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High School Career and Technical Education Finance: Impact of State-Level Policy Changes

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States are increasingly adopting changes to K-12 funding systems in order to promote and encourage student engagement in secondary-level career and technical education (CTE). Two of the most prevalent reforms include: a) establishing tiered weights for CTE in school funding formulas based on the connection between a program of study and workforce needs and b) incentive grant programs that provide funds based on student attainment of industry-recognized credentials. However, it is unclear whether and how these changes induce higher levels of meaningful and useful CTE engagement. This study evaluates the impact of these policy changes on state funding for CTE and high school level CTE enrollment.

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Abstract

States are increasingly adopting changes to K-12 funding systems in order to promote and encourage student engagement in secondary-level career and technical education (CTE). Two of the most prevalent reforms include: a) establishing tiered weights for CTE in school funding formulas based on the connection between a program of study and workforce needs and b) incentive grant programs that provide funds based on student attainment of industry-recognized credentials. However, it is unclear whether and how these changes induce higher levels of meaningful and useful CTE engagement. This study evaluates the impact of these policy changes on state funding for CTE and high school level CTE enrollment.

Growing concerns about the "gap" between the skills employers look for and the skills possessed by students and job applicants have fueled interest in career and technical education (CTE) as a means for reducing labor market inefficiencies. CTE programs can provide students with applied, career-relevant skills thus reducing skill and occupation mismatch and overreliance of on-the-job training, which impose costs on business that reduce worker wages (Levesque, 2019). Advocates of career and technical education have also heralded CTE as a solution for boosting student engagement and high school completion, largely based on recent evidence suggesting this is possible in some settings (Bonilla, 2020; Brunner et al., 2023; Dougherty, 2018; Ecton & Dougherty, 2023; Gottfried & Plasman, 2018; Hemelt et al., 2019; Silliman & Virtanen, 2022). The most recent federal data suggests that 85% of students in the U.S. take at least one CTE course while in high school (Irwin et al., 2023), and that depending on CTE subject area, between one-in-ten and one-in-four students complete a multi-course sequence in a specific program of study (e.g. health science, information technology, or cosmetology) (NCES, 2021). Furthermore, most state-level education funding systems currently allocate funds specifically for K-12 CTE programs. These state-level funds are supplemented by federal funding for CTE programs through the Carl D. Perkins Act which distributes over $1.4 billion annually to states. The ubiquity of CTE courses, the high degree of tax-funded investment, and the shared public interest in the potential for these programs to contribute directly to workforce development highlight some of the reasons why it is important to understand the impacts of policy strategies aimed at increasing students' involvement in CTE programs.

In an effort to spur CTE participation and improve the alignment between CTE programs and workforce needs, state policymakers have adopted a range of policy approaches. Among these changes, one of the most novel and noteworthy are the introduction of changes to

secondary-level CTE funding systems. Recent evidence from innovations in school funding in general educational settings have demonstrated the potential of funding reforms to improve student outcomes (Candelaria & Shores, 2019; Jackson, 2020; Jackson et al., 2016; Lafortune et al., 2018). These studies capitalized on changes in funding formulas that grew out of lawsuits in the 1970s based on equity arguments and lawsuits from the late 1980s through 2000s based adequacy arguments which highlighted structural inequalities in education funding that were based almost exclusively on local property values. Other work in school finance has looked at the impact of passing bonds for capital spending on student outcomes and has found that spending on core infrastructure (e.g., school HVAC systems) in districts with fewer resources positively impacts student learning, whereas expenditures on athletic fields and equipment in more economically resourced districts did not produce analogous results (Biasi et al., 2024). Though each of these literatures highlights how the study of education finance has grown in nuance, not all targeted changes in education spending have been examined. Specifically, while this literature has focused on increases in overall school funding or increases based on supporting specific student populations, it does not address the impact of changes in funding tied to instructional offerings, particularly those that are intended to align with workforce needs.

In response to the policy shift to emphasize both college and career readiness, some states have made changes to how they fund CTE. These funding changes have taken a few forms. For example, several states have broadly increased overall budget appropriations for CTE with some making additional changes to provide funding for districts to establish new CTE programs of study, regional technical centers that serve students in part-day programs, or supplementary career readiness and exploration programs for students. In other cases, rather than broadly increasing allocations to general CTE funding pools, states have adopted major changes to CTE

funding systems to establish targeted funding systems to incentivize student-level participation and training in particular program areas or in programs that are designed to lead to the earning of an industry-recognized processional credential or certification (e.g., a Cisco Systems Certificate). This latter set of targeted policy changes restructures existing K-12 CTE funding systems by establishing new funding tiers based on the program's connection to certain occupations or by providing additional funds based on students' attainment of industry-recognized credentials.

