

WORKING PAPER

# CAREER AND TECHNICAL EDUCATION

Current Policy, Prominent Programs, and Evidence

Sabrina Klein  
Rachel Rosen  
Katie Beal  
Sarah Salimi

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# Overview

Interest in the field of career and technical education (CTE) has experienced a resurgence over the last decade, as the global economy has grown increasingly competitive while students have continued to leave school underprepared for well-paying twenty-first century jobs. Together and separately, the education and workforce sectors have sought to address these challenges and better prepare students for viable economic futures. The results have been many new, innovative programs at both the secondary and postsecondary education levels that seek to give students technical training for specific careers, general training to prepare them for the workplace, and work-based learning opportunities where they can develop connections to employers and the workforce. While there are still many under-researched areas in CTE, this paper attempts to capture the evidence that has emerged—identifying areas where there is more evidence as well as areas where gaps in evidence still exist. The studies that have been conducted on CTE have demonstrated that it shows promise, but it is imperative to continue building evidence, particularly where there is policy interest and momentum but little data. Doing so will help demonstrate how those programs and models serve students and ensure that the continued scaling up of CTE is supported by a rigorous evidence base.

This paper begins with an overview of the issues in the education system and the labor market that have led to the current revival of CTE. It argues that the skills today's employers need are not the ones schools are providing. The paper continues with a description of how various policies have fostered the growth of CTE. In the next section, it provides details on the types of programs and institutions that offer CTE, and the evidence base to support each of them. The paper provides evidence on the effectiveness of CTE at different educational levels, and for specific subgroups, including students with disabilities, and by gender. Further, the paper provides an overview of the available evidence to support different kinds of programs offered at both secondary and postsecondary education levels, touching on the amount of evidence available in each area and the level of rigor used in the studies that generated that evidence.

The paper concludes by suggesting that while CTE instruction at the secondary and postsecondary levels could bolster students' economic mobility by helping them gain postsecondary credentials and obtain higher-paying jobs, there are challenges involved in turning that promise into reality. Investments in evidence-based practices can give CTE programs a better chance at success.



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The Authors



# INTRODUCTION

On May 11, 2023, the World Health Organization officially declared an end to the COVID-19 pandemic. The full effects of the pandemic are yet to be completely understood, particularly the educational impact on a generation of students who had their schooling disrupted for over a year. The fallout from the 2020–2023 period includes sharp declines in postsecondary enrollment, as well as pandemic-related workforce changes. During the same time period, a heightened sense of urgency for racial and economic redress for members of traditionally marginalized groups, and the need to prepare individuals for jobs in the climate economy has continued to grow. This scenario is further complicated by the fact that the United States needs to remain economically competitive in a world where employers are hungry for skilled talent. However, the education system has failed to equitably prepare all students to graduate ready to meet the demands of the labor market.

People with bachelor’s degrees have done relatively well economically in the last several decades, but those with less than a four-year degree—the majority of the workforce, including most young adults—have struggled to find and keep jobs with middle-class wages.<sup>1</sup> This growing economic gap between those with college degrees and those without has contributed to overall increases in income inequality and class polarization. To address these challenges, policymakers, educators, employers, and philanthropists have increasingly begun to invest in new models of career and technical education (CTE). Many definitions of CTE exist, which are shaped by historical contexts and societal views of CTE as “vocational education.” For the purposes of this paper, CTE is defined as a method to organize educational systems, courses of study, and hands-on learning experiences that give high school and college students exposure to the academic and technical skills that they will need to engage in the evolving workforce.<sup>2</sup>

In late 2017, MDRC was invited by Bloomberg Philanthropies to write a paper detailing the level and rigor of the available evidence supporting CTE. This paper is a refreshed and updated version of that paper, including policy and research advances in the field of CTE that have occurred in the five years since the last edition.

## Supply and Demand for Skilled Labor

The American economy has a well-documented need for more workers trained in technical fields.<sup>3</sup> For example, it is projected by the Bureau of Labor Statistics that, from 2021 to 2031, 8.3 million new jobs will be created and that jobs requiring a master’s degree will grow nearly five times the rate of jobs requiring a high school diploma, suggesting a grow-

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1. As of 2015, 65 percent of the population between ages 25 and 34 had less than a bachelor’s degree. Ryan and Bauman (2016); U.S. Census Bureau (2023).
  2. Advance CTE (n.d.).
  3. Goldin and Katz (2009); Krueger (1993).

ing labor market premium for postsecondary qualifications.<sup>4</sup> However, as of 2021, only 36.5 percent of Americans had a bachelor’s degree or higher as their terminal level of education—suggesting that the majority of Americans are at risk of becoming underqualified for jobs previously considered “middle skill” (that is, those that require more than a high school degree but less than four years of college).<sup>5</sup>

As of August 2023, there were about 9.6 million open positions in the labor market even though there were approximately 6 million unemployed Americans at the same time.<sup>6</sup> Although unemployment can be attributed to a range of macroeconomic factors, one reason is that employers report difficulty finding people who have the appropriate labor-aligned skills.<sup>7</sup> This difficulty is likely to become even more acute as several laws that have been passed in the last few years, including the Inflation Reduction Act, the ChiPS and Science Act, and the Infrastructure Investments and Jobs Act (all three of which will create jobs in infrastructure, advanced manufacturing, and the clean energy transition, among other areas), create even more demand for skilled workers. While there is fairly broad agreement about these current employment trends, economists disagree about the cause of skilled worker shortages, and have different longer-term projections for the labor market.<sup>8</sup> Although there is some uncertainty about the specific opportunities that will be available in the labor market of the future, there is more agreement about the kinds of skills young people will need if they are to become workers with viable long-term employment prospects. For example, in-demand skills include strong quantitative and analytic skills, creativity and proficiency in solving complex problems, and good interpersonal communication.<sup>9</sup> Moreover, there is a growing demand specifically for workers who have a combination of strong analytic skills and noncognitive skills (also sometimes referred to as soft skills, twenty-first century skills, transferable skills, or other monikers) in areas such as teamwork and collaboration.<sup>10</sup>

At the same time, there is growing concern that traditional high schools are ill-equipped to help all students develop the skills that they will need to make a successful transition to postsecondary education, which will in turn allow them to build sustainable careers with middle-class wages. The national high school graduation rate reached a record high of 86 percent in the 2018–2019 academic year and remained similar in the 2019–2020 academic year.<sup>11</sup> However, despite these numbers, recent research suggests that students’ actual knowledge and skills declined during the pandemic, and that students in current cohorts are academically less well-prepared than their older counterparts who completed high school before 2020.<sup>12</sup> In addition, many high school graduates—particularly those from families

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4. U.S. Bureau of Labor Statistics (2022).

