Degrees within Reach: Who Benefits from Community College Baccalaureate Introduction?*

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Abstract

Twenty-four states now authorize community colleges to award bachelor's degrees, but there is little causal evidence on whether these programs expand access to the BA or simply shift enrollment across institutions. Using longitudinal administrative data and the staggered rollout of programs across Washington state, I estimate the effect of CCB introduction on degree attainment and earnings. CCB introduction increases overall BA completion for exposed students, but this aggregate effect masks substantial heterogeneity in who benefits and which programs work. Students predicted to otherwise enroll in two-year colleges see gains in bachelor's and graduate degree attainment with suggestively positive effects on earnings, while those likely to attend four-year institutions absent CCB introduction see null to negative effects on the same outcomes. Openings in fields such as nursing and computer science, where seats at four-year institutions are rationed through competitive major admissions, drive these completion gains, while openings in effectively open-access fields generate null effects. Taken together, these results suggest that CCB programs generate the largest benefits where existing constraints on bachelor's degree attainment bind, whether at the student or the program level.

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1 Introduction

American higher education has historically been segmented by credential: four-year colleges and universities produce bachelor's (BA) and graduate degrees, while two-year or community colleges have been limited to sub-baccalaureate credential offerings. Bachelor's degree attainment has therefore depended on access to the four-year sector, which is financially, academically, and geographically less accessible than its two-year counterpart. These barriers have, over time, contributed to widening attainment gaps across income and race (see Dynarski, Page and Scott-Clayton 2022; Dynarski et al. 2023; Hillman 2016). Moreover, for students who do overcome these barriers, seats in high-demand majors are often rationed through enrollment caps and competitive program-level admissions, even at universities that admit nearly all applicants (Bleemer and Mehta 2024). The result is a system in which bachelor's degrees are often the least accessible for students with the most to gain (Zimmerman 2014), whether because enrollment in a four-year institution is out of reach, or because the institution within reach cannot offer a seat in the student's intended field. These constraints have become increasingly consequential as the demand for college-educated labor has grown (Autor 2014); healthcare systems have faced shortages of baccalaureate-trained nurses (American Association of Colleges of Nursing 2023) and technology employers have lobbied state legislatures directly for expanded degree production (Smalley 2022).

Policymakers and administrators have tested a variety of policy tools to improve BA access over time. Community college baccalaureates (CCBs)—bachelor's degrees offered directly by community colleges—represent one of the most prominent and fastest-growing alternatives. Authorized through state-level legislation and adopted gradually across institutions, CCB programs allow community colleges to confer bachelor's degrees rather than serving solely as transfer-preparation institutions. Although West Virginia was the first state to authorize CCB degrees in 1989, policy momentum has picked up significantly over the last decade, and today, 24 states have passed CCB legislation. The implementation of this CCB policy varies significantly across states, however, and only two states (Washington and Florida) have implemented universal approval for every community college in the state to offer at least one baccalaureate program (Love, Bragg and Harmon 2021). By allowing students to complete a bachelor's degree at the same institution where they begin their postsecondary journey, CCBs aim to mitigate frictions common to the traditional transfer pathway (Scott-Clayton

2011; Bailey and Smith Jaggars 2015; Schudde, Jabbar and Hartman 2021; Schudde and Jabbar 2024).

Community colleges are considered the most accessible point of entry into American higher education and they disproportionately serve students from low-income and minoritized backgrounds. Advocates argue that given the reach of these institutions, CCB programs have the potential to expand affordable access to four-year credentials for non-traditional and under-resourced students. Critics, however, raise concerns about mission drift, resource constraints, and whether community colleges can deliver bachelor's-level training with a labor market value comparable to traditional four-year institutions. Offering students access to a bachelor's degree that may be ultimately valued at a lower rate in the labor market has the potential to undermine students and further entrench rather than disrupt the current two-tiered system of bachelor's degree access.

Whether CCB policy ultimately delivers on its promise of expanded access to the BA depends on if and how new programs ease the constraints described above. In practice, CCB programs are approved one at a time, and each approval represents a decision about where new BA capacity will do the most good. For a student with no realistic route to a four-year institution, a nearby CCB program may represent the difference between stopping at an associate degree and completing a BA; for a student who would have enrolled at a public university regardless, the same opening simply substitutes one route to the degree for another. The same logic applies at the level of the program itself: an opening in a field where university seats are rationed adds capacity where demand for seats exceeds supply, whereas an opening in an effectively open-access field expands the set of institutions offering the degree without necessarily expanding the number of students able to obtain one. If the benefits of CCB introduction are concentrated where these constraints bind, then the targeting of new programs should be a central consideration as states continue to authorize these degrees.

This paper provides among the first causal estimates of the academic and labor market returns to CCB degrees. Using linked, longitudinal data from Washington state, I exploit the staggered introduction of CCB programs across the state to estimate how these programs influence student enrollment decisions, degree completion, and labor market outcomes. To isolate the effect of CCB introduction from preexisting differences across Washington colleges and local labor markets, I use stacked event-study and difference-in-differences approaches to compare changes in outcomes before and after CCB introduction for individuals who were and were not geographically proximate to these program openings. The causal interpretation of these estimates requires that no simultaneous shocks or policies differentially influenced college-going or earnings patterns among students with and without access to nearby CCB programs. To support this assumption, I demonstrate consistent pre-trends across affected and unaffected students and show that my results are robust to a variety of control sets and specification choices. Motivated by the democratization versus diversion framework from Rouse (1995), I also estimate separate effects based on predicted counterfactual enrollment pathways, allowing me to distinguish between students for whom CCB openings expand access to the bachelor's degree and those for whom CCBs substitute for traditional four-year enrollment. I additionally re-estimate this design at the level of the program opening itself, distinguishing openings in fields where seats at nearby public universities are rationed through competitive major admissions from openings in fields where those seats are effectively open access.

I find that the introduction of a CCB program increases the probability of bachelor's degree completion by nearly 2 percentage points for geographically exposed students who graduate high school after an institution introduces its first program. Given the BA completion rate among WA high school graduates, this represents a roughly 6 percent increase in BA completion. These completion effects do not appear to come at the expense of associate degree completion, likely because most students who ultimately complete a CCB earn an AA en route to completion. Despite strong undergraduate attainment effects, the intent-to-treat effect of CCB introduction appears to be null for graduate degree completion, and statistically null but suggestively positive for earnings: point estimates on log hourly wages are positive throughout the post-period and are marginally significant in some specifications, although the main pooled estimate cannot be distinguished from zero.

Although these combined effects are policy relevant and point to the general success of CCB programs in democratizing access to bachelor's degrees, an important feature of future policy development is understanding *who* these programs are currently working for and *which* programs are most effective in producing BA and earnings gains for enrollees. On the first question, I argue that the answer depends on the strength of each student's outside option, or path to a bachelor's degree in the absence of CCB entry. Using pre-period data to estimate the probability a student enrolls in a two-year college, four-year college, or no college absent CCB introduction, I find that the overall completion effects are driven by students whose likely counterfactual is two-year enrollment. For students who were unlikely to otherwise enroll in a four-year college, BA completion effects are larger than the overall effect and effects on hourly wages are positive, whereas students who were likely to have enrolled in a four-year college even in the absence of a CCB option see null effects on completion and earnings and small negative effects on graduate degree completion. On the second question, I re-estimate my design at the level of the program opening and find that completion gains are driven by openings in fields such as nursing and computer science, where competitive *program-level* admissions ration seats even at universities that admit nearly all applicants, while openings in effectively open-access fields such as business generate null effects. These results highlight that CCB programs generate the largest benefits where existing constraints on bachelor's degree attainment bind, whether at the student or the program level.

This work contributes to several literatures. First, this paper joins a small but growing body of research on CCB programs and their students. Existing descriptive work documents the characteristics of CCB graduates and their earnings relative to associate and bachelor's degree holders (Kaikkonen and Quarles 2018; Meza and Bragg 2020, 2022, 2025; Acton et al. 2026*b*), but cannot account for selection into CCB programs or identify causal effects.[1] Single-state studies from Washington and Florida show that CCB students demonstrate strong completion rates and employment rates one year post-graduation compared to those who transferred to public universities (Meza and Love 2023). Recent wage comparisons using a near-national sample from the Census Bureau's Postsecondary Employment Outcomes (PSEO) data have shown that CCB graduate earnings fall between those of their AA and traditional BA peers but that earnings averages mask substantial heterogeneity across fields of study (Acton et al. 2026*b*). This study adds new evidence by offering among the first causally identified estimates of CCB program effects on longer-run student outcomes. While these estimates are confined to a single state, the questions, methods, and framework developed here are ones other states may find useful as they confront similar policy decisions.

Second, a long history of empirical evidence demonstrates that returns to education vary substantially across credential types, fields of study, and student characteristics (Lovenheim and Smith 2023). Much of this literature has relied on a clean division between institution types and the cre-

[1] One dissertation study from 2017 uses an instrumental variables approach—leveraging distance to the nearest CCB-granting institution as an instrument—to estimate the causal effects of earning a CCB on earnings in the first year post-degree (Cominole 2017). This study uses a small sample of 6,000 individuals who attended college in Washington state and therefore its identification of effects is limited.

dentials they confer, and this institutional segmentation has allowed researchers to estimate returns to different credential levels by comparing outcomes across institution types, treating the institution-credential pairing as fixed. The introduction of CCBs creates a case of crossover between institution type and degree offered that is unique in the U.S. postsecondary landscape.[2] Prior research has studied returns to the same credential earned at different types of institutions, for example comparing for-profit and public college graduates (Cellini and Turner 2019; Deming, Goldin and Katz 2012) or examining how returns vary across four-year college selectivity (Dale and Krueger 2002; Zimmerman 2014). Rather than the same credential earned at institutions that offer the same set of degrees but vary in their characteristics, the CCB represents the same credential earned at institutions that have historically served fundamentally different roles in the higher education system.

Third, this research highlights the importance of counterfactual enrollment choices in estimating returns to new postsecondary pathways. The literature on these counterfactuals was pioneered by Rouse (1995), which posits that a single estimate of the returns to community college enrollment will inadvertently combine two potentially countervailing forces. For students who, in the absence of a community college option, would have otherwise not enrolled in college, the community college represents a democratization of access to postsecondary education. Conversely, for students who would have otherwise enrolled in a four-year institution, the community college represents a diversionary force, as low completion and transfer rates at community colleges reduce the likelihood of bachelor's degree attainment for these students. Recent work by Mountjoy (2022) quantifies these opposing forces in Texas, finding that the diversionary effects of starting in a community college reduce BA completion and earnings for four-year counterfactual enrollees, while democratization effects yield positive labor market outcomes for students who otherwise would not have enrolled. The introduction of a bachelor's degree option at community colleges further complicates this framework, as the returns to the CCB degree itself are still unknown compared to existing degree alternatives.[3] Section 2.4 extends the framework to CCB introduction.

[2] This feature is so unique, in fact, that it caused significant data confusion between the 2010s and early 2020s when the awarding of CCBs began to increase rapidly. In the commonly used Integrated Postsecondary Education Data System (IPEDS) data on postsecondary enrollment and degree awarding, it is common to classify schools by the "highest" degree awarded. Until recently, two-year and community colleges were classified as those that offered at most an associate degree (AA) and a four-year institution was anything higher than an AA. With the introduction of CCBs, however, many community colleges were classified as four-year institutions, which caused a notable, and errant, decline in the number of AAs awarded by two-year institutions as discussed in Goodman and Winkelmann (2025).

[3] Early experimental evidence suggests that there may be little difference in employer preference for CCBs versus traditional BAs in certain sectors (Acton et al. 2026*a*).

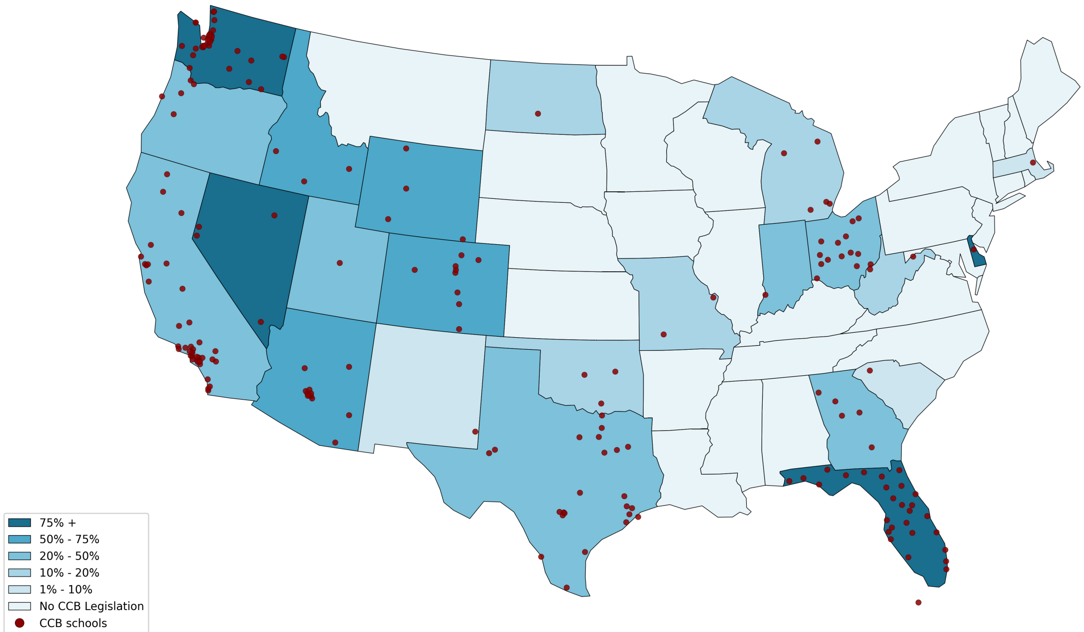
Finally, this paper speaks to a growing literature on program-level rationing. Institutions increasingly manage excess demand for high-return majors through minimum GPA thresholds and enrollment caps (Bleemer and Mehta 2024; Grosz 2020; Hemelt et al. 2021), and these program-level requirements have been shown to stratify students across majors even within open-access institutions. By documenting that the completion effects of CCB entry are concentrated in these rationed fields, I provide new evidence that CCB degree offerings can serve as a mechanism to ease program-level capacity constraints.

The remainder of this paper proceeds as follows: Section 2 discusses policy details including new, descriptive evidence on the cost of CCB programs in Washington and develops the framework that guides the empirical analysis. Section 3 discusses the Washington state administrative data and the geography of postsecondary access in the state, and Section 4 outlines several stylized facts about who enrolls in CCB programs and what they earn relative to their AA- and BA-holding peers. Section 5 details the empirical approach and Section 6 presents the combined effect of CCB introduction. Section 7 then asks who benefits from CCB openings and which openings are most effective, and outlines the implications for program targeting and approval. Section 8 concludes.

2 Background and Policy Landscape

In 1989, West Virginia became the first state to authorize community colleges to offer both associate and bachelor's degrees. Over the course of the last three decades, the CCB movement has gained momentum without garnering significant research attention. Following West Virginia's lead, other states, including Florida, Washington, and Georgia, have enacted similar legislation, allowing community colleges to offer bachelor's degrees in specific high-demand fields. Today, despite 24 total states passing CCB legislation (see Figure 1), Florida and Washington are the only states in which 100 percent of the state's community colleges are authorized to offer the degree (Love, Bragg and Harmon 2021). The proliferation of CCB programs has sparked discussions regarding their impact on higher education. Proponents argue that these programs enhance access to higher education, particularly for non-traditional and under-resourced students, and contribute to local economic development by aligning postsecondary offerings with regional labor demand. Conversely, critics express concerns about potential mission creep, resource allocation, and the capacity of community colleges to effectively deliver bachelor's degree programs without compromising their traditional roles.

Figure 1: CCB Legislation and CCB-Offering Institutions



Notes: This figure plots the location of CCB-offering institutions in each of the contiguous 48 states. There are no CCB-granting institutions in Alaska or Hawaii. Shading corresponds to the share of community colleges in each state that currently offer bachelor's degrees. IPEDS and College Scorecard data from 2022 are used to identify location and CCB-granting status.

Despite the prevalence and growth of CCB legislation over the last several decades, little is known about the effect of CCB program introduction on student outcomes. In an optimistic conception, CCB programs—with their relatively low tuition and flexible scheduling options—can provide an access point for those who otherwise would not have pursued a bachelor's degree or can lower the cost for students looking to complete a BA who otherwise would have done so at a four-year college (Bragg 2019). Limited causal work exists, however, asking if CCBs are indeed operating at their best by providing significant returns for students who opt to pursue bachelor's degrees at community colleges. Understanding the performance of these degree programs in comparison to the existing alternatives is an important first step to understanding who benefits from CCB legislation, and what expansion of the CCB means for access to and value of postsecondary choice for students.

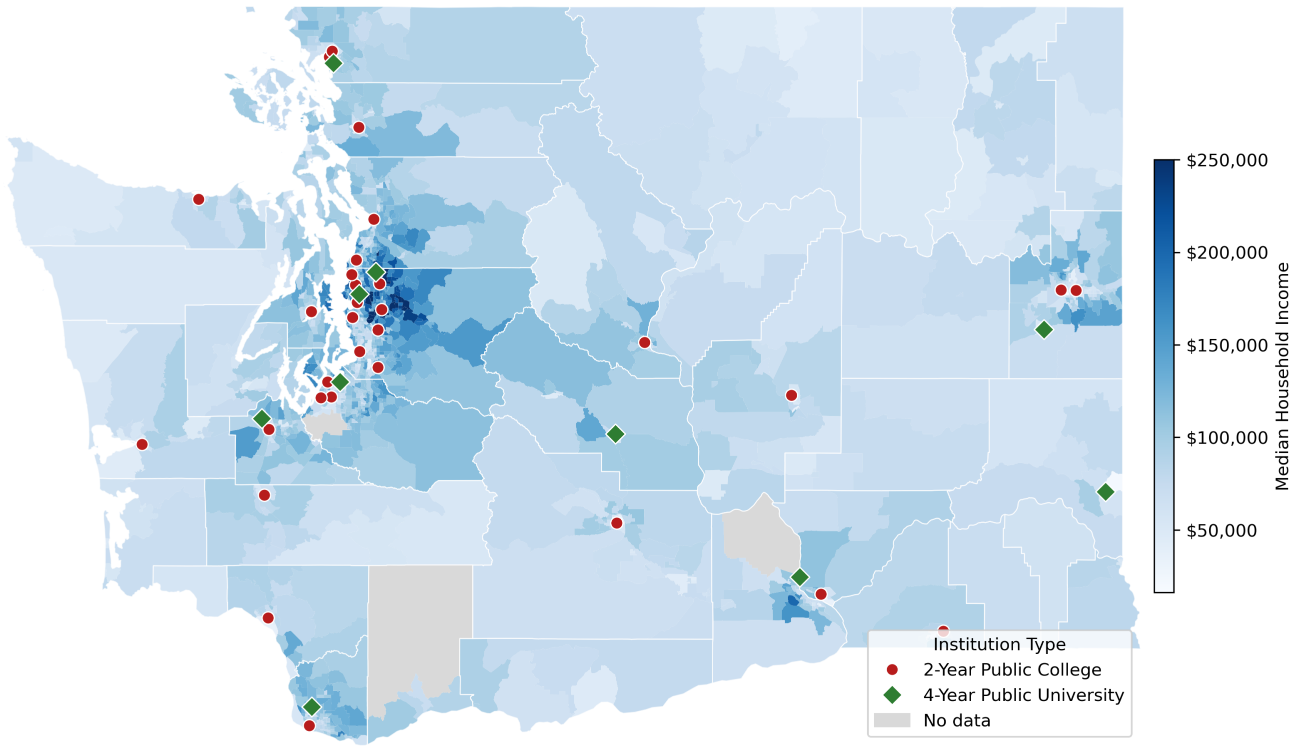
2.1 Washington State CCB Legislation

The authorization of CCB degrees in Washington emerged from ongoing conversations about access and workforce alignment in the state. In the early 2000s, state policymakers identified a growing gap between the number of residents with bachelor's degrees and the workforce needs of regional industries, particularly in healthcare, information technology, and advanced manufacturing. Notably, these are also the fields in which the state's public universities commonly ration seats through competitive major admissions and enrollment caps, creating unmet student demand for seats. I document this pattern in detail in Section 7.2.1. At the same time, Figure 2 shows that many students in rural or economically disadvantaged areas lacked geographic access to four-year institutions (Washington Higher Education Coordinating Board 2004). The state's community and technical colleges, long positioned as open-access institutions designed to serve local communities, were seen as a potential mechanism to expand degree access without requiring the kind of major capital investment in university expansion that the state had expended in the 1980s and 1990s when it created university branch campuses for Washington State University (WSU) and the University of Washington (UW) (Washington State Legislature 1989). This policy context shaped the passage of HB 1794 (Washington State Legislature 2005) in 2005, which authorized a limited pilot for applied baccalaureate degrees (CCB degrees) at select colleges.