Despite the range of recent CTE funding policy innovations, there is little existing research on the impacts of funding changes on CTE participation and later student outcomes or on the CTE funding policies that preexist these new changes. The absence of scholarship related to education finance with respect to CTE is likely explained by at least two distinct reasons. First, over the previous 3 decades, CTE was not a top policy priority and consequently there were only modest changes in the levels and approaches to funding for CTE. Even across multiple reauthorizations of the federal Perkins Act which provides federal money to states for CTE, there were no large changes in how funds for CTE were distributed, or investigations into understanding the implications of existing funding structures. Second, the lack of reliable and consistently-reported data on CTE participation across states creates an impediment to conducting systematic inquiry about the relative impact of any state-specific change (if one occurred at a level large enough to be expected to produce measurable changes in behavior or outcomes). While recent reauthorizations of the Perkins Act do require states to report certain indicators of CTE enrollment at the secondary and postsecondary levels, there are notable issues in the consistency and quality of the data that is reported. For instance, to meet reporting requirements, states have used their own definitions for various CTE enrollment indicators and are not bound to consistent data collection cycles making it difficult compare the relative sizes of

the CTE student populations across states (Haviland & Robbins, 2021; U.S. Department of Education, Office of Career, Technical, and Adult Education, 2022). The U.S. Department of Education, Office of Career, Technical, and Adult Education (OCTAE), which oversees collection and reporting of CTE data, has made repeated efforts in recent years to improve data quality and consistency to enable accurate comparison across states (U.S. Department of Education, Office of Career, Technical, and Adult Education, 2022).

In this article, we have two clear aims. Primarily, we attempt to assess whether changes in state-level CTE funding priorities have achieved their intended result of inducing higher rates of secondary-level CTE participation or redirecting participation to areas of high growth or workforce demand (as stipulated in the Perkins Act). A secondary aim is to highlight the current limitations of publicly-available, federally-collected datasets on CTE enrollments and expenditures for evaluating CTE funding policy changes. While several states have adopted nearly identical changes to CTE funding strategies in recent years, our analysis demonstrates the difficulty of comparing policy outcomes across states. Beyond the broad aims of this paper, we contribute to the literature on CTE policy in several ways. First, we provide an overview of the current state of CTE funding policies across the U.S. and discuss different types of recent CTE funding policy changes. We then introduce readers to national-level data on CTE and make use of these data to evaluate two funding policy changes that have been adopted across multiple states. We conclude by exploring the current limitations of national datasets for assessing CTE policy changes and call for increased attention on strengthening data collections and reporting efforts.

State and Federal Funding for CTE

States vary in how they combine federal, state, and local funding sources to finance secondary-level CTE. The costs of providing CTE are estimated to be 20-40 percent higher than general education costs due to the need for additional equipment and specialized instruction (Dougherty & Smith, 2024; Foster et al., 2014). While states and Local Education Agencies (LEAs) do receive federal money for financing CTE programs, these extra costs essentially require states and LEAs to provide additional funding for the provision of CTE. Nearly every state provides funds for CTE programs specifically, and on average, state allocations for CTE are five times as large as the federal funding amounts states receive for CTE (Advance CTE, 2023).

State-level funding approaches for CTE fall into three main categories: foundational funding only, funding for area CTE centers, and categorical funding (Foster et al., 2014; Pechota et al., 2020). In a foundational funding approach, no specific funds are designated for CTE at the state level. Instead, local administrators allocate state funds across all educational services including CTE programs. As of 2022, only seven states use a foundational funding approach (Advance CTE, 2023; Pechota et al., 2020). States that provide funds for area CTE centers primarily designate CTE funding for area technical centers specifically and may or may not designate some additional funds for CTE programs in other settings. Nine states currently use such an approach (Pechota et al., 2020). A categorical funding approach, the most common funding approach, designates state-level funds for CTE using student-based, unit-based, or cost-/resource-based formulas. The majority of states using a categorical funding approach use student-based formulas to allocate funds to districts based on the number of students participating in CTE (Pechota et al., 2020). Under this formula type, funds for CTE can be allocated by granting additional or differential weights to CTE participants within the overall state funding formula or by using CTE participation as a proportion of total enrollment. Unit-

based formulas provide funds based on the anticipated additional resources needed to provide CTE instruction such as teachers, administrators, and equipment. A cost-based approach provides reimbursement to districts for CTE instruction from a designated pool of funds. If reimbursement requests exceed the amount in the existing funding pool, most states prorate the state funds available for distribution among eligible school districts.