5. Lumina Foundation (n.d.).

6. U.S. Bureau of Labor Statistics (2023).

7. ManpowerGroup (2018); National Governors Association (2023); Meyer (2022).

8. Goos, Manning, and Salomons (2014); Lu (2015).

9. Autor, Levy, and Murnane (2003); Lu (2015).

10. Deming (2017).

11. Harris and Chen (2022).

12. Fahle et al. (2023).

with lower incomes—fail to make successful transitions to postsecondary education or the workforce.<sup>13</sup> For example, while 89 percent of students from families with high incomes enroll in two- or four-year colleges in the fall after high school, just 64 percent of students from families with middle incomes and 51 percent of students from families with low incomes do.<sup>14</sup> Furthermore, overall undergraduate enrollment decreased by 5 percent from 2009 to 2019, and an additional 4 percent between 2019 and 2020.<sup>15</sup> These shifts suggest changing attitudes about the value and feasibility of college among American families—particularly those from households with lower incomes.<sup>16</sup>

Moreover, among those who do enroll, many fail to attain degrees. In community colleges in particular, just under 30 percent of first-time, full-time students attain associate’s degrees within three years.<sup>17</sup> Community colleges disproportionately enroll Black and Latinx students, who are more likely than White students to attend college part time, and less likely to earn degrees.<sup>18</sup> Many of these students struggle in part because of poor high school preparation.<sup>19</sup> Degree-attainment rates are then exacerbated by regional inequalities. Cities where few young adults earn more than a high school diploma also tend to be those with fewer high-wage jobs, creating pockets of economic disadvantage and increasing economic polarization nationally.<sup>20</sup>

The failure to complete some kind of postsecondary training has lasting economic consequences. The median annual wage for those with only a high school diploma is now nearly \$17,680 less than the median for those with a four-year degree.<sup>21</sup> Yet much of this wage gap could be addressed by encouraging more students to attain postsecondary certificates and two-year degrees. Multiple studies have found increases in earnings associated with two-year degrees, although others have found that the wage benefits largely accrue to those with degrees and vocational certificates in healthcare or in fields related to science, technology, engineering, and mathematics (STEM).<sup>22</sup> The COVID-19 pandemic combined with the clean energy transition have both drastically altered the world of work as we know it by creating both labor market opportunities and shortages.

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13. Harris and Chen (2022).

14. Reber and Smith (2023).

15. Irwin et al. (2022).

16. Irwin et al. (2022).

17. National Center for Education Statistics (2018).

18. Snyder and Dillow (2012).

19. Attewell, Lavin, Domina, and Levey (2006); Horn, Nevill, and Griffith (2006); Bailey, Jeong, and Cho (2010).

20. Ross and Bateman (2017).

21. Federal Reserve Bank of New York (2023).

22. Jacobson and Mokher (2009); Jepsen, Troske, and Coomes (2014); Jacobson, LaLonde, and Sullivan (2005); Dadgar and Trimble (2015).

## THE CURRENT POLICY ENVIRONMENT

Federal, state, and local policymakers view CTE as a strategy both for improving economic competitiveness and for reducing educational inequity—making it one of the few policy areas to continually attract bipartisan support.<sup>23</sup> For example, in 2018, Congress enacted the Strengthening Career and Technical Education for the 21st Century Act with strong bipartisan support. The law, known as Perkins V, is the latest iteration of the Carl D. Perkins Career and Technical Education Act (Perkins Act), which is the primary source of federal funding for K–12 and postsecondary CTE programs.<sup>24</sup> In addition, both Republican and Democratic regions of the country have launched and invested funding in state and local CTE initiatives.

CTE is not a new idea. The Smith-Hughes Act first authorized federal funding for vocational training in public schools more than 100 years ago.<sup>25</sup> This vocational training was expressly designed as a path for students who would not pursue bachelor’s degrees. Vocational education was a popular fixture of American public schooling until the 1970s, when civil rights groups, education reformers, and others argued that it was used to track students from low-income backgrounds and students of color into low-paying jobs, and away from college.<sup>26</sup> As a result, vocational education began to decline, and became stigmatized. In the early 1990s, several states and localities across the country launched “school-to-work” programs designed to prepare students for colleges and careers and to connect academic learning with work-based learning experiences (typically, this term refers to internships, apprenticeships, mentoring, and job shadowing). The 1994 School-to-Work Opportunities Act provided federal funding for these types of programs, but it expired in 2001 and was not renewed. The 2001 No Child Left Behind Act required schools to push all students, including those in vocational education, toward academic proficiency. Since “voc-ed” students frequently tested near the bottom on mandated assessments, No Child Left Behind placed a spotlight on the poor academic quality of many vocational education programs, prodding their evolution into today’s CTE.<sup>27</sup>

The current version of Perkins emphasizes the development of high-quality CTE programs at the K–12 and postsecondary levels that are aligned with labor market demands and encourages equity in CTE.<sup>28</sup> For instance, localities must report student outcome data disaggregated

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23. Toppo (2023); The Association for Career and Technical Education (2023); Blissett (2020).

24. Edgerton (2022).

25. Tyack (1974).

26. Oakes (2005).

27. No Child Left Behind required all students to be tested every year in grades 3 through 8, and at least once between grades 10 and 12. The reporting requirements of No Child Left Behind highlighted inequities across states and student subgroups, which then led to a push for high-level academic standards. As a result, many districts and policymakers made it a priority to have standards aligned with college and not careers, and many students ended up being underprepared for careers. See Hanford (2014).

28. Advance CTE (2020). The largest program authorized under Perkins is the Basic State Grants program, which provides formula funds to states for the development and implementation of secondary and postsecondary CTE programs. States received approximately \$1.4 billion in Perkins funding in fiscal year 2022.

by race/ethnicity and socioeconomic status, among other categories, and identify strategies to address gaps in access and success for special populations in CTE programs.<sup>29</sup> In addition, Perkins V encourages coordination with workforce development systems, including postsecondary education and training programs funded by the Workforce Innovation and Opportunity Act (WIOA).<sup>30</sup> Finally, Perkins also provides funding for states to improve data collection related to CTE, which is a necessary first step in being able to develop evidence about questions of equity and effectiveness of CTE programs.

In addition to Perkins V and WIOA, the Every Student Succeeds Act (the federal education law that replaced No Child Left Behind) provides states with opportunities to integrate CTE into their K–12 systems.<sup>31</sup> For example, over 30 states have opted to include indicators of career readiness in their accountability systems, such as completion of CTE courses in a program of study, participation in work-based learning, and earning an industry-recognized credential.<sup>32</sup>

In addition to federal legislation, many policy actions related to CTE in recent years (in high school and in postsecondary programs) have taken place at the state and local levels. In 2022, 36 states enacted over 120 policies related to CTE.<sup>33</sup> Examples of states that have made notable investments include:

- **California:** Building off several years of investments in CTE, in 2022 California launched the Golden State Pathways Program, which is designed to prepare high school students for postsecondary education and careers in high-wage, high-growth industries such as technology, healthcare, and climate. School districts receive funds to partner with postsecondary institutions, offer work-based learning, and provide students with opportunities to earn college credit while in high school.<sup>34</sup> At the postsecondary level, the state's Strong Workforce Program, which was created in 2016, provides funding to community colleges to expand CTE programs in high-demand sectors, develop partnerships with employers, and offer work-based learning opportunities.<sup>35</sup>
- **Ohio:** In recent years, the state has launched several efforts to prepare individuals for careers in high-growth industries. The Innovative Workforce Incentive Program, for instance, aims to increase the number of high school students who earn industry-recognized credentials. School districts receive funding to implement credentialing programs in

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29. National Alliance for Partnerships in Equity (2018). Examples of special populations under Perkins V include individuals with disabilities, individuals from low-income families, single parents, English language learners, and foster youth, among others.