The pilot was intentionally framed as workforce-focused to preempt concerns from universities and legislators about mission creep (Washington State Legislature 2005). By requiring programs to be "applied" in nature and directly tied to employer demand, the state established a policy boundary meant to distinguish these credentials from traditional academic bachelor's degrees offered by universities. As pilot programs began producing graduates, momentum grew to transition from a pilot phase to a permanent statutory authority.

In 2010, Washington adopted SB 6355, legislation that expanded the authority of community and technical colleges across the state to offer applied baccalaureate degrees. At this time, Washington was one of few states to allow all community and technical colleges to offer BAs, quickly joining Florida as one of the largest CCB degree producers. Over the next several years, the Washington State Board for Community and Technical Colleges (SBCTC) continued to shape the policy environment around CCB granting through administrative guidance, accreditation requirements, and

Figure 2: Locations of WA Public Institutions



Notes: This figure shows the locations of Washington public colleges and universities as well as the household income distribution across the state. Household income uses the 2019-2023 ACS 5-year estimates and plots median income at the census tract level. Two-year institutions are represented by red circles while four-year institutions are shown using green diamonds.

inter-institutional planning mechanisms. The existing program approval process requires institutions to demonstrate employer demand, institutional capacity, and alignment with statewide goals for educational attainment. Today, over 7 percent of all bachelor's degrees awarded in Washington state are conferred by community colleges and programs enroll upwards of 4,000 students every year, a figure that is growing as the number of programs offered continues to expand (see Appendix Figure A.1).

2.2 Cost, Structure, and Funding of CCB Programs

Community college baccalaureate programs typically require a minimum of 120 semester credit hours (or 180 quarter credits), following a "2+2" model in which the first two years cover general education and foundational coursework often equivalent to an associate degree, while the latter two years consist of specialized upper-division coursework (Washington State Legislature 2024; Florida

Department of Education 2024). Most states, including Washington, require CCB programs to develop roughly 45-60 credit hours of new upper-division curriculum (Bragg and Harmon 2023).

One of the most commonly cited benefits of CCB programs is the assumption that they offer a less expensive path to a bachelor's degree than traditional four-year institutions. By design, CCBs require two additional years of upper-division coursework beyond an associate degree, mechanically raising costs (both direct and opportunity costs) relative to a two-year credential. However, community colleges have historically charged lower per-credit tuition than four-year institutions, raising the question of whether CCBs maintain a cost advantage despite added upper-division requirements. As described in Acton et al. (2026*b*), there are two distinct pricing structures among CCB programs across the country: a *constant* structure, under which institutions charge the same tuition and fees across all four years, and an *escalating* structure, under which students pay associate degree rates for their first two years and face higher per-credit costs once they begin upper-division coursework. This escalating structure can be seen in Washington state, where annual upper-division course costs are nearly double those of lower-division courses (Meza and Pawlicki 2025).

This escalating structure follows directly from how CCB programs are funded. Washington's community and technical colleges receive operating funds through a formula based primarily on full-time equivalent (FTE) enrollment, and CCB upper-division courses count toward a college's FTE and generate state allocation through that standard formula. Upper-division coursework, however, typically carries higher delivery and accreditation-driven costs than lower-division coursework, and because the uniform state allocation per FTE covers a smaller share of these costs, the primary mechanism for closing that gap is an elevated tuition rate. Under state statute and SBCTC policy, per-credit tuition for upper-division CCB courses is set at rates comparable to those at the comprehensive regional universities rather than at the standard community college rate (State Board for Community and Technical Colleges 2024; 2010).[4] Launching a CCB program therefore does not automatically yield a dedicated new appropriation; higher per-credit revenue from upper-division students is instead the main mechanism for covering a program's added costs. Because Washington's community colleges continue to operate at substantially lower per-student funding levels than the

[4] Applied baccalaureate degrees are explicitly carved out of the tuition cap that applies to all other in-state undergraduates at community and technical colleges, giving colleges the flexibility to set rates that would otherwise not be allowed (Washington State Legislature 2012). These tuition and fees cannot exceed those at regional public universities in the state.

state's universities, this structure raises the possibility that CCB adoption spreads existing institutional resources thin by asking institutions to serve more students with fewer resources per student. Appendix E describes the funding structure in full, situates it in the literature on CCB adoption and institutional finances, and reports event study estimates of the effect of CCB introduction on institutional revenues and expenditures, which are largely null.

Descriptive analyses of the cost of CCB programs have thus far been limited to sticker prices, which may obscure the true cost to students. Both two- and four-year institutions provide substantial grant-based aid that can significantly reduce net price, but two-year colleges are chronically under-resourced relative to four-year institutions and may be less able to offer institutional aid (CCRC 2025).[5] To provide suggestive evidence on this question, Appendix D presents a case-study analysis using net price calculators for a set of fictitious student profiles across Washington's public two- and four-year institutions.[6] The results suggest that, although sticker prices are higher at four-year institutions, institutional aid substantially narrows or reverses this gap in net terms for middle- and lower-income students. Moreover, because most community college net price calculators only generate estimates for AA-level students, these figures likely *understate* the true cost CCB students will face once they reach the higher-priced upper-division years. This evidence suggests that CCB programs may not offer the financial advantage commonly assumed, a point I return to when discussing program targeting in Section 7.3.

2.3 CCB Fields of Study

Washington's CCB legislation requires programs to be applied in nature and concentrated in "high demand" industries, so the fields in which these programs open are shaped by regional labor market needs. Appendix Figure A.2 shows the share of CCB degrees awarded by field of study (two-

[5] Net price comparisons are difficult to make in practice because aggregate net price data from sources like IPEDS and the College Scorecard are subject to selection concerns, as composition differences across two- and four-year programs may confound comparisons. This is especially important in the case of the CCB given that the average enrollee in a CCB program may have different demographic characteristics than the average community college or four-year college enrollee.

[6] Net price calculators are online tools that estimate the out-of-pocket cost a prospective student can expect to face at a given institution, calculated as the total cost of attendance less the grant and scholarship aid that student is expected to receive. The Higher Education Opportunity Act of 2008 requires all postsecondary institutions participating in Title IV federal student aid programs to post a calculator on their websites, so an estimate is available for every public college in Washington (U.S. Department of Education 2011). These estimates are not a guarantee of funding, but they represent the institution's best public-facing estimate of what a year of enrollment will cost and are what a prospective student would see when deciding where to enroll.

digit CIP codes) at the national level and in Washington state in the 2022-23 academic year. Four fields tend to dominate CCB awarding at both the national and state level: Education (CIP 13), Computer and Information Sciences (CIP 11), Health Professions and Related Services (CIP 51), and Business Management and Administration Services (CIP 52). Although the patterns of awarding are similar across the two panels, Washington awards a much higher share of CCBs in the computer and information technology field, nearly 25 percent in Washington compared to 10 percent nationally. Given the tailoring of these programs to local workforce needs, it is unsurprising to see tech-related fields overrepresented in the state, which is home to technology giants such as Microsoft, Amazon, Expedia, and Zillow. Recently, technology-related CCB programs became the most common CCB program type in the state, and as of 2022, community colleges awarded over 15 percent of all BAs in the computer and information sciences field in Washington (see Appendix Figure A.3). Relative to programs in health professions and business, technology programs, especially BS in computer science programs, tend to be newer and therefore currently enroll fewer students.[7]

Note that the pattern of CCB introduction across CIP codes does not follow a specific ordering, although Business and Healthcare programs are more likely to open first; 33 percent of WA community colleges introduce a Business CCB first while 27 percent introduce a Healthcare program first, compared to 15 percent of first programs that are Computer Science/Information Technology (CS/IT) and only 3 percent that are Education. These program entry patterns, especially those in Computer Science and Nursing, are aligned with program-level capacity constraints in the state. In other words, CCB entry in Washington is increasingly clustered in fields that are experiencing both employer demand for labor and capacity constraints at traditional four-year institutions. Section 7.2 takes up this pattern directly, separating the effects of program openings in fields where university seats are rationed from openings in fields where they are not.

[7] Note that the interest in technology-related CCB programs has been spearheaded by Amazon in Washington state, with the company playing a major part in lobbying the state legislature to allow community colleges to offer bachelor of science (BS) degrees in computer science to meet their stated workforce demand. After passing legislation in 2022, Amazon donated $3 million to Seattle-area community colleges to expand their new BS CS programs. This support from major corporations—alongside support from local four-year colleges such as the University of Washington—has allowed programs to grow faster in Washington state than in other, comparable settings such as California and Texas. See a recent report from Bragg and Bragg (2026) for further details.

2.4 How CCB Introduction Expands Attainment: Students and Programs

Whether CCB policy ultimately delivers on its promise of expanded access to the bachelor's degree depends on if and how new programs relieve the constraints that currently limit attainment. This section develops that logic in three parts. I first outline the mechanisms through which CCB entry could plausibly expand access to the BA. I then argue that the effects of program introduction should be concentrated where existing constraints on attainment bind, and that these constraints operate at two distinct levels: the student and the program. Finally, I outline the conditions under which gains in attainment should be expected to translate into gains in the labor market. This framework structures the empirical work in the remainder of the paper.

Mechanisms of Expanded Access

The case for offering bachelor's degrees at community colleges is predicated on the position these institutions occupy in the postsecondary landscape. The first and most direct mechanism is geographic. There are more public two-year than public four-year colleges in Washington, and students are therefore more likely to live near one: over 60 percent of WA high school graduates live within 10 miles of a two-year institution, compared to less than 40 percent within 10 miles of a four-year institution (see Section 3.2), and a substantial literature establishes that proximity matters for students' enrollment and completion decisions (Hillman 2016; Mountjoy 2022; Acton, Cortes and Morales 2024). Second, community colleges are open access by design. Whereas even the least selective public universities in the state deny some share of applicants (see Appendix Table A.3), any student can enroll at a community college, and these institutions serve students throughout the academic preparation distribution: two-year enrollment peaks in the lower-middle of the high school GPA distribution where four-year enrollment falls off (Appendix Figure A.6). A bachelor's degree offered at these institutions therefore reaches students who would not be accepted at their nearest public university or who would not meet the enrollment requirements (standardized test score submission, minimum course requirements, etc.). Third, by allowing students to complete a bachelor's degree at the same institution where they begin their postsecondary journey, CCBs bypass the frictions of the traditional transfer pathway, including credit loss, informational barriers, and the administrative burden of re-enrollment (Scott-Clayton 2011; Bailey and Smith Jaggars 2015;

Schudde, Jabbar and Hartman 2021; Schudde and Jabbar 2024). This continuity is arguably the most distinctive feature of the CCB: it is what separates the policy from simply building additional university branch campuses, an approach the state pursued at considerable capital expense in prior decades (see Section 2.1).

A final, commonly cited mechanism is cost. Community colleges have historically charged lower per-credit tuition than four-year institutions, and advocates frame the CCB as a more affordable route to the BA (Bragg 2019). As Section 2.2 describes, however, this assumption is more nuanced in practice. Washington's escalating tuition structure means that upper-division CCB coursework is priced at rates comparable to the regional universities, and the net price evidence in Appendix D suggests that institutional aid at four-year colleges may narrow or reverse the sticker price gap for some low- and middle-income students. Even where the cost advantage is limited, the perception of lower costs at community colleges could drive enrollment in these programs among students who do not believe they can afford enrollment in a four-year institution.

Where Effects Concentrate: Students

Who benefits from a CCB opening depends on who is currently bound by these constraints. At the student level, the relevant question is the strength of each student's outside option: their path to a bachelor's degree in the absence of CCB entry. The democratization versus diversion framework introduced by Rouse (1995) provides a natural starting point for thinking about this margin. Rouse (1995) and Mountjoy (2022) consider the introduction of a community college option for students choosing between a four-year institution and no college at all; the CCB instead introduces a bachelor's degree option to students who are, in many cases, already choosing among community colleges. Figure 3 visualizes the resulting complier groups. There are likely many CCB enrollees who otherwise would have enrolled in an associate degree program at the same community college (call this effect "Upgrading"); there are also some students who, in the absence of the CCB, may have enrolled in a BA at a traditional four-year institution (call this effect "Lateral Diversion"). Finally, there may be a small group of students who experience "true" democratization; in other words, there may be a small group whose counterfactual enrollment decision would have been no college. For students in the upgrading and democratization groups, a nearby CCB opening may represent the difference between stopping at an associate degree and completing a BA; for laterally diverted students, the same opening simply substitutes one route to the degree for another. A combined estimate of CCB introduction therefore averages over groups with fundamentally different counterfactuals, with weights that are not observable to the policymaker.

Figure 3: Democratization versus Diversion Effects of CCs and CCBs

Notes: This figure shows a theoretical representation of the democratization versus diversion forces proposed by Rouse (1995) and extended in this paper. The left panel shows the potential effects of community college introduction on various complier groups while the right hand panel shows the analogous effects on complier groups of CCB program introduction.

Where Effects Concentrate: Programs

The second constraint operates at the level of the program rather than the institution. Even for students with strong access to the four-year sector, seats in high-demand majors are often rationed through enrollment caps and competitive program-level admissions, a practice that binds even at universities that admit nearly all applicants (Bleemer and Mehta 2024). The same logic that applies to students therefore applies to the openings themselves. A CCB opening in a field where competitive admissions practices are used adds capacity; an opening in an open-access field simply expands the set of institutions offering the degree.

Importantly, these two constraints are distinct and can bind independently of one another. Take, for example, a student living near Eastern Washington University, which admits over 90 percent of its applicants. This student faces no meaningful geographic constraint on four-year enrollment, but if they intend to study nursing they may still be constrained by selective admissions practices.[8] The reverse case is equally plausible: a student living far from any four-year institution who intends to enter a field that is effectively open access faces a binding constraint on enrollment but not on program access. A student may therefore face one constraint, both, or neither, and each CCB approval acts as a decision about where new BA capacity will do the most good.

From Attainment to Earnings

Gains in bachelor's degree completion that may result from CCB program expansion do not necessarily translate to labor market gains. Whether attainment effects pass through to employment and earnings depends on several factors. The first is program quality. Washington's community colleges operate at substantially lower per-student funding levels than the state's universities (see Section 2.2), and if resource constraints affect instructional quality or student support, the seats these programs add could be a lower-quality substitute for the university seats they replace (Lovenheim and Smith 2023; Burland et al. 2026). Section 7.2.1 provides one imperfect check on this concern using nursing licensure outcomes, which hold graduates from all sectors to a common standard. The second is how employers in the labor market understand and value the credential. CCB degrees present as similar to the traditional bachelor's degree on a resume, but the institution name is that of the community college. Whether employers discount the CCB is an open question, but early experimental work suggests the discount may be limited in certain sectors (Acton et al. 2026*a*). Third, the structure of the field itself matters. In licensure fields such as nursing, where all graduates sit for the same examination against the same passing standard, the license rather than the institution is typically the primary labor market signal (Deming et al. 2016). Any credential penalty should be smallest in these fields, which is a pattern consistent with prior descriptive work (Kaikkonen and Quarles 2018; Love 2020; Acton et al. 2026*b*). Finally, the applied orientation of the CCB curriculum may steer students toward direct labor market entry rather than continued study, generating negative effects on graduate degree attainment for the laterally diverted group in particular.

This framework generates two predictions that structure the empirical work in this paper. First,

[8] EWU's BS in Nursing program is capped at 40 students each year, and in 2023 it received 132 completed applications for those seats (Kramer 2023). Section 7.2.1 documents program-level rationing across the state's public universities in detail.

if CCB programs expand attainment by relieving binding constraints, completion effects should be concentrated among students with weak outside options (i.e., those unlikely to otherwise enroll in a four-year institution). Second, completion effects should be larger for openings in fields where seats at nearby universities are rationed than for openings in effectively open-access fields. Section 6 begins with the combined effect of CCB introduction, a policy-relevant metric that communicates the aggregate effect of the policy across the state. Sections 7.1 and 7.2 go on to test where benefits concentrate, providing important lessons for the targeting of these programs as they continue to expand within and across states.

3 Data and Setting

My empirical analysis combines data from several sources that span the state of Washington. Washington is an ideal setting in which to study the introduction of CCBs, although not a representative one, as it is one of very few states that have awarded a sufficient number of CCB degrees for rigorous empirical study.[9] With roughly 1.09 million students enrolled in K-12 public schools in Fall 2023, Washington educates roughly 2 percent of all public K-12 students in the US. The state operates 34 community and technical colleges and is home to 26 accredited, primarily bachelor's degree granting colleges and universities. Collectively, public postsecondary institutions in Washington enroll roughly 250,000 undergraduate students each year (NCES 2023).

The Washington Education Research and Data Center (ERDC) data provide a rich look at student pathways through the state's K-12 and postsecondary systems and beyond into the labor market. My analysis sample begins with all graduates from a Washington state high school between 2005 and 2024.[10] These students are then linked to administrative records from the Washington State Board for Community and Technical Colleges (SBCTC), the Public Centralized Higher Education Enrollment System (PCHEES), and the National Student Clearinghouse (NSC), which capture all postsecondary enrollment and completions in institutions in Washington and across the country.[11]

[9] Florida is the only state that awarded a larger number of CCB degrees during the 2010s.

[10] Although I have data for Washington high school graduates in 2005 through 2024 cohorts, in most of the analyses to follow I use 2005–2018 HS graduating cohorts in order to provide a minimum 6-year window to capture degree completion. Note that 537 observations are dropped immediately from the graduating cohort sample due to missing graduation years or attendance at high schools that cannot be linked to the Washington report card file, representing less than 0.05 percent of the sample.

[11] It should be noted that although the NSC captures more than 91 percent of enrollment nationwide (and more than

These students are further linked to individual quarterly earnings and employer records from the Washington State Employment Security Department (ESD), which measure total earnings and hours at each job each quarter for all Washington employees subject to the state unemployment insurance system.[12] In addition to earnings, I observe employer characteristics such as size and industry. These administrative, student-level records are complemented with publicly available data from the Washington state Office of Superintendent of Public Instruction (OSPI) on school-level characteristics for all Washington high schools as well as college characteristics from IPEDS.

The main limitation of the data, which is common to many state-level administrative datasets, is attrition due to out-migration.[13] In my setting, earnings of Washington state high school graduates who leave the state will not be observed. The main concern with these unobserved earnings is that I cannot differentiate those with true zero earnings from those who leave the state to work elsewhere. One may be concerned that there is selection bias into who leaves the state, so Appendix Table A.2 shows summary statistics for those in my analysis sample with missing earnings versus non-missing earnings. Missing earnings is defined as having no observable quarterly earnings between the ages of 28 and 30, using 2005-2013 graduating cohorts.[14] Individuals with non-missing earnings are roughly 21 percentage points more likely to attend an in-state institution as their first college enrollment, a pattern largely consistent with other work that documents an increased probability of permanently (or semi-permanently) relocating after attending an out-of-state institution for college (Kodrzycki 2001). In order to account for differential attrition due to out-migration, this paper follows the literature (see, for example, Mountjoy 2022) in dropping students above a high-performing threshold (i.e., the 90th percentile of high school GPA). Indeed, I can observe in my data that students in the top percentiles of high school GPA are more likely to have missing earnings (see Appendix Figure A.5). To avoid differential attrition from the earnings sample, I replicate my main analyses dropping

99 percent at four-year public institutions), its name-based match has limitations as detailed in Dynarski, Hemelt and Hyman (2015). Enrollment spells are additionally reported inconsistently across the three enrollment sources; Appendix B.3 describes the cleaning procedure I use to harmonize them.

[12] Employment types that are excluded from state UI systems include self-employed, independent contractors, military personnel, some federal employees, and workers in the informal sector. Stevens (2007) estimates that roughly 90 percent of the civilian labor force is captured in state UI records.

[13] Roughly 70 percent of people born in Washington remain in Washington (Aisch, Gebeloff and Quealy 2014). This is a higher out-migration rate than some states with strong administrative data, like Texas, but still in the bottom half of states.

[14] This measure potentially captures individuals who are in school or not working for some other reason in addition to those who are out of state. Using earnings at ages 28 to 30 minimizes the probability that individuals are still in school while maximizing the number of cohorts I am able to include.

top performers in Appendix Table A.8 and show little change in the headline results.

