The Dropout Effects of Career Pathways: Evidence from California

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Abstract

Contemporary Career and Technical Education (CTE) models have shifted from isolated courses to sequences of study that integrate academics and skills in high-demand sectors. Providing career pathways to high school students may reduce asymmetries about the available careers and strategies for attaining them but they may also catalyze students' intrinsic motivation by shifting their understanding of their social role and capacity for success. In this study, I estimate the effects of an ambitious $500 million effort to encourage the formation of career pathways in California. Funding supported the formation of tripartite partnerships between K-12 school districts, employers and community colleges to develop career pathway curricula (i.e., articulated course sequences) in high-demand occupations and sectors. I provide causal estimates of implementing this multifaceted intervention by leveraging a natural experiment that occurs at the margin of grant receipt. Using Regression Discontinuity (RD) designs, I provide evidence on the most proximate mechanism, increased CTE spending. Per pupil CTE expenditures increased by 21.7 percent for grant recipients at the assignment threshold relative to the CTE spending of unsuccessful applicants. Furthermore, dropout rates declined by 23 percent in treatment districts but were more pronounced for females than males.

1. Introduction

The economic and social consequences of failing to obtain a high school diploma are stark. The limited job prospects and low wages of drop outs led Cullen and coauthors (2013) to label dropping out of high school an "economic death sentence" (p.134). Outside of the labor market, dropouts are incarcerated at greater rates and experience a host of poorer health and social outcomes (Pettit & Western 2004; Cutler & Lleras-Muney 2006; Rumberger & Rotermund 2012). High school graduation rates have stagnated since the 1970's and gaps persist for blacks, Latinos and males (Heckman & LaFontaine, 2010; Murnane, 2013). Despite the reality of only 36 percent of young adults obtaining a bachelor's degree, the majority of high schools in the United States focus on a college preparatory curriculum (Snyder & Dillow 2012; McFarland et al. 2017). This stylized fact coupled with others (e.g., increasingly dynamic workforce needs, the rising costs of attending college, and the challenges to college completion) have fueled a renewed interest in new models of Career and Technical Education (CTE) programs for high school students.

This new generation of CTE models has shifted from isolated courses to sequences of study that integrate academic learning and skill-building in specific career areas (Holzer et al. 2013). Three features distinguish these models from previous vocational programs: aligned career pathways; integration of academics and career preparation; and training in practical technical and employability skills (Holzer et al. 2013; Dougherty & Lombardi 2016). Proponents argue that coupling career preparation and training with a college preparatory curriculum is a dramatically underutilized approach that can meaningfully reduce social inequality by providing salient employment skills in high school that link to postsecondary degree and training programs (Cullen et al. 2013; Holzer et al. 2013; Dougherty, 2018).

Recent studies on new CTE models find promising results in terms of improved high school completion, yet these studies focus on a small number of schools that require an application, specialize in CTE, and are highly-resourced (see Kemple 2008, Doughtery 2018 and Hemelt at al. 2019). Given their small scale, select-student population, and unique set of resources, these studies of CTE impact are useful proof of concepts but may not generalize to the broader population. Furthermore, prior descriptive work on CTE course taking has documented positive student selection into career pathways suggesting that Ordinary Least Squares (OLS) estimates will produce biased estimates of CTE participation (Dougherty 2016, Kreisman & Stange 2017). This study leverages a natural experiment that allows me to recover causal estimates in an at-scale policy environment using data from over 800 school districts in California.

This study examines an innovative statewide competitive grant program, the California Career Pathways Trust (CCPT) that awarded funds to districts partnering with community colleges and local businesses to form articulated career pathways in high-growth sectors. The selection committee used a detailed rubric to rate applicants and a pre-specified threshold based on applicants' plans and their capacity to implement career pathways. Using Regression Discontinuity (RD) designs, I show that at the margin, the applicants who score just above and just below the threshold are indistinguishable based on their baseline characteristics and dropout rates. This study design is unique in that it examines an at-scale implementation of a policy that supported districts in partnering with postsecondary institutions and employers to create career pathway programs for high school students that were aligned to regional labor market needs.

This study focuses on two important outcomes. First, I examine the effect of grant receipt on overall CTE spending. Successful applicants increased their per pupil district spending on

CTE by nearly 100 percent of the grant amount. This finding is consistent with extant literature in public policy of local governments using the proceeds of lump sum grants for their intended purpose (i.e., a flypaper effect). Second, I examine the most salient outcome for an intervention aimed at increasing the career readiness and labor market outcomes for high school students, dropout rates[1]. While dropout rates are a short-term outcome they are strongly correlated with longer-term outcomes. For example, of the 11.5 percent of students in the High School Longitudinal Study (HSLS:09) who experience at least one event dropout, only 36 percent received a high school diploma 4 years later and just 45 percent graduated 6 years.[2] The substantial 23 percent reduction in dropout was driven by reductions for female students and may have been mediated by district choices to provide pathways in traditionally female dominated sectors (e.g., health care).

This study is organized as follows: in section 2, I describe the CCPT grant program, the plans of the applicants and characterize grant implementation. In section 3, I discuss the theoretical considerations for career pathways and the prior literature in this area. In section 4, I describe the data; and in section 5, I describe the RD estimation strategy. I present my results in section 6 and conclude in section 7.

[1] I also examine student test score outcomes but privilege the dropout rates in this study because the reduction in dropout implies that the testing population is endogenous. A reduction in the dropout rate suggests that marginal students remain enrolled in high school, potentially lowering the average ability of tested students in treatment schools. However, I find no evidence suggesting there was a change in average test scores at the assignment threshold. Test score results are available upon request from the author.

[2] These statistics were computed by NCES QuickStats using the variables X3EVERDROP and X3HSCOMPSTAT for the 4-year high school graduation rate and X3EVERDROP and X4HSCOMPSTAT for the 6-year high school graduation rate. These figures do not include GED/High School Equivalency completers. Source: U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS:09).

2. California Career Pathways Trust

2.1. CCPT Treatment Overview

The CCPT competitive grant program was establish by the California Legislature in 2014 to provide up to 500 million dollars in start-up funding to help K-12 school districts, community colleges and employers build partnerships to create and expand career pathway programs. This innovative program's defining feature is the way it interlaced additional funds for career pathway curriculum development and the purchase of new equipment with requirements to develop tripartite partnerships (i.e., between school districts, community colleges and businesses) to support the implementation of these pathways.

The CCPT treatment is particularly interesting because it relied on workforce development experts to design the program. CDE contracted with workforce development experts to create an application and rubric to help applicants identify region-specific high-growth occupations and create career pathways for those occupations. Each application was scored by multiple experts from statewide agencies and funds were awarded to partnerships with the highest rated plans.[3] Specifically, the application required partnerships to propose a multi-year sequence of curriculum beginning in high school that aligned to offerings at the postsecondary partner institutions. Furthermore, applicants were expected to partner with local businesses to provide high school students with internships and apprenticeships (i.e., work-based learning) related to the career pathways.

The structure of the CCPT grant disbursement was interesting for two reasons. First, the short-term nature (i.e., funding for three years) provided initial start-up funding that would also require recipients to supplement with existing CTE funding streams (i.e., other local, state and

[3] The details of the rating system and analytic strategy are discussed in further detail in Section 5.1.

federal sources). This structure may have incentivized partnerships that were in the early stages or assisted existing partnerships in expanding initial plans. Secondly, the grant funds were front-loaded with 50 percent of grant funds dispersed in the first year, 35 percent in year two and the remaining in year three. The grant structure recognized that applicants needed significant funding at the outset to plan and develop pathways. Applicants were required to provide a four-year budget that documented additional CTE revenues across the grant years. Although there was a maintenance of effort requirement and grant recipients were required to document how they used grant funds these types of requirements tend to have little enforcement by state agencies. Grant recipients were required to document their use of awarded funds by reporting enrollment in career pathways and tracking grant spending in publicly available district financial summaries.

The CCPT grant design and implementation focused on providing access to and supports for a range of districts. CDE provided guidance to potential applicants through workshops, webinars and by contracting a non-profit agency to provide technical assistance. CDE officials hosted four full-day application workshops in the four major regions of the state as well as two online webinars to provide an overview of the application and answer applicant questions. Additionally, the applicants could apply for three different tiers of grants (i.e., in the amount of 600,000, 6 million or 15 million dollars) to account for the range in school district sizes across urban and rural areas. Individual school districts were also able to form multiple partnerships although agencies could only serve as the fiscal agent (i.e., lead agency) for one grant application. To facilitate partnerships of interested entities the CDE required interested applicants to submit a Letter of Intent (LOI) two months prior to the application due date. A list of entities submitting LOIs was posted publicly on the CDE website and all fiscal agents were required to submit an LOI to be considered for a CCPT grant.

2.2. CCPT Application

A hallmark of the CCPT application was its prescriptive nature that prompted applicants to incorporate labor market data to support their design choices. The application guided applicants in developing CCPT career pathways with multi-course sequences for high school students that aligned with courses of study at postsecondary partner institutions leading to industry recognized credentials or certificates.[4] The CDE contracted with a national policy advocacy organization, Jobs for the Future (JFF) to design the application and rubric for rating applicant plans.[5] Furthermore, the state and JFF hosted in-person and online webinars to aid applicants with the planning process. The strong level of guidance and resources provided to applicants in the design-phase may have played a key role in implementation fidelity.

Applicants were required to use data from the Bureau of Labor Statistics (BLS) and other government sources to identify high-growth industries and high-wage careers in their region to create vertically-aligned pathways. The application provided links to federal and state data sources that provide occupational growth projections by region which include detailed occupation names, their base employment levels, projected number of new openings, median wages and required education level. The application rubric awarded full points to applicants that use data to identify career pathways in these high-growth or emerging sectors that lead to jobs paying high wages.[6] Health Sciences and Information Communication Technology (ICT) were the two career clusters listed most frequently by applicants that show above average job growth

[4] These Programs of Study (PoS) are codified in federal Perkins IV 2006 legislation and are managed by the Office of Career, Technical, and Adult Education (OCTAE) and the National Association for State Directors of Career Technical Education Consortium (NASDCTEc).

[5] The contents of the CCPT rubric are available in Appendix Table 6. The full Request for Application (RFA) is available from https://www.cde.ca.gov/fg/fo/r17/ccpt1rfa.asp

[6] High wage jobs are those that pay at least 25 percent more than the median wage in a particular region. High-growth jobs are those with growth at least 25 percent higher than average job growth in a region and having at least 1,000 total projected openings.

in many occupations. For example, home health aides, physical therapists, phlebotomists all have 10-year growth projects of 20 percent or higher while software developers, network architects and computer support specialists will experience job growth above the median predicted job growth of 10 percent.[7]

One important feature of the application requirement was a form that detailed the planned Program of Study (PoS) by grade level from high school to college. Several features of the PoS are noteworthy. First, applicants listed both CTE and academic coursework in secondary school (i.e., grades 9 through 12) in addition to courses that could be taken at the partner postsecondary institution. Secondly, the PoS had space for applicants to write the specific occupations and median wage levels students would be prepared for if they exited the pathway after high school. For example, in an application for a PoS in health care administrative services the applicant identified a four-course sequence including Medical Core, Medical Careers 1 and 2, and a Nursing Assistant (CNA) training to be taken during high school in addition to traditional college preparatory coursework. The applicant identified the medical record technician and medical transcriptionists occupations as only requiring a high school diploma with median hourly earnings of 18 dollars per hour. The career pathway would continue at the local community college resulting in a Health Information Technology certificate that includes coursework in medical terminology, health care data analysis and medical quality management etc. This certificate qualifies applicants to work as health information managers/specialists resulting in hourly wages of 30 to 36 dollars. The design of the application emphasized preparing students to enter the workforce at multiple entry points (i.e., after high school, certificate, associates or

[7] Labor market employment projections obtained from the California Occupational Employment Projections 2016-2026 from https://www.labormarketinfo.edd.ca.gov/data/employment-projections.html

bachelor's degree) and to coordinate secondary offerings with those of their postsecondary partners. The application process itself may have aided school districts in understanding the local labor market through detailed growth projection data as well as informing districts of the curriculum necessary for occupations that do not require a bachelor's degree.

The CCPT application process guided interested districts in a planning process to identify high-growth sectors in their region and provided support in choosing career pathways to align with this growth. Applicants were expected to build on existing CTE offerings and match grant dollars with existing district funds. This competitive grant process incentivized local school districts to transform their existing CTE programs to models advocates believe can transform student outcomes. In the next section, I discuss the implementation of these new pathways.

2.3. Implementation Evidence

Implementation evidence from CCPT grantees comes from several sources: a legislative report commissioned by the legislature in the original bill securing the programs passage; a 2-year implementation study of grant winners by researchers affiliated with the agency charged with providing technical assistance to grant winners and my own analysis of CCPT grantees applications. Together, these sources illuminate the lived experience of CCPT grantees and uncover how the design features of the application process resulted in a particular focus on health support occupations traditionally dominated by females.

The legislative report provides useful information on how the grant winners utilized CCPT funding. The authors reviewed financial and enrollment data provided by grant winners; surveyed site-leads and utilized state administrative data on student outcomes. The report finds that a majority of funds were used to develop sequenced curriculum (35 percent) and to align those pathways with postsecondary partner institutions (24 percent) (California Department of

Education, 2017). An additional 16 percent of grant dollars were spent on hiring specialists to create Work Based Learning (WBL) opportunities that connect CTE pathway curriculum with local business partners. The most common pathway implemented by grant winners was in the sector of Health Sciences and Medicine with a total of 49 pathways. Other popular industries included Information Communication Technology (ICT); engineering manufacturing and design.[8] The report notes that student enrollment in Health Sciences and Medicine pathways was nearly twice as large as the second most popular pathway industry sector in information technology (i.e., 19,690 students versus 10,201). The CDE also surveyed grantee project leads on their career pathway configurations and found 90 percent offered a CTE course sequence, 53 percent offered WBL opportunities and 40 percent of sites had programs of study affiliated with their postsecondary partners (CDE, 2017). This report suggests that grantees utilized the funding as intended and that the focus on the grant funding went to re-designing high school course curriculum.