In addition to designating state funds to secondary CTE, all states currently receive federal funds for CTE through the Carl D. Perkins Career and Technical Education Act. This piece of legislation was originally passed in 1984 and has been reauthorized four times since, with its most recent renewal in 2018. With its most recent renewals in 2006 and 2018, funding from the Perkins Act in been allocated to states based on the state's number of high school-aged students and individuals living in poverty (Granovskiy, 2018). Although the 2018 renewal (referred to as Perkins V) did include a substantial increase in overall CTE appropriations, not every renewal of the Perkins Act has coincided with a proportionate increase in CTE funding relative to funding for regular K-12 programming (U.S. Department of Education, 2015). Recent reauthorizations of the Perkins Act have further added new performance-based accountability standards, heightened the level of detail required in state's CTE plans, and increased state's data reporting requirements (Granovskiy, 2018; Imperatore & Hyslop, 2017; Manley, 2011). While the accountability requirements of the Perkins Act shape states' provision of CTE, federal funds have historically represented a small fraction of state's total CTE revenues (Silverberg et al., 2004). Although several studies have explored changes in the landscape of CTE in response to federal legislation (e.g., Castellano et al., 2003; Imperatore & Hyslop, 2017; Manley, 2011), comparatively little is known about state policies shape secondary CTE.

Recent Changes to State-Level CTE Funding

Several recent efforts to reform secondary-level CTE funding have focused on ties between CTE programming and labor market demands. In contrast to other policy approaches that only grant additional money to existing or new CTE programs using current funding systems, this alternative approach emphasizes changes to how CTE funds are distributed in order to incentivize certain forms of CTE participation. Two relatively popular approaches using this orientation are: a) incentive grant programs that provide funds based on the number of students who earn industry-recognized credentials and b) adjustments to weights for CTE that are used in school funding formulas based on the connection between the student's program of study and workforce needs.

Between 2012 and 2019, seven states adopted an industry-recognized credential incentive policy and eight states adopted changes to CTE funding weights. States that adopted credential incentive policies provide financial rewards to either the district or the instructor for each high school student that obtained an industry-recognized credential. Among the states that adopted changes to CTE funding, three states simply increased the overall weight for CTE participants while the other five adopted a new, tiered funding system for CTE that established higher weights for programs aligned with high-demand and/or high-wage career fields. Table 1 provides details on the policies adopted in each of these states.

Possible Policy Mechanisms

There are several potential mechanisms by which the policy changes examined in this article could result in changes to students' engagement with CTE. Policies that incentivize industry-recognized credential attainment as well as policies that increase funding weights for CTE or shift funding allocations to target CTE funding in high-demand workforce areas could all improve capacity for CTE delivery. General funding increases may improve districts' ability to

provide existing CTE programming that is specific to school or district needs. As a nationally-representative survey of school districts found, nearly half of school districts report that a lack of funding or high program cost is a large barrier to offering CTE (Gray & Lewis, 2018). In providing additional overall funding support, districts could improve the quality of current CTE offerings through equipment purchases, instructor professional development, or instructor hiring. Increased funds may also provide support for expanding CTE offerings through the creation of new programs or courses of study. These potential outcomes could then incentivize increased CTE participation among new students who may be attracted to higher-quality or new programs. It could also encourage a greater degree of participation among existing CTE students if more advanced coursework is offered.

In contrast to policies that increase overall CTE funding allocations, policies that target specific CTE program areas or that provide incentives for credential attainment may have a more limited impact on district responses depending on the existing CTE infrastructure. If these funding changes target courses and programs of study that a district does not currently offer, there might be limited impacts on a district's ability to improve program capacity, especially if the funding change decreases the funding amount provided for preexisting CTE programs. Districts that already have robust programs in targeted areas at the time of policy introduction may benefit more as they face lower relative costs in shifting support to targeted programs. These districts might then respond similarly to districts in states that increase overall CTE funding allocations.

Another consequence of this type of policy change might be that districts shift their offerings to promote low-cost CTE programs or credentials that receive higher funding weights in lieu of higher-cost, but still high-demand programs. For example, computer science programs

and their associated industry-recognized credentials are relatively low-cost in comparison to automotive technology and construction programs that require expensive, specialized equipment. If the state considers both types of programs as leading to high-demand occupations, both may receive similarly high levels of funding. When districts consider which programs to promote and devote resources to, they may opt to provide the lower-cost computer science programs. Alternatively, schools and districts may simply attempt to shift more students into these lower-cost but targeted areas to take advantage of the associated funding increase. High-quality CTE courses have been generally found to have smaller class sizes relative to traditional courses, which explains much of the higher cost of offering these programs (Dougherty & Smith, 2024). As class sizes increase when students concentrate in a smaller number of program areas, the marginal cost of offering targeted CTE programs may decrease as well but with an unknown and potentially negative impact on the marginal benefit of participating in the program.