A final limitation of my data is the construction of the sample. My data cover individuals who graduated from a Washington public high school between 2005 and 2024, which imposes two restrictions. First, I do not observe students who attended private high schools or were home-schooled. Estimates suggest these groups account for less than 10 percent of Washington students in the pre-pandemic period, a figure that is likely lower at the high school level.[15] Second, the cohort window mechanically restricts the ages I can observe: assuming students are approximately 18 at high school graduation, individuals in my sample are at most 37 years old in the final year of data. Appendix Figure A.7 maps the ages observed for each cohort across calendar years. As a consequence, roughly 20 percent of all CCB enrollees in Washington—disproportionately older, non-traditional students—are not captured in my sample. I return to what this restriction implies for the interpretation of my estimates in Section 5.3.

3.1 Program Introduction

As there is no central repository for the date of CCB program entry, the dates of CCB program introduction were manually collected from the Washington State Board for Community and Technical Colleges website.[16] Institutions that wish to introduce a CCB program in a new field (i.e., a CCB program in Applied Business Management) are required to go through a three-stage proposal process overseen by the SBCTC, which includes submission of a standard application to the Board as well as external and internal review processes. Appendix B.1 describes this process in detail. After the proposal process is complete, the SBCTC makes available the proposal documents for all new and upcoming CCB programs.

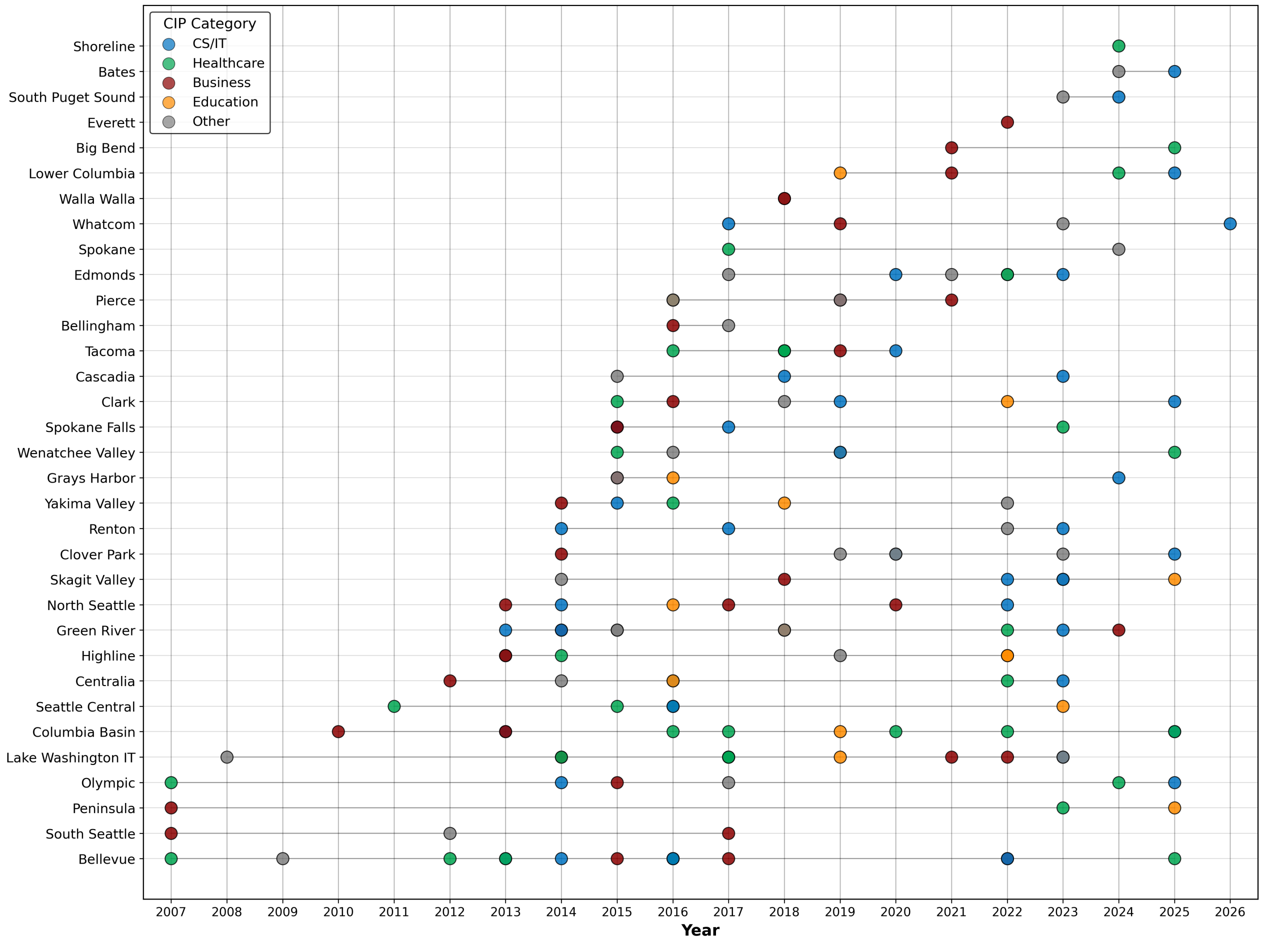
After the initial pilot programs, which were introduced in 2007 and limited to three institutions, colleges that introduced their first program tended to follow up with several new CCB programs within the first 6 years across various fields. Appendix Figure A.4 shows that in the first 6 years after rolling out their first CCB program, colleges introduce, on average, between 2 and 4 programs.

[15] Note that homeschooling and enrollment in private schools grew significantly during the pandemic. As the majority of my analyses exclude students who graduated high school after 2018 this does not impact my analysis.

[16] The advocacy group the Community College Baccalaureate Association keeps a running list of all active CCB programs, but the list does not include introduction dates. Proposed program introduction dates were missing for four programs (2.3 percent), but further research shows that these programs have yet to enroll students.

The most intense period of CCB program growth occurred in the early-to-mid 2010s in Washington, with roughly 60 programs being introduced between 2012 and 2018. Figure 4 shows the pattern of program introduction across institutions by CIP code.

Figure 4: CCB Program Introduction Timeline



Notes: This figure shows the timeline of planned CCB program introductions across Washington community colleges. Each marker represents one individual program introduction that was planned between 2007 and 2026. Field of study uses 2-digit CIP codes, and outside of the four most popular CIP codes (11 - CS/IT; 13 - Education; 51 - Healthcare; and 52 - Business), programs are grouped into an "other" category for ease of visualization.

The introduction of CCB degrees mechanically creates definitional confusion about the "level" of postsecondary institutions. In IPEDS data, for example, the institution would switch from being recognized as one whose highest degree granted is an associate degree—a common method of identifying community colleges—to one whose highest degree granted is a bachelor's degree, which may misclassify the institution as a four-year college.[17] I use the historical (before CCB legislation

[17]The introduction of bachelor's degrees at community colleges may also prompt the more philosophical question of:

passage) set of community and technical colleges in Washington state as my baseline definition of community colleges.[18] I then identify the introduction of a CCB program in my data as the point at which any of these institutions sees its first bachelor's degree program enrollment.

3.2 Distance and the Washington Postsecondary Landscape

Advocates of CCB authorization legislation believe that introducing bachelor's degrees at community colleges has the potential to democratize access to the bachelor's degree, and geographic proximity is the primary mechanism through which this is expected to operate. Measuring that proximity requires locating both students and institutions. To do so, I use Washington State Report Card data to identify exact high school locations (longitude and latitude coordinates), which I use as a proxy for a student's home address in my distance calculations.[19] For each high school, I calculate a pairwise distance in miles between that high school and the closest two-year and four-year institution using postsecondary campus addresses from IPEDS, supplementing these with individually collected campus coordinates for the University of Washington and Washington State University, which each operate multiple campuses offering a reasonable approximation of the degree programs available at their flagships. Appendix B.2 describes this procedure in detail, including the treatment of specialized satellite campuses and of institutions with missing IPEDS location data.[20] I next take the minimum distance in the two- and four-year sector for each high school and graduation year, and I identify the minimum distance to a CCB program by using the distances to each two-year

"are they really community colleges anymore—aren't they just four-year public colleges now?" There is a growing literature in education policy studies about the defining of institution type, especially when "mission drift" occurs (see Levin (2004) for discussion), but in my setting, I will continue to define institutions that have historically identified as a community or technical college (i.e., those that predominantly grant less than four-year degrees) as community colleges or two-year colleges even after they begin offering bachelor's degrees.

[18] This produces an identical set of colleges to if one were to restrict IPEDS institutions to public colleges that primarily offer less than four-year degrees.

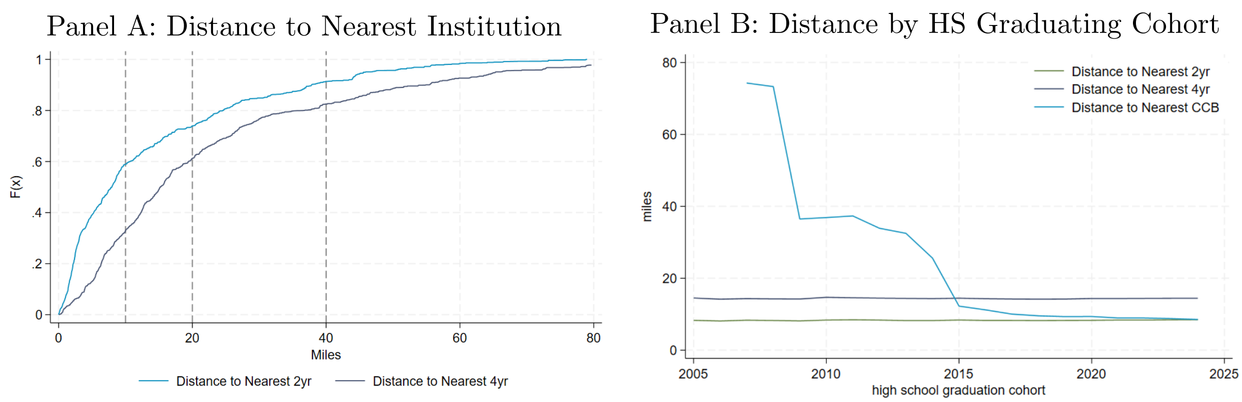
[19] I use high school because my data do not contain home addresses. While the use of high school attended introduces some measurement error into the distance calculations, I believe they are minimal for several reasons. First, the state largely uses a "neighborhood" school system in which students attend their nearest high school. This is not true for the Seattle Public School District (SPS) before 2010, when the district was operating a busing system, but the high schools and community colleges in Seattle are proximal enough that even if a student did not attend the high school closest to their house, the distance calculations that I use should not be subject to significant measurement error. Additionally, data from the National Household Travel Survey (NHTS) indicate that the average high school student in the Pacific region of the U.S. travels under 20 minutes to school, and driving times are comparable for those in urban vs. rural areas (Federal Highway Administration 2022).

[20] I also calculate the average driving time between each high school and college in Washington using Open Route Services and QGIS (HeiGIT and OpenStreetMap contributors 2024; QGIS Development Team 2024). The remainder of the analysis uses straight line distances, but as in existing literature (e.g., Miller 2025; Acton et al. 2025) the two measures are highly correlated and my main results are not sensitive to the distance measure used.

institution in combination with the introduction dates of the various CCB programs.

These measures make clear why community colleges were viewed as a mechanism for expanding BA access in the first place. There are more public two-year than public four-year colleges in Washington, and students are therefore more likely to live closer to a two-year institution. Panel A of Figure 5 shows the cumulative distribution function of distances to the nearest two- and four-year institutions for every high school graduate in WA between 2005 and 2024. Over 60 percent of WA high school graduates live within 10 miles of a two-year institution, whereas less than 40 percent live within 10 miles of a four-year institution. This is key to understanding the motivation behind CCB legislation: policymakers believe that students are more likely to enroll and complete a BA successfully if it is offered closer to home, an idea with recent empirical support (Acton, Cortes and Morales 2024).[21]

Figure 5: Minimum Distances to Public Colleges in Washington State



Notes: Panel A shows the distance to the nearest public two- and four-year institutions for all graduates of WA state public high schools. All graduates of WA public high schools between 2005 and 2024 are included. Distance between each individual's high school and the nearest two- and four-year college is calculated using latitude and longitude coordinates for all institutions. Panel B shows distance to the nearest type of degree (AA, BA, or CCB) by high school graduating cohort (x-axis). Distances are calculated by taking the shortest distance between the student's graduating high school and the closest college offering each type of degree.

The extent to which students live close to BA-granting programs as CCBs expand can be seen in Panel B of Figure 5. Whereas distance to the nearest two- and four-year college remain constant across graduating cohorts, distance to the nearest CCB declines between 2007, when the first CCB programs were introduced, and 2024, the year that 100 percent of WA community colleges began offering bachelor's degrees. This declining average distance over time will provide the variation for my

[21] Figure 8 shows the analogous cumulative distribution functions for students who enrolled, and Appendix Table A.1 reports minimum distances to each institution type in the analysis sample.

empirical strategy and is a simple way to visualize the theory of change that policymakers envision the introduction of CCBs will follow. CCBs become more geographically accessible than a BA at a traditional four-year institution in 2015, when the distance to the nearest CCB drops below the distance to the nearest public four-year institution.[22]

Distance is not the only friction these programs could relieve. Community colleges also tend to serve a population that is historically under-represented in postsecondary education, including academically under-prepared students. Appendix Figure A.6 shows that two-year enrollment peaks in the lower-middle of the GPA distribution, while four-year enrollment and non-enrollment are monotonically increasing and decreasing in GPA, respectively.[23] Together, these patterns suggest that introducing bachelor's degree options at community colleges could mitigate two major sources of friction in BA enrollment: geographic access and academic under-preparation. Section 4 asks whether CCB enrollees are in fact the students these patterns would predict.

3.3 Covariates and Outcomes

Student-level demographics are measured in WA K-12 files and include categorical variables for gender, race/ethnicity, and eligibility for free or reduced price lunch (FRPL) as well as number of AP courses taken, and a cumulative high school GPA.[24] High school-level controls are measured in the NCES Common Core of Data and include the share of students eligible for FRPL, the racial composition of the school, and the share of teachers with at least a Master's degree. I additionally construct an index of neighborhood quality that combines median household income, the share of households under the poverty line, and school-level FRPL eligibility into a one-factor model, normalized to within-cohort percentiles; Appendix B.5 details the construction of this index and its underlying sources.

I study the effect of CCB program introduction on a range of academic and labor market outcomes. **Enrollment** data come from the NSC, PCHEES, and SBCTC files. I create two types of

[22] Also note that accessibility could be conceived as the probability with which a student will be accepted into a BA program. As community colleges are by definition open-access, the CCB is in this way more accessible than a BA from a WA public four-year college, the admissions rates of which are listed in Appendix Table A.3.

[23] Note that this is the same pattern shown in Texas by Mountjoy (2022).

[24] Where possible separate indicator variables are used for Asian, Black, Hispanic, American Indian and Alaskan Native (AIAN), and White students. Students identifying as Pacific Islander are grouped with Asian to create an AAPI indicator. Students for whom race is unknown (less than 1 percent of the sample) are grouped with students who identify as two or more races, which is a separate indicator.

enrollment indicators: ever enrolled at a given type of institution (two-year, four-year, etc.), and first enrollment, which indicates the first institution the individual enrolled in after graduating from high school and is not limited to the years immediately following graduation.[25] **Completions** data come from the NSC and SBCTC files, and include the level, timing, and field of study (six-digit CIP code) of each degree. Throughout the paper, I define degree completion within 10 years of high school graduation. Much of the existing college access and success literature uses a six year window for completion (150 percent of "normal" time to completion), but given the composition of community college populations skewing towards older students, a 10-year window from high school graduation offers more time to capture non-traditional student pathways.[26]

Earnings and employment data come from the Washington State ESD. Quarterly wages and hours worked are generated by summing earnings and hours measures within individual by quarter. Hours worked is particularly unique in administrative data, and allows me to generate a measure of hourly earnings by taking the simple ratio of earnings and hours, which I favor in my results. Earnings are inflated to 2024 dollars using the annual US consumer price index (CPI) and winsorized at the 99th percentile. Earnings outcomes are presented as average earnings within person over two age ranges, 25-27 and 28-30, which assumes students are 18 years old at the point of high school graduation. For earnings outcomes using ages 28-30, the 2013 high school graduating class is the last available cohort.

4 Who Enrolls in Washington's CCB Programs

I begin by establishing several stylized facts about Washington state's CCB enrollees and graduates captured in my sample. Section 4.1 details the characteristics of CCB enrollees and Section 4.2

[25] Washington has a robust dual enrollment program (Running Start) in which high school students can enroll in the state's community and technical colleges to earn college credit. In some cases, high school students can earn enough credits to complete an associate degree while still in high school. Roughly 16 percent of students participate in Running Start. In the results that follow I exclude Running Start enrollment from my enrollment results except where explicitly mentioned. Other, much smaller dual enrollment programs such as College in the High School and Alternative High School are classified as dual enrollment and similarly not counted towards enrollment results.

[26] Results are comparable using both 6-year and 8-year completion windows. My main analysis uses high school graduating cohorts between 2005 and 2018; the 2018 cohort only has outcomes through Summer 2025 and has therefore not yet "completed" its 10-year follow-up window. I reproduce results limiting the sample to students in the 2005 through 2015 graduating cohorts and see no significant difference in results, therefore I continue using 2005-2018 cohorts to maximize my sample size. Appendix B.4 additionally describes the two-part definition of successful transfer that I use in Section 6, as well as the construction of quarters of schooling.

provides a descriptive look at the earnings of CCB graduates relative to their AA- and BA-holding peers. Together, these stylized facts motivate the causal analysis that follows.

4.1 Characteristics of CCB Enrollees

Table 1 shows the characteristics of the full sample (column 1), compared to students who ever enroll in a CCB program (column 3), a non-CCB program at a WA public two-year (column 2), any undergraduate program at a WA public four-year college (column 5) or one of the non-selective public four-year colleges (column 4, all excluding the University of Washington's Seattle campus) during my sample period.[27] This table shows that CCB degrees seemingly occupy a "middle ground": CCB enrollees appear to be more academically prepared than two-year enrollees (3.05 HS GPA compared to 2.78 HS GPA), but less prepared than traditional four-year enrollees (3.35 HS GPA), even those at non-selective four-year colleges (3.26 HS GPA).[28] The number of AP courses completed follows this same pattern. Demographically, 58 percent of CCB enrollees are female compared to 52 percent and 55 percent of two- and four-year enrollees, respectively. CCB programs enroll a higher share of Black students than four-year programs but a lower share than two-year programs. Enrollment share of Asian and Hispanic students in CCBs, however, is higher than or equivalent to two-year programs. Notably, CCB students are much more likely than four-year enrollees (all and non-selective) to be eligible for FRPL, which serves as a proxy for low-income status. Taking these summary statistics at face value would suggest that CCB legislation is indeed expanding access to BA programs for populations traditionally served by community colleges.

This descriptive overview of CCB enrollees suggests that the introduction of these programs in Washington may be effective at democratizing access to BA degrees for those who traditionally face barriers to entry such as minimal academic preparation or distance barriers. This fact further underscores the importance of understanding if CCB programs are indeed increasing the probability of BA completion and earnings among these students. If these programs are not only enrolling

[27] Note that if an individual enrolls in both a WA public two-year and a WA public four-year, they will be counted in both groups, but if a student enrolls in a CCB program they are only counted in that column. Running Start enrollment is excluded from consideration.

[28] The full distribution of high school GPAs can be seen in Appendix Figure A.8, which shows densities of high school GPA by enrollment group analogous to the table. The figure shows that the four-year distribution is concentrated at the high end of the GPA range, peaking around 3.7–3.8 and most tightly clustered near the top of the scale, while the two-year and no college distributions peak much earlier, around 2.0–2.2. The CCB distribution falls between the two groups, peaking near 3.0–3.1, providing additional evidence that CCB enrollees tend to have stronger academic preparation than two-year college students but weaker preparation than four-year college students on average.

