^* = 20$	0.011	-0.013	0.042
	(0.047)	(0.020)	(0.043)

Notes: This table reports the regression discontinuity estimates of students' college graduation rates, under different bandwidths and regression specifications. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.12: Specification Robustness of College Dropout Outcomes: Early EOC (2019-2020)

	Drop Out (Within 1 Year)			Drop Out (Within 2 Years)			Ever Drop Out		
	Overall	2-Year College	4-Year College	Overall	2-Year College	4-Year College	Overall	2-year College	4-Year College
A. Pooled									
$h^* = 10$ (Baseline)	-0.041*	-0.034	-0.007	-0.062**	-0.093***	0.031	-0.076	-0.112***	0.036
	(0.021)	(0.024)	(0.028)	(0.030)	(0.024)	(0.028)	(0.050)	(0.042)	(0.031)
$h^* = 10$ (Donut)	-0.035	-0.033	-0.002	-0.058	-0.094**	0.035	-0.065*	-0.095**	0.029
	(0.041)	(0.043)	(0.027)	(0.043)	(0.039)	(0.038)	(0.038)	(0.044)	(0.039)
$h^* = 10$ (w/Controls)	-0.037	-0.042*	0.005	-0.065*	-0.115***	0.050	-0.083	-0.139***	0.056
	(0.027)	(0.023)	(0.037)	(0.038)	(0.027)	(0.043)	(0.062)	(0.043)	(0.054)
$h^* = 5$	-0.093***	-0.072*	-0.021	-0.120**	-0.162***	0.042	-0.162*	-0.234***	0.072
	(0.034)	(0.041)	(0.057)	(0.052)	(0.035)	(0.057)	(0.093)	(0.067)	(0.058)
$h^* = 20$	-0.027	-0.011	-0.017	-0.035*	-0.033	-0.002	-0.067**	-0.065**	-0.002
	(0.017)	(0.020)	(0.019)	(0.020)	(0.023)	(0.021)	(0.031)	(0.030)	(0.024)
B. Male Students									
$h^* = 10$ (Baseline)	-0.068	-0.024	-0.044	-0.064	-0.050	-0.014	-0.106	-0.099	-0.006
	(0.060)	(0.051)	(0.043)	(0.065)	(0.050)	(0.050)	(0.107)	(0.085)	(0.054)
$h^* = 10$ (Donut)	-0.032	-0.025	-0.007	-0.041	-0.075	0.034	-0.038	-0.063	0.025
	(0.084)	(0.095)	(0.023)	(0.079)	(0.085)	(0.056)	(0.092)	(0.086)	(0.069)
$h^* = 10$ (w/Controls)	-0.041	-0.033	-0.008	-0.048	-0.040	-0.008	-0.086	-0.086	0.000
	(0.045)	(0.049)	(0.044)	(0.051)	(0.043)	(0.063)	(0.081)	(0.074)	(0.078)
$h^* = 5$	-0.245***	-0.118**	-0.127	-0.146	-0.128**	-0.018	-0.253	-0.272**	0.019
	(0.064)	(0.054)	(0.082)	(0.098)	(0.055)	(0.103)	(0.171)	(0.119)	(0.107)
$h^* = 20$	-0.020	0.005	-0.025	-0.020	0.005	-0.025	-0.053	-0.040	-0.014
	(0.046)	(0.038)	(0.027)	(0.041)	(0.037)	(0.032)	(0.064)	(0.057)	(0.035)
C. Female Students									
$h^* = 10$ (Baseline)	-0.020	-0.044	0.023	-0.059	-0.128***	0.069**	-0.053	-0.124***	0.071***
	(0.037)	(0.030)	(0.026)	(0.047)	(0.026)	(0.028)	(0.042)	(0.031)	(0.027)
$h^* = 10$ (Donut)	-0.032	-0.040	0.009	-0.062	-0.103***	0.041	-0.073	-0.110**	0.037
	(0.053)	(0.032)	(0.036)	(0.058)	(0.037)	(0.036)	(0.048)	(0.044)	(0.036)
$h^* = 10$ (w/Controls)	-0.033	-0.050	0.017	-0.075	-0.175***	0.100**	-0.074	-0.180***	0.106**
	(0.050)	(0.033)	(0.044)	(0.063)	(0.035)	(0.039)	(0.068)	(0.034)	(0.045)
$h^* = 5$	0.044	-0.027	0.071*	-0.100*	-0.195***	0.095***	-0.080*	-0.199***	0.119***
	(0.047)	(0.059)	(0.037)	(0.053)	(0.034)	(0.031)	(0.047)	(0.034)	(0.024)
$h^* = 20$	-0.033	-0.027	-0.006	-0.043	-0.064**	0.021	-0.071**	-0.084***	0.013
	(0.027)	(0.022)	(0.023)	(0.033)	(0.025)	(0.025)	(0.034)	(0.025)	(0.027)