Despite the variety of ways that schools and districts might respond to changes in CTE funding and incentives, to date the influence of these policy changes has not been documented. The data available at the national level that are described below are not ideal for answering these policy questions. However, in documenting recent CTE funding policy changes, stating the economic reasoning that might explain what we should expect from such changes, and providing some estimates of whether and how program participation have changed in response, this article is positioned to make recommendations about what further evidence is needed, and how policymakers and practitioners might best respond given what we have observed to date. Specifically, we address the following two research questions:

1. What is the effect of changes to secondary-level CTE funding priorities on the level of state funding for CTE programs?

2. What is the effect of such policy changes on secondary-level CTE participation and the total number of secondary students classified as CTE concentrators?

Data and Method

Data for this analysis on state-level CTE enrollments come from the U.S. Department of Education, Office of Career, Technical, and Adult Education (OCTAE). Starting in the 2007-08 school year, states were required to report the total number of secondary- and postsecondary-level CTE participants and concentrators. At the secondary level, CTE participants are students who complete at least one course in any CTE program while CTE concentrators are those who complete multiple courses within a particular area of study. Following the passage of Perkins V, the CTE concentrator definition was standardized across states to only include students who had completed two or more courses in a CTE program of study. Prior to the passage of Perkins V official guidance from the U.S. Department of Education defined CTE concentrators as student who completed three of more courses in a program area, but states were ultimately at liberty to determine the minimum number of courses a student had to complete to be counted as a concentrator for reporting to OCTAE. Notably during this period, the majority of states defined CTE concentrators as students who completed two or more courses or at least fifty percent of courses within a CTE program of study. We combine this information with data on the total number of secondary-level public school students in the state as reported by the NCES Common Core of Data. Data on federal, state, and local revenues and expenditures come from the School District Finance Survey (F-33) administered by the U.S. Census Bureau and NCES. Given the highly skewed nature of the state-level data, all models use the log-transformation of variables on CTE enrollments, total secondary-level enrollments, and revenues.

We examine state-level variation in the timing of the adoption of funding reforms using the two-stage difference-in-differences estimator proposed by Gardner (2021). This approach prevents the over-weighting of "problematic" comparisons between treated and not-yet-treated units (Goodman-Bacon, 2021). Specifically, we present analyses for two treatment group types: (1) states that adopted a CTE funding reform that revised secondary-level CTE funding allocations to target specific fields of study, and (2) states that adopted a new incentive grant program that provided districts and/or schools with additional funds for each student who earned an industry-recognized credential. Untreated units are all other states that did not adopt either secondary-level CTE funding reform.

Due to missing data in the F-33 survey, we exclude 11 states and Washington, D.C. in all analyses that use district revenue for vocational education programs from state sources as an outcome and restrict analysis from 2008 to the last year of available data in 2020. In analyses that use CTE participants or concentrators as an outcome, we omit data from 44 state-year observations across 13 states due to known administrative data errors in the number of CTE participants and concentrators (confirmed via personal email correspondence with OCTAE representatives in fall 2021). Notably, when these observations are included in analyses, standard errors appear larger but point estimates do not change substantially. Analyses on CTE participants and concentrators use data from 2008 to the last year of available data in 2023. For all analyses using the first treatment group (i.e., states that adopted tiered CTE funding weights), we further exclude three states (Florida, Georgia, and Kansas) because these states increased overall funding weights for CTE students during the period of analysis but did not alter funding weights to account for labor force demands. No other states were excluded from analyses using the second treatment group (i.e., states that adopted an industry-credential incentive program).

