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A Multi-State Analysis of Trends in Career and Technical Education: Massachusetts, Michigan, and Tennessee

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HIGHLIGHTS

- We utilize student-level administrative data from three states—Massachusetts, Michigan, and Tennessee—over several years to learn how state contexts color our understanding of what drives participation in CTE programs and how it might impact subsequent educational outcomes for high school students as part of a multi-state CTE research consortium: The Career & Technical Education Policy Exchange (CTEx).[1]
- We first document that while all states are required to report CTE relevant statistics under *Perkins*, guidelines are sufficiently broad such that key definitions of, for example, program concentrators and completers, are not uniform across states, implying that this or any other multi-state analysis has limitations. We conclude that unifying definitions across states should be a consideration for future federal policy.
- According to state definitions, roughly one in five Massachusetts students, just fewer than one in three Michigan students, and almost one-half of Tennessee students concentrate or complete a CTE program of study in high school.
- We find that while White students are more likely to concentrate in a CTE program of study, these differences are largely driven by across-school differences. Much, and in some cases all, race and ethnicity gaps in concentration rates is eliminated when we compare students within schools.
- In two states (MI and TN), we find students diagnosed with disabilities (SWD) are less likely to concentrate in a CTE program, while in MA they are more likely.
- We also show students reaching at least concentrator status are more likely to graduate high school and to enroll in two-year colleges, while they are less likely to enroll in four-year schools. This high school graduation advantage is particularly pronounced for SWD.
- In all, we find wide variation both across and within states in both concentrator rates and outcomes for concentrators and non-concentrators, suggesting state-specific contexts play an important role in studying CTE that is uncovered by access to statewide longitudinal databases.

OVERVIEW AND PURPOSE

Career and technical education (CTE) remains a timely policy issue largely due to a reinvigorated focus on preparing high school students not only for college but also for careers. The following report provides an overview of CTE engagement, measured by the share of students who concentrate in or complete a CTE program before graduating from high school. Our three-state analysis covers differences in CTE concentration rates over time and across sub-groups. We go on to describe high school graduation rates and college enrollment across concentrators and non-concentrators, with a special focus on students with disabilities.

What makes this descriptive analysis unique is that existing analyses of CTE participation and outcomes across states largely consist of snapshots from federal surveys.[2] While these have been immensely

[1] For more information, see gpl.gsu.edu/ctex.

[2] For example, see "Bridging the Skills Gap: Career and Technical Education in High School." U.S. Department of Education, 2019. ed.gov/datastory/cte/index.html. Common surveys in these reports include the Study National Education Longitudinal Study (NELS), Education Longitudinal Study (ELS), and the High School Longitudinal Study (HSLS).

valuable for researchers and policymakers, these surveys only capture data at various points in time, for only a fraction of students in each state, and are reliant on measurement choices that complicate cross-state comparisons. For example, we find that state-specific definitions of concentrator or completer status are not uniform. Moreover, national surveys are not conducive to studying differences within schools.

In what follows, we utilize student-level administrative data from three states—Massachusetts, Michigan, and Tennessee—over several years to learn how state contexts color our understanding of what drives participation in CTE programs and how it might impact subsequent educational outcomes for high school students. Our advantage lies in longitudinal data for all students, which we harmonize across three distinct state data systems, although with some limitations.

This analysis comes at an opportune moment. With Congress recently reauthorizing the *Perkins Act* (now *Perkins V*), which governs funding and reporting requirements for CTE programs across the country, understanding how states vary in defining and reporting CTE participation and how participation rates and student outcomes vary across states is a sensible step in understanding the broader picture of CTE across the nation. Results highlight the richness of experiences currently available to students as well as the many challenges states and researchers face in understanding and shaping the future of CTE in the United States.

Our research highlights meaningful differences in how states define and report CTE participation. Prior to *Perkins V*, states had broad leeway in developing, defining, and reporting CTE programs and pathways, leading to inconsistent definitions and complicating cross-state comparisons. As we discuss below, *Perkins V* rectifies this to a limited degree while allowing room for future improvements in alignment. Our research also highlights wide variation in participation and student outcomes, even across just three states. Furthermore, race, gender, and disability status play very different roles in program take-up and concentration rates in each of the three states. Our ability to determine what drives these differences (e.g., access to programs, differing graduation requirements, or local economic factors) is limited and further highlights the need for accurate and accessible longitudinal data.

ANALYSIS SAMPLE AND CREATION OF COMMON TERMS

A multi-state analysis of CTE brings to the forefront the lack of uniformity in definitions across states. All states are required to report statistics under *Perkins* reporting requirements. Yet, guidelines are sufficiently broad such that key definitions of, for example, program concentrators and completers, are not uniform across states. Further complicating the issue is that states also vary in definitions and availability of reporting of other student factors such as low-income status. States are also afforded great flexibility in developing CTE courses and programs, including mode of delivery and how credits are assigned.

In the following, we take a “least common denominator” approach to definitions when possible. Even in this case, definitions are not precisely equal across locations. Our primary measure, concentrating or completing a program of study, is a key and telling hurdle. For various reasons, each state defines who is a concentrator in or completer of a CTE program of study differently. Further, the specific courses that lead to one pathway or another are not uniformly defined across states. Below, we briefly describe how we

construct a consistent sample of students, defined by entering ninth grade cohort, and how we define participation in CTE across states.

The key measure we can harmonize across states is whether a student "concentrated" in a CTE program of study. This definition includes all students who either concentrated in or completed a program of study (where the former is a subset of the latter). While not affording the detail of distinguishing between participants (those taking a CTE course but not enough to concentrate), concentrators, and completers, it provides a term commonly reported across states—though definitions still differ as discussed below. Hence, we take as our first key finding from this exercise that any multi-state analyses should be interpreted with caution (here or otherwise), even when great care is taken to reconcile definitions.

DEFINING CTE CONCENTRATORS

During our time frame (entering ninth grade cohorts from 2008-15 in MI and MA, and 2010-14 in TN), states took differing approaches to defining who is a CTE participant, concentrator, or completer. In general, these can loosely be translated to taking a CTE course, completing multiple courses in an aligned sequence but not completing a program of study, and completing an aligned program of study (typically at least three courses in a sequence and often including a capstone experience such as work-based learning or an end of pathway exam), respectively. These definitions are not standardized. Under the 2006 *Perkins IV Act* states could establish their own performance requirements and define populations for which they would report data. The U.S. Department of Education had flexible guidelines for these and other definitions under the *Act* and defined a concentrator as,

> "A secondary student who has earned three (3) or more credits in a single CTE program area (e.g., health care or business services), or two (2) credits in a single CTE program area, but only in those program areas where 2 credit sequences at the secondary level are recognized by the State and/or its local eligible recipients."[3]

To reconcile CTE concentration measures across states, we focus on students who concentrate in a program of study, which includes those who also complete a program. Our data do not allow us to define students as participant or completers across all three states easily or consistently. Yet, despite a common definition in *Perkins* guidelines for concentrators, course length is not uniform across states, and whether any specific course might count for one or more "programs" also differs. Hence, differences in concentration rates across states reflect, in part, differences in the share of students who take CTE courses in addition to differences in how states define two or three courses in a sequence. Below, we provide a table of definitions used for students in the following analysis, which align to state-specific definitions prior to *Perkins V*. While a concentrator is not uniformly defined across states, we are able to provide statistics for all concentrators *according* to those states over our timeframe.

[3] See Program Memorandum: "Student Definitions and Measurement Approaches for the Core Indicators of Performance Under the Carl D. Perkins Career and Technical Education Act of 2006 (Perkins IV)." Troy R. Justesen. *Office of Vocational and Adult Education State Administration and Accountability Group.* March 3, 2007. Accessed at s3.amazonaws.com/PCRN/docs/nonregulatory/studentdef.pdf on April 22, 2020.

Table 1. State-specific Definitions of "Concentrator" Status for the Relevant Time Period

State	Concentrator Definition
Michigan	Student completed at least seven out of 12 segments[4] in a program of study.
Tennessee	Student completed at least three credits in a program of study.
Massachusetts	Student was identified by school or district as being a participant in a CTE program for two or more academic years.

It is worth noting that for federal reporting under the *Strengthening Career and Technical Education for the 21st Century Act*, which reauthorized, through the *Carl D. Perkins Career and Technical Education Act of 2006, Perkins V* through fiscal year 2024, the primary unit for reporting is concentrators, defined as those completing "at least two courses in a single career and technical education program or program of study."[5] States retain a considerable amount of flexibility around this and other components of *Perkins*, however, and it is uncertain if states will become more or less consistent in their reporting.

CHOOSING SAMPLES

We focus our analysis on students who started high school in a public or charter school in Massachusetts, Tennessee, or Michigan. For Michigan and Massachusetts, we use ninth grade cohorts for years 2008 through 2014. For Tennessee, we focus on cohorts entering in years 2010 through 2014. The Tennessee statistics to follow focus on cohorts who would have graduated after CTE programs were reorganized (see Overall Trends in the Share of Students Concentrating or Completing a Program of Study) and for whom we can observe concentrator status, which is typically assigned late in high school. We define high school cohorts as the first year the student was enrolled in ninth grade, regardless of their graduation year or how long they took to progress in high school. This means that students who enrolled in a public high school at later grades (e.g., tenth or eleventh grade) are not considered in our sample for reasons described below.

We restrict our analysis to students who stayed in high school for at least four consecutive years. This has several practical purposes and some limitations. Students are more likely to concentrate in a CTE program in eleventh or twelfth grade. Hence, our definition captures the majority of students who do so. It also limits bias from attrition (e.g., to private schools or out of state). This allows us not only to observe students through their high school careers but also to observe whether students drop out of high school. Since students who stay longer in high school are more likely to graduate and enroll in college, by restricting our sample we reduce the mechanical relationship between the time a student spends in high school, his or her probability of concentrating in a CTE program, and our main outcomes of interest (e.g., college enrollment). This comes at a cost, though. In particular, we do not observe students who transfer in or out of the public/charter systems in these states, and importantly, we do not observe students who

[4] For each Program of Study, the Michigan Department of Education defines a set of standards that outline the basic contents and objectives a program should cover. To simplify monitoring and track student progress, the Michigan Department of Education defines 12 groupings of standards called segments, which are specific to each Program of Study. There are no requirements as to how many segments should be covered in one course or how many hours of instruction should be allocated to cover one segment.

[5] See congress.gov/bill/115th-congress/house-bill/2353

drop out of high school with fewer than four years of attendance. Our estimates capture the experiences of the typical student in each of our states. However, results neither extend well to students who transfer across states nor do they capture the relationship between CTE and outcomes for high school students who drop out before their fourth year of high school. This last caveat is important: If CTE is more common among students who would likely graduate even in its absence than among students who are most likely to drop out (before attending school for four years), we will *underestimate* any positive relationship between CTE and high school graduation (and consequently over-estimate any negative relationship).

In some of the analyses to follow, we report statistics for breakout samples of students according to race, gender, or disability status. All analyses apply our sample restriction that students were enrolled for at least four consecutive years.

OTHER DEFINITIONS

RACE/ETHNICITY

We use four categories to define students' race/ethnicity, taken from how they are categorized by the state for reporting metrics. These are mutually exclusive, including Black, Hispanic, White, and "Other," where Other includes all students not in one of the other three categories. We do not observe whether students identify with more than one race or ethnicity.