Table 1: Summary Statistics by Enrollment Type

	All HS Grads	2yr Enrollees	CCB Enrollees	4yr (non-sel.)	4yr (all)
	(1)	(2)	(3)	(4)	(5)
HS GPA	2.97	2.78	3.05	3.26	3.35
	[0.71]	[0.65]	[0.58]	[0.50]	[0.50]
AP Courses (count)	1.84	1.15	1.42	2.24	2.96
	[3.84]	[2.84]	[2.82]	[3.68]	[4.69]
Female	0.504	0.515	0.579	0.544	0.545
	[0.500]	[0.500]	[0.494]	[0.498]	[0.498]
Asian	0.086	0.075	0.139	0.078	0.135
	[0.280]	[0.263]	[0.346]	[0.267]	[0.342]
Black	0.045	0.055	0.048	0.037	0.038
	[0.207]	[0.229]	[0.215]	[0.189]	[0.191]
White	0.629	0.629	0.562	0.683	0.636
	[0.483]	[0.483]	[0.496]	[0.465]	[0.481]
Hispanic	0.169	0.171	0.199	0.143	0.130
	[0.374]	[0.376]	[0.399]	[0.350]	[0.336]
FRPL	0.429	0.450	0.447	0.326	0.309
	[0.495]	[0.491]	[0.497]	[0.469]	[0.462]
N	1,371,507	450,252	11,871	311,862	431,188

Notes: Table shows characteristics of CCB enrollees versus enrollees in two- and four-year WA public colleges. Anyone ever enrolled in any of the types is included in each enrollment group. CCB enrollment does not count as two-year or four-year enrollment. Column 1 summarizes the full sample (2005-2024 graduating cohorts regardless of enrollment status).

but also boosting BA completion for students who would otherwise have enrolled in AA programs, they could be providing important long-run benefits for students who would otherwise be under-represented among BA earners. If, on the other hand, these programs are simply shifting BA enrollment from four-year to two-year institutions, or the degrees are undervalued relative to a traditional BA in the labor market, they could have a negative effect on graduates' labor market outcomes. The next section takes a descriptive look at earnings across fields.

4.2 CCB Graduate Earnings

To complement the enrollment patterns discussed above, Figure 6 presents regression-adjusted earnings gaps between CCB graduates and AA and traditional BA holders, separately by field of study and at one, three, and five years post-graduation.[29] Each panel plots four estimates for each

[29] Hourly earnings are measured as an average of hourly earnings at the quarterly level between 2 and 6 quarters post-graduation for the 1-year measure, between 10 and 14 quarters post-graduation for the 3-year measure, and between 18 and 22 quarters post-graduation for the five-year measure.

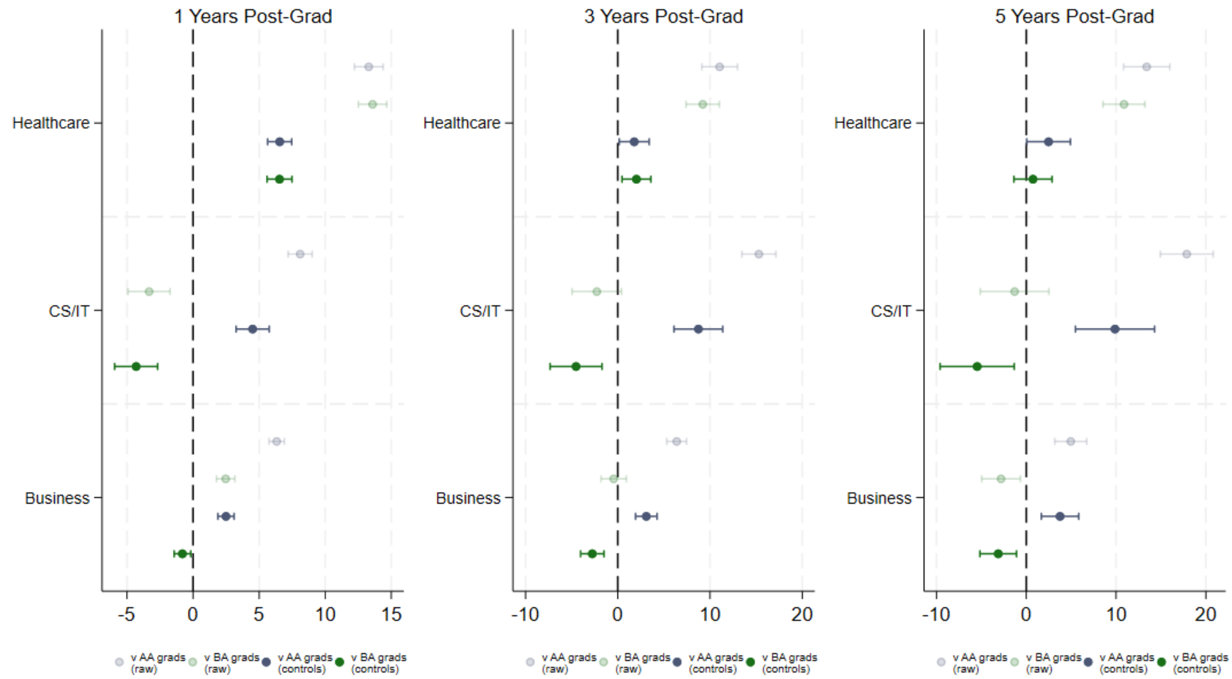
field of study: unadjusted (dashed confidence intervals) and adjusted (solid CIs) estimates of CCB earnings relative to AA holders (green) and CCB earnings relative to traditional BA holders (blue). All specifications control for degree completion year, high school graduation year, years of labor market experience, gender, race, high school GPA, industry of employment, and high school fixed effects. For the CCB-to-AA comparison, specifications also include college fixed effects, restricting the comparison to graduates of the same Washington community college. The CCB-to-BA comparison necessarily spans institutions and therefore omits college fixed effects.

Figure 6 shows—in line with existing literature (Acton et al. 2026*b*)—that CCB graduates generally occupy an earnings "middle ground": they earn a premium relative to AA holders but face a penalty relative to traditional BA holders.[30] This pattern is most pronounced in Computer Science and Information Technology and in Business and Management, which are the two largest CCB-granting fields in Washington. In these fields, the CCB earnings advantage over AA graduates is positive and stable across post-graduation windows, as is the earnings penalty compared to traditional BA holders. In CS/IT in particular, the premium relative to AA holders is large and grows to exceed the penalty relative to BA holders by nearly double.

Healthcare programs are notably different from the other two fields. CCB graduates in Health Professions and Related Services earn a premium relative to both AA and traditional BA holders in the first year after graduation. This pattern should be interpreted with caution, as it likely reflects the composition of healthcare majors being compared: CCB programs in Washington are concentrated in Nursing and Respiratory Care, while the broader healthcare category at four-year colleges includes many pre-medicine students who tend to enter lower-paying research or service roles immediately after graduation before pursuing graduate training. This explanation is supported by the erosion of the premium at years three and five. The limited earnings advantage over AA graduates at longer horizons in healthcare is consistent with prior descriptive work from Washington and Florida (Kaikkonen and Quarles 2018; Love 2020) and with Acton et al. (2026*b*), all of which find that earnings penalties are smallest in fields where licensure requirements are the primary determinant

[30] Throughout the paper I use "premium" and "penalty" descriptively to denote conditional earnings differentials between credential groups, following standard usage in the literature (e.g., Acton et al. 2026*b*). These terms carry no causal or counterfactual interpretation: a "penalty" relative to BA holders does not imply that a traditional BA was necessarily an accessible alternative for CCB graduates. Given well-documented barriers to enrollment in university programs, the relevant counterfactual for many CCB students is likely the earnings of AA holders. The BA comparison speaks to how the labor market values the CCB relative to the traditional baccalaureate.

Figure 6: CCB Earnings vs AA and BA Earnings



Notes: Figure shows regression-adjusted estimates of CCB graduate earnings compared to AA and BA graduate earnings 1, 3, and 5 years post-graduation date. All regressions include fixed effects for degree completion year. AA to CCB comparisons include institution fixed effects. Regressions are estimated separately for each field of study. Fields of study are 2-digit CIP codes.

of labor market outcomes. This is also the pattern referenced in Section 2.4: in fields where all graduates sit for the same licensure examination, the license rather than the institution serves as the primary signal, compressing earnings differences across credential types.

Taken together, the descriptive facts in this section motivate the causal analysis that follows. CCB programs enroll students who fall somewhere between the typical two-year and four-year enrollees in academic preparation and socioeconomic background, exactly the population many advocates and policymakers envision these programs serving. I also observe that, in line with existing descriptive earnings analyses, CCB graduates earn more than AA holders but less than traditional BA holders, with meaningful variation across fields. These gaps map directly onto the counterfactual groups outlined in Section 2.4: for students in the upgrading group, the relevant comparison is the CCB premium relative to AA holders, which is positive across fields, whereas for laterally diverted students, the relevant comparison is the penalty relative to traditional BA holders, which suggests a potentially negative effect of shifting BA enrollment from a four-year institution to a CCB. The adjusted gaps alone, however, cannot tell us which comparison applies to whom: they cannot distinguish whether CCB programs are causing students to complete bachelor's degrees they would not otherwise have earned or simply shifting students who would have completed a traditional BA into a community college pathway. A combined estimate of the effect of CCB introduction on earnings therefore averages over groups with different counterfactual earnings. Section 5 develops the quasi-experimental approach I use to estimate these effects, and Section 7.1 estimates them separately by counterfactual group.

5 Empirical Approach

My empirical approach compares changes in student outcomes before and after CCB program introduction using distance to the new CCB program to define exposure to treatment. CCB programs were rolled out across Washington state community colleges between 2007 and 2025 (see Figure 4), a staggered introduction that lends itself to a stacked event study approach as in Deshpande and Li (2019) and Cengiz et al. (2019). A natural starting point would be a standard two-way fixed effects estimator that exploits this variation, but under staggered treatment timing, two-way fixed effects estimates are biased when treatment effects are heterogeneous across adoption cohorts (Callaway and Sant'Anna 2021; Goodman-Bacon 2021; Sun and Abraham 2021). The stacked approach addresses this by constructing a separate "clean" dataset for each CCB introduction event, pairing students exposed to each new program with control students who have not yet been exposed to any CCB program within the relevant time window. Stacking across events and estimating a common set of event-time coefficients recovers a weighted average of event-specific treatment effects that is robust to the heterogeneity that contaminates the two-way fixed effects estimator.

5.1 Combined Effect

The main identification challenge in estimating the returns to education at any level is one of selection. Students are not sorted randomly into degree programs, thus a naive regression of earnings on degree type—even controlling for observable characteristics—is likely to be confounded by unobserved factors that influence both academic choices and labor market outcomes. In the case of the CCB, students who choose community colleges are more likely to come from marginalized backgrounds relative to their traditional four-year peers (see, for example, Appendix Table A.4), meaning that a selection-on-observables strategy would likely lead to downward-biased estimates of returns to CCBs relative to a traditional BA. To overcome the selection of students into programs, this project will use an event study approach that leverages the staggered roll-out of these programs across the state. Exposure to CCB programs varies by distance to the nearest CCB-offering institution, and the event-study approach provides an estimation of the intent-to-treat effect of the introduction of these programs.

The stacked event study approach treats each CCB introduction (at the institution-level) as its own event (e), creating individual datasets for each event and estimating effects in the given time window around that event. Control students are those who are not exposed to the relevant event (CCB program opening). Exposure is discussed in detail in the next section.[31] Over this time period, some control students experience their own CCB openings. As is standard in the literature, I control for these by constructing indicator variables equal to one if a control student experiences a CCB opening during the pre ($-3 \leq \tau < 0$) or post ($0 \leq \tau \leq 5$) period of the nine year treatment window. These dummies are then included in the regression specification as ω_{iht} in Equation 1.[32]

The regression equation is:

$$Y_{iht} = \sum_{\tau=-3,\, \tau\neq-1}^{5} \alpha_\tau I_{ht}^{\tau} + \mu_{he} + \rho_{te} + \omega_{iht} + X_i\beta + \varepsilon_{iht} \tag{1}$$

where Y_{iht} is the outcome for individual i in high school (h) graduation cohort t. The treatment indicator I_{ht}^{τ} equals one if an individual at high school h is exposed to a CCB opening that is τ years from the year they graduate high school t (different measures of exposure are discussed below). This specification controls for high school-by-event effects as well as time-by-event effects. ω_{iht} is a vector of indicators for any other CCB introductions that occur within the nine panel years of dataset e, and X_i is a matrix of additional controls at the individual level including high school GPA, number of

[31] The main event studies use an unbalanced panel, as CCB program introductions span 2007 to 2015 and high school cohorts 2005 through 2018 are used. To assess whether this imbalance drives results, Appendix Figure A.9 replicates the main estimates using a balanced panel restricted to the 2009 introduction cohort, for which a symmetric event window is available across all treated institutions. The results are qualitatively unchanged.

[32] My results are robust to creating "clean" datasets for each event. In these "clean" datasets I define control students as those that do not experience a CCB opening in the nine year panel around event e. Control students that do experience a CCB opening are dropped from the event-specific dataset.

AP courses completed, gender, race, and FRPL status. Standard errors are clustered at the level of treatment (high school). This design identifies the causal effect of CCB program introduction on the treated individual's probability of completing a degree and their long-run earnings under traditional event study assumptions, discussed in more detail in Section 6.3.

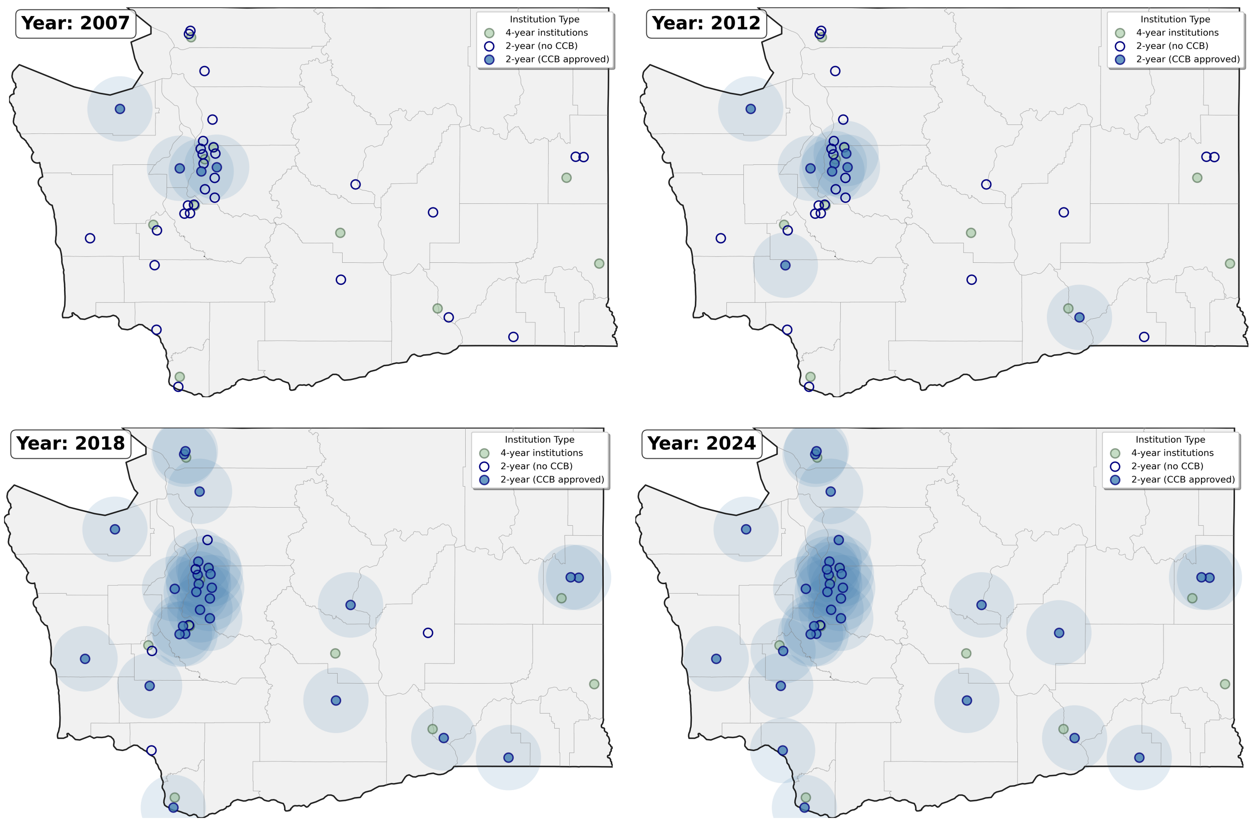
5.2 Defining Exposure to CCB Introduction

Using this stacked event study framework, an open empirical question is which students should be considered "treated" versus untreated (i.e., which students are exposed to CCB programs upon opening). Treated students need to experience a reasonable increase in the probability that they attend a CCB program, and untreated or control students should be similar to the treated students but largely unaffected by the opening of a CCB program. Any exposure definition strategy will be imperfect. In other words, there are likely to be individuals in the control group who enroll in a CCB program (always-takers in a compliers framework) and there are guaranteed to be individuals in the treatment group who do not take-up CCB enrollment (never-takers).

Several simple approaches to defining geographic exposure face complications in this setting. Assigning treatment based on each student's nearest CCB is straightforward but breaks down in areas where colleges are clustered together, for example in the Seattle-Tacoma metropolitan area (Figure 7), leaving many students equidistant from multiple colleges. Alternatively, assigning treatment at the county level, where any student whose county contains a CCB is considered treated, mitigates the clustering problem but introduces its own issues: namely, a student's nearest college is not guaranteed to be in their county, and unlike some states, Washington does not offer in-district tuition that would otherwise incentivize students to attend their county's college.

My preferred approach is the "ring method," in which an inner ring of treated students are defined within a certain distance from the CCB program introduction, with an outer ring of control students just outside serving as the comparison group. My main results will use a 20-mile radius as the "inner" treated ring and comparisons will be limited to students in the 20-40 mile radius, but Appendix Table A.9 shows robustness of main results to varying ring sizes as well as the inclusion of outer ring (40+ miles) students in the control group. A similar strategy has been used in previous literature across a variety of settings (Miller 2025; Currie and Moretti 2003). The intuition behind this method can

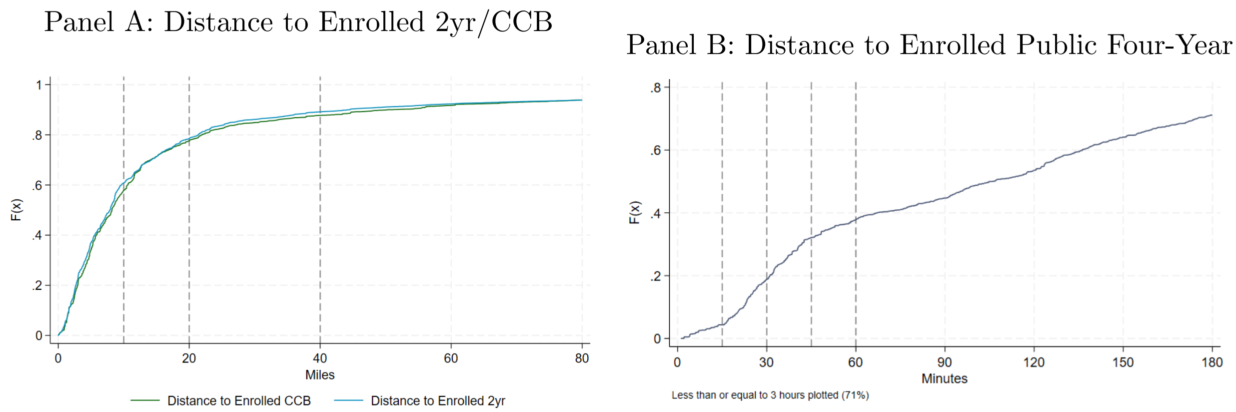
Figure 7: Location of CCB Programs and Exposed Students



Notes: This figure shows the location of two-year (blue) and four-year (green) colleges in Washington state and the exposure of students to CCBs over time. Around each two-year institution is a 20-mile radius ring to illustrate the definition of "geographical exposure" to CCB introduction used in my analysis. The top left panel shows exposure in 2007: the first year CCBs were introduced in WA. The top right panel shows exposure in 2012, the bottom left panel shows 2018, and the bottom right panel shows exposure in 2024, the first year in which all institutions were authorized to offer bachelor's degrees.

be seen in Figure 8: enrollment probability in a given community college declines sharply beyond 20 miles from a student's high school, suggesting the ring method is well-suited to treatment assignment in my setting. This figure also shows that the distribution of distance traveled is nearly identical for students enrolled in community colleges and students enrolled in CCB programs, suggesting that CCB students are not traveling farther than they otherwise would. In other words, students appear to be attending CCB programs at their local community college. Figure 7 shows the location of all CCB-offering colleges in illustrative years (2007, 2012, 2018, and 2024) with a 20-mile radius surrounding each college.

Figure 8: Minimum Distances to Enrolled Public Colleges in Washington State



Notes: Figures show the distance to public two-year institutions, CCB programs, and four-year institutions for all graduates of WA state public high schools who enrolled in one of these institutions (or programs). All graduates of WA public high schools between 2005 and 2024 who enrolled in one of these options are included. Distance between each individual's high school and the enrolled college is calculated using latitude and longitude coordinates for all institutions.