We use a modified version of the two-stage difference-in-differences estimator to explore dynamic treatment effects using an event study approach. In the first stage, we estimate the following equation:

$$Y_{gpit} = \lambda_g + \gamma_p + \boldsymbol{X_{gpit}} + \epsilon_{gpit} \quad (1)$$

Where *Y* indicates my outcomes of interest, *g* represents the set of treatment groups $g \in \{0, 1, \ldots, G\}$, *p* represents the set of treatment periods $p \in \{0, 1, \ldots, P\}$, *i* indexes the states, and *t* indexes the years in this analysis. In preferred specifications, we include a vector of time-varying, state-level covariates $\boldsymbol{X}$. We then residualize the outcome from this estimation by removing the estimated, endogenous fixed effects:

$$\hat{Y}_{gpit} = Y_{gpit} - \hat{\lambda}_g - \hat{\gamma}_p \quad (2)$$

In the second stage of this procedure, we use the residualized outcome variable to estimate static and dynamic average treatment on the treated (ATT) effects:

$$\hat{Y}_{gpit} = \sum_{r=-R}^{P} \beta_r D_{rgp} + u_{gpit} \quad (3)$$

Where *D* is an indicator for whether the state adopted a policy change in treatment period *r*, a variable centered at the first treatment period that indicates the number of time periods preceding and following the first treatment period. To avoid overweighting unbalanced post-policy adoption periods, we trim results to only show findings for the shortest treatment period (i.e., four years for analyses of impacts on CTE participants and concentrators and one year for impacts on state vocational funding).

Results

Among the states that adopted an industry-recognized credential incentive program, we find no statistically significant evidence of any changes in the outcomes of interest following

policy adoption (Table 2). As seen in each panel of Figure 1, we observe no clear patterns in outcomes in the four years following policy adoption. There is suggestive evidence of increased levels of state vocational funding and CTE concentrators and a decreased level of CTE participants immediately following policy adoption. Beyond two years after policy adoption, levels of CTE participants remain higher than the year prior to policy adoption. However, results in all years are too imprecise to rule out no policy effect.

In our analysis of states that adopted changes to CTE funding weights, we also do not find statistically significant evidence of changes in the outcomes of interest following policy adoption (Table 2). As seen in Figure 2, point estimates suggest slightly (but not statistically different from zero) increased levels of state vocational funding and secondary-level CTE participants in the initial years following policy adoption followed by lowered levels three years after adoption and inconsistent impacts on the number of secondary-level CTE concentrators across all years. Again, all results are too imprecise to rule out null effects.

Discussion

The results of our analysis warrant further exploration. The lack of a detectable impact on state-level funding for CTE raises questions as to whether these policy changes are being implemented as intended and how the distribution of funds for CTE changes across districts following policy adoption. It remains to be seen if impacts are different in later years as more years of financial data become available. However, the limited evidence from these analyses regarding policy impacts on CTE participants and concentrators may actually be a function of how these policy changes are related to overall changes in the distribution of funds. While the lack of a detectable change in CTE participants following the adoption of a targeted CTE funding scheme or a credential incentive policy may suggest that either change was inadequate

for inducing students to participate, it is unclear whether these null results are instead simply masking underlying heterogeneity in impacts across districts in the state.

Similarly, the lack of a detectable effect on the number of concentrators is unexpected. Both policy incentive types reward all districts for increasing student participation in advanced CTE coursework, which would suggest an increase in the number of concentrators across the state. However, this null finding may be the result of an increase in the number of concentrators "cancelling out" if these policies encourage students to shift out of one area of study and into another. For example, in states that adopt funding tiers based on industry demand, districts may find that providing high-level coursework in a few program areas is more costly or challenging than offering a variety of low-level courses in high-demand areas. Similarly, a wide variety of introductory-level industry certifications may be less burdensome for districts to administer than advanced programs of study that lead to fewer credentials. Further analysis of specific program areas is needed to understand these outcomes.

Limitations of Current Data

A number of limitations from this analysis arise due to data constraints. As mentioned above, several states do not report detailed data on district-level revenues from state funding for vocational education programs to the F-33. As a result, these states are excluded from those analyses leaving an incomplete picture of how funding policy changes result in changes to the level and overall distribution of state funds for CTE. Furthermore, F-33 data are released several years after initial collection making it difficult to analyze the impacts of fairly recent policy changes.

In this analysis, we are restricted to the policy adoption period of 2010-23 due to when OCTAE began reporting data on CTE enrollments across states. Notably, available data are

noisy due to changes in how states report data to OCTAE and issues in the consistency across states and time in the definitions used to collect data. Beginning in 2011-12, all states received technical assistance from OCTAE to develop accountability systems and address data systems issues (U.S. Department of Education, 2015). However, between the passage of Perkins IV in 2006 and the 2011-12 reporting period, only some states received such assistance, which contributed to wide variation in how states collected data on and reported student participation in CTE. In 2019-20, states began reporting CTE enrollment data under new definitions of participants and concentrators established by Perkins V. While some state-level definitions used to report data were already aligned with these changes, other states altered their reporting to meet these definitional changes. This change means that some states' data on participants and concentrators reported after 2019-20 are not necessarily comparable to previous years of data. Unfortunately, this change also coincided with the onset of the COVID-19 pandemic making it difficult to disentangle the impacts of more recent policy changes adopted during this time from the impact of the pandemic.