STUDENTS WITH DISABILITIES (SWD)

There are several categories of students with disabilities, differing in the type and intensity of disability. Each state has specific definitions that mirror the 13 federally-recognized categories, which we group into four subgroups of special education designation: high-incidence, low-incidence, cognitive, and behavioral. Although state-specific definitions are not identical, there is considerable overlap, which we use to construct these four unified categories. In Table A1 in the Appendix, we show each of the specific disability categories that fall under the broader classifications.

STANDARDIZED TEST SCORES

In some analyses, we utilize state-specific standardized student test scores (e.g., to observe early test score differentials among students who concentrate in CTE or not or to control for these ability measures in regression analyses of the likelihood of concentrating in a CTE program). For Michigan, we use eighth grade reading and mathematics scores from the Michigan Education Assessment Program (MEAP). For Massachusetts, we use eighth grade reading and mathematics scores from the Massachusetts Comprehensive Assessment System (MCAS). For Tennessee, we use the English 1 and Algebra 1 test scores taken in ninth or tenth grade. All scores are standardized to be mean zero with a standard deviation of one (z-scores) within each state cohort using the entire population of students who took the test that year, facilitating our cross-state comparison of where CTE students fall in the achievement distribution within their own states.[6]

[6] Hence, means for our subsamples may not be zero. Students with missing achievement data (such as in Tennessee, where a large minority of students take Algebra I prior to ninth grade) are excluded from achievement summary statistics but included in regression analyses.

COLLEGE ENROLLMENT

We study college enrollment five years after entering high school. This is defined according to whether a student enrolled in college (two- or four-year) during the summer, fall, or spring semester the year after their expected high school graduation date. While we would like to observe delayed enrollment or to allow for those taking more than four years to graduate high school, we are only able to do this for the few oldest cohorts. For consistency, we settle on this definition, which captures the majority of, though certainly not all, college enrollees.[7] Future iterations of this analysis will allow us to observe these outcomes.

STATE-SPECIFIC CONTEXTS

In Massachusetts, students have multiple avenues to participate in high school CTE. Nearly all students live in towns that have access to a regional vocational and technical high school (RVTS). More than two dozen such schools exist across Massachusetts and all serve students who intend to study CTE in high school. In these RVTS settings, students get to explore multiple CTE programs of study in ninth grade and then make an informed choice about their preferred program. They then go on to spend their remaining three years in high school with a largely stable set of peers and instructors in their core academic and technical courses. Students apply to attend these schools, many of which are oversubscribed. Students apply with middle school grades, attendance, and discipline records. In schools that are oversubscribed, they are scored on these elements, given a total application score, and then admitted in descending order until all seats are filled. The RVTSs educate about half of the CTE concentrators in the state. The other half take CTE courses as electives in their residentially-assigned comprehensive high school.

In Tennessee, dedicated CTE high schools are much less common than they are in Massachusetts. Most CTE students in Tennessee are enrolled in comprehensive high schools where CTE courses are available as electives. Each CTE course is associated with at least one program of study; there are 58 distinct programs of study, although each school does not offer each program. The number of CTE programs throughout Tennessee has fallen from over 200 in 2012-13 as programs were reorganized or retired. Amidst this reorganization, the percent of students who were classified as CTE concentrators rose from 31 percent of regular graduates in 2011-12 to 47 percent in 2016-17. Programs of study are grouped into 16 career clusters that cover almost any industry or occupation where one might eventually work. “Audio/Visual Production,” for example, is a program of study in the “Arts, Audio/Visual Technology, and Communications” career cluster, and “Welding” is a program of study in the “Architecture & Construction” cluster. Career clusters include between one and six different programs of study. Currently, each program of study is associated with just one career cluster.[8]

Similar to Tennessee, students in Michigan usually take CTE courses as electives within their comprehensive high school. If the school does not offer a specific program of study, the student can take CTE courses at career centers, which are operated by Intermediate School Districts (ISDs), or in some cases, local school districts (such as Detroit). The Michigan Department of Education (MDE) created

[7] College enrollment is taken from the National Student Clearinghouse, which covers the majority of post-secondary schools in the United States.

[8] A complete crosswalk of programs of study to career clusters is available at tn.gov/content/dam/tn/education/ccte/cte/cte_pos_2018-19.pdf.

Career Education Planning Districts (CEPDs), composed by one or more neighboring districts, to coordinate CTE program offerings across high schools and career centers in the area, reflecting regional priorities. As of 2018-19, there are 52 state-recognized programs of study within 16 career clusters. Schools intending to offer new programs of study require approval from the Office of Career and Technical Education, which verifies that the program covers some pre-defined standards that outline the basic contents and objectives a program should cover. For monitoring purposes, MDE grouped these standards into 12 "segments." Students' progress in the program is measured by the successful completion of each of these segments.

ANALYSIS

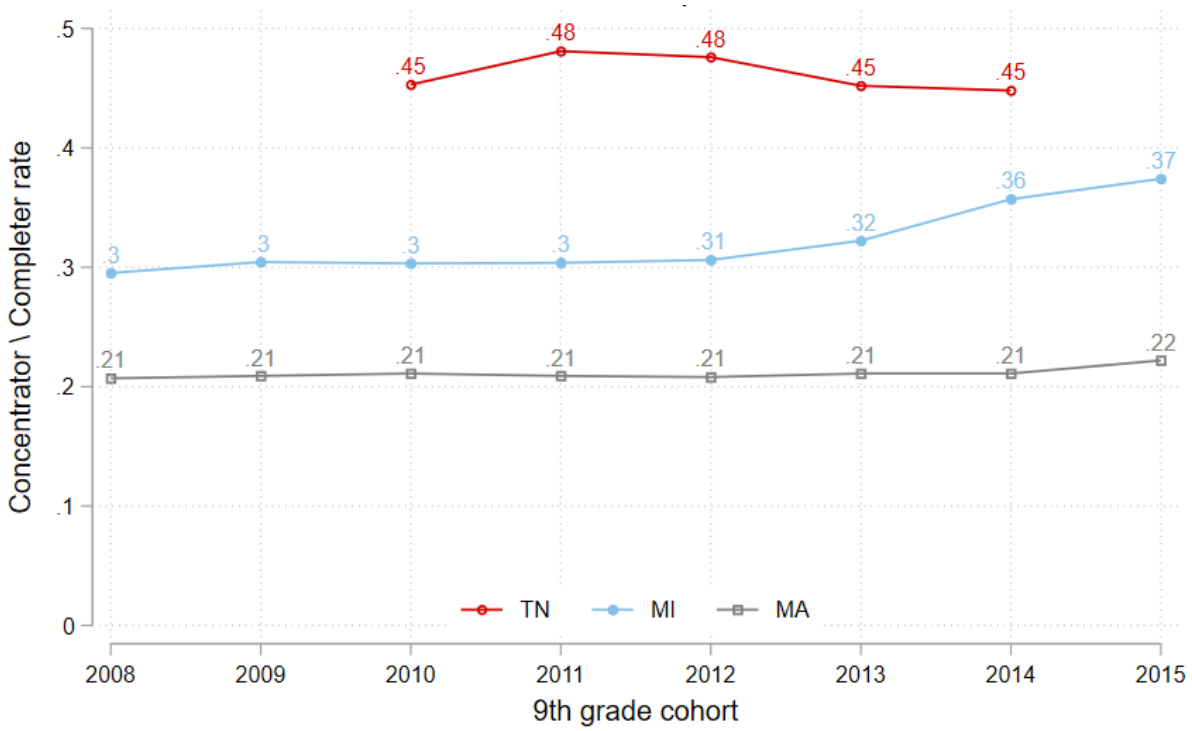
OVERALL TRENDS IN THE SHARE OF STUDENTS CONCENTRATING OR COMPLETING A PROGRAM OF STUDY

We begin by tracking the share of students in each ninth-grade cohort who reach concentrator status or higher (concentrator or completer). As described above, definitions across states vary. For Michigan, we observe students who complete at least half of a CTE program. In Tennessee, these are students who completed three or more credits in a CTE program. In Massachusetts, these are students who are identified by their school as meeting the local definition of concentrator (typically taking at least one year-long course in an approved program of study in a given year) in more than two years of high school. This roughly aligns with the definition in Tennessee.

While definitional differences may contribute to level differences across states, trends have been relatively stable over time, with one exception: Beginning in 2013, Michigan saw an increase in the share of all students who concentrate or complete a program of study. While we cannot rule out a material increase, this rise is in large part or fully attributable to a funding change that incentivized districts to increase concentrator or completer status for students.

According to state-level definitions, roughly one in five Massachusetts students, just fewer than one in three Michigan students, and almost one-half of Tennessee students concentrate or complete a program of study in high school. Figure 1 below shows these figures over time and by state. These differences in concentration rates are likely due to many factors. A few possibilities include: (1) different structures of CTE delivery (such as whole-school models in Massachusetts, versus integrated models in Tennessee and Michigan), (2) different definitions of concentration, (3) different courses counted toward CTE concentration or completion, (4) different accountability benchmarks that may directly or indirectly include CTE courses, or (5) regional differences in the types of CTE program offerings, a possibility that we explore in more detail below. That rates are relatively stable over time suggests that changing supply and demand for these courses is not driving cross-state differences. Michigan's increase in concentration and completion rates following a state-specific funding change adds some support to the impact state requirements and/or definitions have on concentration rates.

Figure 1. Concentrator Rates Across States



Note. Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions.