30. Association for Career and Technical Education (2018).

31. Advance CTE (2017).

32. Advance CTE and Education Strategy Group (2017); Alliance for Excellent Education (2021).

33. Advance CTE and Association for Career and Technical Education (2023).

34. California Department of Education (n.d.).

35. California Community Colleges Chancellor's Office (n.d.).

high-demand sectors and earn “incentive payments” for each qualifying credential earned by students.<sup>36</sup> At the postsecondary level, the state recently created the Talent Ready Grant program, which provides funding to community colleges to develop and expand workforce credential and certificate programs.<sup>37</sup>

- **Texas:** In 2023, Texas enacted Senate Bill 8, a higher education law designed, in part, to develop a skilled workforce and meet the needs of employers in the state. Under the law, community colleges are funded based on outcomes achieved, including the number of credentials awarded in high-demand industries and the number of students who earn college credit through dual enrollment programs that allow high school students to take college courses. The law also creates a financial aid program for dual enrollment that allows high school students from low-income backgrounds to enroll in college courses at no cost.<sup>38</sup>

Other localities have also made investments, suggesting that CTE is continuing its rapid expansion, providing opportunities for policymakers to use the existing evidence base to support that growth, while providing researchers with additional scope to continue rigorous inquiry.

## THE STATE OF THE FIELD

Today’s CTE programs take many forms, and are offered through both secondary and postsecondary institutions, which each serve different populations and aim to provide students with labor market skills and credentials that lead to jobs with middle-class wages and advancement opportunities. CTE policies and funding streams have not been widely evaluated, however they have supported different programs and interventions which have been evaluated. CTE programs vary widely depending on the institutions that design and deliver them, the populations they serve, and the types of components they incorporate. Furthermore, there are often differential impacts for subgroups as defined by race, gender, and class, which may reflect existing inequities in access and opportunity. Figure 1 shows some of the most common components of multifaceted CTE interventions. For example, career pathway models may combine sequenced CTE courses aligned to a career theme, career-awareness opportunities, and work-based learning experiences, or they may combine other components in other ways. Commonly however, all programs are centered in a foundation of CTE coursework.

## Interpreting Evidence

Along with the policy and practice enthusiasm for CTE that has grown over the past several years, the evidence base supporting the expansion and scaling up of CTE has also been

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36. Ohio Department of Education (2023).

37. Bowerman, Edwards, Niemi, and Smith (2022).

38. Texas Higher Education Coordinating Board (2023).



**Figure 1: Common Components of CTE Programs**



growing. Since the first version of this paper was published, a plethora of new studies have expanded on the research in this area. Part of this expansion has come from investments in CTE research made by the Institute of Education Sciences (IES), the research arm of the United States Department of Education, which made CTE one of its priority funding areas in its annual research grant competition in the 2017–2021 period. IES has also funded the CTE Research Network, with the express purpose of expanding the causal evidence base for CTE, and to grow the network of education researchers focused on CTE.

That said, even as the evidence base has been expanding, the quality of evidence still varies. It is important to understand the levels of evidence in order to understand how to interpret the rigor of specific studies and evaluations. The most rigorous study design for understanding causal inference is a randomized controlled trial. This research design is considered the “gold standard” of research because the random assignment to either a program group or a comparison group ensures that any changes in program participants’ outcomes after enrollment in the program are *caused* by the intervention, as opposed to other factors.<sup>39</sup> The next most rigorous studies use “quasi-experimental” designs, which seek to mimic the properties of randomized studies by creating groups that are plausibly comparable. For example, regression discontinuity design studies, which limit analyses to students who fall just to one side or another of an arbitrary “cut point” (for example, an income cutoff or a birth date), are considered some of the strongest quasi-experimental designs.<sup>40</sup> Other models, like comparative interrupted time series and propensity-score matching studies, rely on researchers to create comparison groups based on the matching of observable characteristics. The reliability of the evidence from these kinds of studies depends on the strength of the matches researchers are able to make between program participants and comparison group members, and on other assumptions that may be hard to verify. Finally, the weakest evidence comes from observational studies, which provide evidence of an association between characteristics and outcomes, but not of a causal relationship.<sup>41</sup>

In addition, the strength of the evidence is also related to factors other than just study design: sample sizes, for example, and the number of studies that have similar findings are also important considerations to weigh. If results from a single study using a reliable research design cannot be replicated in subsequent studies, then one should be cautious about applying the results more broadly than in the original setting. But if multiple studies find similar results in different settings and time periods, then even if those studies individually have weaker research designs, collectively they may provide strong evidence of a relationship or trend.

## CTE IN SECONDARY EDUCATION SETTINGS

High schools offer a wide range of CTE courses in both quantity and type. While many schools offer a variety of stand-alone CTE courses, more and more schools are beginning to offer complex career pathway models. These models contain multiple opportunities to learn CTE content through components that may include combinations of coursework, dual enrollment credits, work-based learning opportunities, and opportunities to earn industry-recognized credentials while still in high school. CTE popularity has grown such that nationally, 77 percent of public high school students take at least one CTE course while in high school.<sup>42</sup>

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39. The random process may be created by purposeful random assignment or by a naturally occurring lottery.

40. Other common cut points include pass/fail scores, program eligibility dates, and ages of eligibility.

41. Ross, Brunner, and Rosen (2021).

42. National Center for Education Statistics (n.d.).

While specific CTE content, as well as the pathways and programs that are offered at different schools, is usually locally determined, many states and programs are guided by the Career Clusters Framework (CCF). The CCF was first developed in 2002 through a collaboration between states and the federal government, and is currently in use in some form by all 50 states.<sup>43</sup> Used as an organizing tool for the development of curriculum and instruction, it has provided the backbone for the content of what states offer in CTE, reinforcing the quality of programs by determining content that is linked to a variety of viable career options. Developed by Advance CTE, an organization that represents state CTE directors, the framework outlines 16 career clusters linked to 79 career pathways that provide guidance for states in designing career pathway programs, as well as help outline bridges for career pathways between secondary and postsecondary institutions. Given the number of schools that provide CTE coursework, which has been a fixture of American high schools for decades, there is a lot of research that has been conducted about these kinds of courses.