Summary

States are increasingly adopting changes to K-12 funding systems in order to promote and encourage student engagement in secondary-level CTE. However, little is known regarding whether and how these changes induce higher levels of meaningful and useful CTE engagement. This analysis explores the impact of two types of funding policy changes and contributes to the growing literature on secondary-level career and technical education. Using the novel two-stage difference-in-differences estimator to explore impacts of state-level CTE funding policy strategies improves our understanding of how funding changes may or may not induce intended changes in CTE participation and labor force outcomes.

Despite policies designed to provide more financial support in CTE under specified incentives, we identify no meaningful or discernable impact on district revenues for vocational education from state sources after the adoption of tiered funding weights or the adoption of a credential incentive policy. We also do not find consistent evidence of a change in CTE participants or concentrators following adoption of either policy type. While it is possible that these policies are changing the composition of who is participating, the net effect does not appear to have impacted financial outcomes in the medium term. Further research using detailed state administrative and financial data is needed to provide deeper insight into the differential impacts on participation across CTE program areas as well as short-term labor market impacts of policy changes.

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Table 1. State CTE funding policy changes

State	Summary of policy change	Year adopted	Number
Arizona	Provides $1,000 awards to CTE departments in school districts, charter schools, and career and technical education districts for each high school student who completes a CTE program and graduates from high school with a qualifying credential, certificate, or license.	2019	H.B.2749
Arkansas	Establishes a tiered funding system for full-time students at vocational centers. Funding tiers are tied to fields of study in high-demand areas. The funding system must be approved by the career education and workforce development board.	2019	S.B. 135
Colorado	Provides $1,000 bonuses to school districts for each high school student who either earns an industry certification related to an in-demand occupation, finishes a rigorous workplace training program linked to industry need, or successfully completes a computer science AP course.	2016	H.B.1289
Florida	Provides bonuses of $25-$50 to the instructors of each student who attains an industry-recognized certification. Total bonuses are capped at $2,000.	2013	S.B.1076
Florida	Increases funding weight for students who earn certain industry certifications.	2014	S.B.14-850
Georgia	Increases funding weight for students participating in CTE from 1.1847 FTE to 1.1916 FTE.	2013	H.B.13-283
Indiana	Changes the funding structure for CTE students from a flat amount to a system that grants reimbursement per credit hour with amounts that increase with the degree of demand and the average wage level for a field. Provides additional per pupil reimbursement based on the level/type of the course the student was enrolled in (foundational, introductory, apprenticeship, etc.)	2014	H.B.14-1001
Kansas	Provides $1,000 awards to school districts for each high school graduate who obtains an industry-recognized credential within six months of graduating.	2013	S.B.128
Kansas	Codifies the weight for students participating in CTE by 50 percent.	2017	S.B.17-19
Mississippi	Provides school districts with a career and technical education incentive grant of $600 per student for each student who earns a qualifying industry certification.	2019	S.B.2447

Table 1. ***(cont.)***

State	Summary of policy change	Year adopted	Number
North Carolina	Provides bonuses of $25-$50 to the instructors of each student who attains an industry-recognized credential. Amount of bonus depends on the rigor and employment value of the credential. Total bonuses are capped at $2,000.	2016	H.1030
Ohio	Establishes funding tiers for CTE reimbursements based on industry demand for CTE career clusters with higher funding amounts allocated to fields with higher workforce demand.	2013	N/A
Oregon	Restructures CTE reimbursements to align with workforce demand. Higher reimbursement amounts are allocated for students who participate in courses that are aligned with high-demand, high-wage occupations receive and students who receive an industry credential.	2015	H.B.15-3072
Texas	Establishes CTE funding weight tiers based on the level of the course and whether the course is part of a state-approved program. Weights range from 0.1 to 0.47 FTE.	2019	H.B.3
Washington	Provides $1,000 awards to school districts for each high school graduate who completes an industry-recognized certification program in a designated employment shortage area.	2013	A.B.64