POPULAR CAREER CLUSTERS BY STATE

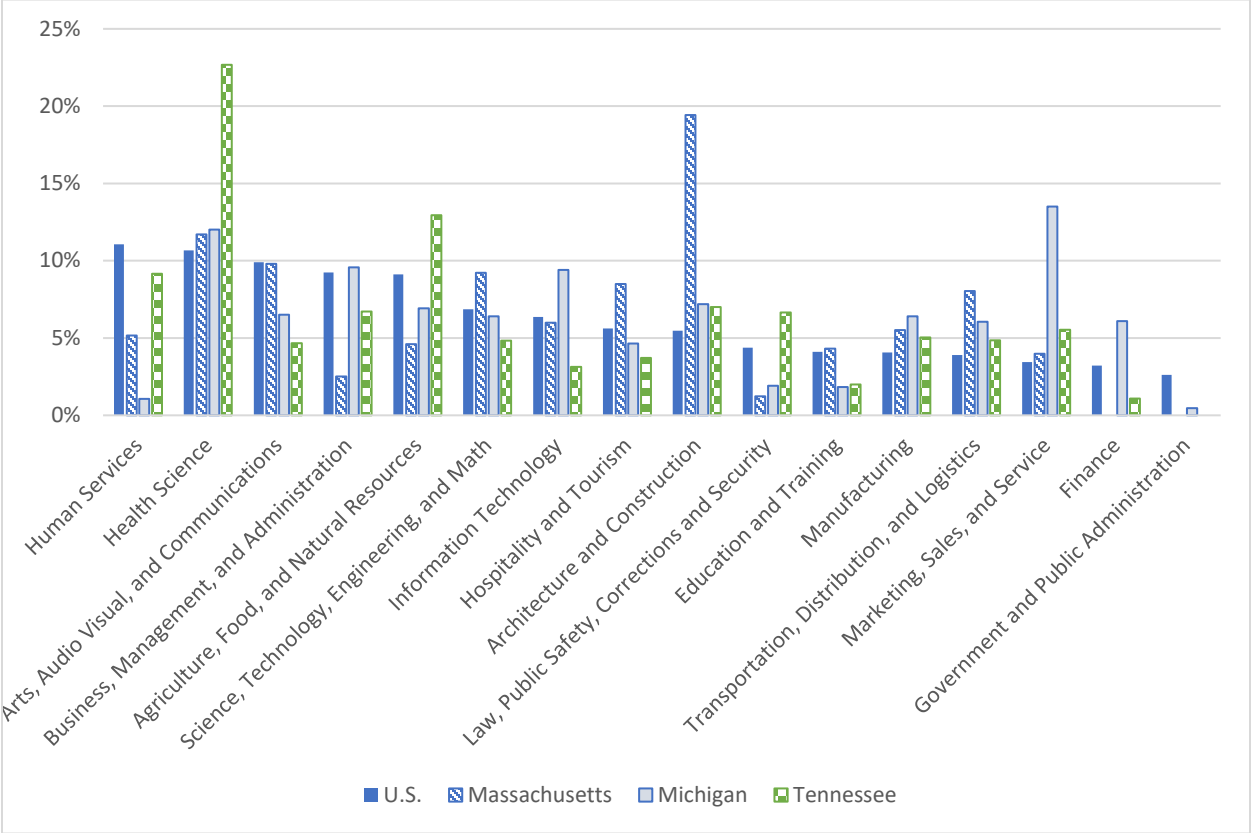
Having described the rate of CTE concentration across states and time, it is helpful to understand more about what CTE students are studying in each state and how that differs from the rest of the nation. Figure 2 plots the nationwide share of 2018-19 CTE concentrators in each of the 16 major career clusters, and for comparison, the share of Massachusetts, Michigan, and Tennessee concentrators in each career cluster.[9] Nationwide, the five most popular CTE clusters are Human Services, Health Science, Arts/Audio-Visual/Communications, Business/Management/Administration, and Agriculture/Food/Natural Resources. These are each relatively popular in one or more of the states we focus on, but there are important differences in the distribution of clusters across states.

In Massachusetts, Architecture/Construction, STEM, and Hospitality/Tourism are among the state's top five most popular clusters, whereas Human Services and Agriculture/Food/Natural Resources are much less common than they are nationally. Human Services CTE concentrators are also relatively uncommon in Michigan, whereas Marketing, Information Technology, and Architecture/Construction students collectively account for three in 10 Michigan CTE concentrators. And in Tennessee, the percent of CTE concentrators in Health Science is 23 percent, almost twice the rate seen in Massachusetts, Michigan, or

[9] Data for Figure 2 is drawn from the U.S. Department of Education Perkins Collaborative Research Network: cte.ed.gov/profiles/national-summary.

the United States more broadly. Tennessee's Agriculture/Food/Natural Resources cluster is also more prominent than in other states, as is Law and Public Safety.

Figure 2. Percent of CTE Concentrators in each Career Cluster, Nationwide and by State

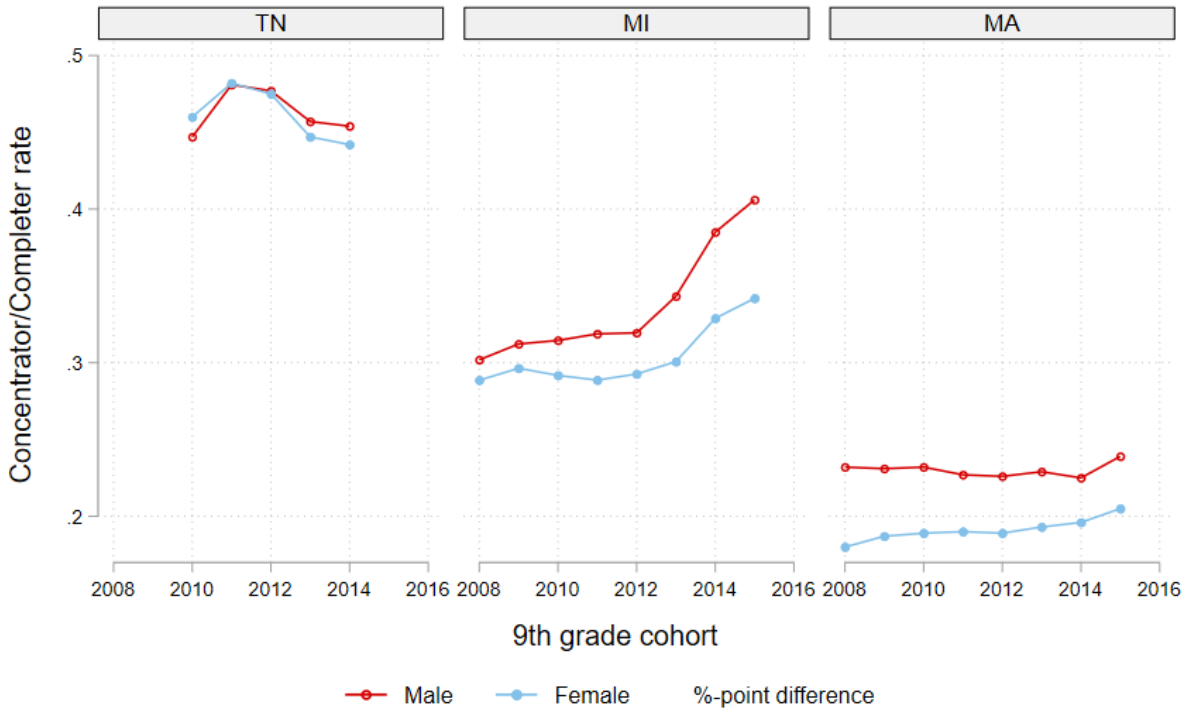


Looking across figures 1 and 2, it does not appear that regional variation in cluster intensities can explain widely varying rates in CTE concentration on its own. Massachusetts has the lowest rate of CTE concentration among these three states and is relatively more invested in Architecture/Construction, a field that can entail more facility costs and capacity constraints than clusters such as Information Technology, Business, or Marketing. However, the same is true of Health Science and Agriculture/Food/Natural Resources, which account for 1 in 3 CTE concentrators in Tennessee, a state with a very high rate of CTE concentration.

CONCENTRATION AND COMPLETION RATES BY GENDER

Figure 3 below breaks out overall trends by gender across states. In Tennessee, male and female students concentrate in CTE at about the same rate, while Michigan and Massachusetts show higher concentration and completion rates for male students than their female counterparts. For our most recent cohort—those starting ninth grade in 2015—just over 40 percent of male students concentrate or complete in Michigan, compared to 34 percent of females. This is the widest gap in our time window, where male students are now 17 percent (6 percentage points) more likely to concentrate or complete than female students.

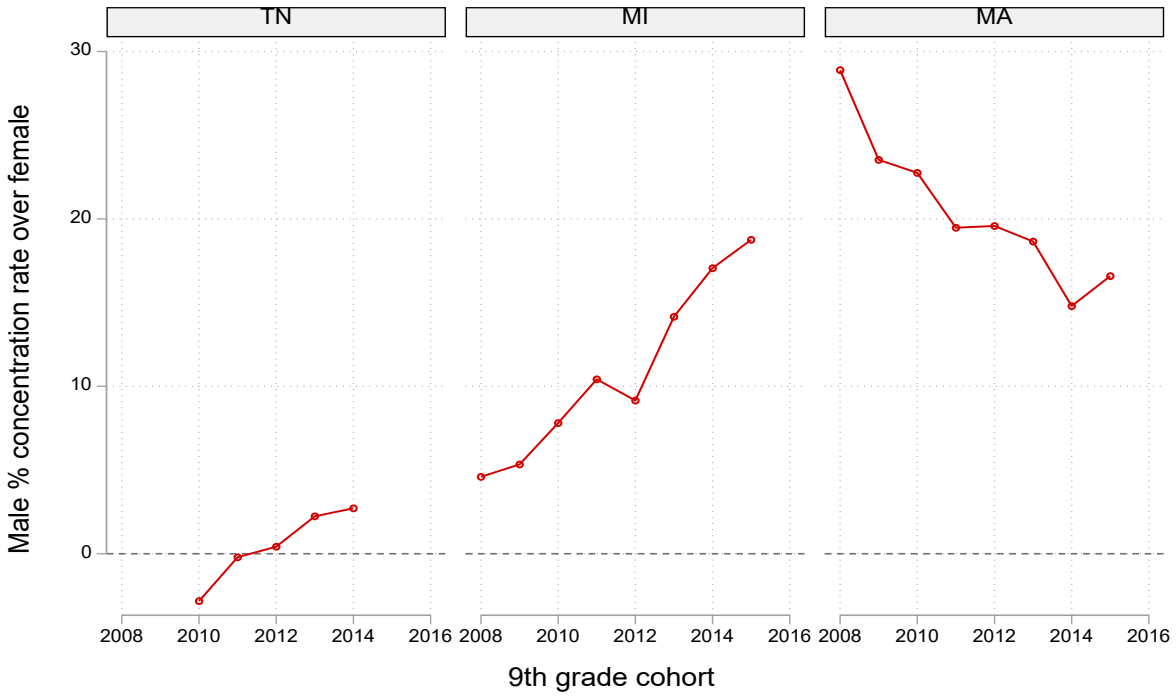
Figure 3. Concentrator Rates by Gender



Note. Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions.

Figure 4 illustrates the Figure 3 gender breakdown in a different way, by plotting the gender gap in CTE concentration in each state over time. Specifically, for each state and cohort Figure 4 plots the percent by which the number of male CTE concentrators exceeds the number of female CTE concentrators. As shown in Figure 4 below, in Massachusetts the gender gap has narrowed over time. For the 2008 entering cohort, male students in Massachusetts were 27 percent more likely to concentrate or complete a program. By the 2015 ninth-grade cohort, similar to Michigan, that gap had narrowed to 17 percent. We cannot point to a particular explanation for the level differences (or lack thereof) in each state, the widening of the gap in Michigan, or the narrowing gap in Massachusetts. Looking back to the Figure 2 distribution of career clusters, it is possible that popular and male-dominated industries are driving some of the gap in Massachusetts (e.g., Architecture/Construction), whereas the popularity of more female-dominated industries (such as Human Services) could be narrowing the gap in Tennessee. We believe this is a promising and important area for future research.