The lead organization in charge of providing technical assistance during the application process also conducted an implementation study of Cohort 1 applicants over two years. Jobs for the Future (JFF) is a national non-profit that advocates for programs and policies to increase college and career readiness and workforce outcomes of underserved populations. Researchers attended four convening's for CCPT grantees, conducted a document review and interviewed representatives from 20 grantee sites. The researchers also conducted multiday site visits at three grantee sites that received 15 million-dollar grants. The report finds that grantees spent their funds on professional development to create and align career pathways, purchased equipment to

[8] In Appendix Table 1, the proportion of applicants proposing each pathway are listed. Health Sciences was proposed by 53 percent of applicants whereas ICT were proposed by 41 percent of applicants. I find no discontinuities in the sectors of pathways proposed at the assignment threshold.

maintain or expand CTE programs and to coordinate across partnership sites (McLaughlin et al. 2017). The report notes that grant recipients focused on training staff to implement these new models of CTE through recognized professional training programs (e.g., Project Lead the Way, Linked Learning models). The findings at the selected sites suggests that the CCPT grant was used as "start-up" funding to train staff, develop plans and launch new pathways.

The report authors also uncovered several noteworthy implementation challenges facing cohort 1 grantees. First, site-coordinators noted that lack of buy-in from district leadership and school boards had been a previous barrier to implementing and extending the reach of career pathways. The coordinators reported that grant dollars and grantee status (i.e., winning a competition) elevated the status of CTE programs for district policymakers. The significant infusion of dollars "legitimized" career pathways as a high school reform approach to address college and career readiness (p. 10, McLaughlin et al. 2017). Second, grantees struggled to find intermediary organizations to facilitate relationships with postsecondary and business partners. Many of the site coordinators in the first cohort were still looking for assistance in establishing work-based learning opportunities, scheduling guest speakers and finding internships for students in the second year of the program (McLaughlin et al. 2017). Finally, coordinators reported difficulty finding qualified staff to implement data systems to track students served by pathways and their outcomes. In summary, many Cohort 1 grantees report that CCPT funding allowed them to make progress in implementing the career pathway model by lowering political barriers but lack of qualified staff resulted in delayed rollout of crucial aspects of the program.

To supplement the available information on CCPT implementation I conducted a document review of the original CCPT applications. Two important findings result from this review. First, the short time line between the grant competition announcement and due date for

letters of interest and first round applications may have resulted in more implementation challenges for the first cohort. Cohort 1 applicants had three weeks to submit their LOI's from the competition announcement and another 6 weeks to devise a plan and submit it to the scoring agency. The announcement of the second round of competition was 13 months before the due date.[9] In addition to the compressed timeline faced by Cohort 1 applicants, the CCPT application underwent some revisions.[10] The updated application in 2015 required second round applicants to provide more specific information about the targeted pathway sectors including the roles and responsibilities of each partner schools, districts and businesses participating in a pathway.

Furthermore, Cohort 2 applicants submitted three additional forms related to the design of pathways compared to Cohort 1 that required additional information on pathway plans. The differences in the timeline for planning and implementation in addition to changes to the application materials suggest that Cohort 2 had more planning time and improved technical assistance from CDE staff (i.e., application support and materials etc.).[11] Given these implementation details, I privilege estimates that examine the effects chronologically (i.e., by school year) rather than from time from grant application.[12]

In summary, the implementation evidence suggests that CCPT grantees used the funding as intended. The surveys and interviews conducted during the first two years of the grant suggest that most grant dollars were used to support pathway creation at high schools. This is noteworthy

[9] There was also a 3 month lag between the submission of the LOIs and the application due date for the second cohort. This may have allowed additional districts to find partners who were interested in applying for CCPT.
[10] Personal communication with CDE staff on December 9, 2015.
[11] CDE contracted with an agency to provide technical assistance to both CCPT applicant cohorts and the agency may also have improved their ability to provide technical assistance over time.
[12] In Appendix Table 2, I provide estimates of the treatment effect using a chronological and dynamic treatment effect approaches. The results support the implementation evidence that Cohort 2 experienced more immediate treatment effects while Cohort 1 effects appear after the first two full years of implementation.

because I examine outcomes measured at the high school level. Furthermore, the implementation evidence for Cohort 1, the first year of the grant was a planning year, consisting of professional development, curriculum development and the purchase of equipment to grow and sustain career pathways in the targeted areas. Another important takeaway comes from the design: applicants were instructed to focus on high-growth sectors and they accordingly focused on careers in the health care industry. Entry level positions in health care support occupations (e.g., medical assistants, certified nursing assistants etc.) are staffed by predominantly female workers. For example, 87 percent of workers in healthcare support occupations identified as woman in 2017.[13] This focus suggests that female students may be particularly drawn to the pathways offered by CCPT grant recipients.

3. Theoretical Considerations and Prior Literature

The empirical literature on the effect of career preparation and training suggests that participation in CTE are associated with consequential, though not transformative, improvements in student outcomes. Previous research has documented a correlation between participation in vocational coursework and increased wages and labor participation rates (Mane 1999; Bishop & Mane 2004; Meer 2007; Kreisman & Stange 2017). However, research on older models of CTE also note that students positively select into vocational courses (Meer 2007; Kreisman & Stange 2017). A defining argument for the career pathway approach is increased student engagement and completion because students are able to make a connection between academics and their future work prospects. Yet the evidence on increases in educational attainment related to vocational course-taking is mixed (Agodini & Deke 2004; Cellini, 2006; Neumark & Rothstein

[13] Retrieved from Table 11. Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity. Household Data Annual Averages, Department of Bureau of Labor Statistics https://www.bls.gov/cps/cpsaat11.htm

2006; Kemple 2008; Dougherty, 2018). This may stem from the inability of previous studies to account for student selection into vocational coursework and heterogeneous capacity across implementing schools and districts. The studies that are able to account for confounding factors find increased on-time high school completion (Dougherty 2018; Hemelt et al. 2019) and longer-run evidence of improved labor market outcomes (Kemple 2008). These three studies, however, represent highly-resourced small-scale implementations of model CTE programming and thus may not generalize when implemented at-scale under varying political and economic conditions.

3.1. Theoretical Mechanisms

A key result of this study shows that the recipients of the CCPT grant increase their spending on CTE programming. The CCPT grant functioned similarly to a lump-sum grant, increasing the overall resources of recipient districts.[14] Economic theory suggests that the provision of a lump-sum grant to a local government will result in a modest increase in spending on the targeted area. A lump-sum grant effectively increases overall income and enables localities to identify other spending priorities for their increased budgets. However, a large body of literature has documented larger increases in spending than would be explained by economic theory, (i.e., the flypaper effect). This well-documented finding that money tends to stick where it is directed includes instances where local spending increases by unity (Hines & Thaler 1995).

The second key result of the paper examines the impact of districts spending additional CTE dollars on student outcomes. Exposure to career training during high school may affect student outcomes through several channels. First, this training can increase students' technical

[14] The CCPT application required applicants to propose a budget that showed maintenance of effort (i.e., no decrease in CTE spending based on prior year spending). However, these requirements are often without teeth and an applicant could, in theory, decrease their CTE spending or slow intended increased in spending as a result of grant receipt.

and soft-skills which can improve their employment prospects and wages. Indeed, previous research has documented a correlation between participation in vocational coursework and increased wages and labor participation rates (Mane, 1999; Bishop & Mane 2004; Meer 2007; Kreisman & Stange 2017). Second, linking classroom learning to the real world may increase student engagement as students are able to make a connection between academics and future work prospects. The evidence on increases in educational attainment related to vocational course-taking, however, is mixed (Agodini & Deke 2004; Neumark & Rothstein 2006; Cellini, 2006; Doughtery, 2018).

This study focuses on the most proximal outcome: persistence in high school. Conditional on an increase in spending, there are three conjectured mechanisms that may influence increased educational attainment. First, CTE pathways may improve outcomes by addressing information asymmetries for students. If students lack information on the types of careers available to them as well as knowledge about the courses necessary to gain entry to those occupations, structured career pathway sequences will serve to better match students with opportunities in the labor market. Second, providing students with career pathways can also function as a behavioral nudge. Schools provide a default choice architecture by institutionalizing guidance counseling thus giving students an inferred recommendation for a set of high school courses (and career choices). Third, career pathways may also increase their sense of belonging and engagement with schooling by reflecting back to students that they are capable of respected middle-class jobs (Benebou & Tirole 2003). As such, participating in career pathways may change how students understand their own capacity, resulting in an increase of effort and improved outcomes.

Career pathways may also simply change the mix of courses students enroll in; time spent in CTE courses results in fewer courses taken in other subject areas. This may result in higher graduation rates along with decreased student learning and/or effort. Nonetheless, these arguments suggest that for students on the margin of graduating, CTE programming has the potential to keep students enrolled in school longer and teach skills valued in the labor market. I now turn to the extant literature on interventions that examine the impact of CTE interventions.

3.2. Relevant Literature

The CCPT call for proposals required partners to develop CTE pathways that are similar to career academies. This model combines academic content with career and technical-skill building within a career theme (e.g., health professions). These models also feature partnerships with local business to provide work-based learning opportunities, job shadowing and mentoring to students (Saunders and Chrisman 2011). The most rigorous evidence on these programs suggests positive effects in terms of educational attainment and evidence on increased wages.

The first evidence on the effects of career pathway programs comes from a randomized evaluation from the mid 1990's of career academies (Kemple and Snipes, 2000; Kemple, 2008). The researchers found that although the intervention did not improve standardized test scores, participants were at lower risk of dropping out of school and more likely to graduate on-time (particularly at schools with greater levels of support). In the long run, Career Academy students' experienced sustained earning gains (averaging 11 percent or $2088 more per year) compared to their counterparts in traditional high schools. The labor market gains were particularly concentrated among young men (a group that has experience earning declines in recent years). This study, however, focused on 9 oversubscribed high schools in primarily urban contexts. Importantly, career academies may be particularly beneficial when students have

access to larger labor markets. Furthermore, these schools, by virtue of being oversubscribed, signal to students and their families that they have unique capacity (i.e., human capital) to provide high-quality services to students.

Two recent studies examine the effect of contemporary career academies on student performance using credibly causal designs. Dougherty (2018) studies the impact of attending three oversubscribed application-based schools in Massachusetts that use a lottery to admit students while Hemelt and colleagues (2019) examine outcomes for attending one career academy high school in North Carolina. Both studies document selection into CTE programs: males, whites and students with lower baseline test scores are more likely to enroll in CTE programs while special education students and English learners are less likely to enroll. In terms of impacts, both studies find increased high school completion using the results of an admissions lottery to simulate a randomized control trial design. These findings have strong internal validity but represent a limited view of the effect of career pathways due to the small-scale and high fidelity nature of the intervention. In this study, I examine the potential of career pathway models to affect change at-scale.

The success of at-scale CTE reforms likely hinges on the fidelity of implementation. As noted by Kemple and Snipes (2000), there was significant heterogeneity in the level of support provided to students at the different Career Academies. Similarly, other evaluations noted the wide range of implementation quality across schools (Guha et al. 2013; Fitzgerald et al 2016). Thus, the ability to bring about meaningful improvements in student outcomes may have less to do with the particular traits of a career pathway program and more to do with institutional capacity to implement a high-quality program.

4. Data and Analytic Sample

4.1. Data Sources

The data come from several sources. First, staff at the CDE provided the original CCPT applications for all applicants as well as the rating score used to determine funding status. The fiscal lead for each application can be a community college, school district, charter school, or county office of education. Most applications contained a list of the names of the secondary and post-secondary institutions and businesses involved in the partnership. I use these lists to locate publicly available data from the CDE and Common Core of Data (CCD) on K-12 public schools and create a data set with district-level characteristics (e.g., race/ethnicity, free/reduced lunch, gender, enrollment etc.) from 2012-13 (i.e., the year prior to grant announcement) to 2016-17. CDE also provides district-level financial data on resources and expenditures in an unaudited form using standardized account code structure (SACS). These data files identify spending on CTE more broadly in addition to identifying specific CCPT related expenditures. Financial data is available from fiscal year 2013 through 2016. Other outcome data from CDE include subgroup level (i.e., by race/ethnicity and sex) information on dropout, truancy, chronic absence, suspension and expulsion counts. Furthermore, I supplement the available district characteristics with county level data from the Bureau of Labor Statistics on labor market conditions (i.e., unemployment, labor participation).

4.2. Sample Construction

There were 230 CCPT applicants across both rounds along with 765 district or county office of education partners, however, I exclude applicants for a variety of reasons. Charter schools for the most part do not report financial data separately to the SACS system nor are they represented in state data on dropouts and other outcome data. I therefore exclude the 27 charter

fiscal lead applicants and their 10 district partners from the analytic sample.[15] Next, I exclude three county offices of education that did not identify any district partners in their application and thus have no outcome data available.[16] I further exclude 53 county offices of education who have no outcome data available but who have partner districts with available data. Finally, 85 additional partners are omitted who lack baseline data on student demographics in the school year before applying for the CCPT grant. This results in a final analytic sample of 814 district entities representing 200 CPPT applications.

The significant proportion of school district applicants is noteworthy because it indicates a high level of interest in CTE programming across the state. Nearly all (i.e., 95 percent) of districts serving high school students applied either as a lead agent or partner in the CCPT grant across both rounds. Of the 68 first round unsuccessful applicants, just over half reapplied in the second round (i.e., 37). Given that applicants can apply across the rounds I use the first application score the applicant receives.[17]

Several factors may explain the high level of interest in the CCPT grant. First, the structure of providing different levels of grant funding (i.e., small, medium and larger grants) addressed the district needs in a state with a significant number of districts in rural locations. Second, applicants were encouraged to focus on their local labor market needs which allowed diverse approaches across the state that did not advantage particular regions more than others. Lastly, the emphasis on forming partnerships may have allowed for relatively under-resourced

[15] Most of the excluded applications were single charter schools or groups of charter schools operated by the same charter management organization.
[16] County offices of education typically oversee specialized schools that serve special populations (i.e., incarcerated youth, hospital or homebound students etc.) and report data on the students they serve. The dropout rates reported are often over 100 percent and represent small populations in comparison to local education agencies.
[17] This approach is akin to how the literature has responded to re-taking exams. The ability to re-take an exam (or in this case re-apply) is endogenous, therefore I use the first application score.

districts to lean on the expertise of community college and school districts.[18] It is likely that together these design features supported robust applicant pools. Furthermore, the high level of participation underscores the widespread interest in CTE programing across a range of districts and speaks to the broader generalizability of these results.