Notes: This table reports the regression discontinuity estimates of students' college dropout rates, under different bandwidths and regression specifications. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.13: Specification Robustness of HS and College Outcomes: Late EOC (2021-2024)

	Graduated HS	Ever College Enroll	First 4-year College Enroll	First 2-year College Enroll
A. Pooled				
$h^* = 10$ (Baseline)	-0.034	-0.080*	0.011	-0.091***
	(0.025)	(0.047)	(0.016)	(0.035)
$h^* = 10$ (Donut)	-0.008	0.020	0.087***	-0.067*
	(0.047)	(0.030)	(0.024)	(0.037)
$h^* = 10$ (w/Controls)	-0.015	-0.071	-0.038**	-0.033
	(0.028)	(0.075)	(0.018)	(0.067)
$h^* = 5$	-0.053***	-0.144***	-0.031***	-0.113***
	(0.015)	(0.008)	(0.010)	(0.014)
$h^* = 20$	-0.013	-0.046	0.022	-0.068**
	(0.025)	(0.040)	(0.016)	(0.028)
B. Male Students				
$h^* = 10$ (Baseline)	-0.004	-0.077	0.001	-0.078
	(0.051)	(0.079)	(0.044)	(0.048)
$h^* = 10$ (Donut)	0.034	0.118**	0.067*	0.051
	(0.061)	(0.048)	(0.035)	(0.056)
$h^* = 10$ (w/Controls)	0.041	0.016	0.019	-0.003
	(0.037)	(0.077)	(0.041)	(0.043)
$h^* = 5$	-0.027	-0.197***	-0.056	-0.140***
	(0.046)	(0.037)	(0.036)	(0.038)
$h^* = 20$	-0.002	-0.021	0.026	-0.047
	(0.039)	(0.056)	(0.031)	(0.038)
C. Female Students				
$h^* = 10$ (Baseline)	-0.056***	-0.082***	0.021	-0.103**
	(0.016)	(0.031)	(0.029)	(0.041)
$h^* = 10$ (Donut)	-0.040	-0.057	0.107**	-0.164**
	(0.057)	(0.052)	(0.053)	(0.078)
$h^* = 10$ (w/Controls)	-0.050*	-0.123	-0.074**	-0.050
	(0.029)	(0.079)	(0.030)	(0.097)
$h^* = 5$	-0.073***	-0.107***	-0.013	-0.095***
	(0.010)	(0.029)	(0.022)	(0.028)
$h^* = 20$	-0.017	-0.064*	0.018	-0.083**
	(0.021)	(0.036)	(0.023)	(0.034)

Notes: This table reports the regression discontinuity estimates of students' high school graduation and college enrollment rates, under different bandwidths and regression specifications. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2021-2024 cohort students who took at least one attempt of the Math 1 EOC, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.14: Specification Robustness of Alternative Pathways: Late EOC (2021-2024)