Figure 4. Male/Female Differences in Concentrator Status



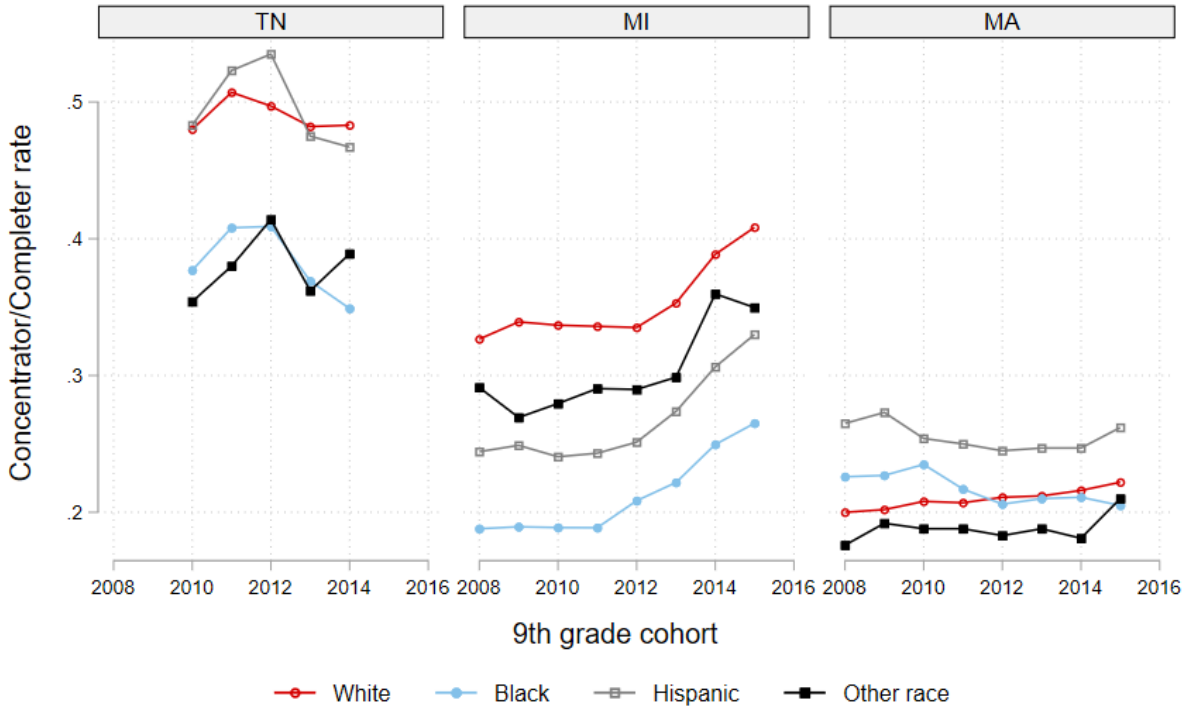
Note. Figure plots percent difference in concentrator rates for male students compared with female students. Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions.

CONCENTRATION AND COMPLETION RATES BY RACE

A similar breakout by race highlights unconditional average differences in concentrator status across groups. We note that these differences do not account for differences in course availability or for other factors correlated with race that might affect CTE participation or concentrator status. We explore how these factors might interact with race below in regression analyses to follow.

Focusing on raw mean differences in Figure 5, we find wide variation both within and across states. In no two states is the relationship between race and concentration rates similar. In Tennessee, White and Hispanic students are more likely to concentrate in a CTE program of study than Black or other non-White students. In Michigan, students who are not White are significantly less likely to concentrate or complete a CTE program than White students. In Massachusetts, Hispanic students are most likely to concentrate in a CTE program, while Black and White students are roughly equal in concentration rates by the end of our time frame—closing gaps among earlier cohorts.

Figure 5. Concentration Rates by Race



Note. Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions.

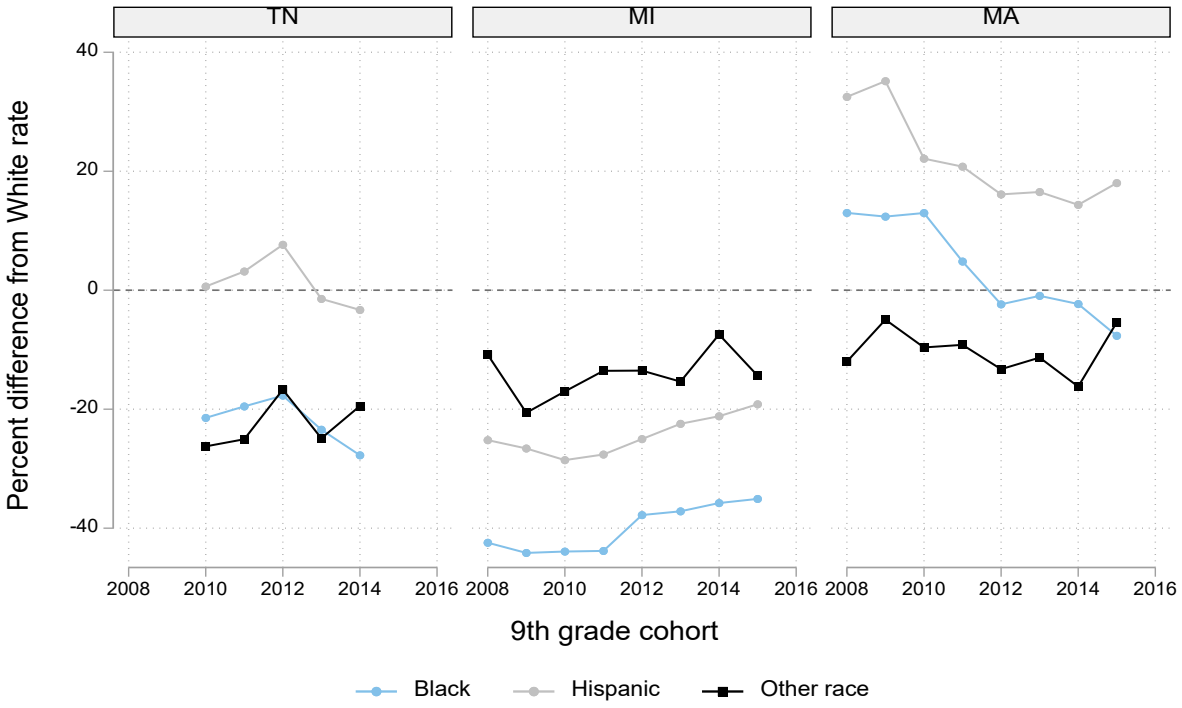
Figure 6 replicates concentration rates from Figure 5 in terms of *percent* differences in concentration rates as compared with White students over time and across states. Points above zero, such as for Hispanic students in Tennessee's 2010 ninth grade cohort, signify that students in that demographic are more likely to concentrate in CTE than White students in the same cohort and state. Points below zero imply the reverse: for example, Black students in Tennessee's 2010 ninth grade cohort were about 25 percent less likely than White students in concentrate in CTE. Lines sloping toward zero imply narrowing gaps between non-White and White students in concentration rates, while lines moving away from zero indicate widening White/non-White gaps. For example, in Tennessee, the Black-White gap in CTE concentration was widened somewhat over time. The pattern is similar when comparing students who identified as neither White, Black, nor Hispanic with their White peers. Concentrator rates for Hispanic students is approximately equal to that of White students in Tennessee, with little change in our observational window.

In Michigan, for ninth grade cohorts 2008 to 2011, Black students were over 40 percent less likely to concentrate than White students, while Hispanic students were more than 25 percent less likely to concentrate or complete a program of study in CTE. Beginning with the 2012 cohort and coinciding with a policy change incentivizing early concentration and completion rates, the Black-White gap closed to a 35 percent difference in the likelihood of concentrating, and the Hispanic-White gap closed to just under a 20 percent difference for the 2015 cohort. In Massachusetts, Black/White and Other race/White gaps, in raw

means, have narrowed to approximately zero over time, where Black students were 12 percent more likely and Hispanic students were more then 30 percent more likely to concentrate at the beginning of our time horizon.

It is important to note that these raw means do not account for geographic and other differences correlated with both race and CTE participation. We explore what role these have in regression analyses below, showing that raw differences across race are largely, and in some cases entirely, explained by differences across schools. When we calculate within-school differences, we find far smaller disparities and in some cases none at all. This analysis and discussion are discussed in full in the Across and Within School Differences in Concentration Rates section below.

Figure 6. Percent Differences in Concentration Rates, Compared with White Students



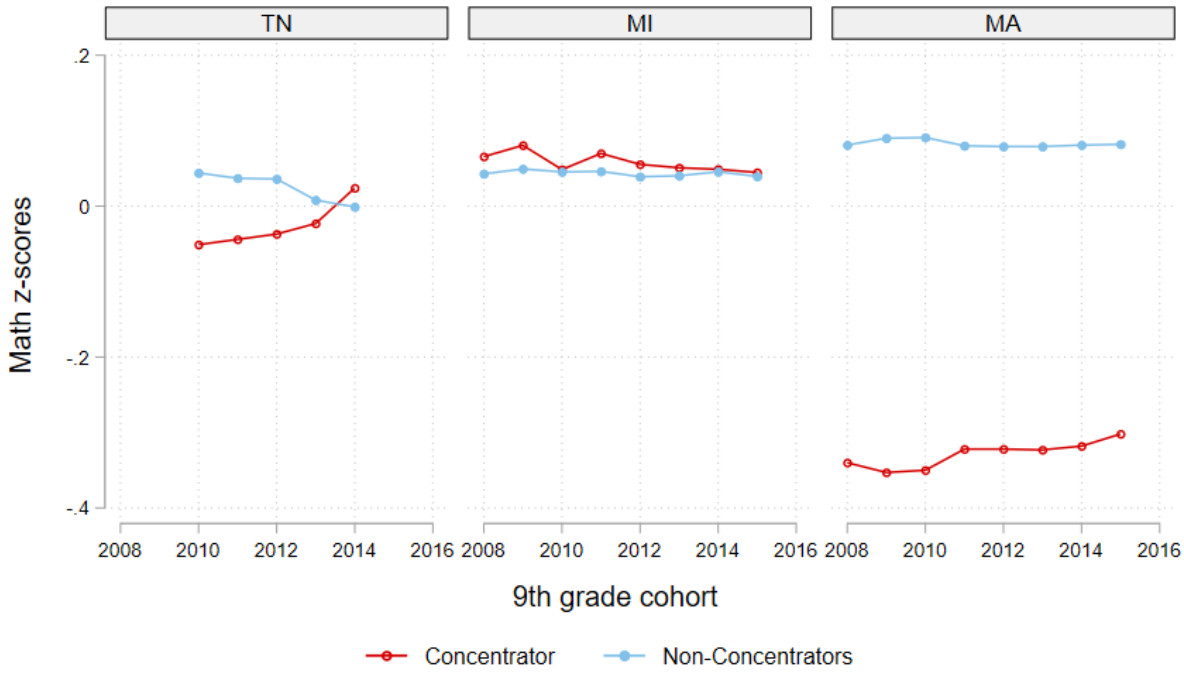
Note. Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions.

EARLY TEST SCORES FOR CONCENTRATORS

Above we document differences in concentrator rates by race and gender over time and across states. We next analyze whether pre-CTE enrollment academic performance, as measured by state-specific standardized math test scores, is predictive of CTE enrollment. In Michigan, these are eighth grade MEAP scores. In Massachusetts, these are eighth grade MCAS scores. In Tennessee, these are scores from Algebra I if taken in ninth or tenth grade. Here we are asking whether students with higher math test scores are more or less likely to enroll in CTE later in their high school careers. Within each state-cohort,

we normalize scores to z-scores (mean 0, standard deviation 1, across all test takers in a given year) and plot mean differences over time for concentrators and non-concentrators in Figure 7.