5.3 Interpretation and Identifying Variation

Given the research design and the structure of my data, the estimates that follow are informative about a specific subset of potential CCB students. Because exposure is defined by the opening of a CCB program near a student's high school around the time of graduation, my estimates capture intent-to-treat effects for recent graduates of Washington public high schools, and the implicit compliers are young people induced to enroll in a CCB program because one was introduced near where they grew up. Older students do not contribute to identification: restricting the sample to the 2005–2024 graduating cohorts excludes roughly 20 percent of Washington's CCB enrollees who are disproportionately older, non-traditional students. The oldest individuals I observe are at most 37 in the final year of data (see Appendix Figure A.7). My outcome windows reinforce this focus on younger enrollees: degree completion is measured within 10 years of high school graduation and earnings are measured at ages 25–27 and 28–30, so all results speak to early-career trajectories. I highlight this limitation because adult learners are one specific population that CCB programs, with their applied focus and flexible scheduling, were designed to serve. To the extent that older students face tighter geographic and financial constraints on four-year enrollment than recent high school graduates, the democratization effects I document below may understate the gains possible in this group, and the aggregate effect of CCB expansion may be larger than my estimates imply. The results should therefore be read as the effect of CCB introduction on traditional-age students, with effects on older enrollees left as an important question for future work.

6 Results

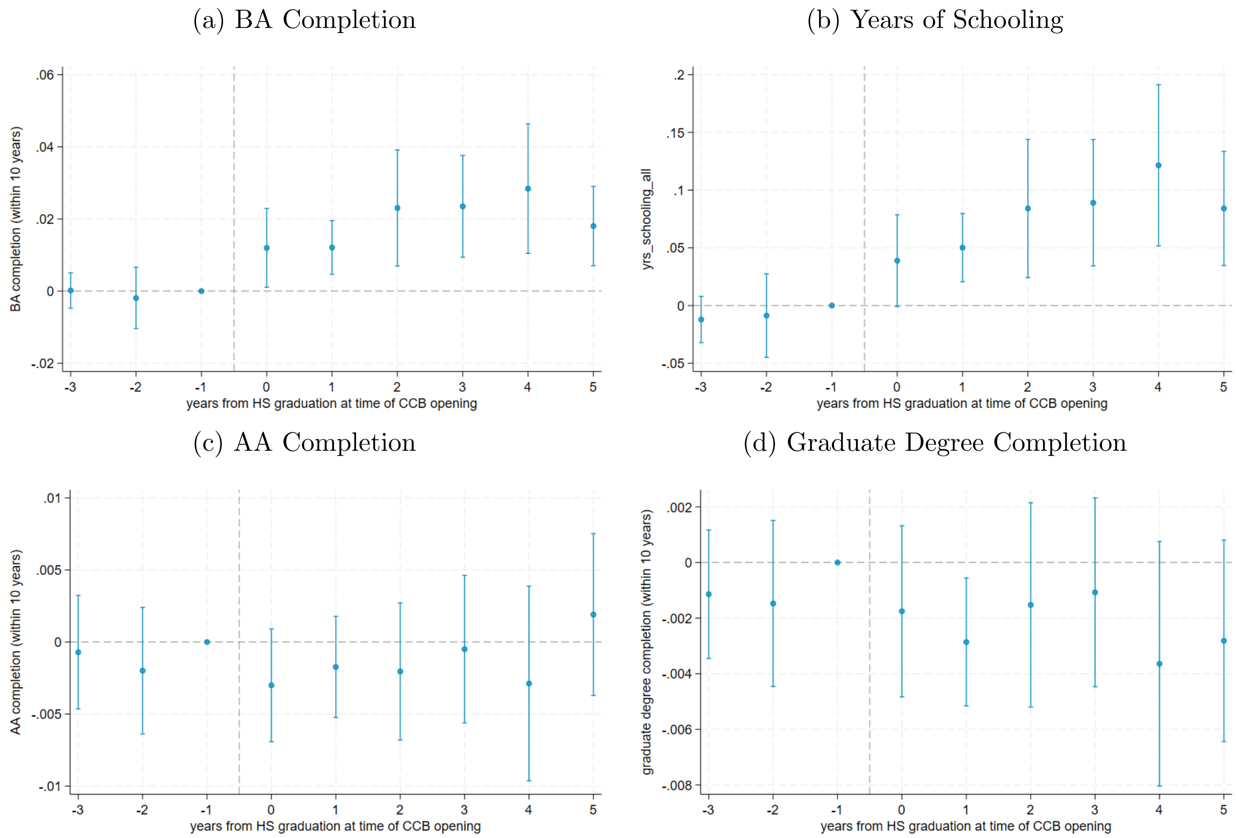
This section presents the combined intent-to-treat effect of CCB program introduction on degree completion and early labor market outcomes. As described in Section 5.1, this parameter captures the average effect of geographic exposure to a new CCB program for students who graduate high school in the years surrounding program introduction. It can be seen as the most direct analog to what a policymaker would observe as the aggregate effect of CCB expansion, and it serves as the foundation for the decompositions that follow in Sections 7.1 and 7.2. I present event study estimates from the stacked design described in Section 5, using the ring method as my preferred treatment exposure definition with an inner ring of 20 miles and an outer ring of 40 miles. Throughout, the pre-period estimates support the parallel trends assumption underlying the design. Section 6.3 confirms that the headline results are robust to a range of specification choices.

6.1 Effects on Degree Completion

Figure 9 presents the stacked event study estimates of the combined intent-to-treat effect of CCB program introduction on enrollment and degree completion outcomes. The x-axis measures years between a student's high school graduation and the opening of a CCB program at their nearest community college, with $\tau = -1$ normalized to zero and serving as the omitted reference period. Pre-period estimates are small in magnitude and statistically indistinguishable from zero across all four outcomes, consistent with the parallel trends assumption necessary for identification. I test parallel trends assumptions more formally in Section 6.3.

Panels A and B show that CCB program introduction meaningfully increases the probability that exposed students complete a bachelor's degree within ten years of high school graduation as well as years of schooling a student receives over that same period. Effects for both outcomes are statistically significant beginning at $\tau = 0$ and grow over subsequent cohorts, representing a bachelor's degree completion effect of between 1 and 2 percentage points in years 2 to 5 after introduction. The positive trend across event time is consistent with a ramp-up in program capacity and visibility

Figure 9: Effect of CCB Program Introduction on Academic Outcomes



Notes: Panels (a)–(d) show the effect of CCB program introduction on individual outcomes. Panels (a), (c), and (d) show effects on bachelor's degree, associate degree, and graduate degree completion, and panel (b) shows effects on the total years of postsecondary enrollment. All panels use NSC and SBCTC data for outcome data. Each event study uses CCB program introductions between 2007 and 2015 (16 introductions) and high school graduating cohorts between 2005 and 2018.

following initial introduction. Early cohorts gained geographic access to CCB programs but were limited in access to program offerings and enrollment capacity, whereas later cohorts benefited from more established programs.

Panel C shows that these bachelor's degree completion effects do not come at the cost of associate degree completion. Effects on associate degree completion are small, centered near zero, and statistically indistinguishable from zero throughout the event window, with point estimates ranging from approximately -0.003 to $+0.002$. This null effect on AA completion is consistent with the structural design of CCB programs: the 2+2 model, in which the first two years of a CCB program fulfill the requirements of an associate degree, means that many CCB completers earn an AA en route to their bachelor's degree rather than instead of one. The absence of any decline in associate degree attainment is therefore largely mechanical, and provides some suggestive evidence that the BA completion effects in Panel A are driven by students who otherwise would have earned an associate degree either before attempting transfer to a four-year institution or before leaving college with an AA alone.[33]

Panel D turns to graduate degree completion as an indication of whether CCB introduction affects students' post-baccalaureate academic trajectories. The post-period estimates are uniformly small and negative, ranging from roughly -0.1 to -0.3 percentage points, and statistically indistinguishable from zero, although the confidence intervals are too wide to rule out economically meaningful effects in either direction. Taken at face value, the pattern is consistent with a null combined effect on graduate degree attainment.

The event study estimates capture the full dynamic pattern of treatment effects, but the results are robust to a simpler pre-post difference-in-differences specification. In this alternative approach, I collapse the event-time dimension into a single binary post-indicator and estimate the average treatment effect across the full post-period window, replacing the vector of event-time dummies in Equation 1 with a single indicator for $\tau \geq 0$. This estimator sacrifices the ability to trace the trajectory of effects over event time and to assess pre-trend behavior, but offers a summary of the average intent-to-treat effect for exposed students. The DiD estimates are consistent with the event study results: BA completion increases by approximately 1.9 percentage points, AA completion effects remain near zero, and graduate degree effects are small and statistically indistinguishable from zero at -0.1 percentage points.[34] The bachelor's degree result is the only combined effect that is statistically significant at conventional levels (significant at the 5 percent level).

6.2 Effects on Earnings

Figure 10 presents intent-to-treat estimates for log real hourly wages at ages 25 to 27 and for quarterly hours worked between ages 25 and 27. Point estimates on earnings are positive throughout the post-period and have a suggestive positive trajectory between years 1 and 3, growing over time as

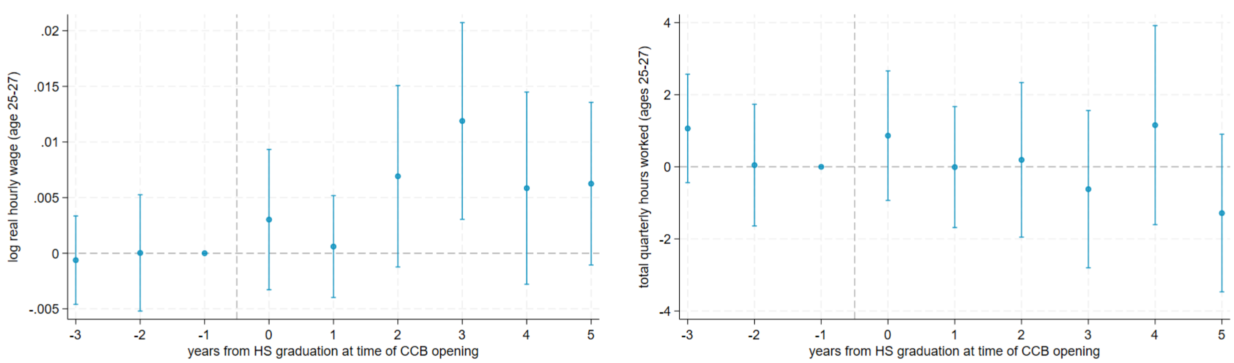
[33] A related question is whether CCB introduction affects *transfer* AA completion rates: that is, whether students who might have earned a transfer associate degree en route to a traditional four-year program are instead remaining at their community college to pursue a CCB. The event study results for transfer AA completion are similarly null throughout the post-period, which is suggestive but not conclusive on this margin. I take up the question of diversion from traditional four-year pathways more directly in Section 7.1.

[34] The combined effect of 1.9 percentage points implies an additional roughly 400 bachelor's degrees awarded. The average number of CCBs awarded to HS graduation cohorts of the same period is upwards of 500 annually.

CCB programs take hold, with the estimates in year three statistically distinguishable from zero. The simple pre-post estimate is positive at 0.005 log points, or roughly 0.5 percent, but is imprecisely estimated. Although this effect is marginally significant in some specifications (see, for example, Appendix Table A.9), I interpret the combined effect on earnings as null. The effects on log real *quarterly* wages in the same age range are uniformly null, as are effects on total quarterly hours worked in the same age window (Panel B), suggesting that any effect of CCB introduction is operating through the hourly wage rate rather than through labor supply.[35]

Figure 10: Effect of CCB Program Introduction on Earnings Outcomes

(a) Log Hourly Earnings (ages 25-27) (b) Quarterly Hours Worked (ages 25-27)



Notes: Panels (a) and (b) show the effect of CCB program introduction on log real hourly wages between ages 25 and 27 and quarterly hours worked between ages 25 and 27. Both panels use ESD data for outcomes. Total hours worked for each individual are summed at the quarterly level. Real hourly wages are calculated by dividing the sum of an individual's total quarterly wages by their total quarterly hours. Wages are adjusted to 2024 dollars and presented in logs. The average across quarters between ages 25 and 27 is taken. Each event study uses CCB program introductions between 2007 and 2015 (16 introductions) and high school graduating cohorts between 2005 and 2018.

The lack of a statistically significant positive effect on earnings paired with the positive observed effect on bachelor's degree completion is surprising given the traditional wage premium associated with BA completion. As Section 2.4 outlines, however, this is largely the pattern one would expect from a parameter that combines groups with opposing enrollment counterfactuals, especially if CCBs are undervalued relative to traditional BAs in the labor market. The imprecise result is additionally consistent with two possibilities: first, that I am underpowered to detect effects on earnings because these effects take time to materialize or due to sample size constraints; or second, because the return to a CCB is small relative to existing postsecondary options. As Section 7.1 will discuss, this average

[35] All earnings results use the full sample, to match the sample used in the BA, AA, and graduate degree results. All results are replicated using a sample that drops top performers, who are more likely to move out of state and therefore be missing from the earnings file as described in Section 3, in Appendix Figure A.12.

conceals meaningful heterogeneity across counterfactual groups.

6.3 Robustness

I next assess the sensitivity of the main results to a variety of specification choices including the definition of the inner treatment ring, inclusion of students who live more than 40 miles from a community college, and control set.

The choice of a 20-mile inner ring is motivated empirically by the sharp decline in the probability of enrollment at a given community college beyond that distance, as documented in Figure 8. Appendix Table A.9 replicates my main results (using a simple pre-post difference-in-differences approach) using inner ring radii of 16, 18, 22, and 24 miles in place of the preferred 20-mile definition. Across all four alternatives, point estimates are similar in magnitude and statistical significance to those from the preferred specification, suggesting that the results are not sensitive to the precise boundary used to assign treatment exposure. I additionally estimate the model without an outer control ring; that is, I use all students outside the inner ring as the comparison group rather than restricting to those within 20 to 40 miles. Although point estimates are similar in magnitude, the inclusion of students far from any CCB-opening college introduces additional noise and yields wider confidence intervals (Panel B of Appendix Table A.9). Restricting the comparison group to the outer ring therefore improves precision without meaningfully changing the estimated effects, further supporting the use of the ring method as the preferred treatment assignment strategy.

Additionally, Appendix Figure A.10 presents estimates across three control specifications: no controls, individual-level controls (gender, race/ethnicity, high school GPA, and FRPL status), and the full control set described in Section 5.1. The all controls version is my preferred specification throughout the paper, as it accounts for correlation between geographic proximity to postsecondary institutions and demographic or academic characteristics such as low-income status and high school GPA. Reassuringly, the estimates are similar across specifications.

A final specification concern, given the relatively small number of events I use in my stacked event study design, is that one single opening (for example at the largest CC or in the population-dense Seattle area) could be driving results. I address this by conducting a series of leave-one-out style tests in which I replicate the stacked event studies dropping one event each run. Appendix

Figure A.11 shows the main estimates reproduced 16 times with each run leaving out one single CCB introduction. Each of the leave-one-out estimates falls within the confidence interval of the main findings and even the most extreme cases show positive impacts on BA completion. These tests serve to confirm the robustness of my main results to concerns about sensitivity to a relatively small number of events.

6.3.1 Event Study Assumptions

Beyond robustness to specification choices, causal interpretation of the stacked event study estimates relies on several key assumptions. I discuss each below and provide supporting evidence where possible using both the structure of the research design and institutional features of the CCB approval process in Washington state. Appendix C reports the supporting tests in full.

Parallel Trends. The central identifying assumption of the event study is that, in the absence of CCB program introduction, trends in outcome measures among students in the treatment ring would have evolved in parallel to those in the outer control ring. This assumption is not directly testable, but the near-zero pre-period estimates in the event study plots presented thus far provide supporting evidence. I additionally implement formal sensitivity analysis following Rambachan and Roth (2023), which allows for inference under restricted violations of parallel trends and quantifies the magnitude of violation that would render the estimated effect statistically insignificant at the 5 percent level. Using this approach, I estimate that the effect on BA attainment is robust to post-treatment violations of parallel trends up to 47 percent as large as the bound implied by the pre-treatment estimates, suggesting that a substantial divergence between treated and control areas would be required to overturn the conclusions presented here. Appendix C describes the breakdown value and its construction in more detail.

No Anticipation. A second assumption necessary for causal interpretation is that students do not adjust their behavior in anticipation of a CCB program opening before it officially begins enrollment. Anticipatory responses, such as students delaying enrollment in expectation of a nearby CCB, should produce non-zero pre-period estimates and bias the event study coefficients. The flat pre-period estimates provide suggestive evidence that I do not see meaningful anticipation effects. This is further supported by the institutional features of the SBCTC approval process described in

Appendix B.1: program proposals are reviewed internally and approved by the Board before any public announcement of enrollment availability, limiting students' ability to anticipate and respond to upcoming openings.

Exogeneity of Treatment Timing. Causal interpretation also requires that the timing of CCB program introduction is not driven by pre-existing trends in outcomes among exposed students. This assumption may be of particular concern given that program proposals are evaluated primarily on the basis of employer demand and workforce alignment. Appendix Figure A.15 shows that, compared to the overall state unemployment rate between 2007 and 2024, the counties that saw CCB openings did not face systematically higher or lower unemployment in the year of a CCB opening. To formalize this, I estimate hazard models in which the dependent variable equals one in the year of CCB adoption and zero in all prior years, regressed on lagged county-level unemployment rates; the joint F-statistic on the lagged unemployment terms is 0.77 ($p = 0.52$). Because labor market conditions relevant to a CCB program may operate at the level of the specific occupational field rather than the county as a whole, I repeat this exercise using industry-specific measures from the Quarterly Census of Employment and Wages, matching each opening on both county and the NAICS code associated with its field of study. None of these measures predict adoption timing, with joint F-statistics ranging from 0.45 to 0.49 (Appendix Table A.5). Finally, Appendix Table A.6 shows no significant differences in institutions' financial positions at the point of CCB introduction across early, middle, and late adopters, suggesting that institutional capacity was not a driver of introduction timing.

Stable Unit Treatment Value Assumption (SUTVA). The design additionally assumes that control students in the outer ring are not themselves affected by the introduction of CCB programs at nearby colleges; in other words, that there are no spillovers from treated to control areas. Given that CCB programs are designed to serve local students and that there are no on-campus accommodations, some degree of spillover is possible but unlikely to be substantial. Take, for example, Panel A of Figure 8, which shows that roughly 80 percent of students who ultimately enroll in a community college do so at one within 20 miles of their high school. Reassuringly, this pattern is nearly identical for students who enroll in CCB programs, implying that students are not traveling beyond where they otherwise would have attended a community college to seek out a CCB program. Furthermore, any spillover of this kind would attenuate my estimates toward zero, meaning that the estimates presented here are, if anything, conservative.

The combined results discussed in this section suggest that CCB program introduction is effective at its primary goal: expanding bachelor's degree access and improving attainment among students who live near participating community colleges. These gains do not substitute for associate degree completion, and they are accompanied by earnings effects that are positive but too imprecise to distinguish from zero by ages 25-27. The aggregate pattern is encouraging from a policy standpoint, but it tells the policymaker little about the distribution of benefits across affected students. As Rouse (1995) emphasizes and Mountjoy (2022) demonstrates empirically in the context of community college access more broadly, combining the effects of a policy across groups with fundamentally different enrollment counterfactuals produces a single parameter that may obscure important heterogeneity. In my setting, that heterogeneity operates both across students' counterfactual enrollment decisions and across the program openings themselves. Section 7 takes both concerns seriously.

7 Lessons For Program Targeting: Who Benefits and Which Programs Work?

The combined effect estimated in Section 6 tells a policymaker that CCB introduction boosts bachelor's degree completion among exposed students, which is a strong positive signal about the potential for the policy to benefit students. The framework in Section 2.4, however, predicts that this aggregate conceals variation along two margins: the strength of each student's outside option, and whether seats in the field of the opening are rationed at nearby public universities. This section tests each prediction in turn.

Section 7.1 takes up the first question, estimating effects separately by students' predicted counterfactual enrollment in order to distinguish students for whom CCB entry expands access to the bachelor's degree from those for whom it substitutes for traditional four-year enrollment. Section 7.2 takes up the second question, re-estimating my design at the level of the program opening to separate openings in fields where university seats are rationed from openings in fields where they are not. Section 7.3 then outlines what both sets of results imply for the targeting and approval of new CCB programs.