	Career-Based	College Credit Plus	ACT/SAT
A. Pooled			
$h^* = 10$ (Baseline)	-0.101***	0.002	0.007
	(0.029)	(0.004)	(0.010)
$h^* = 10$ (Donut)	-0.078	0.005	0.001
	(0.059)	(0.013)	(0.018)
$h^* = 10$ (w/Controls)	-0.093**	-0.002	-0.010
	(0.036)	(0.004)	(0.010)
$h^* = 5$	-0.123***	0.004	0.017***
	(0.028)	(0.004)	(0.004)
$h^* = 20$	-0.099***	-0.001	0.021*
	(0.020)	(0.003)	(0.011)
B. Male Students			
$h^* = 10$ (Baseline)	-0.077***	0.007	-0.019**
	(0.026)	(0.008)	(0.009)
$h^* = 10$ (Donut)	-0.137***	0.024	-0.031
	(0.052)	(0.028)	(0.023)
$h^* = 10$ (w/Controls)	-0.048**	0.000	-0.030
	(0.023)	(0.003)	(0.018)
$h^* = 5$	-0.047	0.007	-0.007
	(0.039)	(0.010)	(0.009)
$h^* = 20$	-0.054**	0.007	0.007
	(0.023)	(0.006)	(0.012)
C. Female Students			
$h^* = 10$ (Baseline)	-0.120**	-0.002	0.025*
	(0.048)	(0.002)	(0.014)
$h^* = 10$ (Donut)	-0.031	-0.010***	0.028
	(0.084)	(0.003)	(0.027)
$h^* = 10$ (w/Controls)	-0.119**	-0.004	0.005
	(0.053)	(0.005)	(0.012)
$h^* = 5$	-0.185***	0.003***	0.031**
	(0.018)	(0.001)	(0.014)
$h^* = 20$	-0.135***	-0.007	0.030**
	(0.036)	(0.004)	(0.014)

Notes: This table reports the regression discontinuity estimates of students' take up rates of different alternative graduation pathway options after their first attempt of the Math EOC, under different bandwidths and regression specifications. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2021-2024 cohort students who took at least one attempt of the Math 1 EOC, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.15: Specification Robustness of Career Pathway Activities: Late EOC (2021-2024)

	Industry-Recognized Credentials			CTE Coursework		
	Took IRC	Took 3+ IRC Pts	Took 12+ IRC Pts	Took Any CTE Course	CTE Concentrator	Completed CTE Course Sequence
A. Pooled						
$h^* = 10$ (Baseline)	-0.050	-0.053***	-0.054***	-0.009	-0.034	-0.035*
	(0.033)	(0.018)	(0.019)	(0.027)	(0.024)	(0.020)
$h^* = 10$ (Donut)	-0.021	-0.076	-0.074	0.013	0.001	0.004
	(0.068)	(0.056)	(0.059)	(0.087)	(0.051)	(0.053)
$h^* = 10$ (w/Controls)	0.007	0.011	0.002	-0.033	-0.037*	-0.032
	(0.027)	(0.017)	(0.017)	(0.026)	(0.019)	(0.025)
$h^* = 5$	-0.078**	-0.054***	-0.054***	-0.024	-0.061*	-0.062***
	(0.032)	(0.020)	(0.014)	(0.023)	(0.033)	(0.017)
$h^* = 20$	-0.064***	-0.060***	-0.078***	0.017	0.002	0.004
	(0.021)	(0.016)	(0.020)	(0.031)	(0.020)	(0.024)
B. Male Students						
$h^* = 10$ (Baseline)	-0.010	-0.002	-0.079**	-0.005	-0.109***	-0.046
	(0.033)	(0.033)	(0.035)	(0.032)	(0.032)	(0.038)
$h^* = 10$ (Donut)	-0.016	0.007	-0.155***	0.056	-0.082	-0.014
	(0.090)	(0.091)	(0.053)	(0.106)	(0.062)	(0.061)
$h^* = 10$ (w/Controls)	0.092***	0.104***	-0.014	-0.087	-0.137***	-0.105*
	(0.022)	(0.037)	(0.029)	(0.054)	(0.038)	(0.060)
$h^* = 5$	-0.020	-0.027	-0.037	-0.037	-0.137**	-0.070***
	(0.041)	(0.037)	(0.031)	(0.036)	(0.054)	(0.014)
$h^* = 20$	-0.016	-0.003	-0.087***	0.026	-0.007	0.020
	(0.030)	(0.028)	(0.025)	(0.048)	(0.043)	(0.039)
C. Female Students						
$h^* = 10$ (Baseline)	-0.082*	-0.090***	-0.035**	-0.012	0.019	-0.029
	(0.044)	(0.021)	(0.016)	(0.034)	(0.033)	(0.018)
$h^* = 10$ (Donut)	-0.025	-0.145***	-0.008	-0.024	0.066	0.016
	(0.061)	(0.053)	(0.067)	(0.098)	(0.070)	(0.049)
$h^* = 10$ (w/Controls)	-0.047	-0.056**	0.011	0.002	0.034	0.020
	(0.030)	(0.025)	(0.011)	(0.019)	(0.053)	(0.039)
$h^* = 5$	-0.125***	-0.070***	-0.066***	-0.014	-0.009	-0.059***
	(0.023)	(0.011)	(0.006)	(0.031)	(0.023)	(0.016)
$h^* = 20$	-0.103***	-0.103***	-0.073***	0.013	0.011	-0.007
	(0.029)	(0.018)	(0.024)	(0.033)	(0.030)	(0.021)