Figure 7. Eighth and Ninth Grade Math Z-scores for Concentrators and Non-Concentrators



Note. Scores are eighth grade MEAP (MI), eighth grade MACS (MA) and Algebra I (TN), normalized within state-cohort to z-scores. Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions.

In Tennessee, we find that while in earlier cohorts non-concentrators had higher entering math scores—by approximately one-tenth of a standard deviation—by the most recent entering cohorts, test score differences between eventual concentrators and non-concentrators are marginal, advantaging concentrators if anything. In Michigan, concentrators and non-concentrators have nearly identical scores on average. In Massachusetts, differences are quite large. Concentrators score, on average, approximately 0.4 standard deviations lower in eighth grade math than non-concentrators. As noted above, about half of CTE concentrators are enrolled in CTE-dedicated high schools (RVTS) of choice to which they apply in eighth grade.

THE ROLE OF SCHOOLS IN CONCENTRATION RATES

While the figures above show meaningful across-group differences in the likelihood students concentrate in a CTE program, they do not allow us to observe how these factors interact or what role geography (i.e., schools) play. To address this, we estimate student-level regressions separately by state where the outcome is whether a student concentrated (or completed) a program of study. In Table 2 below, we begin by first observing differences across race/ethnicity, gender, English language learner (ELL) status, and disability status within each state for students in the same entering ninth-grade cohort. We then add measures of student test scores in eighth or ninth grade in the second column of each state regression.

Finally, in the third column, we add a school-cohort fixed effect. The addition of this school-by-cohort fixed effect removes, or differences out, the school-cohort mean concentration rate for each student. Thus, the third column shows average differences in concentration rates across race, gender, ELL status, disability status, and math/reading scores *within* schools, differencing out the across-school component. Comparing these results with the first and second columns gives a sense of the degree to which differences in concentration rates across student types are the result of differences in program offerings and completion rates across schools or whether these disparities exist within schools as well. Table A2 in the Appendix shows summary statistics for measures in the regression models.

The first column of each state-specific regression reflects descriptive details shown in the figures above. In Michigan and Tennessee, Black students are less likely to concentrate than White students by 14 and 11 percentage points, respectively. Hispanic students are 7 percentage points less likely to concentrate in Michigan, with no difference in Tennessee as observed above. In Massachusetts, we see these patterns across race reversed. Black and Hispanic students are more likely, by 1.4 and 6 percentage points, respectively, to concentrate than White students. We also find that in Michigan and Tennessee, students who were ever classified as having a disability are less likely to concentrate than their peers. In Massachusetts, with the exception for students with behavioral disabilities, SWD are more likely to concentrate in a CTE program. (We have a separate analysis for SWD in the A Focus on Students Diagnosed with Disabilities section.) Similarly, ELL students are less likely to concentrate in all states, noting that part of this effect is captured by the inclusion of indicators for Hispanic and Other race, many of whom are ELL students.

In the second column of each state panel, we add controls for eighth- or ninth-grade math and reading scores, normalized to have mean 0 and standard deviation 1, within each state cohort (as well as ACT scores in Tennessee, if observed). First, we document that in Michigan and Massachusetts, students with higher test scores in early grades are less likely to concentrate in a CTE program. In Tennessee, students with higher ninth-grade math scores are more likely to concentrate, but higher ACT-scoring students are less likely to concentrate, suggesting a weaker relationship between CTE and prior or concurrent test scores in Tennessee compared to the other states. The second column also shows that in Michigan and Tennessee, gaps between Black, Hispanic, and White students widen once accounting for achievement. If those students score, on average, lower than White students, and if students who score higher on math and reading tests also are less likely to concentrate, the second column implies that the relationship between math and reading ability and race moves in different directions for non-White and White students, at least in models without school fixed effects. We believe this is another important area for future research.

Finally, in the third column of each panel we include a school-cohort fixed effect, meaning we are comparing students within, as opposed to across, schools. We begin by noting that while female students are less likely to concentrate than male students in Michigan and Massachusetts and equally likely in Tennessee, this relationship is largely unchanged by adding a school fixed effect. This makes sense as, in most cases, the gender balance is constant across schools (i.e., few if any schools are disproportionately male or female), with an exception for Massachusetts where some schools are CTE-dedicated high schools (RVTSs) and enroll more male students by virtue of the fact that they receive more male than female

applicants. The same is largely true for SWD and for the relationship between test scores and concentration rates, which are modestly affected by the school fixed effect in Tennessee and Michigan. In Massachusetts, the test score relationship is reduced to nearly zero, likely due to the admissions nature of the RVTSs.

Yet, the addition of school fixed effects dramatically narrow racial differences in concentrator rates. In Michigan, we find that two-thirds of the Black-White and Hispanic-White gap is due to Black and Hispanic students attending different schools. Within schools, these gaps reduce to a 5- and 2-percentage point gap, respectively. In Tennessee, we see a similar result. The initial 10-percentage point Black-White gap reduces to 3 percentage points. In Massachusetts, within school gaps across race are no larger than 1 percentage point. These results suggest that differences across race are largely driven by differences in CTE concentration rates across schools with more or less non-White student populations, and that within schools, participation rates across race are significantly smaller, and in some cases, non-existent.

Table 2. Regression Estimates: Probability of Concentrating or Completing a CTE Program of Study

	Michigan			*Tennessee*			*Massachusetts*		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Female	-0.035***	-0.035***	-0.033***	-0.002	-0.004	-0.003	-0.035***	-0.028***	-0.019***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.001)	(0.001)	(0.001)
Black	-0.137***	-0.150***	-0.050***	-0.107***	-0.159***	-0.035***	0.014***	-0.028***	-0.003***
	(0.010)	(0.010)	(0.004)	(0.015)	(0.015)	(0.006)	(0.002)	(0.002)	(0.001)
Hispanic	-0.066***	-0.073***	-0.025***	0.0016	-0.024**	-0.008	0.060***	0.014***	-0.013***
	(0.011)	(0.011)	(0.004)	(0.011)	(0.011)	(0.005)	(0.002)	(0.002)	(0.001)
Other non-White	-0.041***	-0.032**	-0.026***	-0.101***	-0.082***	-0.038***	-0.009***	-0.002	-0.007***
	(0.015)	(0.014)	(0.006)	(0.015)	(0.013)	(0.007)	(0.002)	(0.002)	(0.001)
ELL	-0.063***	-0.072***	0.001	-0.035	-0.050**	-0.065***	-0.052***	-0.072***	-0.039***
	(0.020)	(0.020)	(0.005)	(0.021)	(0.020)	(0.015)	(0.002)	(0.003)	(0.002)
Gifted				-0.252***	-0.127***	-0.079***			
				(0.014)	(0.014)	(0.012)			
High incidence	-0.019***	-0.035***	-0.036***	-0.012**	-0.0485***	-0.034***	0.075***	-0.011***	-0.007***
	(0.005)	(0.004)	(0.004)	(0.006)	(0.006)	(0.004)	(0.002)	(0.002)	(0.001)
Low incidence	-0.054***	-0.058***	-0.048***	-0.085***	-0.067***	-0.038***	0.028***	-0.040***	-0.024***
	(0.011)	(0.010)	(0.013)	(0.019)	(0.021)	(0.013)	(0.004)	(0.004)	(0.002)
Intellectual	-0.174***	-0.161***	-0.159***	-0.244***	-0.0545***	-0.040***	0.029***	-0.031***	-0.025***
	(0.008)	(0.008)	(0.008)	(0.015)	(0.015)	(0.013)	(0.005)	(0.005)	(0.003)
Behavioral	-0.130***	-0.144***	-0.139***	-0.211***	-0.190***	-0.161***	-0.063***	-0.138***	-0.068***
	(0.008)	(0.007)	(0.007)	(0.013)	(0.013)	(0.012)	(0.004)	(0.004)	(0.002)
Math 8th/9th		-0.012***	-0.009***		0.017***	0.017***		-0.046***	-0.006***
		(0.003)	(0.002)		(0.003)	(0.002)		(0.001)	(0.001)
Reading 8th/9th		-0.013***	-0.039***		0.003	0.0013		-0.0442***	-0.008***
		(0.002)	(0.001)		(0.003)	(0.002)		(0.001)	(0.001)
ACT score					-0.018***	-0.013***			
					(0.001)	(0.001)			
Sch.-x-Cohort FE			Yes			Yes			Yes
Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Outcome mean	0.32	0.32	0.32	0.46	0.46	0.46	0.21	0.21	0.21
Observations	865,929	865,929	865,929	304,900	304,900	304,900	601,577	601,577	601,577

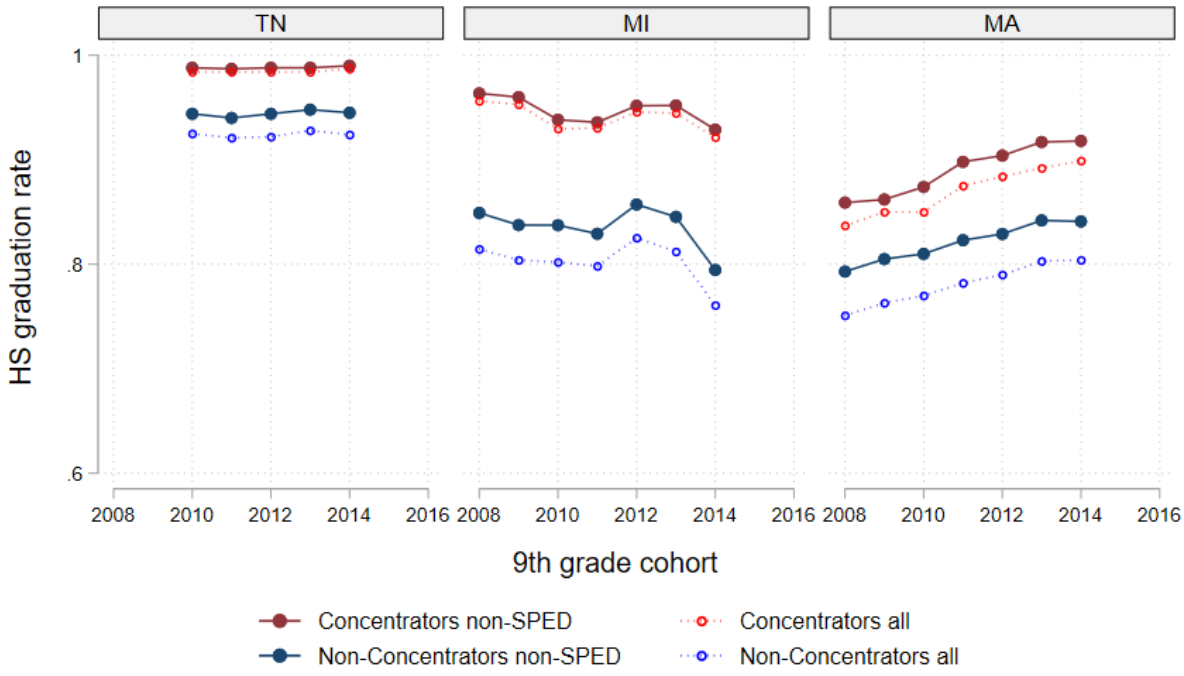
Note. Dependent variable is an indicator = 1 if a student concentrated or completed a CTE program. Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. Sch.-x-cohort are school-cohort fixed effects. High/Low/Intellectual/Behavioral are disability types. Math and Reading are z-scores for eighth (MI and MA) and ninth (TN) grade standardized scores. Results are interpreted as percentage point differences in concentrator/completer rates. Regressions are separate by state. Robust standard errors are in parentheses. Table A2 in the Appendix shows summary statistics for the regression models. [0.1; ** 0.05; *** 0.01].*

CTE AND HIGH SCHOOL GRADUATION

We next focus on high school graduation rates. We briefly remind the reader that our sample is limited to students who enrolled in high school for four consecutive years in our states, meaning we do not observe students who dropped-out before their fourth year of high school. For these analyses, we show graduation rates for all students and separately for students who were never classified as having a disability. In the section titled A Focus on Students Diagnosed with Disabilities, we conduct a separate breakout analysis, focusing on students diagnosed with disabilities.