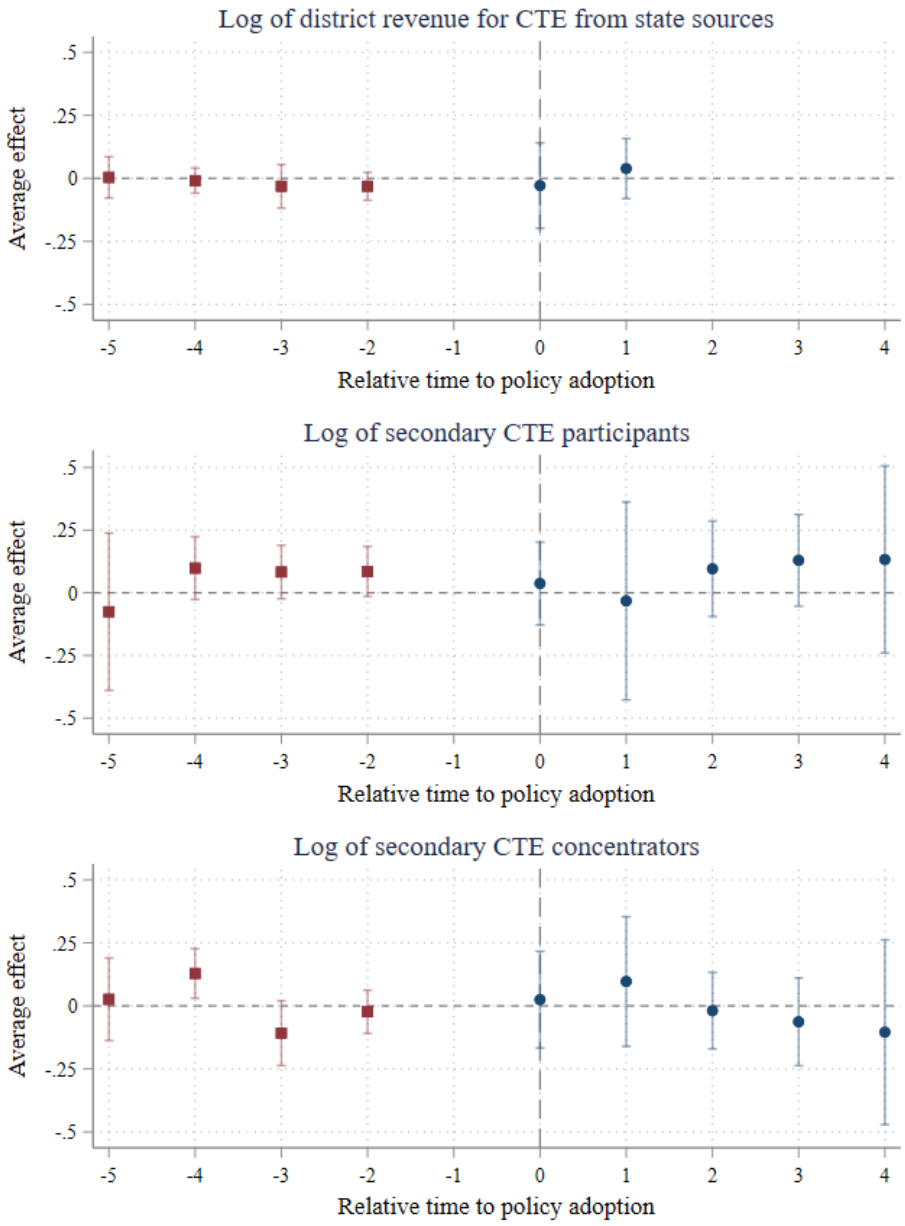
Table 2. Difference in outcomes between treated and untreated states following policy adoption

	ATT Estimate	Standard Error
A. Tiered Funding Weight		
CTE participants	0.022	(0.081)
CTE concentrators	-0.040	(0.126)
State funding for vocational programs	0.081	(0.074)
B. Credential Incentive Policy		
CTE participants	0.053	(0.103)
CTE concentrators	-0.002	(0.082)
State funding for vocational programs	0.009	(0.056)

Note: Point estimates represent the static ATT estimated using Gardner's (2021) two-stage, difference-in-differences estimator averaged across the shortest observed treatment duration (i.e., 5 years post policy adoption). Panel A represents outcomes for states that adopted a tiered CTE funding weight model and Panel B represents outcomes for states that adopted an industry-recognized credential incentive policy. Models include controls for the log of the total number of secondary-level public school students in the state. Standard errors are clustered at the state level.