Notes: This table reports the regression discontinuity estimates of students' take up rates of various career-focused activities after their first attempt of the Math EOC, under different bandwidths and regression specifications. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2021-2024 cohort students who took at least one attempt of the Math 1 EOC, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.16: Specification Robustness of College Graduation Outcomes: Late EOC (2021-2024)

	Ever Graduated Any College	Ever Graduated 2-Year College	Ever Graduated 4-Year College
A. Pooled			
$h^* = 10$ (Baseline)	-0.020	-0.022*	0.002
	(0.014)	(0.011)	(0.003)
$h^* = 10$ (Donut)	-0.003	-0.009	0.006
	(0.014)	(0.010)	(0.004)
$h^* = 10$ (w/Controls)	-0.034	-0.040*	0.006
	(0.027)	(0.021)	(0.006)
$h^* = 5$	-0.032***	-0.031***	-0.001
	(0.004)	(0.004)	(0.001)
$h^* = 20$	-0.005	-0.006	0.002
	(0.012)	(0.010)	(0.003)
B. Male Students			
$h^* = 10$ (Baseline)	-0.017***	-0.019***	0.003
	(0.005)	(0.005)	(0.002)
$h^* = 10$ (Donut)	-0.015	-0.022**	0.008
	(0.012)	(0.009)	(0.005)
$h^* = 10$ (w/Controls)	-0.034***	-0.039***	0.005
	(0.011)	(0.009)	(0.004)
$h^* = 5$	-0.019***	-0.019***	0.000
	(0.005)	(0.004)	(0.001)
$h^* = 20$	-0.011*	-0.010	-0.002
	(0.006)	(0.006)	(0.002)
C. Female Students			
$h^* = 10$ (Baseline)	-0.023	-0.024	0.001
	(0.022)	(0.017)	(0.005)
$h^* = 10$ (Donut)	0.006	0.001	0.005
	(0.019)	(0.014)	(0.006)
$h^* = 10$ (w/Controls)	-0.032	-0.038	0.006
	(0.042)	(0.032)	(0.010)
$h^* = 5$	-0.043***	-0.041***	-0.002
	(0.005)	(0.005)	(0.001)
$h^* = 20$	0.000	-0.003	0.004
	(0.020)	(0.015)	(0.005)

Notes: This table reports the regression discontinuity estimates of students' college graduation rates, under different bandwidths and regression specifications. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2021-2024 cohort students who took at least one attempt of the Math 1 EOC, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.17: Specification Robustness of College Dropout Outcomes: Late EOC (2021-2024)