7.1 Who Benefits? Students' Outside Options

The positive effect on BA completion documented in Section 6, paired with an imprecisely estimated effect on earnings, is consistent with several distinct combinations of group-specific effects. Table 2 shows a stylized version of the three most likely of these. In all three scenarios, I assume that those students whose counterfactual enrollment decisions would have been a two-year college or no college experience positive effects of CCB introduction on BA completion.[36] The effect on laterally diverted students is the key differentiating factor: in Scenario A, the effect on BA completion for the lateral diversion group is positive, in Scenario B it's null, and in Scenario C it's negative. These are all reasonably realistic effect directions; laterally diverted students may be getting more personal attention in CCB programs and are able to live at home, generating a positive effect (Scenario A); those same students might be equally likely to earn a BA at a CC as they were at a four-year, which would generate a null effect (Scenario B); alternatively, the CCB program may be of lower quality compared to traditional four-year institutions, which are funded at a much higher per-student rate than their community college peers.

[36] These scenarios hold if null effects are assumed for democratized students (no college counterfactual), which is likely closer to reality. In practice the no-college counterfactual group is too small in my sample to estimate separately, and the results below report effects for the two-year and four-year counterfactual groups only.

Table 2: Potential Counterfactual-Specific Effects

Scenario	**Upgraders** *(cf.: 2yr institution)*	**Lateral diverters** *(cf.: 4yr institution)*	**Democratized** *(cf.: no college)*	**Combined effect** *(all CCB enrollees)*
Scenario A *all positive*	↑↑ **Positive** BA > 2yr path	↑ **Positive** CCB BA ≈ 4yr BA	↑ **Positive** new BA access	↑ **Positive**
Scenario B *null lateral diversion*	↑↑↑ **Strongly positive** Pr(BA) > 2yr path	↔ **Null** no net change	↑ **Positive** new BA access	↑ **Positive**
Scenario C *neg. lateral diversion*	↑↑↑ **Strongly positive** Pr(BA) > 2yr path	↓ **Negative** Pr(BA) < than 4yr	↑ **Positive** new BA access	↑ **Positive**

Notes: This table shows three combinations of counterfactual-specific treatment effects consistent with a positive combined effect on BA completion. Upgraders would have enrolled in a 2-year associate degree program absent CCB access; lateral diverters would have enrolled in a traditional 4-year institution; democratized students would not have enrolled in any college. Arrow count reflects approximate relative magnitude. Scenario C is directly analogous to the democratization/diversion framework, with upgrading replacing democratization and lateral diversion replacing diversion.

The relative size of the effect for each counterfactual group matters for the combined effect and for the interpretation of my results. Moreover, these effect combinations could help explain why we see a positive effect on BA completion paired with a null effect on earnings. Take, for example, a case in which the BA completion effects align with Scenario B but the lateral diversion group sees a negative effect on earnings (in line with Scenario C) because employers penalize CCBs relative to traditional BAs in the labor market (as seen in descriptive overviews of earnings such as in Figure 6.) This could lead to a positive BA effect paired with null earnings effects. Distinguishing among these scenarios requires estimating effects separately by counterfactual group, which in turn requires knowing where each student would have enrolled in the absence of a CCB option.

7.1.1 Approximating Counterfactual Enrollment

Understanding students' outside options presents an econometric challenge as these choices are not directly observed. In the ideal experiment, not only would access to CCB programs be randomized, but before randomization, students would be required to register whether they intended to enroll in a two-year college, a four-year college, or no college at all. Then, randomization would be balanced across these three groups and outcomes could be measured for students in each of these three counterfactual groups. As the ideal experiment is inaccessible to me, I instead use Washington's rich administrative data to predict where each student would most likely have enrolled in the absence of CCB program availability.

To do this, I leverage pre-CCB data (high school graduating cohorts 2005 and 2006) to estimate a multinomial choice model of enrollment outcomes. In this model, students can make one of three choices: (1) no postsecondary enrollment, (2) enrollment in a two-year college, or (3) enrollment in a four-year college.[37] The model conditions on a wide range of student-level covariates, including demographic characteristics (gender, race/ethnicity, age), socioeconomic background (FRPL eligibility, neighborhood income), and academic preparation (high school GPA, AP courses completed) as well as contextual variables including neighborhood quality and geographic proximity to postsecondary options. Each of these characteristics has been shown to predict where students enroll. Academic preparation sorts students across institution types as documented in Appendix Figure A.6, and a substantial literature establishes that distance matters for students' college decisions (Terry Long 2004; Griffith and Rothstein 2009; Turley 2009; Acton, Cortes and Morales 2024), particularly on the community college enrollment margin (Rouse 1995; Mountjoy 2022). The model is represented in Equation 2.

$$P(\text{Enroll}_i = j \mid X_i) = \frac{e^{X_i\beta_j}}{e^{X_i\beta_0} + e^{X_i\beta_2} + e^{X_i\beta_4}}, \quad j \in \{0, 2, 4\} \tag{2}$$

I use this model to generate predicted probabilities of enrollment across the three postsecondary options for each student who graduates from a Washington public high school during my time period. This prediction exercise provides an empirical approximation of where each student would most likely have enrolled had CCB programs not been introduced. The predicted probabilities are then used to assign each student to the counterfactual state that aligns with their highest predicted probability.[38]

Table 3 compares the characteristics of students assigned to each predicted counterfactual group

[37] Note that I use the highest level of enrollment observed for each student in the six years after high school graduation to best capture the student's counterfactual schooling decision.

[38] Note that results are consistent using various assignment rules. For example, Appendix Figure A.14 shows the analogous results using a classification scheme where, in order to be classified in a counterfactual group, that enrollment choice needed to have at least a 10 percentage point higher predicted probability than the next closest enrollment choice.

to those of students whose highest observed enrollment was in fact a two- or four-year institution. The predicted groups closely resemble their observed counterparts, and the characteristics that separate them are those the literature would suggest. Students assigned to the four-year counterfactual group have stronger academic preparation and come from higher-income neighborhoods than those assigned to the two-year group, and they live substantially closer to a four-year institution. In other words, geographic access to a four-year college is one of several characteristics that distinguishes likely four-year enrollees from likely two-year enrollees, which is what motivates its inclusion in the model.

Table 3: Characteristics of Predicted versus Actual Enrollees

	Two-Year Enrollees		Four-Year Enrollees	
	Actual (1)	Predicted (2)	Actual (3)	Predicted (4)
HS GPA	2.62	2.34	3.26	3.36
AP Courses	0.53	0.02	2.31	2.30
FRPL Status	0.493	0.589	0.279	0.245
Gifted Flag	0.030	0.018	0.102	0.101
Asian	0.065	0.052	0.111	0.110
Black	0.056	0.063	0.040	0.034
White	0.650	0.626	0.700	0.729
Hispanic	0.167	0.189	0.095	0.078
Distance to 4yr	16.53	17.12	14.09	13.94
N	278,076	347,348	467,860	525,772

Notes: Table shows the average characteristics of students who are predicted to enroll in a two- versus four-year college versus the average characteristics of those who we observe do so in the data. Enrollment status used is "highest" enrollment, meaning if a student originally enrolled in a two-year college but ultimately transferred to a four-year college, their highest enrollment would be counted as four-year.

Any assignment of this kind will be imperfect. Some students assigned to the four-year counterfactual group would have otherwise enrolled in a two-year program or no college at all, and some students assigned to the two-year group would have attended a four-year institution despite predicted characteristics suggesting otherwise. These misclassifications add noise to the counterfactual grouping, likely attenuating any estimated differences in treatment effects between the two groups toward zero. As a transparent alternative that relies on a single observable rather than a fitted model, Appendix Figure A.13 splits the sample by whether a student lives within 20 miles of a four-year institution. That coarser split produces the same qualitative pattern as the results below, but is measured with considerably more noise. My preferred approach uses the formal prediction from

Equation 2 to estimate the stacked event study separately for students who, in the absence of CCB programs, would have been likely to enroll in two- versus four-year institutions, providing suggestive evidence on the returns to CCB degrees for these distinct complier groups.

7.1.2 Results by Counterfactual Enrollment

Figure 11 shows treatment effects estimated separately for students predicted to otherwise enroll in two-year and four-year institutions (upgraders and lateral diverters, respectively). These results are neatly aligned with the democratization versus diversion framework, highlighting that students who would have likely enrolled in a two-year college in the absence of a CCB program drive the positive effects on BA completion. Students in this group are roughly 2.5 percentage points more likely to earn a BA post-CCB adoption. Students who were likely to have otherwise enrolled in a four-year, however, see null effects of CCB introduction on bachelor's degree completion.

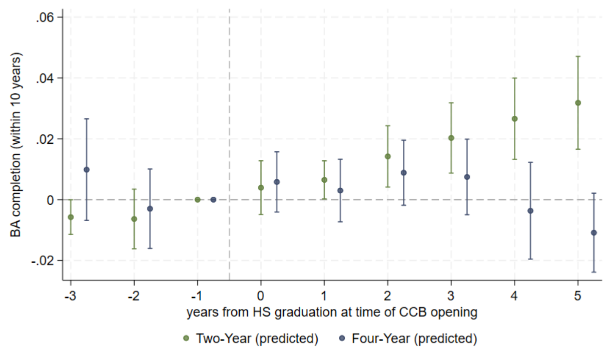
Moving to additional outcomes, there are clearly opposing effects of CCB introduction on graduate degree completion for the two counterfactual groups, with the upgrading group being 0.2-0.5 percentage points more likely to earn a graduate degree and the lateral diversion group being 0.5 to 1 percentage point *less* likely to earn a graduate degree. These opposing effects are a clear example of the countervailing forces that Rouse (1995) discusses in her work. The negative effect for laterally diverted students is consistent with the prediction in Section 2.4 that the applied orientation of the CCB may steer students towards direct workforce entry as opposed to the pursuit of an additional degree or training. A second, complementary mechanism is institutional continuity. Upwards of 50 percent of WA high school graduates who earn a graduate degree from a Washington four-year institution earn their degree from the same institution where they earned their BA.[39] Just as students may transition from the AA to the BA more seamlessly when they are offered by the same institution, students are likely to transition from BA to graduate studies more easily if they are offered at the same place, a pathway that the CCB, by construction, does not provide.

Panels C and D present log hourly wage results at ages 25-27 and 28-30. Both estimates are noisy, but show a similar pattern to the BA completion figure in Panel A: suggestive positive effects of CCB introduction on wages for the two-year counterfactual group and largely null effects for four-

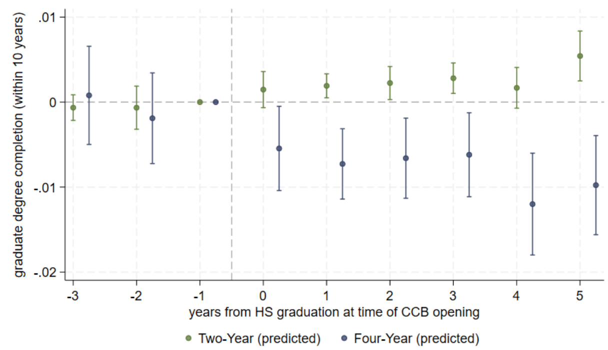
[39] Author's calculation using NSC data for WA high school graduates who complete a BA in WA state (2014 high school graduates and earlier).

Figure 11: Effect of CCB Program Introduction by Counterfactual Enrollment

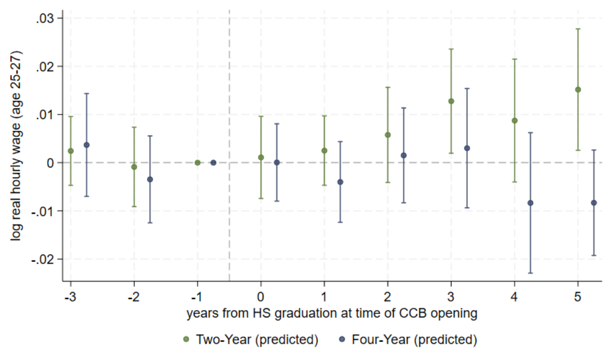
(a) BA Completion



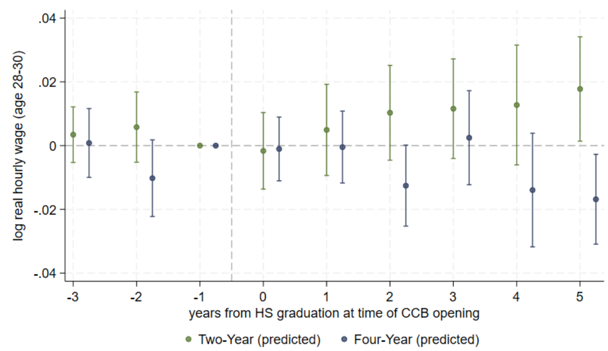
(b) Graduate Degree Completion



(c) Log Hourly Wages (ages 25-27)



(d) Log Hourly Wages (ages 28-30)



Notes: Panels (a)–(d) show the effect of CCB program introduction on student outcomes separated by predicted counterfactual enrollment as described in Section 7.1.1. Panels (a) and (b) show effects on bachelor's degree and above-BA degree completion, and panels (c) and (d) show effects on labor market outcomes average real hourly wages between ages 25 and 27 and ages 28 and 30. Panels (a) and (b) use NSC and SBCTC data for outcome variables, panels (c) and (d) use ESD data for outcomes. Each event study uses CCB program introductions between 2007 and 2015 (16 introductions) and high school graduating cohorts between 2005 and 2018. All panels include all controls as described in Section 5.1.

year counterfactual groups. The simple pre-post estimates of CCB introduction show a roughly 0.6 percent increase ($p < 0.10$) in hourly wages at age 25-27 for students predicted to enroll in a two-year college, and a near-zero effect (-0.09 percent, not significant) for students predicted to enroll in a four-year institution.

Taking the significant upgraders estimate and computing a simple Wald ratio would suggest that earning a CCB is associated with a 29 percent increase in earnings for students whose counterfactual is two-year enrollment. Expressed in terms of years of schooling—CCB introduction increases schooling by roughly 0.11 years for this group—this implies a return of 5.7 percent per additional year. This is broadly consistent with, although on the low end of, estimates from the literature, which range from roughly 5 percent (Kane and Rouse 1993) to 10 percent (Card 1993) per additional year of schooling. More recent work from Zimmerman (2014) finds an 11 percent return, though he cautions that his exclusion restriction holds for his admissions outcome rather than time in school or BA completion, complicating a causal interpretation of the schooling return directly.

The null effect on earnings in the lateral diverters group could reflect two possibilities: first, because there is no effect on BA completion for this group, simply shifting students from BAs to CCBs may have no effect on earnings, implying that CCBs and BAs are valued similarly in the labor market (as reflected in recent work from Acton et al. 2026*a*). Alternatively, the laterally diverted group may be small enough in size that even a meaningful effect on earnings (positive or negative) is too imprecisely estimated to detect in an intent-to-treat framework. Future work with larger sample sizes will hopefully be able to speak more precisely to the earnings effects for this group.

These results underscore that the positive combined effect of CCB introduction on BA completion documented in Section 6 is driven largely by students who would have otherwise enrolled in two-year programs. These are students for whom CCB program introduction is expanding access to the bachelor's degree, and the suggestively positive combined effect on earnings resolves into clear positive effects for this group. For students who would likely have enrolled in a four-year institution even in the absence of CCB entry, CCB access appears to generate little benefit and may modestly harm graduate school progression. The enrollment counterfactual decision, however, is only one of the two constraints that may bind students' outside options. Section 7.2 turns to the second, asking whether the openings themselves differ in what they add to the local supply of bachelor's degrees.

7.2 Which Openings Work? Capacity Constraints in High-Demand Fields

Thus far, the results presented have focused on what happens when students are exposed to any CCB opening at a local community college. The openings that make up a state's CCB portfolio, however, are unique. As described above, an opening in a field where the state's public universities cap enrollment and turn away qualified applicants each cycle adds bachelor's degree capacity in an area where demand for seats exceeds supply, whereas an opening in a field where any student in good academic standing can declare the major does not. If CCB programs expand attainment by adding capacity where it is scarce, then the effect of program introduction on bachelor's degree completion should be larger for openings in the former group than the latter. This section documents program-level rationing at Washington's public universities and presents results that vary by program and capacity constraint status.

7.2.1 Program-Level Rationing at Washington's Public Universities

Colleges and universities across the U.S. increasingly manage excess demand for majors by rationing seats in specific programs using minimum GPA thresholds in prerequisite coursework and explicit enrollment caps (Bleemer and Mehta 2024). Because this program-level selection affects only a subgroup of applicants, institution-level admissions rates like those reported in Appendix Table A.3 can substantially overstate access to any particular major. Appendix Table A.10 compiles major-level admission requirements and program-level admissions rates (where available) across Washington's public four-year institutions for nursing and computer science, the two fields most likely to be capacity-constrained across the state.[40] The table shows that even at the state's near open-access universities, these programs often admit only one third to one half of applicants. Notably, major-level admissions practices of this kind have been shown to increase within-institution racial stratification across majors, potentially contributing to racial wage gaps (Bleemer and Mehta 2024). To the extent that CCB introduction can expand access to high-demand programs and majors, these programs have the potential to ameliorate this type of stratification across high- and low-return majors and could contribute to closing wage gaps.

Consider the example of Eastern Washington University (EWU), which admits 92 percent of its applicants at the institution level. Its BS in Nursing program is capped at 40 students each year and requires a minimum 3.0 GPA in nursing prerequisites as well as in all college-level coursework, and in 2023 it received 132 completed applications for those 40 seats (Kramer 2023). Constraints of this kind in nursing are not specific to EWU: annual reports from the Washington Nursing Care Quality Assurance Commission document that pre-licensure programs across the state's public universities operate at capped enrollment and turn away qualified applicants each cycle (Washington State Nursing Care Quality Assurance Commission 2023), a pattern that mirrors national evidence on oversubscription in nursing education (Grosz 2020; American Association of Colleges of Nurs-

[40] Other capacity-constrained programs are often one-off constraints such as Dental Hygiene at Eastern Washington University or Industrial Design at Western Washington University. The analyses that follow will focus on Computer Science and Nursing as the most commonly capacity-constrained majors and programs across the state.

ing 2023). Computer Science is a secondary example of a constrained major in Washington state. The University of Washington's Bothell campus, which has a general admission rate upwards of 90 percent, reports admitting only 44 percent of applicants to its Computer Science and Software Engineering major,[41] and as described in Section 2.3, student and employer demand for computing degrees in the state is shaped by the presence of a large technology sector. In other words, capacity-constrained fields may vary across states, and other states considering CCB expansion are likely to face a different set of oversubscribed fields determined by their own regional labor markets.

Importantly, programs like nursing and computer science are also among the most expensive to deliver: instructional costs per student credit hour in these fields are higher than in business and the social sciences, driven by accreditation-mandated clinical ratios, specialized equipment, and the high opportunity cost of faculty with strong outside employment opportunities (Hemelt et al. 2021). Although differential tuition for high-cost majors is increasingly common at public universities nationally (Stange 2015), undergraduate tuition at Washington's public four-year institutions is essentially uniform across majors, making it difficult to recover these costs.[42] Given this elevated cost of delivery, the tuition carve-out for CCBs described in Section 2.2 is a necessary condition for community college entry into these constrained fields. Even with that common price ceiling in place, CCB entry remains attractive for several reasons. Rationing at the four-year institutions essentially guarantees demand for new programs, and advocates note the ability of community colleges to deliver these programs at lower cost. Finally, employers have in some cases subsidized community college entry, as with Amazon's support for Seattle-area computer science programs described in Section 2.3.

Section 2.4 raised the concern that the seats these programs add could be a lower-quality substitute for the rationed university seats they replace. Although quality is a notoriously difficult construct to measure in postsecondary education, nursing licensure results offer an imperfect and preliminary measure of program quality. All registered nursing graduates in Washington, regardless

[41] Other capacity-constrained majors at UW Bothell include Applied Computing (39 percent), Computer Engineering (70 percent), Mechanical Engineering (69 percent), and Nursing (74 percent). Non-capacity-constrained majors are classified either as "Minimum Requirement" or "Open" majors. Minimum requirement majors require specific prerequisite courses and a minimum GPA; students who meet these requirements are admitted. Open majors are those in which any student in good academic standing may enroll.

[42] Author's review of published tuition schedules at UW, WSU, and EWU (2025–26). WSU's rate schedule, for example, lists a single undergraduate resident rate across all campuses and majors, with differential rates applying only at the graduate and professional degree levels (e.g., graduate nursing, Doctor of Nursing Practice, PharmD, DVM). EWU similarly charges one undergraduate rate, with documented program-specific surcharges limited to graduate programs.

of degree level or institution type, sit for the same national licensure examination (the NCLEX-RN) and face the same passing standard, and as Appendix Table A.11 reports, first-time pass rates at the colleges that host nursing CCBs are similar to those at the state's four-year public pre-licensure BSN programs. Some heterogeneity exists across institutions—Seattle Central, for example, has an ADN pass rate of only 78.7 percent, over 10 percentage points lower than the rate for UW or WSU candidates—but the common examination and comparable pass rates suggest that resource differences across sectors do not necessarily translate into weaker licensure outcomes, and that CCB seats could function as meaningful substitutes for rationed university seats.