## CTE Instruction and Training

While a lot of the research that has been conducted over time about CTE has focused on CTE instruction and training, much of it has been observational in nature. For example, multiple studies have found a relationship between taking CTE courses and increased high school graduation rates, particularly among students from families with low incomes who tend to be overrepresented in CTE programs.<sup>44</sup> Taking CTE courses in high school has also been associated with higher wages.<sup>45</sup> A recent lottery-based design study that examined outcomes for students who attended CTE-dedicated high schools in New York City compared to students who attended other kinds of high schools found strong evidence that attending a CTE-dedicated high school modestly improved student engagement, increased the likelihood that students earned more CTE credits, and kept more students on track to earn a diploma compared to their counterparts in other kinds of high schools.<sup>46</sup> Similarly, other studies have observed that participation in CTE was associated with decreased rates of dropping out of high school, by keeping students on track to matriculate.<sup>47</sup>

Other studies have investigated questions of *dosage*, or whether students who take multiple higher-level CTE courses (known as CTE concentrators) have more positive outcomes than other CTE students. One study found that students who took CTE courses toward the end of high school, when the courses are more likely to be advanced, were more likely to graduate from high school.<sup>48</sup> Another study found that the wage benefits of CTE occurred entirely among students who took upper-level CTE courses.<sup>49</sup> CTE concentrators are more than 20

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43. Advance CTE (2021).

44. Plank, DeLuca, and Estacion (2008); Dougherty (2016).

45. Bishop and Mane (2005); Mane (1999).

46. Kemple, Unterman, and Dougherty (2023).

47. Gottfried and Plasman (2018a).

48. Gottfried and Plasman (2018b).

49. Kreisman and Stange (2020).

percentage points more likely to graduate from high school than similar students who do not concentrate in CTE, and are more likely to enroll in two-year colleges; these effects are strongest among young men and students from families with low incomes.<sup>50</sup> A recent study found that men who completed CTE concentrations had higher incomes compared to women who completed academic concentrations, and 30 percent of CTE concentrators enrolled in college after graduation.<sup>51</sup> While these findings are promising, being a CTE concentrator is something students choose, and that choice may be correlated with other hard-to-measure characteristics that often lead to success, such as motivation. None of these findings was produced through a randomized controlled trial or a quasi-experimental design, so it is not possible to fully attribute the findings to CTE concentration. That said, the volume of similar findings across different settings and populations does suggest that positive student outcomes are strongly associated with taking CTE courses, and particularly with concentrating in a CTE area, in high school.

## Dual Enrollment

Dual-enrollment programs are designed to ease students' transitions from high school to college by allowing students to take college courses during high school for which they can earn college credit. While dual-enrollment programs do not always include CTE programs, some dual-enrollment programs can encompass CTE courses or even pathways, wherein students receive college credit during high school for completing CTE courses. These programs have been growing in popularity, and the share of community college students who are actually dual-enrolled high school students has climbed by as much as 8 percent, especially since the onset of the pandemic.<sup>52</sup>

Several studies of dual-enrollment programs that focus on career-related coursework have found that students who participate in these programs have higher high school grade point averages, graduate high school at higher rates, stay enrolled in college at higher rates, and enroll in four-year degree programs at higher rates, compared to students who do not engage in dual enrollment.<sup>53</sup> A study using quasi-experimental methods to examine 616,000 high school juniors' CTE dual-enrollment pathway participation in North Carolina found that participation varied by race, gender, and economic background.<sup>54</sup> For example, White students were the most likely to participate in the CTE dual-enrollment pathway and Asian students were the least likely.<sup>55</sup> The same study also observed that students who participated in the CTE dual-enrollment pathway earned a larger number of CTE college credits and were more likely to graduate from high school. Conversely, one study found that students who remained at the same two-year institution for college where they dual

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50. Dougherty (2016).

51. Olivera-Aguilar, Kell, Ezzo, and Robbins (2022).

52. National Student Clearinghouse (2023).

53. Rodríguez, Hughes, and Belfield (2012); Karp et al. (2007); Fink, Jenkins, and Yanagiura (2017).

54. Edmunds, Unlu, Phillips, Hutchins, and Mulhern (2022).

55. Edmunds, Unlu, Phillips, Hutchins, and Mulhern (2022).

enrolled as high school students were 29 percentage points more likely to undermatch, meaning they were more likely to remain at the two-year institution where they had dual enrolled, rather than enroll in a four-year institution, compared to their peers who enrolled in a different postsecondary institution.<sup>56</sup> In this same study, the students who stayed at the dual-enrollment institution had a 33 percentage point lower probability of completing a bachelor's degree.<sup>57</sup> Given the potential for unintended consequences of dual enrollment found by this study, as dual-enrollment programs continue to grow, more rigorous studies examining the intersection of dual enrollment and CTE are needed.

## Career Pathways Programs

A career pathway is a series of structured and connected programs and support services that enable students to advance over time to higher levels of education and training.<sup>58</sup> They are found in both high schools and community colleges. Career pathways are multifaceted and may combine a range of components such as career awareness, work-based learning, contextualized instruction (teaching basic concepts in the context of the career where they will be used), and small learning communities (in which students take multiple courses with the same small group of peers). Many high schools offer one or two pathways, while others offer “wall-to-wall” pathways—meaning that all students choose a career-themed pathway (typically in eighth or ninth grade). Notably, career pathways are rarely designed to move students directly into the workforce from high school. More often they are presented as pathways to college *and* career, and typically promote the idea that all students need at least some postsecondary education, although not necessarily a four-year degree.

There are several types of career pathway models in high schools: Career Academies, early college high schools, Pathways in Technology Early College High School (P-TECH) model schools, and regional vocational technical high schools. The Career Academy model includes an overarching career theme (such as health sciences or information technology), rigorous coursework designed to prepare students for college, an integrated curriculum, a sequence of CTE courses aligned with the career theme, a small learning community, and work-based learning experiences. An estimated 7,000 Career Academies currently operate across the country.<sup>59</sup> Early College High Schools (ECHSs) allow students to earn as many as two years of college credits while in high school, and some of them have a CTE focus. P-TECH model schools are similar to ECHSs in that they allow students to earn high school diplomas and associate's degrees simultaneously and within a career theme, but they also have one or more industry sponsors who provide work-based learning opportunities, and the associate degrees students can earn are in industries related to the work of the industry partner. Regional vocational technical high schools are schools that typically serve several

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56. Jagesic, Ewing, Wyatt, and Feng (2022).

57. Jagesic, Ewing, Wyatt, and Feng (2022).

58. Career Ladders Project (2013).

59. National Career Academy Coalition (2018).

districts in a geographic region, offering CTE content and coursework to students in a variety of fields, and all students in the school are CTE students.