A potential threat to interval validity is that local education agencies and county offices of education who lack financial, demographic or outcome data is endogenous to their CCPT grantee status. It is important to note that missing data only threatens the internal validity of a regression discontinuity design if it discontinuous at the threshold for assigning treatment status. I run auxiliary regressions to test whether any type of missing data is discontinuous at the threshold and find no evidence to support this potential threat.[19]

In Table 1, I present descriptive statistics for this sample of 814 school districts. Just under one half of the sample applied during the first round of CCPT funding and over both rounds over 60 percent received funding. The majority of the grants awarded were at the 6 million dollar and 15 million dollar level with just 5 percent of districts receiving the smaller 600,000 dollar grants. California has just over 1,000 total school districts. However, many school districts serve students in K-8 districts in rural regions and then form regional high school districts to serve high school students across a broader geographic region. Elementary school districts were eligible to apply but in practice few did.[20]

[18] The flexibility allowed applicants to propose diverse solutions. For example, one partnership was statewide and focused on several districts interested in teacher preparation career pathways that geographically spanned the entire state.

[19] These results are available in the Appendix 7.

[20] Of the Elementary school districts included on applications none were listed as a fiscal agent but rather as partners with regional high school districts or regional CTE centers serving multiple school districts. Elementary applicants typically indicated their students would participate in field trips to ROP centers or have speakers from partners at their school sites to inform students about options during high school.

The possible application scores ranged from zero to 200 points though in practice they ranged from 28 to 184.5 points with a mean of 138 points. Prior to the announcement of the CCPT grant, districts spent approximately 226 dollars on CTE-related expenses per high school pupil enrolled in their district in 2013. There were broad increases in spending during the sample period due to increased funding from the state's new Local Control Funding Formula (LCFF). In 2015, the first and second year of CCPT funding for cohorts two and one, respectively, CTE spending per high school pupil increases by approximately 90 percent to 436 dollars per pupil.

During the sample period the school level dropout rate at applicant districts declined from a mean of 2.51 percent of students in 2013 to 1.53 percent in 2017.[21] District enrollment of high school students range in size from just 10 students to over 100,000 with the average district educating just under 8,000 students in traditional high school grades 9 through 12. The mean proportion of students eligible for the free or subsidized lunch is 51.7 percent of students but this ranges from nearly zero to almost all students. The average school district enrolls almost 47 percent Hispanic students with whites averaging 34 percent of enrollment. Asians and blacks represent relatively smaller proportions of the public high school population in California at 8.8 and 4.6 percent, respectively. The truancy rate, defined as a student having three or more unexcused absences of 30 or more minutes in one school year, consists of one-third of high school students. Just over 8 percent of students are suspended in a school year at the average school district.

[21] The school-level dropout rate is an event dropout rate consisting of all dropouts (i.e., numerator) in a particular school year divided by all enrolled students (i.e., denominator).

5. Analytic Strategy

5.1. CCPT Application Scores

Each submitted application was scored using a common detailed rubric. The rating rubric contained seven sections that mirrored the required sections and forms of the CCPT application in each round[22]. Each application was read by three different professionals from CDE, the California Community Colleges Chancellor's Office (CCCCO), or the California Workforce Investment Board (CWIB) and then averaged to arrive at the final score. In cases of large discrepancies between reviewer scores (i.e., more than 20 percent of total point difference) applications were assigned to a fourth reviewer, a manager in the Career and College Transition Division or a consultant. The fourth reviewers score was compared to the initial three scores and the outlying score was removed before averaging three scores[23]. The cut score was based on the lowest amount of points applicants in the "outstanding" category could receive on the rubric (e.g., 140 points in round 1 and 150 points in round 2).

5.2. Identification Strategy

The regression discontinuity approach relies on the assumption that the two groups of applicants, those who scored one point above and below the cut score, are equal in expectation except that one group received a large grant to create career pathways. In other words, in order to provide credibly causal estimates of increased funding for career pathways the only change at the margin of the CCPT grant award status is the probability of grant receipt. The estimation strategy can be described as follows:

[22] The complete rating rubric is available in Appendix Table 6.
[23] After personal communications with CDE I was unable to determine how many applications underwent the fourth reviewer rating process. CDE staff maintained it was "minimal." My investigation of the continuity of baseline characteristics and the density of the rating score does not suggest manipulation.

$$Y_{id} = \beta\, I(CCPT\ Score_i \geq 0) + f(CCPT\ Score_i) + X_d + \boldsymbol{\tau} + \varepsilon_{id} \qquad (1)$$

Here $I(CCPT\ Score_i \geq 0)$ is an indicator for whether the application score was above the minimum specified threshold for the applicant, *i*, and by extension their district partners, *d*. The variable, X_d represents district-level baseline characteristics, $\boldsymbol{\tau}$ represents a vector of fixed effects for cohort and the grant level amount. Finally, ε_{id} represents the error term, which are clustered at the applicant level. The estimand of interest, β represents the change in dropout status at the CCPT assignment threshold controlling for a function of the application score $f(CCPT\ Score_i)$. The preferred model allows for the slopes to vary on either side of the threshold and models a linear relationship between the application score and dropout outcomes. This preferred model is guided by a visual inspection of the data and Akaike's Information Criteria (AIC) (Cook et al. 2015).

The literature on regression discontinuity designs is evolving with regards to the recommended estimation strategy, weighting structure and bandwidth selection. I check a variety of specifications to provide a complete view of the estimated effects in addition to visual inspection of the data to inform our intuition around bandwidth selection and functional form. Following the literature, I estimate local linear regressions using observations in smaller bandwidths successively closer to the CCPT grant assignment threshold (Lee and Lemieux, 2010). I also examine estimates using the bandwidths calculated using the IK method from the procedure introduced by Imbens and Kalyanarman (2012). In this application, the IK bandwidth procedure recommends using less than 20 percent of the full sample. Recent literature from Calonico and colleagues (2014, forthcoming) recommend bias-correction procedures that build on the data-driven bandwidth selections of the IK procedure and similarly, use triangular kernel weights to emphasize the outcomes of observations close to the assignment threshold. In

practice, these procedures produce similar results and I show a range of specifications and bandwidth restrictions to confirm the robustness of the RD results.

The implementation evidence described above suggests that treatment may not have been uniform across the two cohorts. The literature on dynamic treatment effects suggests fitting treatment effects at different points in time (i.e., one year after treatment, two years after treatment etc.) rather than assuming constant effects. In this case, the timing of implementation for both cohorts varied. I estimate both dynamic treatment effects and effects based on calendar year for both cohorts, separately, and in stacked models with fixed effects for application year. I discuss these specification results in section 6 below.

5.3. CCPT Treatment Status

First, I show the first-stage relationship between CCPT grantee status and the assignment variable visually in Figure 1. The first-stage is virtually sharp, the change in probability of treatment status changes from nearly zero to 1 at the assignment threshold. The parametric estimates in Table 2 confirm these findings ranging from 0.98 to 0.99 using quadratic polynomials and controls for application year and grant amount. One district, Los Angeles Unified School District (LAUSD), received a rating score below the threshold but received a CCPT grant. Personal communication with staff at CDE confirmed LAUSD's grantee status and verified their original application score as being below the assignment threshold. I analyze all outcomes using an intent to treat (ITT) analysis based on the original assignment score rather than treatment status itself though these are highly related.[24]

[24] It is noteworthy that LAUSD is the largest district in the state. I confirm the main results by omitting LAUSD entirely and find qualitatively similar results that are available in Appendix Table 5.

The first-stage relationship between the application score and the grant threshold clearly support a discontinuous jump at an arbitrary threshold dictated by CDE staff. Although the rubric was made available to applicants it is unlikely that applicants could manipulate their overall rating score or have known the exact cut off point to determine grant eligibility. The scoring process, however, was not blind and the three raters knew the identity of the fiscal agent and partnering district(s) as the participating entities were explicitly listed and evaluated in the application rating process. It is possible that raters may have had individual preferences. However, the process of having three raters independently rate applications blind to the scores of the other raters limits the possibility that a single rater could have manipulated the assignment variable. Furthermore, the process of engaging a fourth reader for outlier scores suggests score manipulation was unlikely.

The causal warrant of an RD is predicated on the necessary assumption that applicants are unable to manipulate their grantee status. In Figure 2a, I present a histogram of the assignment variable using very small bin widths to examine potential heaping around the threshold. The histogram does not appear to contain heaps or observations concentrated just above or below the assignment threshold. The Cattaneo et al. density test (2017b, 2018) displayed in Figure 2b is also used to test continuity in the assignment variable near the assignment threshold. This density estimator improves upon the McCrary (2008) density test by using a nonparametric approach that does not bin or transform the raw data. Figure 2b clearly demonstrates that there is no statistically significant jump in the density of the CCPT assignment variable at the threshold.

Lastly, I examine the baseline characteristics of applicants in the 2012-13 school year for both rounds of applicants.[25] In Table 3, I present evidence that baseline covariates are continuous at the assignment threshold using a two-stage procedure. In the first stage, I regress the outcome of interest (i.e., dropout rate for the relevant subgroup and year) on a linear function of all the baseline covariates. From this regression one can obtain predicted dropout rates that are an index of baseline characteristics (i.e., predicted dropout rates). This index is thus weighted by the influence of the baseline characteristics on the outcome of interest. I then estimate an auxiliary regression of the index on the assignment variable to check whether the baseline characteristics are discontinuous at the threshold avoiding multiple comparison issues that arise with testing each baseline characteristic separately.[26]

In summary, both the institutional details and empirical evidence support the validity of the RD design for providing credibly causal estimates of CCPT grantee status. There is no evidence of manipulation of the forcing variable or discontinuities in baseline characteristics at the CCPT grant assignment threshold. Given these results supporting the causal warrant of the RD, I now turn to the results.

6. Results

6.1. CTE Expenditures

Increased grant funding should, in theory, either increase the number of career pathway spaces available for students or increase the quality of the program. Although districts are required to match CCPT funds with existing funding and report CCPT-related expenditures as a

[25] I choose 2012-13 because the CCPT call for applications was publicized as a two-round process during the 2013-14 school year and some districts may have intended to apply in the second round and changed their behavior prior to applying for the grant especially with regards to current levels of CTE spending.
[26] To be thorough, I also present the baseline characteristics in separate regressions in Appendix 2.

condition of grant receipt the literature suggests that these requirements are often poorly enforced. To investigate whether districts increased CTE spending in response to grant receipt I examine unaudited school district financial data.

In Table 4, I present parametric estimates for the full analytic sample (i.e., 814 school districts) of the "first-stage" effects of the CCPT application score on two CTE per pupil expenditures. In panel A, the outcome is CTE per pupil expenditures. These estimates show a discontinuous jump in per pupil CTE expenditures of 45 to 164 dollars at the assignment threshold. I visually inspect the data and use the AIC to determine the preferred model, column 3 (i.e., linear splines with baseline controls), which suggest an increase in CTE spending of 65 dollars per pupil. Secondly, I estimate whether there is a discontinuous jump in per pupil CCPT grant funds (Panel B) at the assignment threshold. If the state only provides CCPT dollars to grant winners then mechanically we expect to find that control districts (i.e., unsuccessful CCPT applicants) spend zero CCPT grant dollars while treatment districts report CCPT grant expenditures. Both of these findings are substantiated. Panel B in Table 4 shows a discontinuous jump in spending on the order of 38 to 59 dollars at the assignment threshold. The magnitude of these parametric estimates provides an additional insight. The preferred specification in Panel B indicates that grant winners increased spending by 59 dollars whereas overall CTE per pupil expenditures increased by approximately 64 dollars. These two estimates imply a fly paper effect: treatment districts spent nearly all of the grant dollars on the targeted area.

In Figure 3, I present visual evidence to complement the parametric estimates. The figure depicts an increase in per pupil CTE spending in 2015 at the assignment threshold confirming the parametric estimates in Table 4. These results provide convincing evidence of a fly paper effect for CTE funding, namely that the receiving districts used the majority of CCPT funds for

their stated purpose. Further support for this finding comes from the legislative report, which documented the spending of CCPT grantees and describes how school districts used the additional funding to create new pathways (i.e., curriculum development, purchase of new equipment, teacher training). This report in particular suggests that districts both increased their overall capacity to serve students and invested in increasing the quality of the programming (California Department of Education, 2017). Conditional on this increase in career pathway spending, I now turn to examining the impact on educational attainment.

6.2. Dropout effects

Next, I show graphically in Figure 4, the impact of CCPT grantee status eligibility on dropout rates. Figure 4a shows no impact on 2016 dropout rates. However, in 2017 there is a substantial decrease in dropout rates at the assignment threshold. The parametric estimates in Table 5 confirm the results in the figures for the full analytic sample. The reduction in dropout in 2017 is one-third of a percentage point, an implied dropout reduction of 23 percent (i.e., 0.33/1.4). In Table 6, I show estimates with increasingly tighter bandwidths that confirm the visuals and parametric estimates. The statistically insignificant results from the tightest bandwidths suggested by Calonico et al. (2014) and Imbens and Kalyanaraman (2012) show qualitatively similar findings though these estimates are less precise due to the increase in standard errors of 150 percent. Most importantly, the estimates from alternative bandwidths remain negative implying reductions in dropout that are within the confidence interval of the full sample estimates.