Figure 8 below plots high school graduation rates by concentrator and special education participation over time. Red lines plot high school graduation rates for concentrators and blue lines for non-concentrators. Solid lines are for students not enrolled in special education, and dashed lines are for all students, including those ever classified as having a disability.

Figure 8. High School Graduation Rates by Concentrator Status

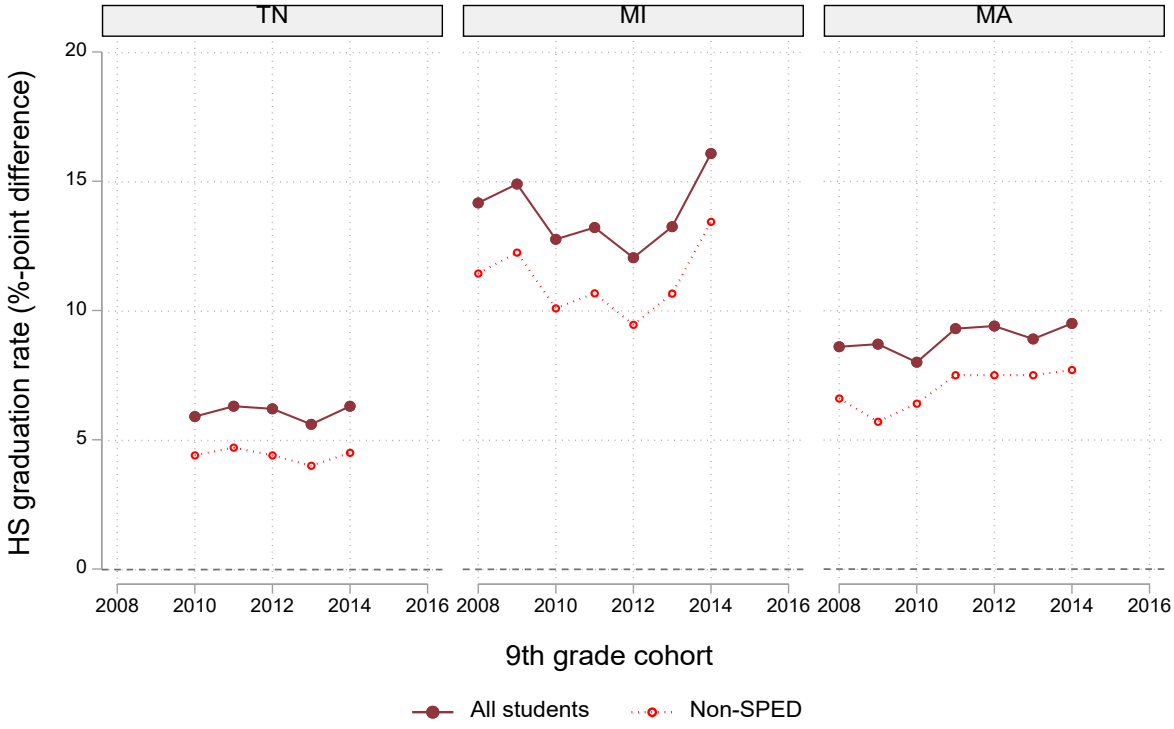


Note. Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions. SWD are determined by whether students ever classified as taking special education (SPED).

We find that even conditioning on students who persist for four years, concentrators graduate at higher rates than non-concentrators in all states and all years. In Tennessee, graduation rates for concentrators are near 100 percent regardless of disability status. Figure 9 plots percentage point differences between concentrators and non-concentrators. Non-concentrators are roughly 5 percentage points less likely to graduate high school than concentrators. In Michigan, concentrators (again, regardless of special education enrollment) graduate high school at higher rates. Among all students, concentrators are

between 12 and 15 percentage points more likely to graduate. Similarly, in Massachusetts, concentrators are more likely to graduate than non-concentrators by nearly 10 percentage points.

Figure 9. Percentage Point Differences in High School Graduation



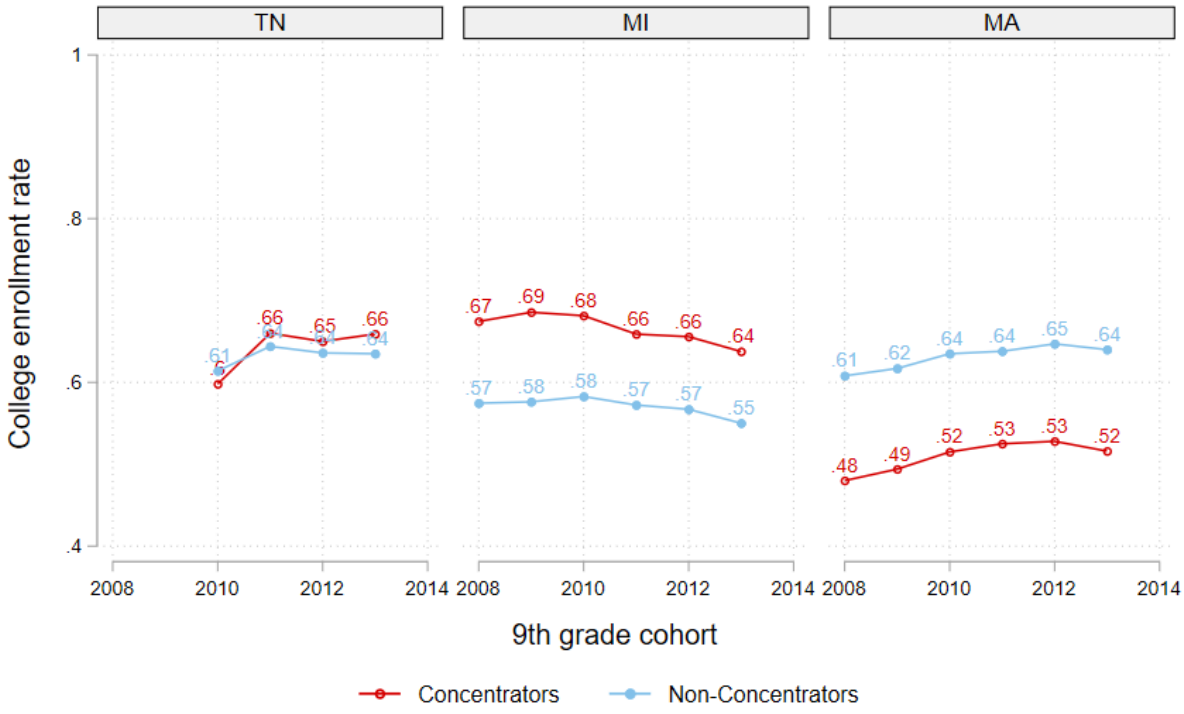
Note. Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions. SWD are determined by whether students ever classified as taking special education (SPED).

Figures 8 and 9 demonstrate that the high school graduation rate advantage for CTE concentrators is higher for students enrolled in special education, evidenced by larger graduation advantages for all students than for their peers. We explore this further in the A Focus on Students Diagnosed with Disabilities section below.

COLLEGE ENROLLMENT

Building on high school graduation rates above, we turn next to college enrollment. To maximize our sample window, we define college enrollment as enrolling in college within five years of entering high school (i.e., within one year of the expected high school graduation date, although we do not condition the sample on completing high school on time). Figure 10 shows enrollment in any college by concentrator status over time for our states. In Tennessee, concentrators have become marginally more likely to enroll in college than non-concentrators over time by 2 to 4 percentage points. In Michigan, concentrators are about 9 to 10 percentage points (roughly 17 percent) more likely to enroll in college than non-concentrators. In Massachusetts, this pattern is reversed. Non-concentrators are 11 to 12 percentage points more likely to enroll in college than non-concentrators.

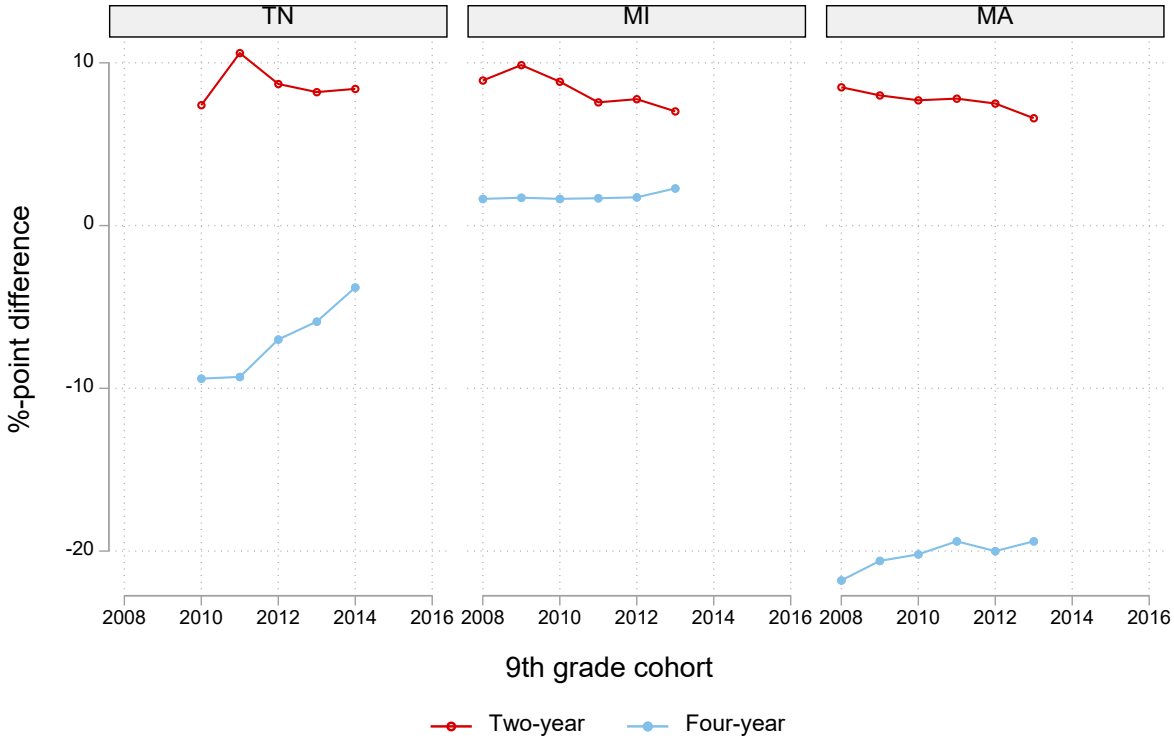
Figure 10. College Enrollment Rate by Concentrator Status



Note. College enrollment is within five years of entering high school (or one year after expected graduation). Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions.