7.2.2 Results by Capacity Constraint Status

To test whether the effects of CCB introduction are concentrated in capacity-constrained fields, I re-estimate the stacked event study design from Section 5 at the program level. Events are now defined as the opening of a CCB program in either a capacity-constrained field (CIP code 11 or 51) or a non-capacity-constrained field (all other CIP codes).[43] I use the same treatment exposure definition (ring method with a 20-mile inner ring) although results are robust to alternative definitions. As colleges typically introduce several programs across fields within a few years of their first opening (see Appendix Figure A.4), the first program opening of each type is used. If the institution's first program opening is in a capacity-constrained major, any other introduction in a non-capacity-constrained major in the six years following the first opening is controlled for in the capacity-constrained analysis but dropped from the non-capacity-constrained sample. If an institution's first opening is in a non-capacity-constrained major, I include it in the non-capacity-constrained sample only if the next capacity-constrained opening is four or more years after the original opening. Using these rules, an institution's first opening of each type is used and the vector of controls ω is extended to include indicators for other CCB openings at the same institution (of the same type, capacity-constrained or not capacity-constrained) that occur within the event window.

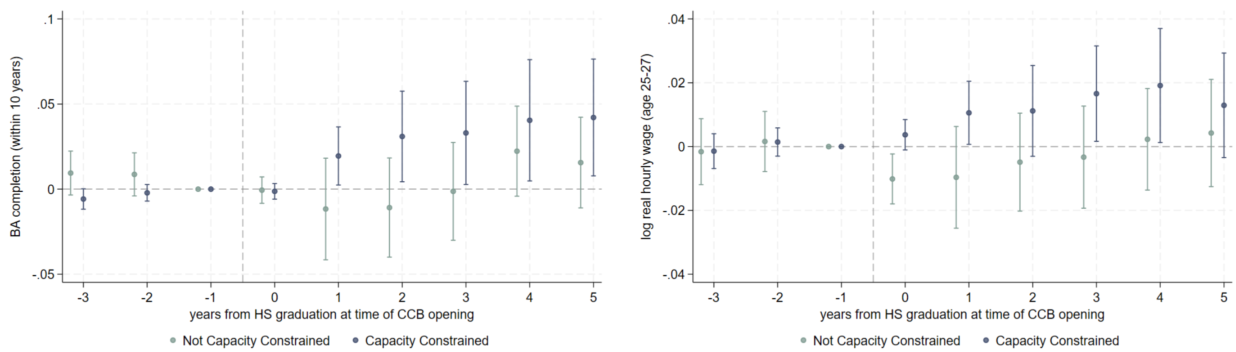
This design tests the second prediction of the framework in Section 2.4: openings in capacity-constrained fields should generate larger effects on bachelor's degree completion than openings in

[43] Engineering Technologies (CIP 15) is a borderline case as several universities in the state limit admissions to engineering programs. Engineering programs at four-year institutions, however, are more likely to be classified as CIP 14 majors. I classify Engineering Technologies (CIP 15) as non-constrained in the pooled analysis, but there is only one CIP 15 opening included in my sample and results are robust to dropping the opening.

fields where seats at nearby universities are effectively open access. Whether that expanded attainment translates into earnings gains depends on the quality of the seats these programs add and on how the labor market values the credential. Because the rationed fields are among the highest-earning fields for bachelor's degree holders in the state, earnings effects that track the completion effects would suggest that these openings are producing degrees where employer demand is currently unmet.

Figure 12: Effect of CCB Program Introduction by Capacity Constraints

(a) BA Completion (b) Log Hourly Wages (ages 25-27)



Notes: Panels (a) and (b) show stacked event study estimates of the effect of CCB program introduction on the probability of bachelor's degree completion within 10 years and on log real hourly wages between ages 25 and 27, with program openings separated by capacity constraint status as described in Section 7.2.1. Capacity-constrained openings are programs in CS/IT (CIP 11) and Health Professions (CIP 51); all other CIP codes are classified as non-constrained. Panel (a) uses NSC and SBCTC data for outcomes and panel (b) uses ESD data. Treatment exposure uses the ring method with a 20-mile inner treatment ring and a 20-40 mile control ring. High school graduating cohorts between 2005 and 2018 are used and all controls described in Section 5.1 are included.

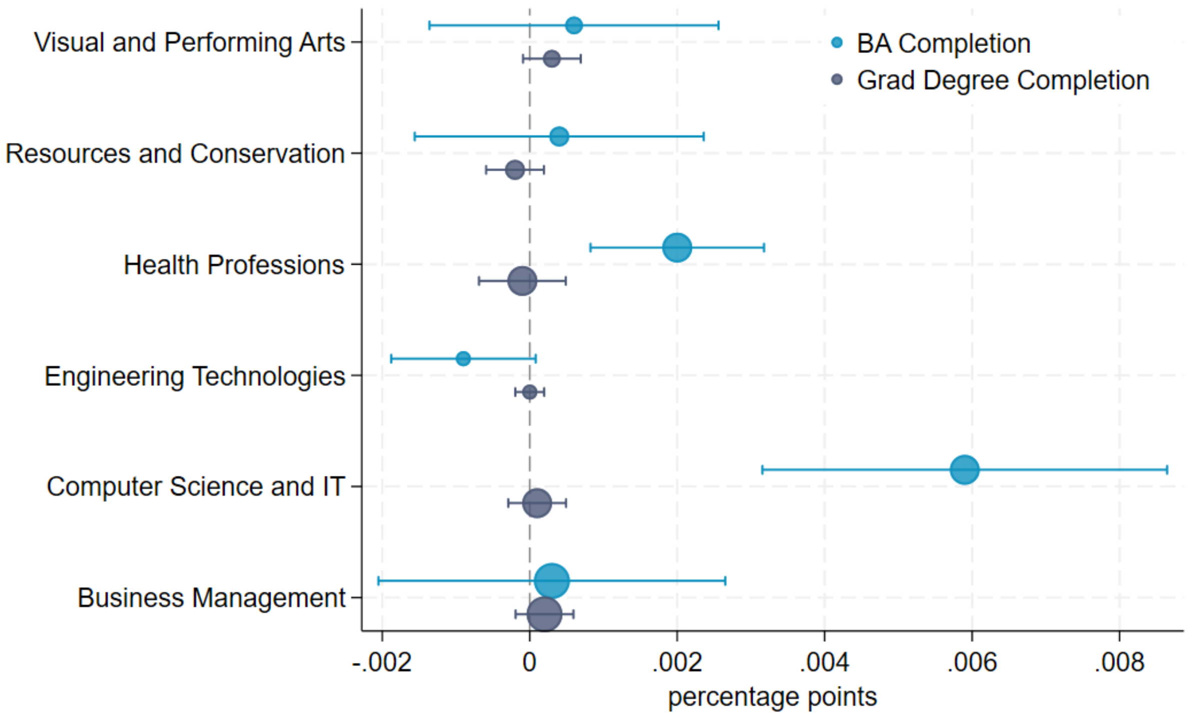
Panel A of Figure 12 presents stacked event study estimates pooling program openings by constraint status. Openings of capacity-constrained programs generate large increases in the probability of bachelor's degree completion for exposed students, growing from roughly 2 percentage points at $\tau = 1$ to over 4 percentage points by $\tau = 5$, while openings of non-constrained programs generate suggestively positive but statistically insignificant effects. Pre-period estimates are flat for both groups, supporting the parallel trends assumption at the program level. Estimates for the non-constrained group are noisy and centered near zero through the early post-period, turning positive only in the final cohorts and never distinguishable from zero. It is perhaps unsurprising that students exposed to non-capacity-constrained programs would see some positive completion effects in later years as programs mature, though at a substantially lower level than those exposed to programs where seats at the nearest alternative are rationed.

Panel B shows that these completion effects are accompanied by gains in early-career earnings. Openings of capacity-constrained programs increase log real hourly wages at ages 25-27 by roughly 1.5 percent by $\tau = 5$, while openings of non-constrained programs generate effects that are centered near zero throughout the post-period. As in Panel A, pre-period estimates are flat for both groups, and the trajectory of the earnings estimates closely tracks that of the completion estimates, growing over event time as programs mature.

This analysis can also be conducted such that the outcome variable, rather than bachelor's degree completion overall, is BA completion in the field of the CCB opening. Figure 13 shows these field-specific estimates using the simple pre-post difference-in-differences specification. The field-specific estimates are concentrated where the capacity constraints framework would predict. A CCB opening in Computer Science and IT increases the probability that an exposed student completes a bachelor's degree in that field by 0.6 percentage points, and a Health Professions opening increases field-specific completion by 0.2 percentage points; both estimates are statistically distinguishable from zero. Given baseline field-specific BA completion rates in Computer Science and Nursing among WA high school graduates, these estimates represent increases of roughly 40 percent and 12 percent, respectively. In contrast, estimates for other common CCB programs such as Business Management, Visual and Performing Arts, and Resources and Conservation are small and statistically indistinguishable from zero.

The pooled and field-specific results underscore the importance of CCB program entry in capacity-constrained majors. The event study estimates in Figure 12 show that openings in capacity-constrained fields generate large, positive effects on overall BA completion and on early-career earnings, and the field-specific estimates show that these gains are concentrated in the field of the opening itself. The field-specific patterns also map onto the mechanisms discussed in Section 7.2.1. The largest effects appear in CS/IT, where the CCB substitutes directly for a rationed university program and where employer support has accelerated CCB program entry. Finally, the null effects for business and the remaining non-constrained fields are what the capacity constraints logic would predict: where seats in a field are already available at nearby public universities, a new CCB program expands the set of institutions offering the degree without necessarily expanding the number of students able to obtain one. The value of a CCB opening to nearby students therefore appears to depend substantially on whether the program is relieving a binding constraint on seats in that field, a

Figure 13: CIP-Specific DiD Estimates



Notes: This figure shows the simple pre-post DiD estimates of CCB introduction on CIP-specific BA completion rates. Outcome variables are BA completion in a given two-digit CIP code within 10 years. Program-level introductions are used: i.e., instead of using the first program opening at a given institution, events are defined as program openings in the given CIP code. For a map of program openings by CIP code, see Figure 4.

conclusion that is additionally consistent with the licensure evidence in Section 7.2.1 suggesting that the seats these programs add are not systematically weaker than the university seats they substitute for.

These results are robust to a series of specification choices and robustness checks. As noted above, reclassifying or dropping the single Engineering Technologies opening does not change the pooled estimates. Defining the health professions outcome at the four-digit level (CIP 51.38, Nursing) rather than pooling all health fields yields similar estimates. The sample construction rules described above also do not appear to be driving the results: estimates are similar when the four-year gap requirement for the non-constrained sample is extended to six years, and when all non-constrained first openings are retained with indicator controls for subsequent capacity-constrained openings in place of the sample restriction.

7.3 Implications for Targeting and Program Approval

The results presented in Sections 7.1 and 7.2 highlight the importance of program targeting. Specifically, both sets of results show that the effects of CCB introduction are concentrated where constraints on bachelor's degree attainment bind. At the student level, those who lack realistic access to a four-year institution, whether measured coarsely by distance or more formally by predicted counterfactual enrollment, see meaningful gains in bachelor's degree completion with suggestive gains in earnings. At the program level, openings generate large completion gains where seats in the same field are rationed at the state's public universities and more moderate effects in more commonly open-access fields. Each of these represents a distinct consideration for a state that continues to expand its CCB portfolio.

These findings have direct implications for how states consider and approve new CCB programs. Washington's approval process currently requires institutions to demonstrate employer demand, institutional capacity, and alignment with statewide attainment goals (see Section 2), but does not explicitly weigh either of the considerations documented here. The results presented here suggest two refinements to this process. First, programs are likely to generate the largest completion gains at colleges serving students with limited access to four-year institutions; distance to the nearest public four-year is a strong proxy for this margin. Second, approval processes could explicitly consider whether seats in the proposed field are rationed at nearby public universities.[44] Openings in fields where program-level admissions bind, like nursing and computer science, generated large completion gains in my sample, while openings in effectively open-access fields like business did not.

There are two important caveats to these findings. First, null completion effects for openings in unconstrained fields do not imply that these programs generate no value. As discussed in Section 5.3, my estimates speak to traditional-age students, and openings in fields like business may still serve the older, non-traditional students who fall outside my sample. Moreover, especially for students living at home, CCB options may offer a more convenient route to the BA. Second, whether these two considerations reinforce or offset one another when they coincide—as in the case of an opening in a capacity-constrained field at a college serving students far from any four-year institution—remains

[44] Program-level considerations such as these are often taken into account in Washington state. These considerations could be formalized across all proposals for new CCB programs.

an open empirical question that the scope of CCBs in Washington is yet too small to answer, and one that should be revisited as these programs continue to expand.

8 Discussion

Policymakers are increasingly turning to community colleges as a structural solution to expanding bachelor's degree access. Community college baccalaureate legislation has now spread to 24 states and is being considered in at least two more as of 2026, but rigorous evidence on whether these programs are meeting their stated mission remains limited. Using a relatively new administrative data set from Washington state, this paper provides among the first causal estimates of the effects of CCB introduction on degree attainment and earnings, following public high school graduates from secondary school into the labor market. The results reveal both the promise and the potential pitfalls of these degrees as they continue to scale.

In the aggregate, CCB introduction boosts bachelor's degree completion for exposed students, which is an encouraging sign that these programs add a pathway to the BA rather than simply reshuffling BA-bound students across institutions. These aggregate effects, however, mask heterogeneity that is a key input for policymaking. Students who would otherwise have enrolled in a two-year college see large completion gains and suggestively positive earnings effects. This is an encouraging finding, as this "upgrading" group is the population the policy was designed to serve. In contrast, students who would otherwise have enrolled at a four-year institution see null effects on completion and earnings as well as negative effects on graduate school completion. This pattern extends the democratization versus diversion framework of Rouse (1995) from community college access to the introduction of a new community college credential.

These opposing effects suggest that the strength of a student's outside option is an important predictor of whether or not they will benefit from CCB introduction. Constraints of cost, distance, and academic preparation may put a four-year program out of reach: both distance-based proxies and formal counterfactual predictions show that students unlikely to otherwise reach a four-year institution drive the completion gains, consistent with recent evidence on the role of geography in enrollment (Acton, Cortes and Morales 2024; Acton et al. 2025). Separately, the programs themselves differ in what they add. Competitive major admissions ration seats even at universities that admit nearly all applicants, and the program-level analysis shows the gains concentrate in nursing and computer science, fields where those seats are most tightly rationed in Washington. Both findings give states a basis for targeting as CCB legislation continues to expand.

Students already well-positioned to earn a traditional BA see largely null effects of CCB introduction. For these students, who can readily secure a seat in their chosen program, shifting enrollment from a four- to a two-year institution for a BA may result in similar outcomes. In fields where seats are rationed, however, the CCB may be the only feasible route to a bachelor's degree in that field. Understanding whether CCB programs are welfare-enhancing for four-year counterfactual enrollees, especially those targeting open-access majors, and helping students and institutions recognize when the CCB is not the right fit requires additional research.

Several limitations motivate future research. Most importantly, this evaluation is confined to a single state. Although Washington's extensive CCB system makes it an ideal setting to study the introduction of these programs, its unique features such as the large technology sector, appropriations structure, and institutional relationships may not generalize. Extending this analysis to Florida, Texas, and states with more recent legislation is necessary to understand how CCB introduction affects students nationally. The earnings results warrant particular caution, as the cohorts observed here remain early in their careers and estimates will sharpen as later cohorts mature. Finally, identifying the labor market value of the CCB relative to a traditional BA remains an open question that forthcoming experimental work on employer preferences may help resolve (Acton et al. 2026*a*).

Taken together, the evidence suggests that community college baccalaureate programs are a promising tool for expanding bachelor's degree access, but that their success hinges on who they ultimately reach and which fields they enter. Where students lack a realistic route to a four-year degree, the CCB can effectively expand access to the BA and potentially drive labor market returns. Where students are already on a four-year path with access to their intended field, the programs offer little and may modestly disrupt student outcomes. As more states authorize these degrees and existing programs continue to scale, the central challenge is one of careful, targeted implementation: designing CCB programs around the students who have the most to gain.

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A Appendix Tables and Figures

Table A.1: Minimum Distances to Institution Types in the Sample

	Earnings Cohorts (05-13) (1)	Full Sample (05-24) (2)
Minimum Distance to 2yr College	8.32	8.33
	[10.20]	[10.34]
Minimum Distance to 4yr College	23.81	24.25
	[25.25]	[25.96]
Minimum Distance to CCB Program	46.02	23.73
	[65.71]	[44.94]
Observations	578,397	1,371,738

Table A.2: Missing Earnings Balance Table

	Missing Earnings (1)	Not Missing Earnings (2)
Demographics		
Female	0.529	0.502
Asian	0.082	0.085
Black	0.044	0.045
White	0.730	0.705
Hispanic	0.096	0.117
FRPL Eligible	0.348	0.371
Disability Flag	0.099	0.089
First Enrollment		
2yr College	0.330	0.428
4yr College	0.404	0.347
No College	0.265	0.225
In-State	0.455	0.666
Public College	0.565	0.673
Academic Performance		
HS GPA	2.949	2.873
	[0.725]	[0.695]
AP Courses	0.881	0.689
	[2.597]	[2.155]
Observations	186,108	392,290

Notes: This sample includes individuals in 2005-2013 WA high school graduating cohorts. Missing earnings indicates that the individual has no recorded quarterly earnings between the ages of 28 and 30 in the WA UI data.

Table A.3: Admissions Rates at WA Public Four-Year Colleges

Institution	Location	Acceptance Rate
University of Washington	Seattle	43%
University of Washington	Tacoma	83%
University of Washington	Bothell	92%
Central Washington University	Ellensburg	90%
Eastern Washington University	Cheney	92%
Washington State University	Pullman	85%
Western Washington University	Bellingham	91%
The Evergreen State College	Olympia	97%

Notes: Publicly available admissions rates are given for each of the public four-year institutions in Washington State for the 2023-24 admissions cycle. Note that undergraduate admissions rates for Washington State branch campuses are not reported separately by IPEDS.

Table A.4: Characteristics by First Enrollment Type

	Dual Enrollment Excluded			Dual Enrollment Included		
	First Enroll in 2yr (1)	First Enroll in 4yr (2)	No Enroll (3)	First Enroll in 2yr (4)	First Enroll in 4yr (5)	No Enroll (6)
Demographics						
Female	0.506	0.553	0.427	0.529	0.539	0.427
Asian	0.082	0.114	0.049	0.090	0.115	0.049
Black	0.057	0.037	0.042	0.050	0.039	0.042
White	0.613	0.669	0.586	0.634	0.662	0.586
Hispanic	0.181	0.114	0.236	0.160	0.117	0.236
FRPL Eligible	0.466	0.285	0.605	0.423	0.274	0.605
Disability Flag	0.102	0.033	0.222	0.082	0.034	0.222
Academic Performance						
HS GPA	2.760	3.311	2.513	2.885	3.358	2.512
	[0.656]	[0.632]	[0.707]	[0.691]	[0.606]	[0.707]
AP Courses	1.007	3.209	0.730	1.188	3.877	0.730
	[2.404]	[4.982]	[2.294]	[2.729]	[5.392]	[2.294]
Observations	433,063	563,187	375,553	602,402	394,123	375,278

Notes: Table shows observational characteristics by initial enrollment type. Two- and four-year enrollment are defined by initial enrollment. Dual enrollment indicates enrollment in Running Start programs.

Table A.5: Pre-Adoption Trends in CIP-Specific Labor Market Conditions

Dependent variable: Adoption in year t	F-statistic	p-value
Log establishment count (lags 1–2)	0.49	0.618
Log employment level (lags 1–2)	0.45	0.641
Log total annual wages (lags 1–2)	0.45	0.642

Notes: Each row reports the joint F-statistic and p-value from a separate regression of an indicator for CCB adoption in year t on one- and two-year lags of the listed industry-specific labor market measure (in logs), restricted to the pre-adoption period. Comparison units are restricted to county $\times$ industry cells matching the 2-digit CIP code of the treated program, using never-treated and not-yet-treated county $\times$ industry cells as controls in a stacked event-study design. All models include stack, unit, and year fixed effects, with standard errors clustered at the county level.