In Table 7, I provide additional estimates for subgroups of students by race/ethnicity and gender for the full analytic sample. The reductions in dropout rate appear to be driven by reductions for females, whites and 11th and 12th grade students. The reduction in dropout rates for

white students is 0.528 percentage points while the reduction is 0.404 percentage points for females. While the reduced dropout rate is smaller in magnitude for Hispanic students the point estimates remain negative implying a benefit for these students. The subgroup estimates for male students, however, are not statistically significant. I also estimate dropout effects by grade level and find statistically insignificant results for 9th and 10th grade students. The reductions for 11th and 12th grade students are 0.368 and 0.561 percentage points respectively.[27] These estimates of treatment heterogeneity raise two important issues. First, female students appear to be more responsive to the CCPT treatment which was characterized by health care career pathways that emphasized careers in female dominated jobs. Second, career pathways had no effect on students at-risk of dropping out of high school early (i.e., 9th and 10th graders). These findings have important implications for the targeting and design of career pathway programing.

The heterogenous impacts in favor of females suggests that identity and motivation are more important than a general asymmetric information explanation. The availability of career pathways in high-growth fields may not promote increased high school engagement or educational attainment for all social groups, particularly if they fail to conform with societal gender expectations. Further, the null impacts for marginal high school students suggests that 9th and 10th grade students at-risk of dropout may not respond to multi-year sequences that require four years of coursework. Most of the career pathway course sequences included traditional courses (e.g., anatomy, medical terminology etc.) in the early grades while practical based

[27] I also estimate all models using Seemingly Unrelated Regressions (SUR) to allow the error structure to correlate across models to directly test whether the differences by grade level, gender or race/ethnicity are statistically significant. The magnitude and statistical significance of the estimates using SUR are qualitatively similar to the effects shown in Table 7. Using the SUR framework, I find that the estimated effects for 11th graders are statistically significantly different than those for 9th graders but find no differences for other grade levels. Finally, I am unable to reject the null hypothesis that the estimates for whites and Hispanics and males and females are the same.

training and courses preparing students for certificates (e.g., phlebotomy etc.) were relegated to students in 11th and 12th grades.

6.3. Robustness Checks

If the dropout effects are in direct response to the receipt of CCPT grant funds and the subsequent creation and expansion of career pathways then we should only find reductions in dropout rates at the CCPT assignment threshold. I follow Lee (2008) who proposed falsification tests at alternate rating score values that have no practical importance. In Appendix Table 3, I present the results of these auxiliary regressions for placebo thresholds of the CCPT grant impact on dropout rates. It is noteworthy that the reduction in dropout rates is only observed at the actual RD threshold and not at the placebo cutoffs, bolstering our confidence in the reduced dropout rate finding.

There may be concerns that the reductions in dropout rates are the result of a compositional change in the student population. These data are measured at the district level so an internal validity threat would surface if stronger students transfer into CCPT districts or weaker students transfer out of treatment districts. One way to assess the presence of inter-district transfers is to estimate auxiliary RD regressions using enrollment. Enrollment in grades 10 and beyond are potentially endogenous to the CCPT treatment therefore I use 9th grade enrollment. There are no changes in the level of 9th grade enrollments at the assignment threshold after awardees receive grant dollars. Inter-district transfer rates provide another indication of the potential internal validity threat. Although the state of California does not track inter-district transfer rates, in Los Angeles Unified, 41 parents requested transfers to other districts in 2015-16, an implied inter-district transfer rate of less than one-thousandth of a percent for the largest district in the state.

Furthermore, other large districts report similarly low inter-district transfer requests.[28] These data suggest that compositional changes in the student population did not drive the reduction in dropout rates I find here.

Finally, in Appendix table 4, I provide estimates and figures that report dynamic treatment effects (i.e., heterogenous treatment effects by cohort and treatment year). The figures and parametric estimates provide a broadly similar picture of treatment effects concentrated 2 and 3-years post-grant receipt and specifically for female students. Furthermore, by estimating the effects separately for cohorts it becomes apparent that dropout reductions are evident for Cohort 2 in year two while Cohort 1 experiences dropout reductions in year three. These results support the hypothesis that the second cohort had more planning time and thus experienced dropout rate reductions sooner than the first cohort (i.e., evidence of heterogenous treatment effects). Stacking the cohorts provides increased statistical precision and confirms the reduction in dropout rates estimating effects by calendar year, when both Cohorts have had time to implement their planned career pathway programming. The dynamic treatment effects are similarly precise when stacked and confirm the dropout findings.

7. Discussion

In this study, I explore a large-scale competitive grant program that supports school districts in creating articulated career pathways linking high school coursework to community college attendance and job prospects. I leverage unique application data to exploit a natural experiment that occurs at the margin of awarding grants to provide credibly causal estimates of the increased availability of career pathways on high school dropout rates. This study provides

[28] Information on the number of parents requesting transfers retrieved from https://edsource.org/2015/parents-miss-out-on-option-to-transfer-out-of-low-ranking-schools/83726

convincing evidence on the first and most proximate mechanism: does a lump-sum grant for CTE career pathways result in an increase in targeted spending? Using district-level spending data, I show that CCPT grant recipients increased their CTE spending after receiving the grant relative to non-grant winners. One prominent argument for providing career training in high schools is that it reduces information asymmetries for students about the available careers and preparation needed to pursuing those careers. However, another mechanism involves catalyzing intrinsic motivation through the provision of school programming that reflects back to students that they are capable of attaining middle-class careers. The RD estimates document a substantial decrease in the dropout rate for all students but these are driven by reductions for female students. These reductions appear to be driven by applicants' choices to implement career pathways in fields that traditionally attract females (i.e., health care etc.). The effectiveness of the career pathway model for females strongly suggests that mediators based on identity and motivation are more salient than an asymmetric information mechanism.

The reduction in high school dropout are consistent with other smaller scale studies of specialized high schools that provide CTE training for students (Brunner et al. 2019, Dougherty 2018; Hemelt et al. 2019, Kemple 2008). Other longer-term evidence on CTE training for high school students finds that graduates from these programs are less likely to enroll in postsecondary institutions (Brunner et al. 2019, Cellini 2004). The explicit partnership between high schools and community colleges through the CCPT program may attenuate the diversion that other studies have found. As the CCPT program matures, there will be an opportunity to examine impacts on the community college partners (i.e., enrollment, certification completion etc.) using the same CCPT application score forcing variable and RD design.

The available implementation information provides compelling insight into how planning time for districts mediates student outcomes. The first cohort had limited time to create their planned reforms while the second cohort were able to plan over a longer period and benefit from the learned experience of the earlier adopters. In contrast, previous studies have found male students to be more likely to self-select into CTE career academies whereas the CCPT design and the programs effects targeted female students (Dougherty 2018; Hemelt et al., 2019). The unique design of the CCPT required applicants to identify high-growth sectors based on available government labor market projects and wage-growth data. The health care sector entry level roles are traditionally dominated by female workers and this intervention may provide schools with an approach for engaging female students in CTE pathways.

Additional research is needed to understand the longer-term impacts of career pathway programs, however the substantial reduction in dropout rates of over 20 percent is striking. This translates to a reduction in one student dropping out for 300 students served at a cost of nearly 18,000 dollars. These calculations assume, however, that benefits of the grant dollars are only realized for the students served during this time period. In reality, the CCPT grant provided start-up funds to develop curriculum for pathways, train staff and purchase equipment. Thus, the cost per student served is an upper bound estimate as the staff and equipment are likely to serve additional students. Notwithstanding, the present discount value of a high school diploma is estimated to be 300,000 dollars (Cullen et al. 2013). Career pathways may be a cost-effective method of increasing students' educational attainment and providing skills valued by the labor market.

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Table 1. Descriptive Characteristics

Variable	Mean	Std. Dev.	Minimum	Maximim
Application Characteristics				
CCPT Grant Recipient (Year 1 or 2)	0.639	0.481	0	1.0
CCPT Score (centered)	3.2	21.65	-83.3	43.3
I(CCPT $Score_i \geq 0$)	0.636	0.481	0	1.0
Round 1 applicant	0.473	0.500	0	1.0
Round 2 applicant	0.527	0.500	0	1.0
600,000 dollar grant	0.055	0.229	0	1.0
6 million dollar grant	0.448	0.498	0	1.0
15 million dollar grant	0.496	0.500	0	1.0
Spending Characteristics				
Per pupil CTE spending, 2013	$226.39	241.73	0	1367.68
Total CTE spending, 2013	$1,987,145	7,226,672	0	56,663,452
Per pupil CTE spending, 2015	$436.36	426.18	0	2624.8
Total CTE spending, 2015	$2,612,019	6,595,140	0	50,523,460
Per pupil CCPT spending, 2015	$51.78	130.01	0	742.54
Total CCPT spending, 2015	$235,389	627,091	0	3,621,278
Outcomes				
Dropout rate, 2016	0.015	0.016	0	0.148
Dropout rate, 2017	0.014	0.015	0	0.151
Baseline Characteristics				
Dropout rate, 2013	0.025	0.02	0	0.097
County unemployment rate	0.099	0.03	0.05	0.245
Enrollment grades 9-12	7,865	20,268	10	159,724
Free/Reduced-Price Lunch	0.517	0.221	0.003	0.996
Asian	0.088	0.109	0	0.643
Black	0.046	0.061	0	0.363
Hispanic	0.466	0.249	0	0.989
White	0.344	0.231	0	0.881
Truancy rate	0.339	0.208	0.04	0.859
Suspension rate	0.083	0.053	0	0.286

NOTES. Abbreviations: CCPT, California Career Pathways Trust. Sample includes 814 school districts with a CCPT assignment variable. Per pupil funding and dropout rates are top coded at 99th percentile. Behavioral, dropout and financial data retrieved from the California Department of Education (CDE) at https://www.cde.ca.gov/ds/dd/. Enrollment and student characteristics retrieved from the Common Core of Data (CCD).

Table 2. First Stage RD Estimates, CCPT Grantee Status

	Dependent Variable: CCPT Grant Recipient (Round 1 or 2)			
	Fuzzy RD			
Independent Variable	(1)	(2)	(3)	(4)
I(CCPT Score$_i$ ≥ 0)	0.987***	0.986***	0.981***	0.981***
	(0.010)	(0.011)	(0.015)	(0.015)
N	814	814	814	814
R^2	0.989	0.990	0.990	0.990
Linear spline	yes	yes	yes	yes
Quadratic spline	no	no	yes	yes
Controls	no	yes	no	yes

NOTES. *** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$ Applicant group clustered standard errors in parentheses. Each column contains a regression of the estimated effect of treatment status on the assignment variable. The controls contain fixed effects for round of application (i.e., in the 2014 or 2015 round) and grant level (i.e., 600,000, 6 million or 15 million dollars).

Table 3. Auxiliary RD Estimates of Baseline Covariate Balance

Dependent variable:	2016 Dropout index		2017 Dropout index	
Sample	(1)	(2)	(3)	(4)
Overall	0.000	0.050	-0.042	-0.036
	(0.087)	(0.113)	(0.091)	(0.122)
Hispanic	-0.070	-0.099	-0.104	-0.178
	(0.095)	(0.118)	(0.101)	(0.138)
White	-0.017	0.025	-0.043	0.004
	(0.100)	(0.133)	(0.096)	(0.125)
Female	-0.032	0.008	-0.034	-0.047
	(0.089)	(0.116)	(0.099)	(0.134)
Male	-0.017	0.023	-0.067	-0.054
	(0.089)	(0.118)	(0.091)	(0.122)
N	814	814	814	814
Linear spline	Yes	Yes	Yes	Yes
Quadratic spline	No	Yes	No	Yes

NOTES. *** $p < .001$ ** $p < .01$ * $p < .05$. Applicant group clustered standard errors in parentheses. Each cell contains the results of a two-stage regression: in the first stage the 2016 or 2017 outcome for the relevant subgroup is regressed on all 2013 baseline covariates (i.e., dropout rate, enrollment, CTE spending, FRPL rates, racial/ethnic enrollment, truancy and susension rates) and a predicted drop out composite is generated. The predicted achievement composite is then regressed on $I(\text{CCPT Score}_i \geq 0)$.

Table 4. Reduced-form RD Estimates for CTE Spending

	Panel A:				
Dependent Variable:	2015 CTE Per Pupil Expenditures				
Independent Variable	(1)	(2)	(3)	(4)	mean
I(CCPT Score$_i$ ≥ 0)	44.84	164.4*	65.61*	119.3**	436.36
	(50.68)	(70.61)	(29.81)	(40.66)	
R^2	0.113	0.154	0.493	0.501	
N	814	814	814	814	
	Panel B:				
Dependent Variable:	2015 CCPT Grant Per Pupil Expenditures				mean
I(CCPT Score$_i$ ≥ 0)	59.40***	54.63***	40.76***	38.77**	51.78
	(9.81)	(14.00)	(9.62)	(13.96)	
R^2	0.155	0.157	0.257	0.260	
N	814	814	814	814	
Linear spline	yes	yes	yes	yes	
Quadratic spline	no	yes	no	yes	
Controls	no	no	yes	yes	

NOTES. *** p < .001 ** p < .01 * p < .05. Applicant group clustered standard errors in parentheses. Each cell contains the result of a separate regression of the effect of I(CCPT Score$_i$ > 0) on Career and Technical Education related per pupul expenditures. Akaike's information criterion (AIC) implied optimal order of polynomial is linear.

Table 5. Reduced-form RD Estimates, Dropout Rate

Dependent Variable:	2016 Dropout Rate		2017 Dropout Rate	
Independent Variable	(1)	(2)	(3)	(4)
I(CCPT Score$_i \geq 0$)	0.0648	0.0456	-0.27	-0.333**
	(0.177)	(0.166)	(0.177)	(0.153)
R^2	0.008	0.6	0.013	0.498
N	814	814	814	814
Baseline controls	no	yes	no	yes

NOTES. *** p < .01 ** p < .05 * p < .1. Applicant group clustered standard errors in parentheses. Each cell contains a regression of the dropout rate on I(CCPT Score$_i \geq 0$), a linear spline of the assignment variable and baseline covariates (See Table 1 for a description of controls). All models condition on a linear spline of the assignment variable given the Akaike's information criterion (AIC) implied optimal order of polynomial is linear. The results are based on dropout rates. For example, in Column 4, the dropout rate reduction was 0.333 percentage points.