	Drop Out (Within 1 Year)			Drop Out (Within 2 Years)			Ever Drop Out		
	Overall	2-Year College	4-Year College	Overall	2-Year College	4-Year College	Overall	2-year College	4-Year College
A. Pooled									
$h^* = 10$ (Baseline)	0.050***	0.033***	0.017**	0.036**	0.014	0.022**	0.027*	0.001	0.026***
	(0.010)	(0.006)	(0.007)	(0.015)	(0.009)	(0.010)	(0.014)	(0.007)	(0.008)
$h^* = 10$ (Donut)	0.078***	0.049**	0.029***	0.105***	0.056***	0.050***	0.074***	0.022*	0.052***
	(0.021)	(0.019)	(0.006)	(0.015)	(0.015)	(0.004)	(0.014)	(0.013)	(0.005)
$h^* = 10$ (w/Controls)	0.117***	0.085***	0.032***	0.079***	0.037***	0.043***	0.063***	0.020**	0.043***
	(0.013)	(0.011)	(0.010)	(0.018)	(0.011)	(0.016)	(0.020)	(0.009)	(0.016)
$h^* = 5$	0.029**	0.022***	0.007	-0.004	-0.009***	0.005	0.001	-0.009***	0.010
	(0.013)	(0.005)	(0.008)	(0.008)	(0.002)	(0.008)	(0.007)	(0.002)	(0.008)
$h^* = 20$	0.001	-0.008	0.009*	-0.002	-0.017	0.015**	-0.007	-0.023*	0.016***
	(0.016)	(0.014)	(0.005)	(0.016)	(0.013)	(0.006)	(0.016)	(0.013)	(0.006)
B. Male Students									
$h^* = 10$ (Baseline)	0.072***	0.045***	0.027**	0.047**	0.019	0.028**	0.048***	0.010	0.037***
	(0.020)	(0.011)	(0.014)	(0.018)	(0.016)	(0.013)	(0.015)	(0.010)	(0.013)
$h^* = 10$ (Donut)	0.114***	0.083***	0.031*	0.121***	0.090***	0.031*	0.082***	0.045**	0.036*
	(0.030)	(0.026)	(0.018)	(0.029)	(0.024)	(0.018)	(0.023)	(0.023)	(0.021)
$h^* = 10$ (w/Controls)	0.161***	0.113***	0.048***	0.097***	0.052	0.046***	0.080***	0.034	0.046***
	(0.028)	(0.026)	(0.011)	(0.035)	(0.034)	(0.009)	(0.027)	(0.027)	(0.009)
$h^* = 5$	0.031	0.014	0.017	-0.009	-0.027***	0.018	0.017	-0.013	0.030
	(0.038)	(0.018)	(0.021)	(0.030)	(0.010)	(0.020)	(0.030)	(0.010)	(0.020)
$h^* = 20$	0.015	-0.001	0.016	0.004	-0.015	0.019	0.005	-0.017	0.022
	(0.023)	(0.015)	(0.013)	(0.019)	(0.015)	(0.012)	(0.017)	(0.014)	(0.013)
C. Female Students									
$h^* = 10$ (Baseline)	0.036***	0.026***	0.010	0.031	0.011	0.019	0.014	-0.005	0.019
	(0.010)	(0.008)	(0.007)	(0.020)	(0.011)	(0.013)	(0.021)	(0.011)	(0.013)
$h^* = 10$ (Donut)	0.051	0.022	0.029**	0.094***	0.029	0.065***	0.069**	0.003	0.066***
	(0.034)	(0.026)	(0.014)	(0.034)	(0.027)	(0.016)	(0.031)	(0.024)	(0.016)
$h^* = 10$ (w/Controls)	0.087***	0.066***	0.021**	0.067**	0.028**	0.039*	0.051	0.013	0.039*
	(0.008)	(0.007)	(0.010)	(0.029)	(0.014)	(0.022)	(0.034)	(0.019)	(0.022)
$h^* = 5$	0.032***	0.029***	0.002	0.003	0.005	-0.002	-0.009	-0.006	-0.003
	(0.010)	(0.006)	(0.006)	(0.010)	(0.007)	(0.006)	(0.012)	(0.009)	(0.006)
$h^* = 20$	-0.007	-0.012	0.006	-0.005	-0.018	0.013	-0.013	-0.027	0.013
	(0.022)	(0.017)	(0.008)	(0.026)	(0.016)	(0.012)	(0.027)	(0.017)	(0.012)

Notes: This table reports the regression discontinuity estimates of students' college dropout rates, under different bandwidths and regression specifications. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2021-2024 cohort students who took at least one attempt of the Math 1 EOC, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.18: Impact of Passing Early EOC on HS Graduation and College Enrollment (by Cohort)

	Graduated HS	Ever College Enroll	First 4-year College Enroll	First 2-year College Enroll
Full Sample	-0.002	-0.029	0.094	-0.123***
	(0.048)	(0.075)	(0.060)	(0.046)
2019 Cohort	0.012	-0.016	0.110	-0.125***
	(0.063)	(0.102)	(0.089)	(0.049)
2020 Cohort	-0.007	-0.049	0.075	-0.123*
	(0.048)	(0.117)	(0.087)	(0.064)
Cohort 2020-2019 Diff	-0.019	-0.033	-0.035	0.002
	(0.062)	(0.158)	(0.127)	(0.066)
N	1,005	1,005	1,005	1,005
Baseline (Pooled)	0.855	0.472	0.184	0.288
Baseline (2019)	0.825	0.473	0.176	0.297
Baseline (2020)	0.883	0.474	0.194	0.281