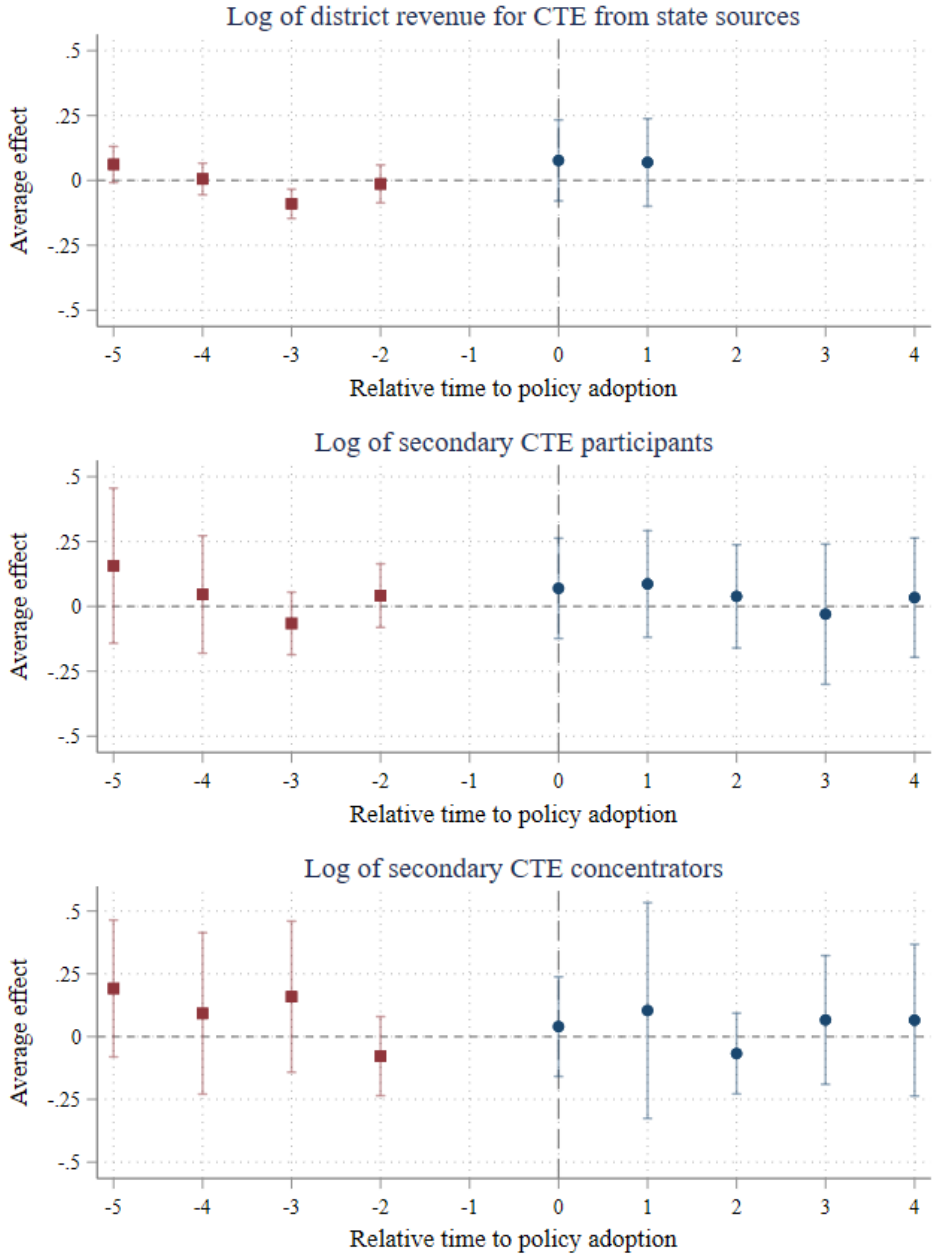
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Figure 1. Difference in outcomes after adopting industry-recognized credential incentive program



Note: Point estimates represent the dynamic ATT estimated using Gardner's (2021) two-stage, difference-in-differences estimator. Each panel corresponds to differences in the average of the log of regular public school district revenues for vocational or technical programs from state sources, the log of total secondary-level CTE participants, and the log of total secondary CTE concentrators. Models include controls for the log of the total number of secondary-level public school students in the state. Standard errors are clustered at the state level. Bars represent the 95% confidence interval. Estimates and figures generated using the *did2s* and *event_plot* Stata packages developed by Butts (2021) and Borusyak (2021).

Figure 2. Difference in outcomes after adopting tiered funding weights for CTE students



Note: Point estimates represent the dynamic ATT estimated using Gardner's (2021) two-stage, difference-in-differences estimator. Each panel corresponds to differences in the average of the log of regular public school district revenues for vocational or technical programs from state sources, the log of total secondary-level CTE participants, and the log of total secondary CTE concentrators. Models include controls for the log of the total number of secondary-level public school students in the state. Standard errors are clustered at the state level. Bars represent the 95% confidence interval. Estimates and figures generated using the *did2s* and *event_plot* Stata packages developed by Butts (2021) and Borusyak (2021).