Table 6. Reduced-form RD Estimates, Dropout Bandwidth Robustness Checks

Dependent Variable:	2016 Dropout Rate		2017 Dropout Rate	
Sample	(1)	(2)	(3)	(4)
	est.	n	est.	n
Full Sample	**0.0456**	814	**-0.333****	814
	(0.166)		**(0.153)**	
$\|CCPT\ Score_i\| \leq 60$	0.0494	809	-0.337**	809
	(0.173)		(0.161)	
$\|CCPT\ Score_i\| \leq 40$	0.0455	768	-0.397**	768
	(0.213)		(0.197)	
$\|CCPT\ Score_i\| \leq 20$	-0.0308	547	-0.657**	547
	(0.298)		(0.258)	
$\|CCPT\ Score_i\| \leq 10$	-0.755*	284	-0.670	284
	(0.436)		(0.418)	
Kernel Weights	-0.252	601	-0.685**	601
	(0.332)		(0.293)	
CCT Estimates	-0.399	207	-0.567	195
	(0.612)		(0.593)	
IK Estimates	-0.865	150	-1.289**	150
	(0.478)		(0.432)	

NOTES. *** $p < .01$ ** $p < .05$ * $p < .1$. Applicant group clustered standard errors in parentheses. Each cell contains a regression of dropout rates for districts within the specified bandwidth on $I(CCPT\ Score_i \geq 0)$, a linear spline of the assignment variable and baseline covariates. Columns 2 and 4 contain the number of districts in the bandwidth. Kernel weight estimates estimate triangular kernel weights for observations within one standard deviation of the forcing variable. CCT are Calonico, Cattaneo and Titunik (2014) suggested bandwidths with kernel weights. IK are Imbens and Kalyanaraman (2012) suggested bandwidths with kernel weights.

Table 7. Reduced-form RD Estimates by Subgroup

Sample	2016 Dropout Rate			2017 Dropout Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
Subgroup	point est.	point est.	mean	point est.	point est.	mean
Total	**0.065**	**0.046**	**0.015**	**-0.270**	**-0.333****	**0.014**
	(0.177)	**(0.166)**		**(0.177)**	**(0.153)**	
Hispanic	0.0522	0.0579	0.018	-0.201	-0.244*	0.016
	(0.200)	(0.169)		(0.174)	(0.132)	
White	-0.500	-0.498	0.014	-0.666**	-0.528***	0.014
	(0.382)	(0.305)		(0.265)	(0.164)	
Female	-0.007	-0.016	0.012	-0.280*	-0.404***	0.011
	(0.165)	(0.158)		(0.155)	(0.146)	
Male	0.141	0.119	0.018	-0.253	-0.256	0.017
	(0.204)	(0.198)		(0.206)	(0.170)	
Grade Level						
Grade 9	0.0486	0.191	0.005	-0.0630	-0.0187	0.005
	(0.143)	(0.129)		(0.156)	(0.130)	
Grade 10	0.0161	0.0467	0.007	-0.213	-0.125	0.006
	(0.220)	(0.206)		(0.147)	(0.148)	
Grade 11	0.0743	0.00881	0.011	-0.272	-0.368**	0.009
	(0.176)	(0.188)		(0.179)	(0.182)	
Grade 12	0.276	0.260	0.037	-0.401	-0.561*	0.035
	(0.370)	(0.305)		(0.379)	(0.300)	
Baseline controls	no	yes		no	yes	

NOTES. *** $p < .01$ ** $p < .05$ * $p < .1$. Applicant group clustered standard errors in parentheses. Each cell contains the result of a separate regression of I(CCPT $\text{Score}_i \geq 0$) on dropout rates for different subgroups. Columns 3 and 6 contain the dependent variable mean (i.e., overall sample dropout rate). All models condition on a linear spline of the assignment variable. Columns 2 and 4 also condition on the full set of controls from the preferred specification in Table 4. N= 814 school districts for all regressions.

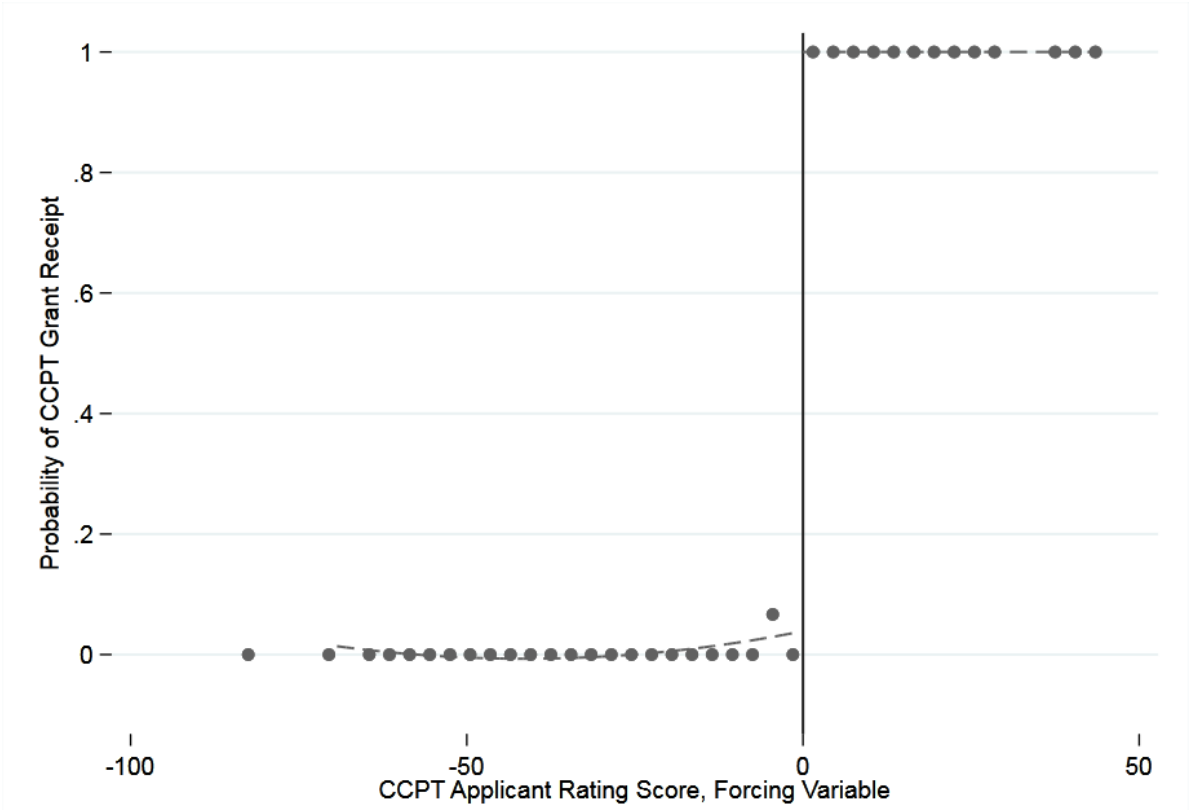
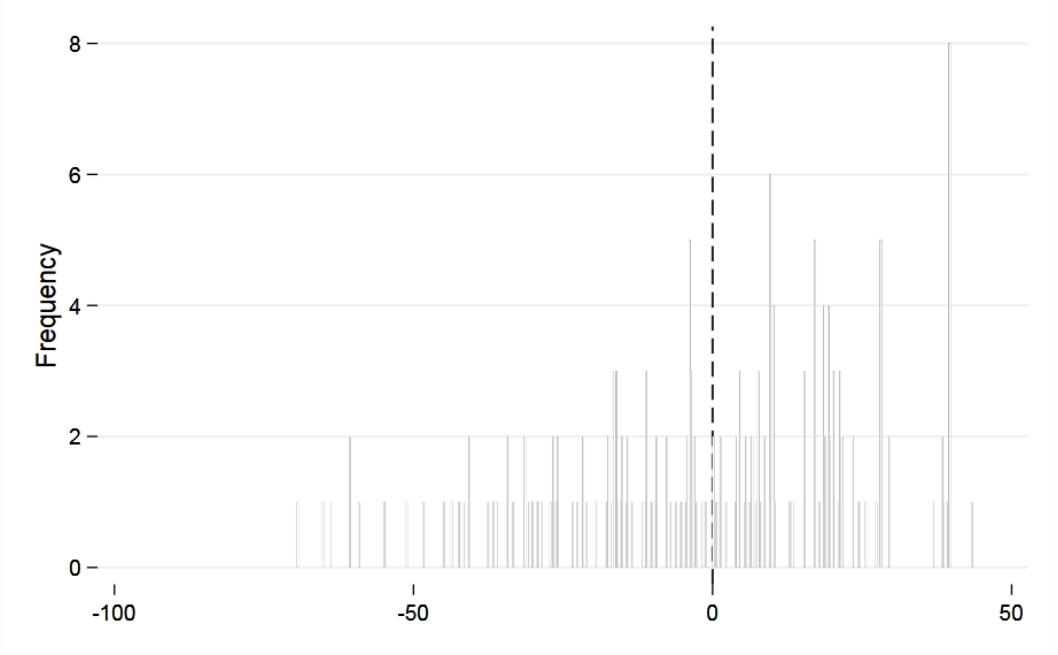
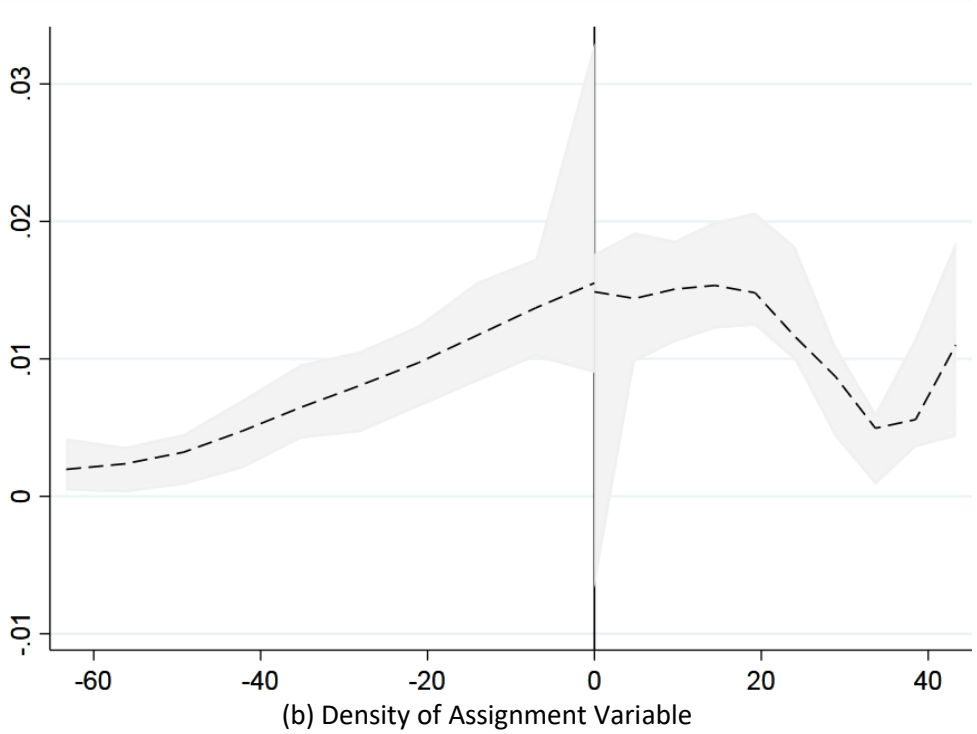


Figure 1. First-stage, CCPT Grantee Status

Notes. Graph of CCPT grantee treatment status by the assignment score (i.e., CCPT application score). Forcing variable centered at zero. Bin width 1.5 points, full sample.



(a) Histogram of CCPT Assignment Variable



(b) Density of Assignment Variable

Figure 2. Integrity of the Assignment Variable

Notes. Assignment variable centered at zero. Full sample, bin width 0.25 points. Cattaneo, Jansson & Ma (2018) density test discontinuity estimate: 0.015 (.792). Standard error in parentheses.