The Career Academies model has grown in part because of an MDRC randomized controlled trial that found that eight years after high school, Academy students earned, on average, 11 percent more per year than non-Academy students, with the effects concentrated among young men.<sup>60</sup> More recently, another lottery-based study of a single Career Academy in North Carolina found positive effects on high school graduation and college enrollment.<sup>61</sup> The study also found that in this district the Academy served a different population than the Academies in the original MDRC study. In this study, Academy students were higher performing and more likely to be White than non-Academy students.

The ECHS model allows students to earn credits toward associate's or bachelor's degrees, typically through a partnership with a college. In ECHSs, all students have the opportunity to earn an associate's degree while enrolled in high school. Although some of these schools have a CTE focus, the evidence about them is not disaggregated into those with a CTE focus and those more generally focused on college credit accumulation. The evidence that does exist is primarily for those ECHSs that serve students from traditionally marginalized communities and those from families with low incomes. For example, one lottery-based randomized controlled trial examined 10 ECHS programs in 5 states and found that they improved high school graduation rates and the rates at which students earned postsecondary credentials. In particular, ECHS students were 20 percentage points more likely to have earned associate's degrees four years after high school than their non-ECHS counterparts.<sup>62</sup> Another randomized controlled trial of ECHSs found positive effects on ninth-grade outcomes, including taking and passing core college prep courses.<sup>63</sup> Finally, a study of all ECHS programs in North Carolina (which has the largest concentration of ECHSs of any state) also found that students in these schools were more likely to earn associate's degrees and to enroll in four-year institutions that were ranked as less selective.<sup>64</sup> When considering geographic variation in ECHSs in North Carolina, another study found that school participation in ECHS programs varied by locale, and that rural schools participated at higher rates than urban or suburban schools.<sup>65</sup> Using a lottery-based design, another study of ECHSs in North Carolina found that students in the sample who attended ECHSs obtained college credentials at a higher rate than their peers in the control group.<sup>66</sup> The study also found a 15.8 percentage point impact on four-year degree attainment for students who attended ECHSs.<sup>67</sup>

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60. Kemple and Willner (2008).

61. Hemelt, Lenard, and Paepflow (2017).

62. Berger et al. (2013).

63. Edmunds et al. (2012).

64. Lauen, Fuller, Barrett, and Janda (2017).

65. Edmunds, Unlu, Phillips, Hutchins, and Mulhern (2022).

66. Edmunds, Unlu, Furey, Glennie, and Arshavsky (2020).

67. Edmunds, Unlu, Furey, Glennie, and Arshavsky (2020).

One more traditional model of CTE pathway delivery is known as the regional vocational high school. These schools are particularly common in many states in the Northeast. In this model, a single school offers all the available CTE in a given district or region. Two recent rigorous studies (one using a regression discontinuity design, the other based on a random admissions lottery) found that students who enrolled in these schools were more likely to graduate from high school than comparable students who did not enroll in them. Further, one of these studies found that students who enrolled in CTE schools were more likely to enroll in postsecondary education, and the other found that they were more likely to earn industry credentials while in high school, with stronger effects among students from families with low incomes.<sup>68</sup> Through a quasi-experimental design study, findings demonstrated that male students at stand-alone regional vocational technical high schools in Connecticut were more likely to graduate from high school than male students who did not attend these schools and had 32 percent higher quarterly earnings for up to 10 quarters after the end of high school. However, there was little evidence to support these same returns for female students.<sup>69</sup>

One newer model of CTE high schools is the P-TECH 9–14 school model, which has been evaluated using a randomized admission lottery. Students who attended these schools were more likely to earn more CTE credits compared to their peers, and students in these schools earned more dual enrollment credits than students in a comparison group, with stronger effects for female students.<sup>70</sup> Further, the students in the sample were academically below average in math and English language arts when they entered high school, suggesting that these schools may provide strong support for academically weaker students.<sup>71</sup>

Another popular pathway model is the Linked Learning model, which has four main components: rigorous academics, sequenced CTE courses, work-based learning, and comprehensive support services. Since 2014, the Linked Learning model has expanded nationally, and is found in California, Texas, the Midwest, and New England, among other locations. However, the evidence about Linked Learning is confined to a study with a propensity-score matching design that found that students in the program were more likely than comparison group students to graduate from high school and enroll in college. Effects were stronger among students who began high school with poor academic preparation and among Black students.<sup>72</sup>

## Work Based Learning

Work-based learning provides opportunities for students to develop both career and industry knowledge. This is often through connections with employer partners who provide intern-

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68. Dougherty (2016); Neild, Boccanfuso, and Byrnes (2015).

69. Brunner, Dougherty, and Ross (2023).

70. Dixon and Rosen (2022); Rosen, Byndloss, Parise, Alterman, and Dixon (2020).

71. Additional findings from this study are expected to be released by MDRC in October 2023.

72. Warner et al. (2016).



ships, or mentoring, or job shadowing opportunities. However, it may also include coursework that provides hands-on skills training, taught either within a high school or through dual enrollment at a community college. Despite the prevalence of work-based learning in many pathways programs, there is limited evidence about its effects as a stand-alone component. One randomized controlled trial of Urban Alliance’s high school internship program (which combines a paid internship with professional training and mentoring) found large effects on college attendance for young men in the initial results, however these results were not found in the final report from the study.<sup>73</sup> The study also did not find any effects on students’ soft skills, but did observe effects on the attainment of hard skills for students with a GPA of 3.0 or higher.<sup>74</sup> Another, less rigorous study of work-based learning found mixed results.<sup>75</sup> Additional examinations of work-based learning are needed as these opportunities continue to be important components of CTE programs (evidence about apprenticeships, which are one form of work-based learning, is reviewed below).

## CTE AND STUDENT EQUITY

In the past, CTE programs have varied in the extent to which they have balanced the needs of employers and the goal of economic competitiveness with the needs of participants and the goal of educational equity. Programs that emphasized the former tended to engage more deeply with employers, for example by seeking their opinions on the careers that career pathways programs should promote, and on the curricula they should use. These programs were also likely to have relatively narrow standards for admission, so that they can train qualified workers more reliably. At the other end of the spectrum were programs that emphasized the perceived preferences of students. These programs tended to strive more for equity through open admissions policies and by letting students choose among a range of pathways, including some that may not have been as well aligned with employers’ needs. Increasingly, the new generation of programs that are currently being designed aim to balance these goals. For example, the P-TECH 9–14 schools in New York City work closely with employers to design degree pathways but offer open-access admission.<sup>76</sup> The California Partnership Academies program emphasizes equity by requiring that at least 50 percent of participants be students who meet “at-risk” criteria, while also encouraging the growth of academies with themes that correspond to employment sectors facing labor shortages in California.<sup>77</sup>

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73. Theodos et al. (2023).

74. Theodos et al. (2017).

75. Darche, Arnold, and Newhouse (2004).

76. These schools serve grades 9 through 12 and the first two years of college. Each has an industry sponsor and allows students to earn cost-free associate’s degrees in fields related to the work of the employer, at the same time as they earn high school diplomas. They have what are referred to as “limited unscreened” admissions, meaning they require only that students express interest in the school by attending an open house in order to be eligible for admission; they do not have admissions criteria related to test scores or attendance. In an effort to further encourage equity, the New York City Department of Education eliminated the limited unscreened category of high school admissions in 2019.