In Figure 11 below, we plot percentage point differences in enrollment between completers and non-completers in two-year (red lines) and four-year (blue lines) colleges. This exercise unmasks differences in college enrollment choices not seen in Figure 10. For example, while concentrators and non-concentrators in Tennessee attend any college at similar rates, concentrators are nearly 10 percentage points more likely than non-concentrators to attend a two-year school and are between 4 and 9 percentage points less likely to attend a four-year institution—a gap that has narrowed steadily over time. A similar pattern emerges in Massachusetts where concentrators are between 7 and 9 percentage points more likely to attend a two-year school but are roughly 20 percentage points less likely to attend a four-year institution (note that Massachusetts has one of the highest rates of four-year college attendance of any state). In Michigan, concentrators are more likely to attend any college, but their advantage is larger for two-year institutions. Figure A1 in the Appendix plots average college-going rates by college level and concentrator status for all states. Two-year colleges in each of these states also receive *Perkins* funds and offer CTE programming. Thus, these patterns may align with students continuing in existing CTE programs.

Figure 11. Two-/Four-year Enrollment Rate Differences (%-point) by Concentrator Status



Note. Figure plots percentage-point differences between concentrators and non-concentrators in college enrollment by college type. College enrollment is within five years of entering high school (or one year after expected graduation). Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions.

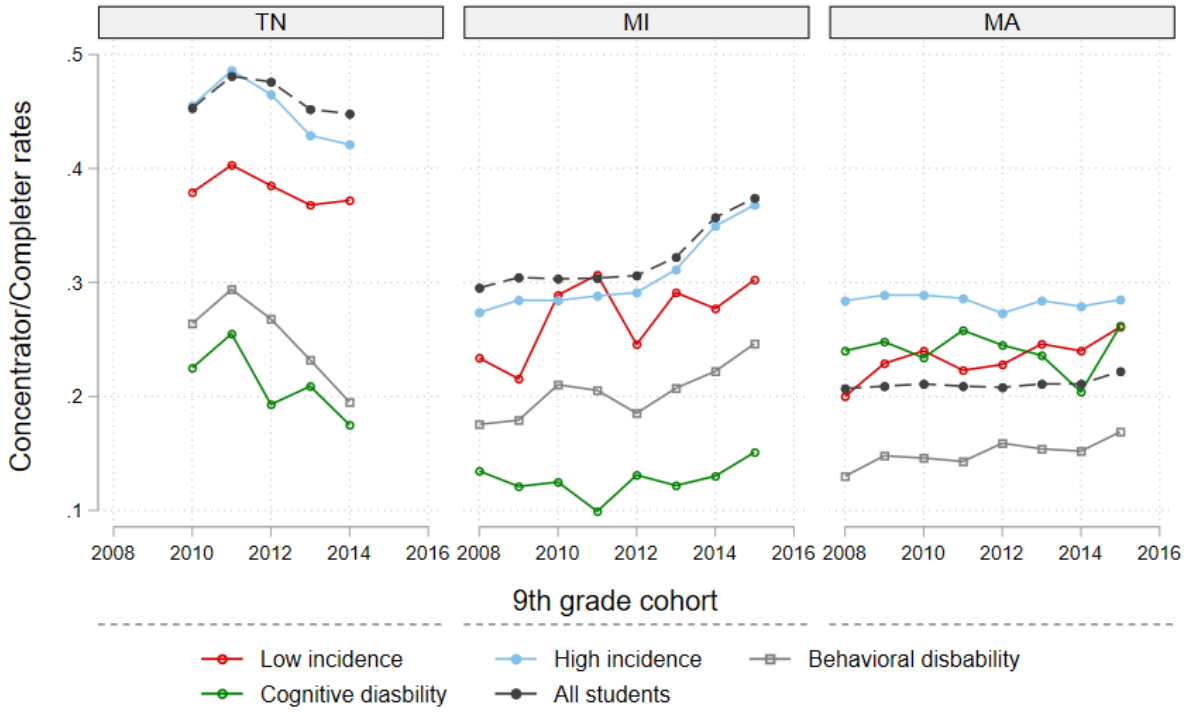
A FOCUS ON STUDENTS DIAGNOSED WITH DISABILITIES

In the following section, we devote a special focus to students diagnosed with disabilities (SWD). Part of the motivation is that those in the SWD subgroup attend college at lower rates and have lower labor market participation rates, with important variation by the type of disability.[10] In Figure 12 below, we plot concentrator rates for SWD (colored lines) and for all students including SWD (black dashed line) in each state. Tennessee SWD, particularly those with high incidence disabilities, are much more likely to concentrate in a CTE program than those students with behavioral or cognitive disabilities. In Michigan, a

[10] Newman, Lynn, Mary Wagner, Renee Cameto, Anne-Marie Knokey, and Debra Shaver. "The Post-High School Outcomes of Youth with Disabilities up to 4 Year After High School. National Longitudinal Transition Study-2 (NLTS2)." SRI International. (2009).
Newman, Lynn, Mary Wagner, Renee Cameto, Anne-Marie Knokey, and Debra Shaver. "Comparisons Across Time of the Outcomes of Youth with Disabilities up to 4 Years after High School. A Report of Findings from the National Longitudinal Transition Study (NLTS) and the National Longitudinal Transition Study-2 (NLTS2). NCSER 2010-3008." *National Center for Special Education Research* (2010).
Sanford, Christopher, Newman, Lynn, Mary Wagner, Renee Cameto, Anne-Marie Knokey, and Debra Shaver. "The Post-High School Outcomes of Young Adults with Disabilities up to 6 Years After High School. Key Findings from the National Longitudinal Transition Study-2 (NLTS2). NCSER 2011-3004." *National Center for Special Education Research* (2011).

similar pattern emerges. In Massachusetts, SWD are more likely to concentrate in a CTE program than their peers.

Figure 12. Concentrator Rates by Disability Status

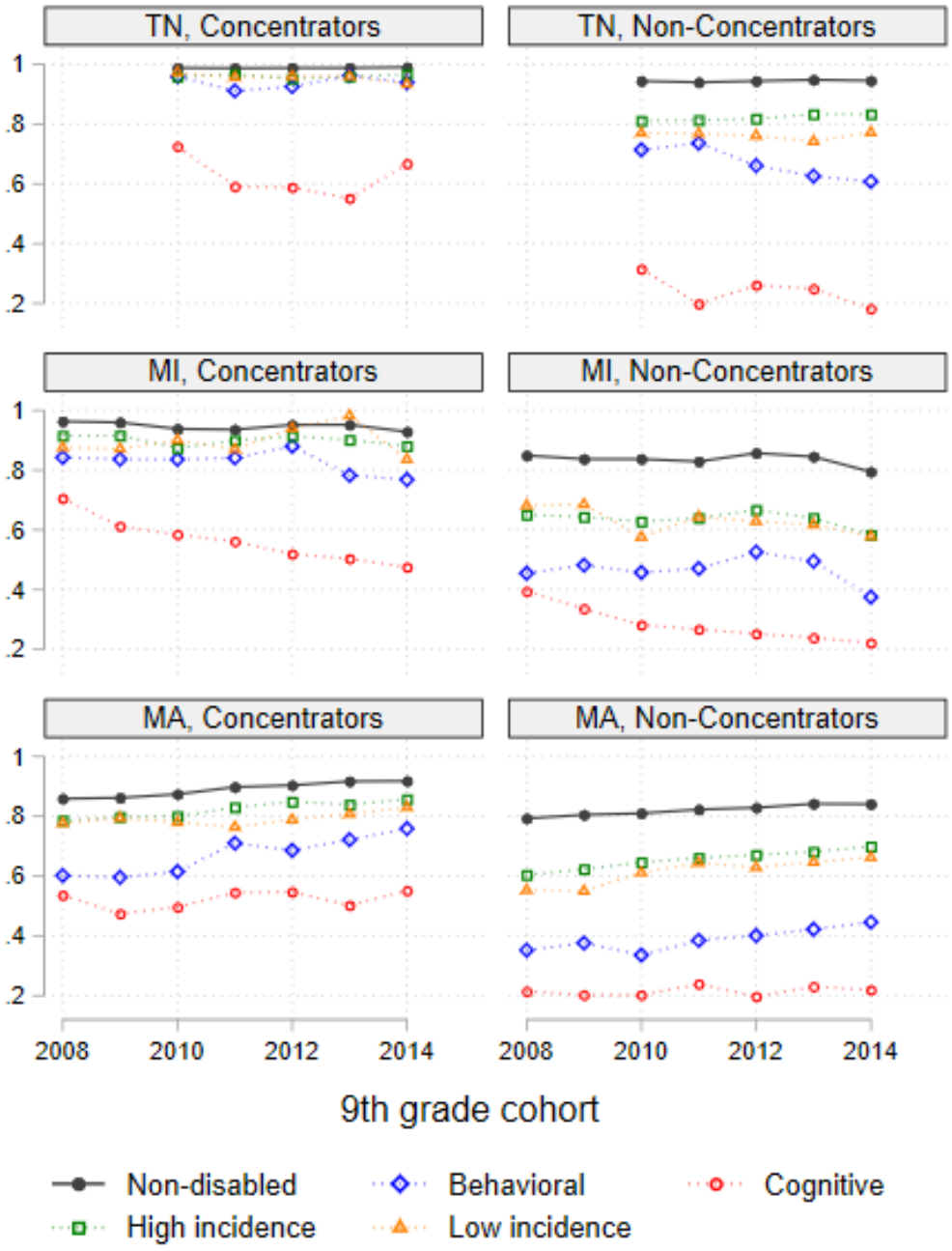


Notes: Sample is students who were ever classified as having a disability who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for concentrator definitions. Disability classifications are low and high incidence, behavioral and cognitive. See Appendix Table A1 for how these are constructed.

In Figure 13, we plot high school graduation rates by disability status, including students not classified as having a disability for comparison. While students without disabilities graduate at higher rates than SWD, these gaps are narrower among CTE concentrators. Across all disability categories, concentrators graduate at significantly higher rates than non-concentrators and in some cases, are on par with non-SWD in their cohorts. In most cases, these gaps are cut in half or more.

One potential inference from Figure 13 is that SWD should be encouraged to concentrate in CTE to improve their chances of successfully completing high school, and research from a variety of settings has found that CTE can positively affect high school graduation rates. But caution is warranted, because much of that research has not focused specifically on SWD, and it is possible that non-CTE SWD graduate at lower rates for factors unrelated to their participation in or access to CTE. This is an area where more research is urgently needed.

Figure 13. High School Graduation Rate by Disability and Concentrator Status



Note. Sample is students who were ever classified as having a disability who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for concentrator definitions. Disability classifications are low and high incidence, behavioral and cognitive. See Appendix Table A1 for how these are constructed.