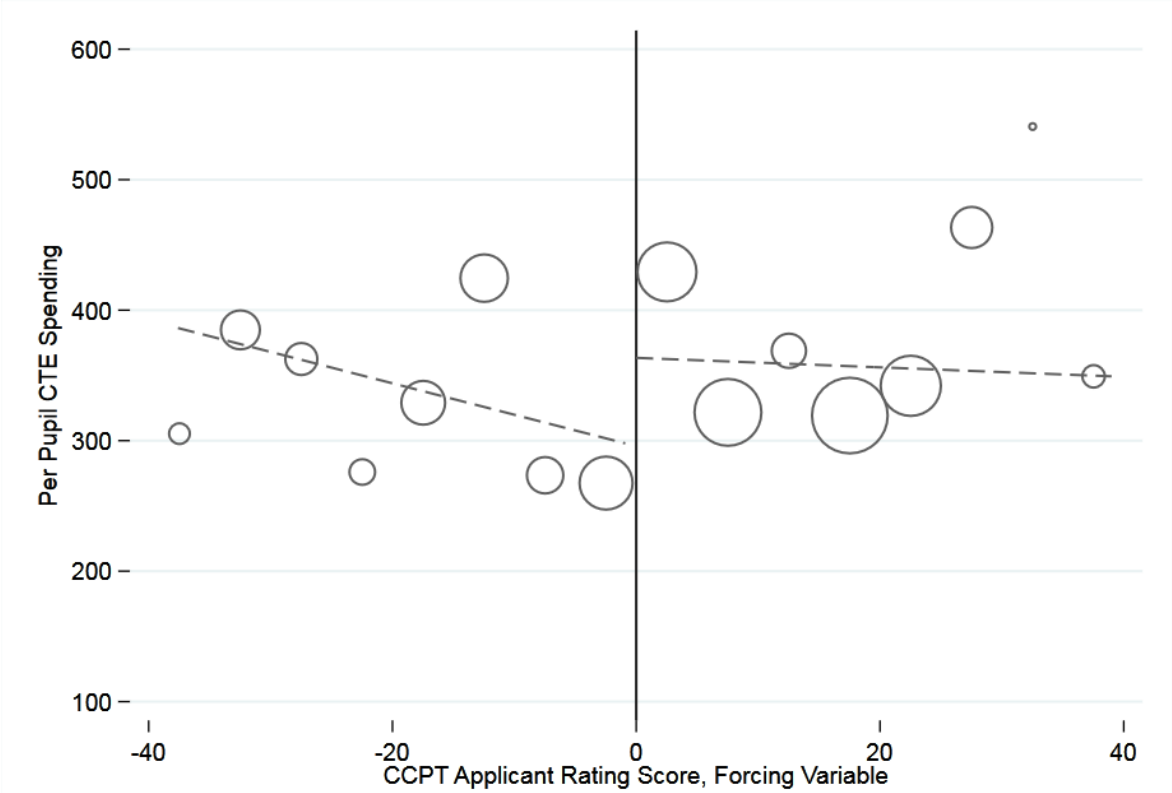
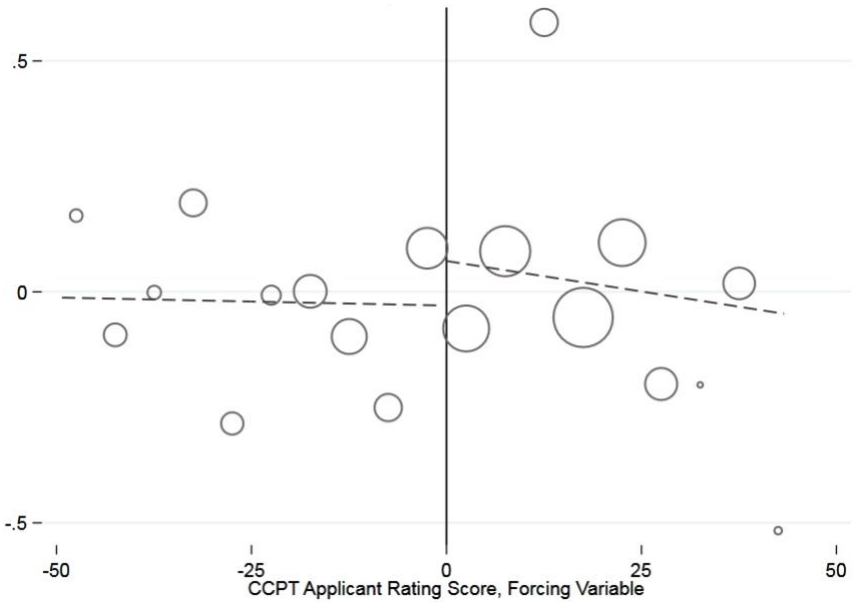
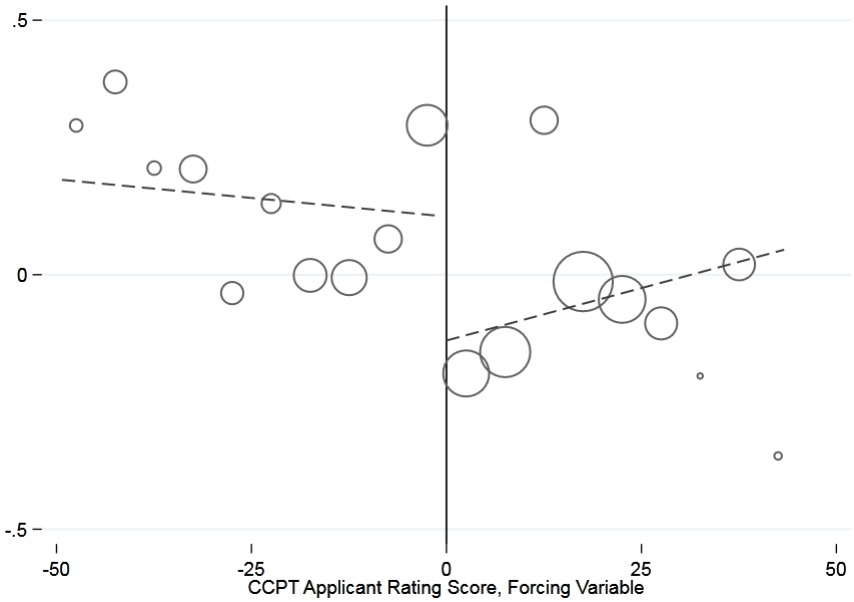


Figure 3. First-stage, 2015 Per Pupil CTE Spending

Notes. Graph of 2015 per pupil Career and Technical Education (CTE) expenditures by the CCPT assignment variable. Bandwidth +/- 40 points, Bin width 2.5 points.



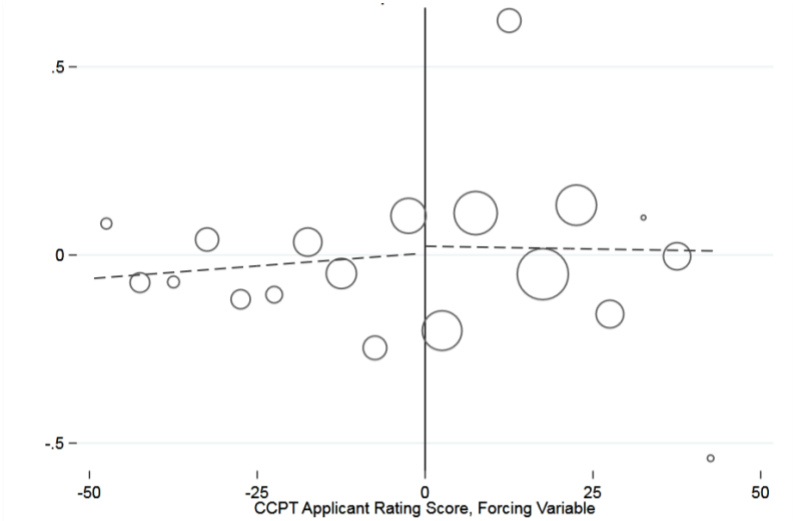
(a) Dropout rate, 2016



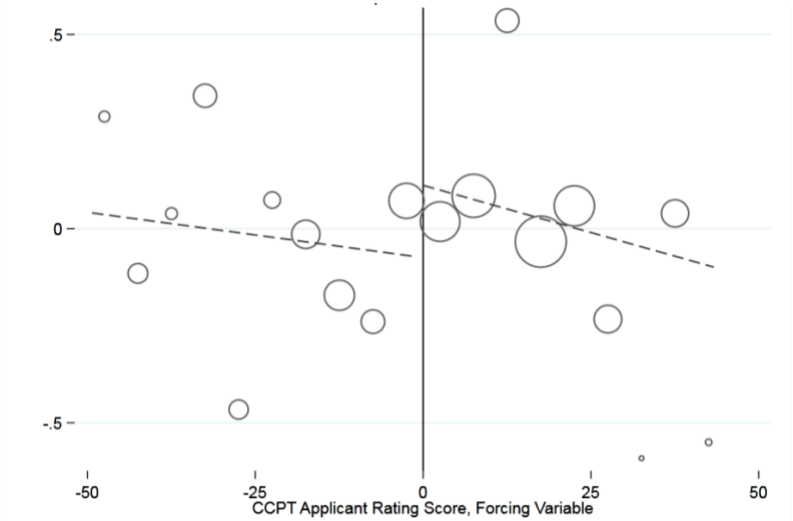
(b) Dropout rate, 2017

Figure 4. Reduced Form Results, Dropout Rates

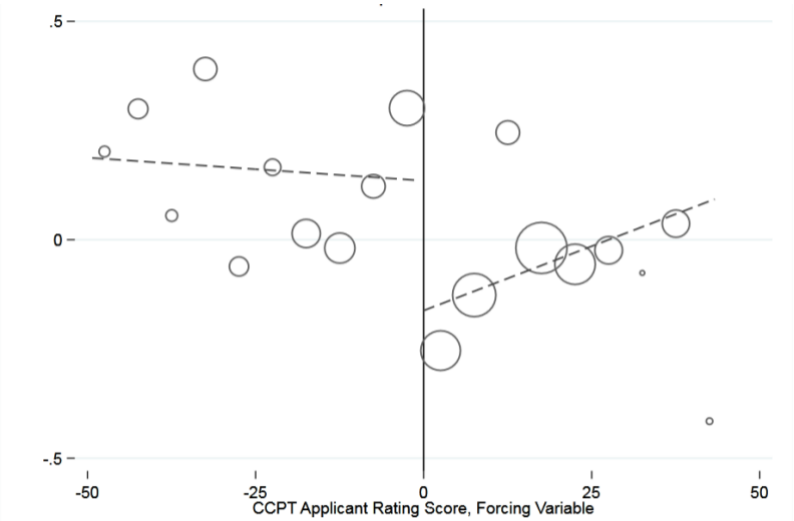
Notes. Graphs of the residualized dropout rates at in 2016 and 2017 by the CCPT assignment variable. Markers weighted by the number of districts in bin. Bin width 2.5 points. Bandwidth +/- 50.



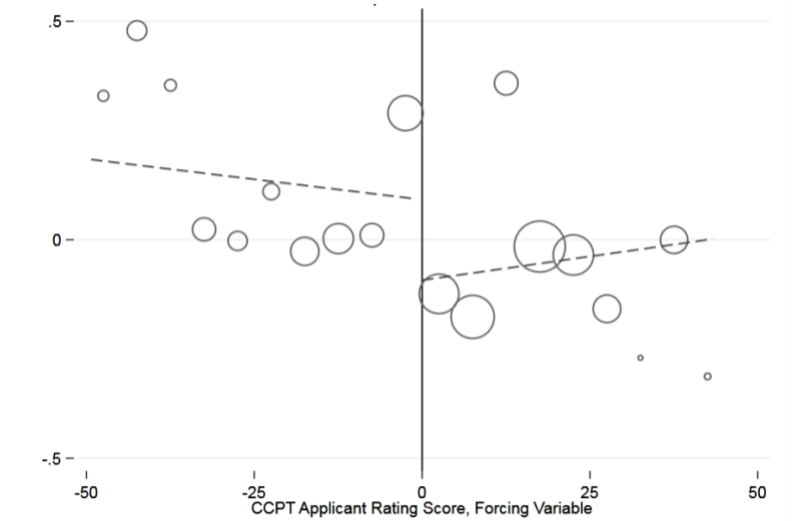
(a) Female dropout rate, 2016



(b) Male dropout rate, 2016



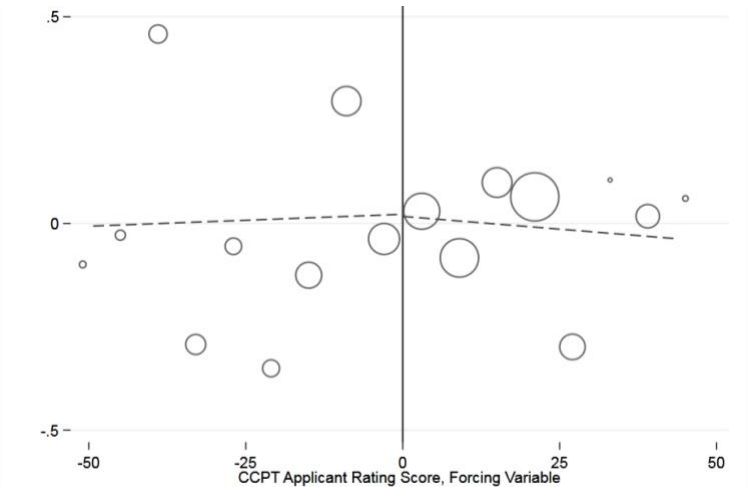
(c) Female dropout rate, 2017



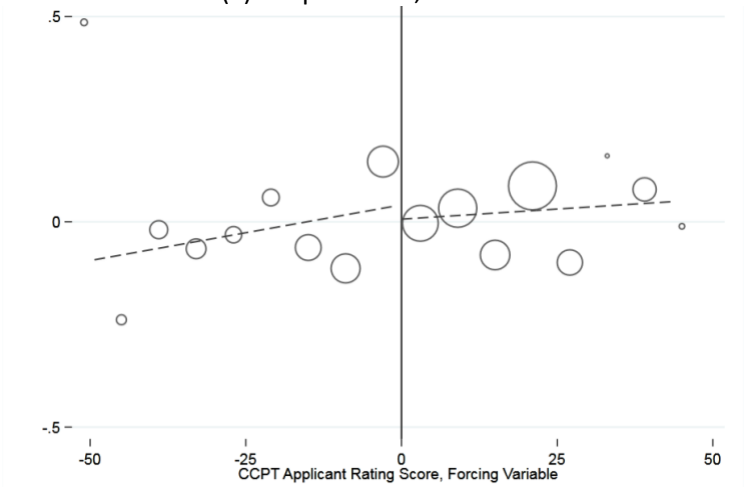
(d) Male dropout rate, 2017

Figure 5. Reduced Form Results, Dropout Rates by Subgroup

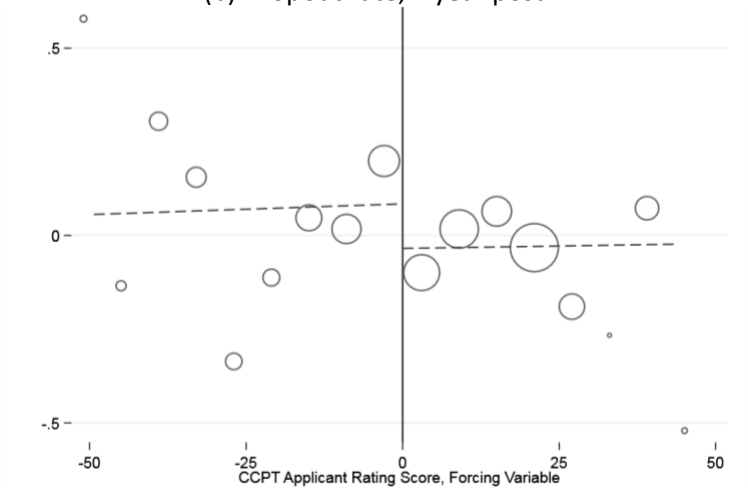
Notes. Graphs of the residualized dropout rates at in 2016 and 2017 by the CCPT assignment variable for indicated subgroups. Markers weighted by the number of districts in bin. Bin width 2.5 points. Bandwidth +/- 50.