77. At-risk students are those who meet three of the following six criteria: (1) having a poor attendance



As CTE continues to develop and change in the twenty-first century, so do critical examinations of how to improve the equity of and access to CTE programs and pathways for all students. The distribution of students in CTE has become an area of empirical exploration. Examinations of CTE enrollment still find large differences by race, gender, and class.

## CTE, Race, and Gender

When exploring the relationship between CTE and gender, studies largely demonstrate that gender divides in CTE still persist. For example, one recent study of CTE course-taking patterns found significant differences in participation by gender, where White male students were more likely to participate in CTE more broadly than women and students of color.<sup>78</sup> Particularly, studies have observed that gendered occupational stereotypes still exist, wherein female students largely enroll in healthcare and education-related CTE. However, female students are also more likely to pursue pathways that lead to four-year degrees.<sup>79</sup> Additionally, students of color were less likely to participate in STEM CTE programs, even when controlling for socioeconomic status.<sup>80</sup> Another study observed a traditional gender divide in engineering CTE (E-CTE) courses in high schools, as more male students enrolled in these programs. However, female students who completed E-CTE courses were more likely to earn a bachelor's degree than their male peers.<sup>81</sup>

Since 1980, female students have enrolled in postsecondary education at high rates compared with male students. They have also graduated high school at higher rates than their male counterparts.<sup>82</sup> However, while male educational performance and attainment have, broadly, lagged behind female students, as several of the findings described above indicate, some CTE programs have been a bright spot and have supported successful outcomes for young men. In particular, the Career Academies, P-TECH, and the Connecticut regional vocational high schools' study found positive impacts for these students. These studies demonstrate that while young men have been falling behind young women educationally for decades, participation in CTE pathways and programs seems to be an exception.<sup>83</sup>

Studies have also shown that outcomes for students vary by subgroup. Recent examinations of participation of students of color and students with low incomes in certain CTE pathways show that participation was more likely to lead to higher earnings compared to their non-CTE peers, and other CTE pathways were associated with higher postsecondary

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record, (2) being behind in credits, (3) demonstrating low motivation, (4) being economically disadvantaged, (5) having low scores on state tests, and (6) having low grade point averages.

78. Leu and Arbeit (2020).

79. Leu and Arbeit (2020); Dougherty and MacDonald (2020).

80. Leu and Arbeit (2020).

81. Gottfried and Plasman (2018b).

82. Reeves, Buckner, and Smith (2021).

83. Conger (2015); Conger and Long (2010); Fortin, Oreopoulos, and Phipps (2015); Statista Research Department (2023).

enrollment outcomes.<sup>84</sup> One observational study found that Asian students were the least likely to participate in CTE coursework in high school.<sup>85</sup> Particularly for students with low incomes, some evidence demonstrates that CTE participation increases on-time graduation by 7 to 10 percentage points.<sup>86</sup>

## **CTE and Students with Disabilities**

Some studies have found that students with disabilities who take CTE courses and programs are more likely to graduate on time, and more likely to earn an industry-recognized credential when compared to their peers.<sup>87</sup>

Overall, the available evidence indicates that pathways programs can have positive outcomes for students, but that impacts vary in important ways across CTE areas, for students from different backgrounds, particularly for women and students of color. CTE aims to help students develop skills beginning in high school that will prepare them to pursue postsecondary education and prepare them for the workforce, equipping them to enter careers that offer opportunities for growth and offer living wages.

## **POSTSECONDARY CTE EDUCATION**

Increasingly, CTE is a popular option for students who choose to pursue postsecondary education. As mentioned previously, earning a degree or credential after high school has been shown to increase earnings and employment for students. Many postsecondary institutions offer programming for students to earn degrees or credentials (both for credit and non-credit) in CTE areas. For example, community colleges offer dozens of “CTE majors” that lead to certificates or two-year credentials and offer pathways for students to “stack” multiple credentials and earn a certificate or associate’s degree. For example, CTE majors include degrees and certificates in agriculture, engineering, and construction. Certificates can be industry-recognized or college-issued. There is growing popularity at the community college level in offering short-term or “rapid” certificates. While community colleges have historically been known for providing CTE degrees and credentials, universities are growing and expanding such options at the four-year level. Community colleges are also well-positioned to offer and provide CTE programming, but often experience severe budgetary deficits and other constraints. Since most students attend postsecondary education close to home, for many students this means attending a community college or regional comprehensive university to acquire a CTE credential or degree.<sup>88</sup> Regional comprehensive universities are broad access institutions, and about 53 percent of bachelor’s degree seeking students attend a regional comprehensive university. These institutions enroll large

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84. Ecton and Dougherty (2022).

85. Xing, Garza, and Huerta (2020).

86. Dougherty (2018).

87. Dougherty, Grindal, and Hehir (2018); Gottfried, Plasman, Freeman, and Dougherty (2021).

88. Hillman (2016); Klasik, Blagg, and Pekor (2018).

numbers of first-generation students, students of color, students with low incomes, working adults, and veterans.<sup>89</sup>

Despite both policy interest and growth in postsecondary CTE enrollment, evidence on postsecondary CTE is limited. Much of the available research on postsecondary CTE centers on the relationship between CTE participation in high school and postsecondary enrollment and degree attainment in a related field of study.<sup>90</sup> There is also a growing conversation in postsecondary CTE literature around how to develop postsecondary CTE credentials that are in alignment with local labor markets.<sup>91</sup> Alignment has been a growing topic of interest in federal policy making, particularly demonstrated through the latest reauthorization of the Perkins Act. Strong alignment between CTE and local labor markets has the potential to address regional workforce needs by aligning students with living wage employment and careers that they can train for locally. Lastly, developing evidence-based, market-aligned CTE programs at the postsecondary level remains difficult for higher education leaders, particularly at public institutions.<sup>92</sup>

There is much to be learned about the effects of postsecondary CTE on students, institutions, and communities. Many studies of postsecondary CTE have used observational methods, with fewer studies using more rigorous causal methods in their study design. This may be because identifying a randomly assigned comparison group in these settings can be challenging. That said, a growing area of exploration is the relationship between taking CTE courses in high school (for example, dual enrollment or dual credit programs) and college CTE aspirations. Several correlational studies have found students who complete CTE courses or CTE clusters in high school are more likely to major in that same area.<sup>93</sup> Results from a descriptive study also found that most students who participated in CTE coursework in high school have postsecondary educational aspirations. However, those students who aspired to earn a bachelor's degree after high school took fewer CTE credits compared to their peers who planned to attend a community college or pursue a certificate program.<sup>94</sup> Another area of examination in postsecondary CTE focused on the outcomes of students who participate in non-credit programs, and one study found that the majority of students who participated in CTE non-credit programs were nontraditional students from low-income backgrounds.<sup>95</sup> In this same study, researchers observed that more than half of the non-credit earning students did not complete their initial term, even for those students who aspired to eventually participate in credit-bearing coursework, which highlights the disparities for students in non-credit programs who want to eventually pursue credit-bearing programs.<sup>96</sup> However, a separate study using quasi-experimental methods examined labor market out-

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89. American Association of State Colleges and Universities (2023).