CONCLUSIONS

In this report, we undertake a descriptive analysis of CTE trends across three states (Michigan, Massachusetts, and Tennessee) as part of the Career & Technical Education Policy Exchange—a multi-state CTE research consortium.[11] We take, as our primary participation measure, whether students reach concentrator status, which aligns to federal reporting requirements and allows us to create some semblance of homogeneity across states that have quite different measures of participation.

Our first result is that states vary widely in how they measure and define CTE participation and completion, which is a limiting factor in this or any multi-state CTE analysis. This also provides room for improvement at the federal level to generate unifying metrics. Our second key result is that, while we find differences across groups of students, we find little consistency in those differences across states and time. Whether we compare concentrator rates by gender, race, or disability status, there are few standout similarities across Massachusetts, Michigan, and Tennessee. This suggests that state-specific contexts matter and that national-level statistics likely mask significant and meaningful differences.

That being said, our analysis revealed themes that were apparent in each of the three states to some degree. Specifically, our third key result is that students reaching concentrator status (or more) are more likely to graduate high school and to enroll in two-year colleges, although they are less likely to enroll in four-year schools. Moreover, the high school graduation advantage is particularly pronounced for students with disabilities; if they are additionally classified as CTE concentrators, they are more likely to graduate high school than non-CTE peers with disabilities. We note caution in interpreting these results. None of our estimates should be interpreted as causal effects of CTE but rather a careful accounting of outcomes for CTE concentrators compared with high school students who did not concentrate in a CTE program.

Finally, our fourth key result is that while Black, Hispanic, or other non-White students are typically less likely than White students to concentrate in CTE (with some state-specific exceptions), most or all of these gaps are explained by unobserved differences in school-level factors. That is, in raw differences, we detect large and meaningful gaps in the likelihood of becoming a CTE concentrator by race and/or ethnicity. Yet, when we compare students within schools using regression analysis, we find that these differences are largely, and in some cases entirely, eliminated. This suggests that school-level factors play a meaningful role in CTE availability or take-up by non-White students, and more specifically, that schools with more non-White students likely have lower CTE concentration rates overall.

We hope for this analysis to be the first in a series of studies making use of state longitudinal data systems, which may be better suited to studying CTE across state lines. This analysis begins a path of research important for policymakers and scholars alike. Our next steps include focusing on more consistent measures of participation and access and following students further into college and potentially into the labor market. Promising areas for more in-depth research include efforts to develop a better understanding of gaps in access to or take-up of CTE by race, as well as the effect of CTE on secondary and postsecondary success for students with disabilities.

[11] For more information, see gpl.gsu.edu/ctex.

ACKNOWLEDGMENTS

The Career & Technical Education Policy Exchange (CTEx) is a consortium of researchers and state partners studying CTE policy in Massachusetts, metro-Atlanta, Michigan, and Tennessee. CTEx is administratively housed within the Georgia Policy Labs in the Andrew Young School of Policy Studies at Georgia State University. Research arising from this lab provides actionable, evidence-based research directly to policymakers and practitioners. While part of our contribution is in compiling longitudinal databases from currently siloed data (e.g., merging K-20 systems with CTE participation data, CTE achievement data, postsecondary data, and workforce data), our lab is designed as a tool to facilitate research on the causal impact of various aspects of CTE education on student success. This research could not have been conducted without enthusiastic and generous participation from state partners in Massachusetts, Michigan, and Tennessee. This unique partnership, through CTEx, has allowed us to generate what we think is a first step in a line of research we hope will include new states, more outcomes, and greater detail as we move forward. The authors also wish to thank Japera Hemming, Walt Ecton, Thomas Goldring, Tyler Rogers, and Maggie Reeves for their contributions to this report.

APPENDIX

Table A1. Classification for Students with Disabilities

Grouped categories	State-Specific Special Education Categories		
	Tennessee	Michigan	Massachusetts
High Incidence	Language Impairment	Speech and Language Impairment	Communication Disability
	Functional Delay	Early Childhood Development Delay	Specific Learning Disabilities
	Specific Learning Disability	Specific Learning Disability	Communication Impairment
	Autism	Autism	Health Impairment
	Other Health Impairment	Other Health Impairment	
Low Incidence	Orthopedic Disability	Deaf-Blindness	Sensory/Deaf-Blindness
	Blindness	Hearing Impaired	Sensory/Hearing
	Deaf	Visual Impairment	Sensory/Vision
	Deaf-Blindness	Severe Multiple Impairment	Multiple Disabilities
	Hearing impaired	Traumatic Brain Injury	Physical Disability
	Speech Impairment		Neurological Disability
	Developmental Delay		
	Multiple Disabilities		
	Visually Impaired		
	Traumatic Brain Injury		
Cognitive	Intellectual Disability	Cognitive Impairment	Intellectual Disability
Behavioral	Emotional Disturbance	Emotionally Impaired	Emotional Disability

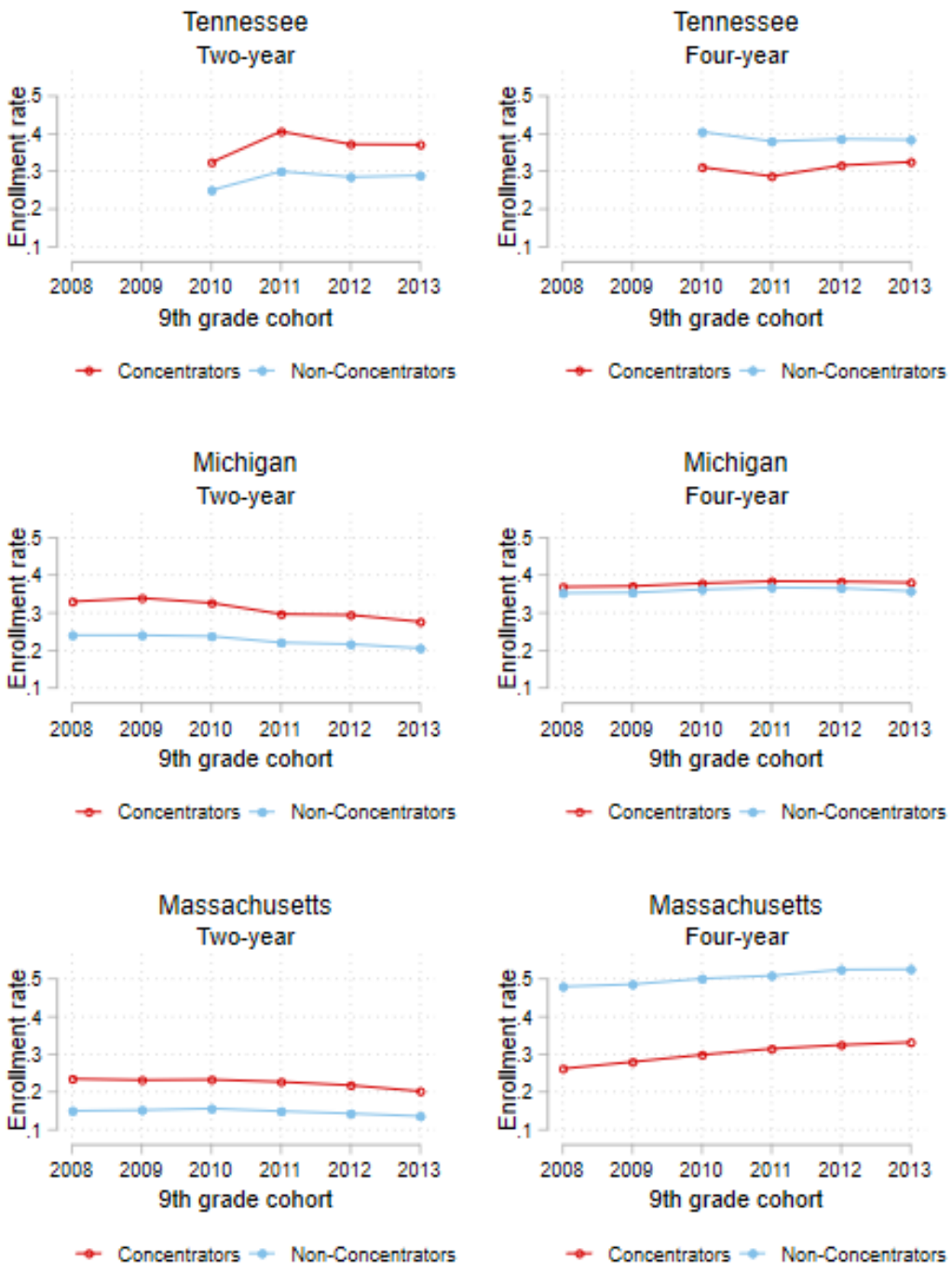
Note. Table lists individual disabilities for each broad category by state.

Table A2. Summary Statistics for Covariates in the Participation and Completion Regression Models

	Tennessee	Michigan	Massachusetts
Black	0.23	0.19	0.7
Hispanic	0.06	0.05	0.097
Other	0.03	0.04	0.163
White	0.68	0.73	0.083
Female	0.50	0.50	0.492
Poor		0.42	0.443
IEP		0.03	
Gifted	0.02		
ELL	0.01	0.03	0.057
Former ELL	0.01		0.068
High incidence disability	0.10	0.10	
Low incidence disability	0.01	0.00	
Intellectual disability	0.01	0.01	
Behavioral disability	0.01	0.01	
Algebra 1 standardized score (Grade 9)	0.00	0.048	-0.005
English 1 standardized score (Grade 9)	0.00	0.047	0.003
Best ACT	0.20		
Missing Algebra 1	0.03		
Missing English 1	0.01		
Missing ACT	0.08		
School Proportion FRL		0.38	
School Proportion Non-White	0.32	0.27	0.3
School Type - Urban		0.22	
School Type - Suburban		0.42	
School Type - Town		0.11	
School Type - Rural		0.25	
County in top 50% of median household income	0.78		
County percent nonwhite	0.22		
County median age	0.39		
Students	304,900	865,929	601,557

Note. Table provides summary statistics for regression analysis sample in Table 2. Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study.

Figure A3. College Enrollment Rates by College Type and Concentrator Status



Note. Figure plots enrollment for concentrators and non-concentrators by college type. College enrollment is within five years of entering high school (or one year after expected graduation). Sample is students who attended high school for four consecutive years. Concentrators are defined using state-specific definitions for students who concentrate in or complete a program of study. Ninth-grade cohort is year entering ninth grade. See Table 1 for definitions.

ABOUT THE AUTHORS

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ABOUT THE GEORGIA POLICY LABS

The Georgia Policy Labs (GPL) is a collaboration between Georgia State University and a variety of government agencies to promote evidence-based policy development and implementation. Housed in the Andrew Young School of Policy Studies, GPL works to create an environment where policymakers have the information and tools available to improve the effectiveness of existing government policies and programs, try out new ideas for addressing pressing issues, and decide what new initiatives to scale. The goal is to help government entities more effectively use scarce resources and make a positive difference in people's lives. GPL has three components: The Metro Atlanta Policy Lab for Education works to improve K-12 educational outcomes; the Career and Technical Education Policy Exchange focuses on high-school-based career and technical education in multiple U.S. states; and the Child & Family Policy Lab examines how Georgia's state agencies support the whole child and the whole family. In addition to conducting evidence-based policy research, GPL serves as a teaching and learning resource for state officials and policymakers, students, and other constituents. See more at gpl.gsu.edu.