(a) Dropout rate, Baseline



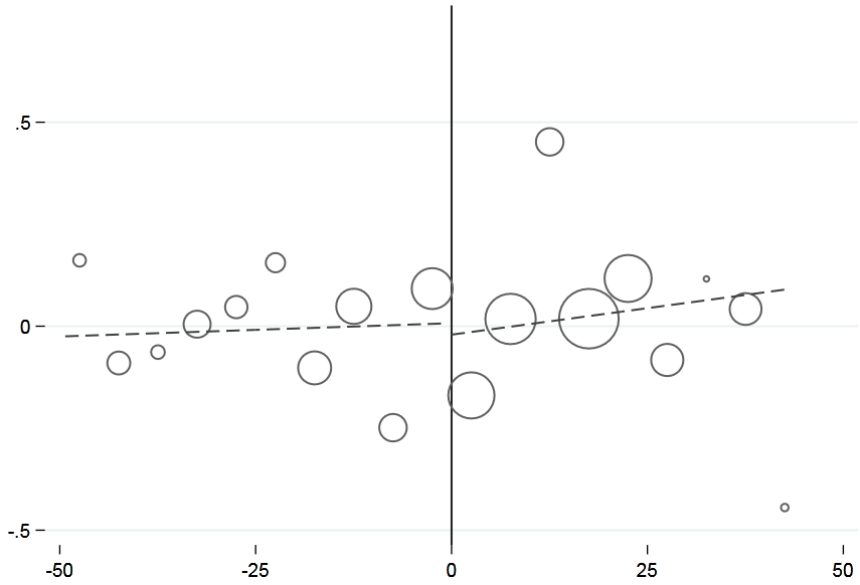
(b) Dropout rate, 1 year post



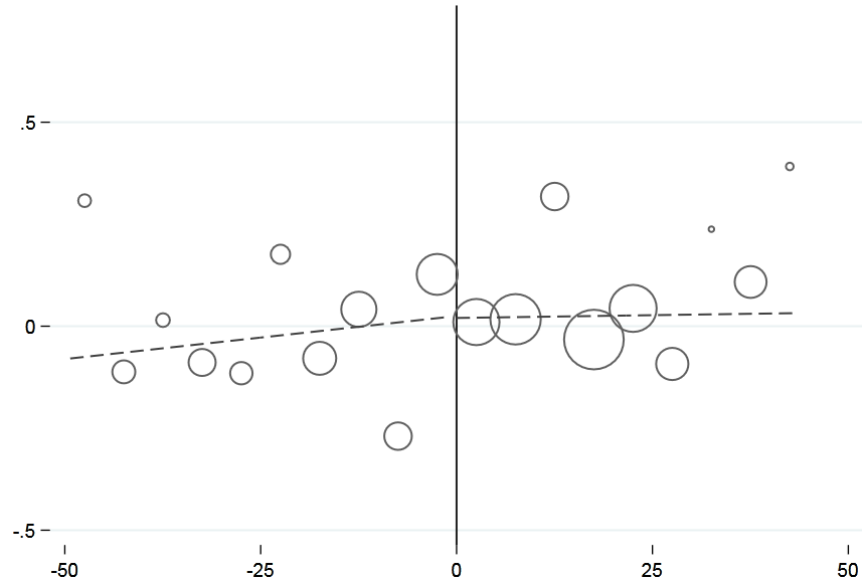
(c) Dropout rate, 2 years post

Appendix 1. Dynamic Treatment Effects, Dropout Rates

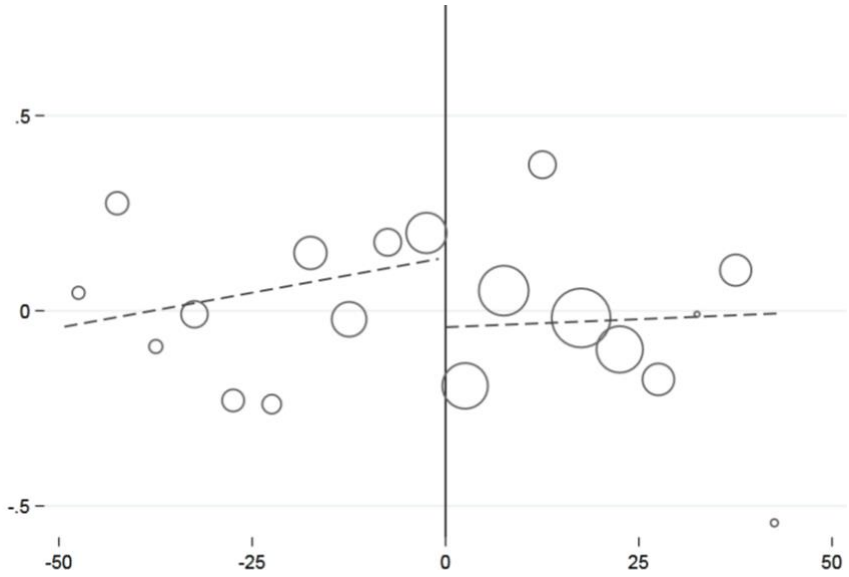
Notes. Graphs of the residualized dropout rates at baseline (e.g. 2013 or 2014), 1-year post (e.g. 2015 or 2016), and 2-year post (i.e., 2016 or 2017) by the CCPT assignment variable. Markers weighted by the number of districts in bin. Bin width 3 points. Bandwidth +/- 50.



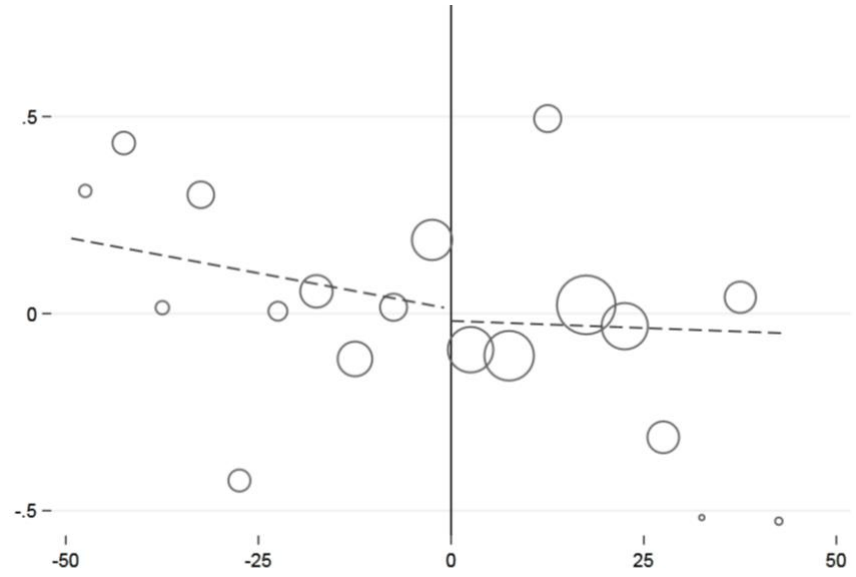
(a) Female dropout rate, 1 year post



(b) Male dropout rate, 1 year post



(c) Female dropout rate, 2 years post



(d) Male dropout rate, 2 years post

Appendix 2. Dynamic Treatment Effects, Dropout Rates by Subgroup

Notes. Graphs of the residualized dropout rates at baseline (e.g. 2013 or 2014), 1-year post (e.g. 2015 or 2016), and 2-year post (i.e., 2016 or 2017) by the CCPT assignment variable. Markers weighted by the number of districts in bin. Bin width 2.5 points. Bandwidth +/- 50.

Appendix 1. Reduced-form RD Estimates of Pathway Sector Offerings

Dependent Variable:	(1)	(2)	(3)
			mean
Pathways Listed in Application	0.015	0.002	0.990
	(0.021)	(0.015)	
Sector			
Health Sciences and Medicine	-0.093	-0.307	0.538
	(0.117)	(0.167)	
Information and Communication Technology	0.195	-0.014	0.412
	(0.116)	(0.171)	
Logistics and Transportation	0.006	-0.007	0.161
	(0.093)	(0.126)	
Energy and Environment	0.093	0.052	0.201
	(0.091)	(0.139)	
Engineering, Design and Architechture	0.047	-0.401**	0.221
	(0.101)	(0.140)	
Engineering and Manufacturing	-0.008	-0.081	0.417
	(0.118)	(0.170)	
Arts, Media and Entertainment	-0.057	-0.226	0.186
	(0.100)	(0.142)	
Business and Finance	0.042	-0.265	0.231
	(0.104)	(0.164)	
Hospitatility and Tourism	0.131	0.019	0.156
	(0.088)	(0.130)	
Public Services and Safety	-0.010	-0.104	0.206
	(0.103)	(0.152)	
Building and Construction	0.073	-0.082	0.176
	(0.090)	(0.146)	
Education and Child Development	0.003	-0.027	0.106
	(0.067)	(0.102)	
Agriculture	0.202	0.324*	0.261
	(0.107)	(0.161)	
Linear spline	yes	yes	
Quadratic spline	no	yes	

NOTES. *** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$. Robust standard errors in parentheses. Each cell contains the result of a separate regression of I(CCPT $Score_i \geq 0$) on whether the applicant propsed sector pathways in their original application. N=201 applicants for whether pathways were listed in the original CCPT application. n= 199 for all other models indicating the plan to implement the particular pathways sector. All models contain fixed effects for round of application (i.e., in the 2014 or 2015 round) and grant level (i.e., 600,000, 6 million or 15 million dollars). The third column provides the average number of applicants proposing a particular pathways sector.

Appendix 2. Auxiliary RD Estimates of Baseline Covariate Balance, Individual Covariates

	(1)	(2)	(3)	(4)
Sample:	Full Sample		1 SD ($CCPT_i$)	0.5 SD ($CCPT_i$)
Baseline Covariate				
Unemployment rate	-0.037***	-0.037**	-0.043**	-0.062***
	(0.068)	(0.092)	(0.100)	(0.119)
Per pupil CTE spending	-0.040	0.035	0.009	0.085
	(22.858)	(28.523)	(29.344)	(40.353)
CTE spending (log)	-0.054	0.002	-0.019	0.037
	(0.149)	(0.184)	(0.183)	(0.283)
District enrollment (log)	-0.004	0.007	0.005*	0.010***
	(0.017)	(0.014)	(0.006)	(0.007)
Free/reduced price lunch	0.050	0.035	0.059	0.146
	(0.018)	(0.023)	(0.023)	(0.032)
American Indian	-0.007	-0.019	-0.028	-0.017
	(0.001)	(0.001)	(0.001)	(0.001)
Pacific Islander	0.002	0.010	-0.000	0.006
	(0.000)	(0.000)	(0.000)	(0.000)
Asian	0.003	-0.002	-0.001	0.006
	(0.001)	(0.001)	(0.001)	(0.002)
Hispanic	-0.003	0.011	0.003	0.015
	(0.004)	(0.004)	(0.005)	(0.004)
Black	0.009	0.005	0.010	0.012
	(0.001)	(0.001)	(0.001)	(0.001)
White	0.000	-0.010	-0.008	-0.002
	(0.004)	(0.004)	(0.004)	(0.005)
District dropout rate	0.053	0.019	0.009	0.015
	(0.127)	(0.165)	(0.149)	(0.194)
Truancy rate	0.095	0.144	0.111	0.174
	(2.564)	(3.657)	(3.948)	(5.862)
Suspension rate	0.021	-0.014	0.039	0.090
	(0.462)	(0.638)	(0.620)	(0.719)
N	814	814	603	322
Controls	yes	yes	yes	yes
Linear spline	yes	yes	yes	yes
Quadratic spline	no	yes	no	no

NOTES. *** $p < .01$ ** $p < .05$ * $p < .1$. Applicant group clustered standard errors in parentheses. Each cell contains the result of a separate regression of the estimated effect of the baseline characteristic on the $I(CCPT_i \geq 0)$ and the indicated controls. The control variables included in these models are from 2012, the year prior to the baseline. Unemplomployment rate is measured at the county level, all other variables are measured at the district level.

Appendix Table 3. Placebo Robustness Checks, Dropout Rate Reduced-form RD Estimates

Dependent Variable:	2016 Dropout Rate		2017 Dropout Rate	
Independent Variable	(1)	(2)	(3)	(4)
Placebo RD: I(CCPT Score$_i$ ≥ -15)	0.011	0.159	-0.187	-0.007
	(0.207)	(0.128)	(0.205)	(0.146)
Placebo RD: I(CCPT Score$_i$ ≥ -10)	-0.118	-0.061	-0.226	-0.104
	(0.226)	(0.148)	(0.212)	(0.141)
Placebo RD: I(CCPT Score$_i$ ≥ -5)	-0.207	-0.246	-0.045	-0.067
	(0.196)	(0.130)	(0.170)	(0.125)
Actual RD: I(CCPT Score$_i$ ≥ 0)	**0.0648**	**0.0456**	**-0.27**	**-0.333****
	(0.177)	**(0.166)**	**(0.177)**	**(0.153)**
Placebo RD: I(CCPT Score$_i$ ≥ +5)	-0.042	-0.171	0.031	-0.058
	(0.190)	(0.128)	(0.177)	(0.120)
Placebo RD: I(CCPT Score$_i$ ≥ +10)	-0.065	-0.161	-0.005	-0.083
	(0.187)	(0.127)	(0.180)	(0.121)
Placebo RD: I(CCPT Score$_i$ ≥ +15)	-0.046	-0.079	0.058	0.016
	(0.165)	(0.114)	(0.162)	(0.118)
Baseline controls	no	yes	no	yes

NOTES. *** p < .01 ** p < .05 * p < .1. Applicant group clustered standard errors in parentheses. Each cell contains the results of a separate regression of the CCPT application grantee threshold discontinuity for different values of the assignment variable. The boldface results are the main results at the actual RD assignment threshold. The placebo RD results are also listed for thresholds that were not used for determining CCPT grantee status. N= 814 for all regressions.