90. Xu and Ran (2020); Xu, Jaggars, Fletcher, and Fink (2018).

91. Atwell, Ecton, Klein, D'Amico, and Sublett (2022).

92. Sublett and Tovar (2021).

93. Plasman, Gottfried, and Sublett (2017); Plasman, Gottfried, and Sublett (2019).

94. Xing, Garza, and Huerta (2020).

95. Xu and Ran (2020).

96. Xu and Ran (2020).

comes for short- and long-term certificate program participants in two different states and observed positive impacts on earnings. As many adults pursue certificates as an avenue to switch career fields, this same study observed that certificate attainment increased rates of employment, even in cases where there were no positive impacts on earnings.<sup>97</sup> The increase in employment rate without an impact on earnings may not be inherently negative, as the study observed that this finding could be reflective of a career transition, which may not increase wages initially.<sup>98</sup>

There have also been several studies of the economic benefits students can gain by earning vocational certificates or career-focused associate's degrees. While these benefits vary widely by field, studies have found that some certificates produce large effects, particularly those related to healthcare and information technology.<sup>99</sup> Specifically, one large, multistate observational study found that men who received certificates earned \$530 more a quarter on average than men who did not, and women earned \$740 more.<sup>100</sup> These earnings gains varied from field to field and from state to state, with the most positive findings concentrated among vocational certificate holders. However, the effects of certificates were found to lessen over time, which another study observed when comparing certificate earners to associate's degree earners.<sup>101</sup> Men who received associate's degrees earned \$1,160 more per quarter on average than men who did not earn their degrees, and women earned \$1,790 more than women who did not earn degrees. These effects were strongly positive in all states and were sustained over time.<sup>102</sup>

Evidence about postsecondary pathway models is also limited. For example, a small randomized controlled trial of some of Project Quest's training (specifically, occupational skills training related to healthcare at a few community colleges in Texas) found that six years after the program, Project Quest students earned close to \$5,000 a year more than control group students. The study was small, with just over 400 participants ranging in age from 18 to 64.<sup>103</sup> Another study, of the I-BEST program (which includes basic skills training in vocational courses), used a propensity score matching design and found that I-BEST students stayed in community college courses at increased rates.<sup>104</sup> Further, there is currently no evidence about degree apprenticeship programs at the postsecondary level. A qualitative exploration of degree apprenticeships at the community college level demonstrated that there may be several challenges in implementing such programs, particularly with regard to employer engagement in apprenticeship programs.<sup>105</sup>

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97. Xu and Trimble (2016).

98. Xu and Trimble (2016).

99. Grossman et al. (2015); Stevens, Kurlaender, and Grosz (2018).

100. Grossman et al. (2015); Stevens, Kurlaender, and Grosz (2018).

101. Minaya and Scott-Clayton (2022).

102. Belfield and Bailey (2017).

103. Elliott and Roder (2017).

104. Jenkins, Zeidenberg, and Kienzl (2009).

105. Voeller (2022).

There still is much to be learned about postsecondary CTE. As the United States grapples with the value of higher education, CTE is an area of important exploration regarding the return on investment for students. The limited available evidence on postsecondary CTE focuses on the link between taking CTE courses in high school and postsecondary degree and credential attendance and persistence. There is a pressing need for further research on postsecondary CTE to better understand its effectiveness, build evidence on outcomes for student subgroups, learn more about the relationship between postsecondary CTE and employers, and gain deeper insights into alignment with industry demands and local labor markets.

## **CAREER READINESS AND APPRENTICESHIPS**

Career development programs provide students with opportunities to develop skills necessary to be successful in the workforce, as well as offer students the opportunity to obtain industry-based experiences, such as apprenticeships. These programs often span both secondary and postsecondary education and can operate through outside entities such as unions and non-profit organizations.

### **Career-Readiness Skills Training**

The employer community has repeatedly called for workers with strong career-readiness skills (also called twenty-first century skills, soft skills, and employability skills), the general habits and competencies that make a person an effective employee, such as how to effectively manage time, and how to work cooperatively with others. For this reason, many programs now aim to help students develop better interpersonal and noncognitive skills such as empathy, adaptability, and communication, and to improve their ability to solve problems. The demand for such skills is projected to grow in the future. For example, the YouthForce NOLA career pathways program in New Orleans features internships for high school students that are accompanied by 60 hours of soft-skills training. At the postsecondary level, the California Community Colleges Chancellor's Office sponsors The New World of Work (NWoW) program for students in CTE programs. The program includes a curriculum covering 10 soft skills embedded in a CTE course, a work-based learning experience, and an assessment leading to a digital badge that signals competency in each of the 10 skills. While this paper reviewed the available quantitative evidence on CTE, it is worth noting that one study examining the NWoW program offered several key qualitative insights into the implementation of the program.<sup>106</sup> Of note, the findings stated that students who participate in programs similar to the NWoW program should be encouraged to obtain work experience at the same time that they receive classroom instruction. The findings also showed that participants in NWoW felt that having clear avenues to receive feedback from employers on their performance would improve their ability to practice and reflect on those skills. Lastly, the NWoW program curriculum focused on instructing students on 10 soft skills, however

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106. Dalporto and Lepe (2022).

participants of the program shared that learning 10 skills in a single course was unattainable, and that future programs could benefit by limiting the number of skills taught.

Although there is a growing demand for workers with both analytic skills and soft skills, there is currently little to no rigorous or causal evidence about the effects of programs that seek to develop these skills in students and young adults.<sup>107</sup> Readiness skills training is challenging to measure and evaluate because there aren't clear instruments that can reliably measure these kinds of outcomes nor are there clear outcomes related to the measurement of these skills. This is an area where more development and research are needed.

## Apprenticeships

Apprenticeships for young people have long been popular in Europe; recently they have experienced a surge of interest in the United States as well. Quality apprenticeships include paid work, competency-based training for middle-skill jobs (that is, instruction that makes sure apprentices can actually demonstrate the skills they are supposed to be learning), and opportunities for full-time employment after the apprenticeship. At the federal level, the United States is increasing investments in youth apprenticeship programs.<sup>108</sup> An example of a youth apprenticeship program is CareerWise Colorado, which is modeled on youth apprenticeship in Switzerland. Launched in 2017, the program aims to meet employers' needs for skilled workers while also helping young people acquire the skills and credentials necessary to find jobs with good wages and opportunities for advancement. This program operates in four regions in Colorado and has recently been adapted for use in New York City. Students join the program in their junior or senior year of high school, and divide their time among high school, the workplace, and a local community college. Employers have a strong influence over CareerWise's design and curriculum, and the program enjoys the support of elected leaders and state agencies. Programs like CareerWise offer insights into how quality apprenticeship programs can increase positive outcomes for students and offer a model for other states to consider in developing apprenticeship programs.