Notes: This table reports the regression discontinuity estimates of students' high school graduation and college enrollment rates, splitting the sample by cohorts. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.19: Impact of Passing Early EOC on Alternative Pathway Takeup (by Cohort)

	Career-Based	Flexible Competency (Non-Career)	College Credit Plus
Full Sample	-0.180***	0.052*	-0.012
	(0.059)	(0.030)	(0.020)
2019 Cohort	-0.087	0.073	-0.036
	(0.063)	(0.061)	(0.029)
2020 Cohort	-0.237**	0.029	0.020
	(0.092)	(0.044)	(0.036)
Cohort 2020-2019 Diff	-0.150	-0.043	0.056
	(0.099)	(0.087)	(0.048)
N	1,005	1,005	1,005
Baseline (Pooled)	0.437	0.178	0.086
Baseline (2019)	0.349	0.164	0.096
Baseline (2020)	0.493	0.190	0.078

Notes: This table reports the regression discontinuity estimates of students' propensity to take up different graduation pathways, splitting the sample by cohorts. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level

Table A.20: Impact of Passing Early EOC on College Persistence (by Cohort)

	Graduated College			**Drop Out (Within 1 Year)**			**Drop Out (Within 2 Years)**			**Ever Drop Out**		
	Overall	2-year College	4-Year College	Overall	2-Year College	4-Year College	Overall	2-Year College	4-Year College	Overall	2-year College	4-Year College
Full Sample	0.051	0.018	0.055	-0.041*	-0.034	-0.007	-0.062**	-0.093***	0.031	-0.076	-0.112***	0.036
	(0.039)	(0.016)	(0.037)	(0.021)	(0.024)	(0.028)	(0.030)	(0.024)	(0.028)	(0.050)	(0.042)	(0.031)
2019 Cohort	0.169***	0.076***	0.127***	-0.045	-0.054	0.009	-0.052	-0.105***	0.053	-0.044	-0.110**	0.065
	(0.036)	(0.024)	(0.040)	(0.036)	(0.033)	(0.042)	(0.049)	(0.034)	(0.053)	(0.070)	(0.056)	(0.057)
2020 Cohort	-0.065*	-0.045**	-0.013	-0.054	-0.017	-0.037	-0.085*	-0.087**	0.002	-0.116*	-0.118**	0.001
	(0.037)	(0.018)	(0.039)	(0.034)	(0.044)	(0.040)	(0.051)	(0.039)	(0.036)	(0.060)	(0.048)	(0.035)
Cohort 2020-2020 Diff	-0.234***	-0.121***	-0.140***	-0.009	0.037	-0.045	-0.033	0.018	-0.051	-0.072	-0.008	-0.064
	(0.039)	(0.035)	(0.049)	(0.055)	(0.062)	(0.063)	(0.072)	(0.052)	(0.072)	(0.084)	(0.058)	(0.073)
N	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005
Baseline (Pooled)	0.070	0.016	0.044	0.140	0.098	0.042	0.202	0.164	0.039	0.238	0.190	0.048
Baseline (2019)	0.007	-0.024	0.012	0.174	0.129	0.045	0.219	0.194	0.025	0.243	0.213	0.030
Baseline (2020)	0.111	0.053	0.058	0.106	0.064	0.042	0.184	0.132	0.052	0.224	0.162	0.062

Notes: This table reports the regression discontinuity estimates of students' college persistence (graduation and drop out) rates, splitting the sample by cohorts. The running variable is the minimum scale score distance from the Math EOC cutoff among students who scored a total of 3 points and 4 points across the Math 1 and Math 2 EOC exams. The sample is limited to 2019-2020 cohort students who took at least 5 of the 7 required EOCs, and who were in the district's administrative sample for at least 9th and 10th grade of high school. All standard errors are clustered by the 21 discrete scale score distance from respective Math EOC cutscores.

*** Significant at the 1% level ** 5% level * 10% level