Appendix 4. Reduced-form RD Estimates Dynamic Treatment Effects

	Cohort 1			Cohort 2			Stacked		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total	Female	Male	Total	Female	Male	Total	Female	Male
Calendar Year									
2016	0.187	-0.174	-0.213	-0.177	-0.268	-0.0565	0.0456	-0.016	0.119
	(0.167)	(0.167)	(0.229)	(0.301)	(0.273)	(0.366)	-0.166	-0.158	-0.198
2017	-0.249	-0.407**	-0.0806	-0.400	-0.437	-0.349	-0.333**	-0.404***	-0.256
	(0.170)	(0.203)	(0.165)	(0.286)	(0.267)	(0.327)	-0.153	-0.146	-0.17
Dynamic									
1 year after	0.101	-0.138	0.0745	-0.177	-0.268	-0.0565	-0.108	-0.106	-0.0899
	(0.149)	(0.166)	(0.178)	(0.301)	(0.273)	(0.366)	(0.167)	(0.157)	(0.188)
2 years after	0.187	0.174	0.213	-0.400	-0.437	-0.349	-0.169	-0.232	-0.112
	(0.167)	(0.167)	(0.229)	(0.286)	(0.267)	(0.327)	(0.158)	(0.153)	(0.187)
3 years after	-0.249	-0.407**	-0.0806	-	-	-	-	-	-
	(0.170)	(0.203)	(0.165)						

NOTES. *** p < .01 ** p < .05 * p < .1. Applicant group clustered standard errors in parentheses. Each cell contains the result of a separate regression of I(CCPT Score$_i$ ≥ 0) on dropout rates for indicated subgroup and cohort. All models condition on a linear spline of the assignment variable and the full set of controls from the preferred specification in Table 4. n= 385 for cohort 1 and n=429 for cohort 2; N= 814 stacked panel.

Appendix Table 5. Reduced-form RD Estimates on Dropout Rate, Alternate Sample

Dependent Variable:	2016 Dropout Rate		2017 Dropout Rate	
	(1)	(2)	(3)	(4)
Independent Variable	Panel A: Full Sample			
I(CCPT Score$_i \geq 0$)	0.0648	0.0456	-0.27	-0.333**
	(0.177)	(0.166)	(0.177)	(0.153)
R^2	0.008	0.6	0.013	0.498
N	814	814	814	814
	Panel B: Excluding Los Angeles Unified			
I(CCPT Score$_i \geq 0$)	0.077	0.047	-0.264	-0.334**
	(0.177)	(0.166)	(0.176)	(0.153)
R^2	0.008	0.599	0.012	0.498
N	813	813	813	813
Baseline controls	no	yes	no	yes

NOTES. *** p < .01 ** p < .05 * p < .1. Applicant group clustered standard errors in parentheses. Each cell contains a regression of the dropout rate on I(CCPT Score$_i \geq 0$), a linear spline of the assignment variable and baseline covariates (See Table 1 for a description of controls). All models condition on a linear spline of the assignment variable given the Akaike's information criterion (AIC) implied optimal order of polynomial is linear. The results are based on dropout rates. For example, in Column 4, the dropout rate reduction was 0.333 percentage points.

Appendix Table 6. California Career Pathways Trust Scoring Rubric

Section 1: Statement of Need (30 points)

Outstanding (30–23 points)	Strong (22–15 points)	Adequate (14–8 points)	Minimal (7–0 points)
Thoroughly and convincingly describes each of the career pathways being proposed in the RFA. Includes a variety of data sources and information on how they determined the targeted pathways in the proposed career pathways program. Targeted career pathways are all strongly identified as high-skill, high-wage, and high-growth jobs or emerging sectors. Active and integrated approach to leveraging existing structures and resources	Contains a strong description of each career being proposed in the RFA. Includes a variety of data sources and information on how they determined the targeted pathways in the proposed career pathways program. Targeted pathways are all well identified as high-skill, high-wage, and high-growth jobs or emerging sectors. Well planned approach to leveraging existing structures and resources, whether regionally, multi-region	Adequately describes each of the career pathways being proposed in the RFA. Includes a selection of data sources and information on how they determined the targeted pathways in the proposed career pathways program. Targeted pathways are adequately defined as high-skill, high-wage, and high-growth jobs or emerging sectors. Awareness of existing structures and resources, whether regionally, multi-region, and or/statewide	Minimally describes each of the career pathways being proposed in the RFA. Includes a minimal selection of data sources and information on how they determined the targeted pathways in the proposed career pathways program. Not all pathways are defined as high-skill, high-wage, and high-growth jobs or emerging sectors. Insufficient awareness for existing structures and resources, whether regionally, multi-region

Section II: Target Group (10 points)

Outstanding (10-9 points)	Strong (8–6 points)	Adequate (5–3 points)	Minimal (2–0 points)
Thoroughly and convincingly describes the characteristics of the students being served and the recruitment methods being used in the proposed career pathways program. Active and integrated approach to leveraging existing structures and resources, whether regionally, multi-region, and/or statewide. Form B was complete with a realistic number of students to be served in each career	Contains a strong description of the students being served and the recruitment methods being used in the proposed career pathways program. Well planned approach to leveraging existing structures and resources, whether regionally, multi-region, and/or statewide. Form B was complete with a realistic number of students to be served in each career pathway.	Adequately describes the students being served and the recruitment methods being used in the proposed career pathways program. Awareness of existing structures and resources, whether regionally, multi-region, and/or statewide. Form B was complete with a realistic number of students to be served in each career pathway.	Minimally describes the students being served and the recruitment methods being used in the proposed career pathways program. Insufficient awareness for existing structures and resources, whether regionally, multi-region, and/or statewide. Form B was complete with an unrealistic number of students to be served in each career pathway.

Section III: Career Pathways Program Planned Approach (60 points)

Outstanding (60–46 points)	Strong (45–31 points)	Adequate (30–16) points)	Minimal (15–0) points)
Thoroughly and convincingly describes the development and integration of CTE curriculum aligned with high-need/growth or emerging economic sectors. Provides overwhelming evidence of articulation to postsecondary credits, earned in dual enrollment and credit by exam, and connection to current labor market needs. Form C was outstanding and completed for each career pathway. Innovative activities are described in detail and partners offer a variety of service (including many on	Contains a strong description of the development and integration of CTE curriculum aligned with high-need/growth or emerging economic sectors. Provides evidence of articulation to postsecondary credits, earned in dual enrollment and credit by exam, and connection to current labor market needs. Form C was completed and makes sense for each career pathway being proposed in the RFA. Activities are described in detail and partners offer services	Adequately describes the development and integration of CTE curriculum aligned with high-need/growth or emerging economic sectors. Provides some evidence of articulation to postsecondary credits, earned in dual enrollment and credit by exam, and connection to current labor market needs. Form C was completed for each career pathway. Activities are described and partners offer services. Awareness of existing structures and resources, whether regionally, multi-region,	Minimally describes the development and integration of CTE curriculum aligned with high-need/growth or emerging economic sectors. Provides minimal evidence of articulation to postsecondary credits, earned in dual enrollment and credit by exam, and connection to current labor market needs. Form C was not completed for each career pathway. Activities are minimally described and partners offer a minimal amount of services. Insufficient awareness for existing

Section IV: Partnerships (40 points)

Outstanding (40–30 points)	Strong (29–20 points)	Adequate (19–10 points)	Minimal (9–0 points)
Extensive partnerships with business entities, community organizations, K–12 programs, and postsecondary educational agencies. Active and integrated approach to leveraging existing structures and resources, whether regionally, multi-region, and/or statewide. Thoroughly describes the roles and responsibilities of all partners on Form D. Outstanding monetary and non-monetary	Strong partnerships with business entities, community organizations, K–12 programs, and postsecondary educational agencies. Well planned approach to leveraging existing structures and resources, whether regionally, multi-region, and/or statewide. Contains a good description of the roles and responsibilities of all partners on Form D. Strong monetary and non-monetary commitments	Limited evidence of partnerships with business entities, community organizations, K–12 programs, and postsecondary educational agencies. Awareness of existing structures and resources, whether regionally, multi-region, and/or statewide. Adequately describes the roles and responsibilities of all partners on Form D. Limited monetary and non-monetary	Minimally or no evidence of partnerships with business entities, community organizations, K–12 programs, and postsecondary educational agencies. Insufficient awareness for existing structures and resources, whether regionally, multi-region, and/or statewide. Provides minimal or no description of the roles and responsibilities of all partners on Form D.

Section V: Program Outcome Measures (20 points)

Outstanding (20–16 points)	Strong (15–11 points)	Adequate (10–6 points)	Minimal (5–0 points)
Thoroughly and convincingly describes three or more goals that are realistic and measurable. Sophisticated student tracking system where staff has the experience and knowledge of entering student data and running student level data reports and leverages common metrics and accountability measures. Thoroughly describes innovated strategies and services that will ensure student completion of career	Describes well three or more goals that are realistic and measureable. Good student tracking system and staff has experience and knowledge of entering student data and running student level reports and leverages common metrics and accountability measures. Strong description of innovative strategies and services that will ensure student completion of career pathways program and transitions into	Describes three or more goals that are realistic and measureable. Adequate student tracking system and staff has some experience with entering student data and running student level reports and leverages common metrics and accountability measures. Adequate description of strategies and services that will ensure student completion of career pathways program and transitions into employment,	Describes three goals that are not realistic and cannot be measured. Limited to no student tracking system in place. Staff has minimal to no experience entering student data and running student level reports and leverages common metrics and accountability measures. Minimal description of strategies and services that will ensure student completion of career pathways program and transition

Section VI: Capability and Sustainability (20 points)

Outstanding (20–16 points)	Strong (15–11 points)	Adequate (10–6 points)	Minimal (5–0 points)
Thoroughly demonstrates how the program specialist(s) will convene, connect, measure, and broker efforts to establish or enhance a career pathways program by integrating, leveraging, and building upon regional, state and federal investments. Thoroughly describes how the career pathways program will be sustained and includes multiple partners and resources that will help in	Strong description of how the program specialist(s) will convene, connect, measure, and broker efforts to establish or enhance a career pathways program by integrating, leveraging, and building upon regional, state and federal investments. Thoroughly describes how the career pathways program will be sustained and includes multiple partners and resources that will help in sustaining the	Adequately describes how the program specialist(s) will convene, connect, measure, and broker efforts to establish or enhance a career pathways program by integrating, leveraging, and building upon regional, state and federal investments. Adequately describes how the career pathways program will be sustained and includes partners and resources that will help in sustaining	Minimally describes how the program specialist(s) will convene, connect, measure, and broker efforts to establish or enhance a career pathways program by integrating, leveraging, and building upon regional, state and federal investments. Minimally describes how the career pathways program will be sustained and includes limited partners and resources that will help in

Section VII: Budget and Budget Narrative (20 points)

Outstanding (20–16 points)	Strong (15–11 points)	Adequate (10–6 points)	Minimal (5–0 points)
Thoroughly and convincingly identifies the program expenses for the career pathway program for the 2014–15, 2015–16, 2016–17, and 2017–18 school years and identifies resources that will sustain the program during the 2017–18 and 2018–19 school years. A variety of matching funds, in-kind contributions, and set aside funds from the school district is also identified in the budgets. Provides thorough budget narratives describing each line item	Good identification of program expenses for the career pathway program for the 2014–15, 2015–16, 2016–17, and 2017–18 school years and identifies resources that will sustain the program during the 2017–18 and 2018–19 school years. A variety of matching funds, in-kind contributions, and set aside funds from the school district is also identified in the budgets. Provides good budget narratives describing each line item for each budget year.	Adequately identifies program expenses for the career pathway program for the 2014–15, 2015–16, 2016–17, and 2017–18 school years and identifies resources that will sustain the program during the 2017–18 and 2018–19 school years. Adequately identifies matching funds, in-kind contributions, and set aside funds from the school district. Provides adequate budget narratives describing each line item for each budget	Minimally identifies program expenses for the career pathway program for the 2014–15, 2015–16, 2016–17, and 2017–18 school years and identifies resources that will sustain the program during the 2017–18 and 2018–19 school years. Minimally identifies matching funds, in-kind contributions, and set aside funds from the school district. Provides limited budget narratives describing each line item for each budget year.

SOURCE: California Department of Education (2015) California Career Pathways Trust Request for Applications. Appendix A: pp. 39-43. Retrieved from https://www.cde.ca.gov/ci/ct/pt/ on March 16, 2016

Appendix Table 7. Auxiliary RD Estimates of data missingness

Sample:	Full Sample		$\|CCPT\ Score_i\| \leq 15$		
Dependent Variable	(1)	(2)	(3)	(4)	(5)
					mean
Has outcome data	0.017	0.024	0.038	0.053	0.895
	(0.037)	(0.035)	(0.066)	(0.065)	
Has financial data	0.015	0.020	0.026	0.040	0.912
	(0.034)	(0.033)	(0.063)	(0.064)	
Has enrollment/demographic data	0.015	0.002	-0.017	0.028	0.893
	(0.081)	(0.074)	(0.157)	(0.136)	
N	994	994	397	397	
Baseline controls	no	yes	no	yes	

NOTES. *** $p < .01$ ** $p < .05$ * $p < .1$. Applicant group clustered standard errors in parentheses. Each cell contains the results of a separate regression of data availability (i.e., a dichotomous indicator whether data is available) and $I(CCPT\ Score_i \geq 0)$. All models condition on a linear spline of the assignment variable.