Youth apprenticeship models are prevalent around the globe, but somewhat less popular in the United States. Although youth apprenticeship models in the United States have grown rapidly, they are relatively new to this country and therefore there has not been much evidence about their effectiveness in this country. However, there are a growing number of promising programs in the United States. For example, in an observational examination of outcomes of the CareerWise program in Colorado, about 64 percent of students pursued postsecondary education and 37 percent pursued employment after completing the program.<sup>109</sup> Another examination of outcomes for the first two cohorts of the CareerWise program found that upon completing the program nearly two thirds of participants met the program's definition of success by pursuing postsecondary education, gaining employment, or both. Another study

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107. Deming (2017).

108. Lerman (2022).

109. Fuller, Lipson, Mallah, Pendse, and Snyder (2022).



explored outcomes for students who completed a CTE concentration and participated in a youth apprenticeship program.<sup>110</sup> After matriculating from high school, the study observed that two thirds of students continued into their field of concentration and those who had completed a youth apprenticeship program were significantly more likely to continue into their field of concentration.<sup>111</sup>

There have been several studies of apprenticeship programs for adults. For example, one study of Registered Apprenticeship programs, which are regulated by the Department of Labor and mainly serve adults, found a positive association between program participation and higher earnings. However, the study was unable to determine whether the program itself caused higher earnings, or whether these outcomes were related to the participants' characteristics.<sup>112</sup> Similarly, another study of a variety of workforce programs also found that participating in apprenticeships had positive economic benefits, but the study was not explicit about how the programs involved were defined or what populations they served.<sup>113</sup>

A large, quasi-experimental study of the long-term effects of vocational education in 11 European countries found that while participants were more likely to be employed when they were young than people who enrolled in general education programs, later in life they were more likely to struggle to adapt to technological change and to maintain employment. The pattern of findings was most pronounced in countries that emphasize apprenticeship programs, including Denmark, Germany, and Switzerland.<sup>114</sup> The authors did find that one reason for the pattern was that as they grew older, people who had gone through vocational education (apprenticeship-based or another model) were less likely to receive additional career-related training than their counterparts with general education backgrounds. One limitation of this study was that it only included men, who tend to be employed more continuously than women. It is not known whether the pattern holds for women.<sup>115</sup>

## CONCLUSION

In the last five years, the evidence base for CTE has grown, and there are now more rigorous evaluations, particularly of pathways models. Additionally, evidence examining issues related to equity in CTE participation as well as more evidence about postsecondary CTE degrees and credentials has increased. In these areas there are multiple studies suggesting that participation in CTE can improve students' outcomes, particularly around increases in wages and attainment of postsecondary degrees and credentials. However, many of the studies in CTE focused on equity as well as CTE programs in postsecondary settings are less rigorous in nature. In addition, multiple studies find that career-related certificates

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110. Mindham and Schultz (2019).

111. Mindham and Schultz (2019).

112. Reed et al. (2012).

113. Hollenbeck (2008).

114. Hanushek, Schwerdt, Woessmann, and Zhang (2017).

115. Hanushek, Schwerdt, Woessmann, and Zhang (2017).

and associate's degrees are linked to increased wages, supporting the notion that one way to improve students' prospects is to encourage them to attain these kinds of credentials. However, several studies at the high school level are supported by strong rigorous studies, including career pathway models, particularly Career Academies, ECHSs, P-TECH schools, and regional vocational technical high schools.

There is a growing consensus that CTE can improve economic mobility by increasing the number of students who earn career-focused postsecondary credentials and get better-paying jobs. CTE is one of the few areas of policy that enjoys bipartisan interest, and it can attract cooperation from educators, workforce policymakers, and regional and national employers. National advocacy organizations and those focused on building the capabilities of other providers also support CTE. All of this interest has contributed to an environment of entrepreneurial innovation and zeal.

The conditions are ripe for the field to create policy changes, increase public and private investment, and grow. But there are also challenges and threats. Can regional employers and educators accurately project which sectors are likely to see economic growth? Are the K–12 and postsecondary systems nimble enough to train students in the skills employers seek, and align those skills with local labor market demands? Can CTE train enough workers to build a pipeline of talent to meet the needs of the rapidly transitioning climate economy? Will students of color and lower performing students have access to CTE in higher-paying sectors (such as STEM)? Will employers be able to provide enough work-based learning and apprenticeship opportunities for programs to expand to a larger scale while continuing to offer the same services? Can the political and public support for CTE be sustained? And can the evidence base continue to expand in order to determine which CTE programs have the greatest payoffs for students, local labor markets, and employers? These risks can be mitigated by astute social investments in the following areas:

1. Expand the evidence base of the policies and practices associated with student success, to build on that success and to understand the variation in effects for different student subgroups.
2. Build regional capacity to align CTE with relevant labor market data so that education and training can be reliably tied to sectors experiencing economic growth.
3. Provide incentives for employer partnerships to engage employers in supporting CTE as a robust pipeline for talent.
4. Scale evidence-based models in ways that allow them to remain faithful to their models while adapting to different labor markets and contexts.
5. Build reliable measures to examine career-readiness skills.
6. Ensure equitable access to CTE for underrepresented students, through public schools, community colleges and regional comprehensive universities.



7. Support the dissemination of CTE research findings to inform policymakers and practitioners about the investments that are most likely to achieve their education, labor-market, and equity goals.



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# ABOUT MDRC

MDRC, a nonprofit, nonpartisan social and education policy research organization, is committed to finding solutions to some of the most difficult problems facing the nation. We aim to reduce poverty and bolster economic mobility; improve early child development, public education, and pathways from high school to college completion and careers; and reduce inequities in the criminal justice system. Our partners include public agencies and school systems, nonprofit and community-based organizations, private philanthropies, and others who are creating opportunity for individuals, families, and communities.

Founded in 1974, MDRC builds and applies evidence about changes in policy and practice that can improve the well-being of people who are economically disadvantaged. In service of this goal, we work alongside our programmatic partners and the people they serve to identify and design more effective and equitable approaches. We work with them to strengthen the impact of those approaches. And we work with them to evaluate policies or practices using the highest research standards. Our staff members have an unusual combination of research and organizational experience, with expertise in the latest qualitative and quantitative research methods, data science, behavioral science, culturally responsive practices, and collaborative design and program improvement processes. To disseminate what we learn, we actively engage with policymakers, practitioners, public and private funders, and others to apply the best evidence available to the decisions they are making.

MDRC works in almost every state and all the nation's largest cities, with offices in New York City; Oakland, California; Washington, DC; and Los Angeles.