Table A.6: Summary Stats: Community College Finances

	Per FTE Student			Institution-Level ($M)		
	Pre-2010 (1)	2011–17 (2)	Post-2017 (3)	Pre-2010 (4)	2011–17 (5)	Post-2017 (6)
Revenues						
Tuition and Fees	2,267	2,115	2,093	10.96	8.45	7.17
	[482]	[410]	[646]	[7.85]	[4.32]	[3.21]
State Appropriations	3,514	3,828	3,899	15.25	14.28	13.29
	[481]	[691]	[797]	[5.02]	[5.42]	[3.72]
Gifts, Grants, and Contracts	33	19	146	0.13	0.07	0.57
	[44]	[17]	[141]	[0.19]	[0.06]	[0.59]
Total	10,863	10,383	11,152	48.45	39.01	38.81
	[2,393]	[2,208]	[1,913]	[22.19]	[15.59]	[13.32]
Expenditures						
Instruction-Related, Total	4,489	4,440	4,857	19.88	17.05	16.90
	[683]	[827]	[1,278]	[8.21]	[7.42]	[6.65]
Instruction-Related, Salaries	2,490	2,506	2,716	11.02	9.67	9.57
	[446]	[447]	[540]	[4.79]	[4.20]	[3.84]
Academic Support	453	621	575	1.78	2.45	2.08
	[239]	[190]	[227]	[0.65]	[1.41]	[1.24]
Student Services	894	966	1,157	4.00	3.84	3.54
	[241]	[505]	[824]	[1.84]	[3.28]	[1.45]
Total	8,141	8,865	9,376	36.16	34.50	31.43
	[769]	[1,275]	[2,370]	[14.99]	[16.06]	[8.26]
Reported FTE Students	4,530	3,899	3,621	4,530	3,899	3,621
	[2,160]	[1,660]	[1,390]	[2,160]	[1,660]	[1,390]

Notes: Table shows financial summary stats for community colleges that introduced CCBs at different points (pre-2010, between 2011 and 2017, and after 2017). Data from IPEDS and cleaned/harmonized by the Urban Institute are used. Data from 2005 (before any CCB program introductions) are used. Standard deviations are given in brackets. Institution-level totals are in millions of dollars. All values are in 2016 dollars.

Table A.7: Net Price Results

	Low-Income (100% FPL)			Middle-Income (250% FPL)			High-Income (500% FPL)			Independent		
	Total COA (1)	Grant Aid (2)	Net Price (3)	Total COA (4)	Grant Aid (5)	Net Price (6)	Total COA (7)	Grant Aid (8)	Net Price (9)	Total COA (10)	Grant Aid (11)	Net Price (12)
Panel A. Living Alone or with Roommates (off-campus)												
Seattle-Area Institutions												
University of Washington – Seattle	36,746	25,722	11,024	34,021	22,114	11,907	36,746	0	36,746	36,746	25,722	11,024
Seattle Community Colleges	28,005	12,318	15,687	28,005	3,864	24,141	28,005	0	28,005	28,005	12,318	15,687
Spokane-Area Institutions												
Eastern Washington University	28,581	16,846	11,735	28,581	12,452	16,129	28,581	3,107	25,474	28,581	16,846	11,735
Spokane Community Colleges	23,102	9,590	13,513	23,102	1,394	21,709	23,102	790	22,312	23,102	9,785	13,318
Washington State Averages												
Four-Year Public Institutions	34,244	20,193	14,051	34,244	17,047	17,197	34,244	751	33,471	34,244	20,707	13,537
Two-Year Public Institutions	24,014	10,339	13,675	24,014	3,351	20,663	24,014	1,709	22,305	24,014	10,339	13,675
Panel B. Living With Parents or at Home												
Seattle-Area Institutions												
University of Washington – Seattle	24,044	20,675	3,369	24,044	16,831	7,213	24,044	0	24,044	24,044	20,675	3,369
Seattle Community Colleges	15,535	12,318	3,217	15,535	1,206	14,329	15,535	0	15,535	15,535	12,318	3,217
Spokane-Area Institutions												
Eastern Washington University	–	–	–	–	–	–	–	–	–	–	–	–
Spokane Community Colleges	9,203	9,961	−758	9,203	1,637	7,566	9,203	1,573	7,631	9,203	10,022	−819
Washington State Averages												
Four-Year Public Institutions	25,347	18,983	6,364	25,347	14,642	10,705	25,347	489	24,858	25,347	19,554	5,793
Two-Year Public Institutions	14,174	15,565	−1,391	14,174	6,096	8,078	14,174	3,172	11,002	14,174	15,565	−1,391

Notes: Table shows the average net price faced by students in different financial situations at different colleges around the state. Student types are stylized examples and a description of methodology and details can be found in Appendix D.1. All net prices are given in current dollars (as provided by the net price calculators).

Table A.8: Robustness: Drop Top GPA Percentiles

	With Top Performers			Without Top Performers		
	(1)	(2)	(3)	(4)	(5)	(6)
BA Completion	0.0044	0.0195	0.0195	0.0085	0.0173	0.0173
	(0.0029)	(0.0063)	(0.0063)	(0.0043)	(0.0068)	(0.0067)
AA Completion	−0.0031	−0.0005	−0.0004	−0.0027	−0.0010	−0.0011
	(0.0018)	(0.0019)	(0.0019)	(0.0024)	(0.0026)	(0.0026)
Transfer Degree Completion	−0.0050	−0.0028	−0.0027	−0.0033	−0.0018	−0.0020
	(0.0018)	(0.0019)	(0.0019)	(0.0024)	(0.0026)	(0.0026)
Graduate Degree Completion	−0.0034	−0.0009	−0.0008	−0.0068	−0.0052	−0.0055
	(0.0009)	(0.0015)	(0.0015)	(0.0018)	(0.0022)	(0.0022)
Log Real Hourly Wages (Ages 25–27)	−0.0008	0.0052	0.0050	0.0009	0.0042	0.0045
	(0.0019)	(0.0030)	(0.0030)	(0.0032)	(0.0040)	(0.0039)
Log Real Quarterly Wage (Ages 25–27)	−0.0043	0.0029	0.0028	−0.0024	0.0007	0.0009
	(0.0036)	(0.0045)	(0.0045)	(0.0053)	(0.0063)	(0.0062)
Demographic Controls		X	X		X	X
Neighborhood Quality			X			X

Notes: Table shows results of a basic stacked pre-post difference-in-differences approach described in Section 6. This table uses CCB program introductions between 2007 and 2015 (16 introductions) and high school graduating cohorts between 2005 and 2018. Degree completion measures use 10-year post-HS graduation follow-up windows. Results with and without the top 10 percent of performers (in terms of high school GPA) are shown. Specifications with no controls, individual only controls, and all controls are shown.

Table A.9: Robustness: Ring Sizes

	Ring Size = 20 mi (preferred)			Ring Size = 16 miles			Ring Size = 18 miles			Ring Size = 22 miles			Ring Size = 24 miles		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Panel A: Outer Ring = 20–40 miles															
AA Completion	−0.0031	−0.0005	−0.0004	−0.0023	−0.0013	−0.0012	−0.0026	−0.0002	−0.0001	−0.0036	−0.0017	−0.0017	−0.0042	−0.0024	−0.0024
	(0.0018)	(0.0019)	(0.0019)	(0.0017)	(0.0018)	(0.0018)	(0.0017)	(0.0020)	(0.0020)	(0.0018)	(0.0018)	(0.0018)	(0.0017)	(0.0017)	(0.0017)
BA Completion	0.0044	0.0195	0.0195	0.0065	0.0126	0.0123	0.0063	0.0205	0.0203	0.0047	0.0170	0.0169	0.0048	0.0141	0.0141
	(0.0029)	(0.0063)	(0.0063)	(0.0025)	(0.0047)	(0.0047)	(0.0027)	(0.0070)	(0.0070)	(0.0029)	(0.0052)	(0.0052)	(0.0028)	(0.0045)	(0.0044)
Transfer Degree Completion	−0.0050	−0.0028	−0.0027	−0.0037	−0.0031	−0.0029	−0.0043	−0.0024	−0.0022	−0.0052	−0.0037	−0.0037	−0.0056	−0.0042	−0.0042
	(0.0018)	(0.0019)	(0.0019)	(0.0018)	(0.0019)	(0.0019)	(0.0018)	(0.0020)	(0.0020)	(0.0018)	(0.0017)	(0.0017)	(0.0016)	(0.0016)	(0.0016)
Grad Degree Completion	−0.0034	−0.0009	−0.0008	−0.0037	−0.0028	−0.0028	−0.0035	−0.0011	−0.0011	−0.0026	−0.0004	−0.0004	−0.0025	−0.0008	−0.0008
	(0.0009)	(0.0015)	(0.0015)	(0.0010)	(0.0014)	(0.0014)	(0.0010)	(0.0016)	(0.0016)	(0.0008)	(0.0013)	(0.0013)	(0.0008)	(0.0012)	(0.0012)
Log Hourly Earnings (25–27)	−0.0008	0.0052	0.0050	0.0027	0.0051	0.0048	0.0017	0.0073	0.0070	−0.0020	0.0035	0.0035	−0.0015	0.0029	0.0029
	(0.0019)	(0.0030)	(0.0030)	(0.0020)	(0.0027)	(0.0027)	(0.0020)	(0.0033)	(0.0032)	(0.0020)	(0.0027)	(0.0027)	(0.0020)	(0.0024)	(0.0024)
Individual Controls		X	X		X	X		X	X		X	X		X	X
Neighborhood Controls			X			X			X			X			X
Panel B: Outer Ring = 20+ Miles															
AA Completion	−0.0021	0.0013	0.0013	−0.0024	0.0004	0.0004	−0.0022	0.0016	0.0016	−0.0021	0.0007	0.0007	−0.0023	0.0001	0.0000
	(0.0015)	(0.0023)	(0.0023)	(0.0015)	(0.0021)	(0.0021)	(0.0015)	(0.0025)	(0.0025)	(0.0015)	(0.0021)	(0.0021)	(0.0015)	(0.0020)	(0.0020)
BA Completion	0.0113	0.0247	0.0247	0.0122	0.0227	0.0227	0.0122	0.0269	0.0269	0.0116	0.0227	0.0227	0.0116	0.0205	0.0205
	(0.0026)	(0.0075)	(0.0075)	(0.0026)	(0.0068)	(0.0068)	(0.0026)	(0.0085)	(0.0085)	(0.0025)	(0.0065)	(0.0064)	(0.0024)	(0.0057)	(0.0057)
Transfer Degree Completion	−0.0031	−0.0002	−0.0002	−0.0034	−0.0012	−0.0011	−0.0032	0.0000	0.0000	−0.0027	−0.0004	−0.0004	−0.0026	−0.0006	−0.0006
	(0.0015)	(0.0021)	(0.0021)	(0.0016)	(0.0021)	(0.0020)	(0.0015)	(0.0023)	(0.0023)	(0.0014)	(0.0019)	(0.0019)	(0.0014)	(0.0018)	(0.0018)
Grad Degree Completion	−0.0026	−0.0002	−0.0002	−0.0032	−0.0014	−0.0013	−0.0029	−0.0003	−0.0002	−0.0020	0.0001	0.0001	−0.0018	−0.0002	−0.0001
	(0.0009)	(0.0016)	(0.0016)	(0.0010)	(0.0016)	(0.0016)	(0.0009)	(0.0018)	(0.0018)	(0.0008)	(0.0014)	(0.0014)	(0.0008)	(0.0013)	(0.0013)
Log Hourly Earnings (25–27)	−0.0003	0.0048	0.0049	0.0014	0.0054	0.0054	0.0007	0.0064	0.0065	−0.0008	0.0037	0.0038	−0.0004	0.0031	0.0031
	(0.0018)	(0.0033)	(0.0033)	(0.0018)	(0.0032)	(0.0032)	(0.0018)	(0.0037)	(0.0037)	(0.0018)	(0.0030)	(0.0030)	(0.0018)	(0.0027)	(0.0027)
Individual Controls		X	X		X	X		X	X		X	X		X	X
Neighborhood Controls			X			X			X			X			X

Notes: Table shows results of a basic stacked pre-post difference-in-differences approach described in Section 6. This table uses CCB program introductions between 2007 and 2015 (16 introductions) and high school graduating cohorts between 2005 and 2018. Degree completion measures use 10-year post-HS graduation follow-up windows. Results using various ring sizes (16 miles, 18 miles, 20 miles, 22 miles, 24 miles) are shown. The 20 mile ring size is preferred. Results that do not drop the outermost ring are also shown. In these examples, the treated group is the inner ring and the control group is anyone in the state outside of the inner ring. In the preferred approach the control group is limited to students just outside of the inner ring (i.e., 20-40 miles in the preferred specification; anyone farther than 40 miles is dropped). Specifications with no controls, individual only controls, and all controls are shown.

Table A.10: Program-Level Admission at WA Public Universities: Nursing and Computer Science

Institution	Institution admit rate	Program admission structure	Program-level selectivity
Panel A: Nursing (pre-licensure BSN)			
Washington State (WSU)	83%	Limited-enrollment major; min. 3.0 cumulative GPA; min. TEAS score of 70	Approx. 250–300 applicants per year for 90 seats (Spokane); Fall 2023: 257 applicants, 228 qualified, ≈120 admitted (≈53% of qualified)
Eastern Washington (EWU)	92%	Capacity-constrained; cohort capped at 40 per semester; min. 3.0 GPA in nursing prerequisites and 3.0 cumulative across all coursework	132 completed applications for 40 seats in inaugural 2023 cycle (≈30%). Program established Fall 2023.
UW Bothell	92%	No pre-licensure BSN offered. RN-to-BSN completion only: admission requires an associate degree in nursing and current WA RN licensure	
UW Tacoma	89%	No pre-licensure BSN offered. RN-to-BSN completion only: admission requires an ADN or hospital nursing diploma and current WA RN licensure	
Central Washington (CWU)	93%	No nursing program offered at any level.	
Panel B: Computer Science			
UW Bothell	92%	Capacity-constrained; min. 2.0 in each prerequisite; holistic committee review; meeting minimums does not guarantee admission	44% of applicants admitted (Computer Science & Software Engineering); 39% in Applied Computing
UW Tacoma	89%	Capacity-constrained (BS and BA tracks); min. 2.0 in each prerequisite and 2.5 cumulative prerequisite GPA; competitive applicants typically 3.0+	Rate not published; program states it "normally has more applications than space"
Western Washington (WWU)	93%	Competitive major application in fall, winter, and spring; admission determined by GPA in three gateway CS courses; 3.0+ receives preferential review; prerequisites do not guarantee admission	Rate not published; department states admission is competitive and space-limited
Central Washington (CWU)	93%	Minimum-requirements admission; B− or higher in pre-admission courses; grade gates for continuation; no competitive seat cap	Effectively unrationed for students meeting grade requirements

Notes: The table covers Washington's near-open-access public four-year institutions; the University of Washington's Seattle campus is excluded because the institution itself is selective (43% admit rate). Institution-level admit rates are for the 2023–24 cycle (see Appendix Table A.3). Program-level figures are drawn from the most recent publicly available sources and vary in vintage: WSU applicant and seat counts are from WSU College of Nursing materials and reporting in *The Spokesman-Review* (March 2023); EWU figures are from EWU School of Nursing program pages and the same article; UW Bothell and UW Tacoma nursing eligibility rules and CS admission structures are from university program pages (accessed July 2026); UW Bothell CS admission rates are from university-published major admission data; CWU program information is from university catalog and advising pages (accessed July 2026). Because EWU's BSN launched in Fall 2023, the only public pre-licensure BSN pathways available to students during the analysis period (CCB introductions 2007–2015) were at the UW Seattle campus and WSU. Business, the largest unconstrained comparison field in the main analysis, operates as an open or minimum-requirements major at the institutions shown here; it is capacity-constrained only at UW Seattle.

Table A.11: First-Time NCLEX-RN Pass Rates at WA Public Nursing Programs, 2020–2024

Program	Passed / Delivered	Pass rate (%)	Nursing CCB host
Panel A: Public university pre-licensure BSN			
University of Washington	667 / 750	88.9	—
Washington State University	1,107 / 1,246	88.8	—
Panel B: Community and technical college ADN programs			
Bellevue College	329 / 368	89.4	Y
Bellingham Technical College	280 / 293	95.6	N
Big Bend Community College	85 / 86	98.8	N
Centralia College	105 / 122	86.1	N
Clark College	390 / 427	91.3	N
Columbia Basin College	214 / 241	88.8	Y
Everett Community College	496 / 563	88.1	N
Grays Harbor College	116 / 135	85.9	N
Highline College	318 / 370	85.9	N
Lake Washington Inst. of Technology	312 / 374	83.4	Y
Lower Columbia College	518 / 576	89.9	N
Olympic College	313 / 343	91.3	Y
Peninsula College	136 / 150	90.7	N
Pierce College	239 / 286	83.6	N
Renton Technical College[a]	58 / 82	70.7	N
Seattle Central College	483 / 614	78.7	Y
Shoreline Community College	454 / 526	86.3	N
Skagit Valley College	299 / 317	94.3	N
South Puget Sound Community College	142 / 160	88.8	N
Spokane Community College	414 / 442	93.7	N
Tacoma Community College	399 / 430	92.8	N
Walla Walla Community College	469 / 520	90.2	N
Wenatchee Valley College	249 / 278	89.6	Y
Whatcom Community College	145 / 153	94.8	N
Yakima Valley College	240 / 268	89.6	N
Panel C: LPN-to-BSN CCB tracks (pre-licensure at BSN level)			
Columbia Basin College[b]	13 / 13	100.0	Y
Green River College[b]	15 / 15	100.0	Y
Olympic College[c]	25 / 28	89.3	Y
Wenatchee Valley College[b]	11 / 13	84.6	Y

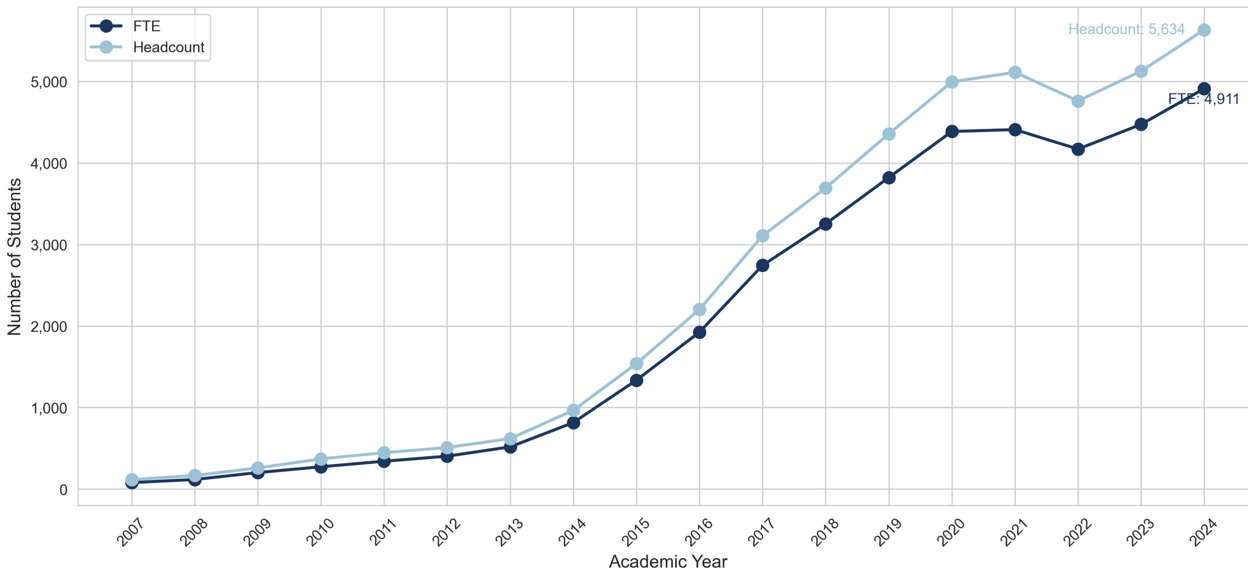
Notes: Pass rates are first-time NCLEX-RN pass rates, pooled within program across the 2020–2024 examination years (total passed over total delivered). All programs shown administer the same national examination against the same passing standard; the NCLEX-RN does not vary by degree level or institution type. Data are from the Washington Board of Nursing NCLEX School Reports (January 2025). Eastern Washington University's pre-licensure BSN enrolled its first cohort in Fall 2023 and does not yet appear in the reports; during the analysis period, the University of Washington and Washington State University operated the state's only public pre-licensure BSN programs. NCLEX-PN results (practical nursing licensure, a separate examination) are excluded. Pass rates reflect candidates who sit for the examination and do not capture pre-test attrition.

[a] 2020–2023 only; no candidates reported in 2024.

[b] 2024 only; first cohort to reach licensure.

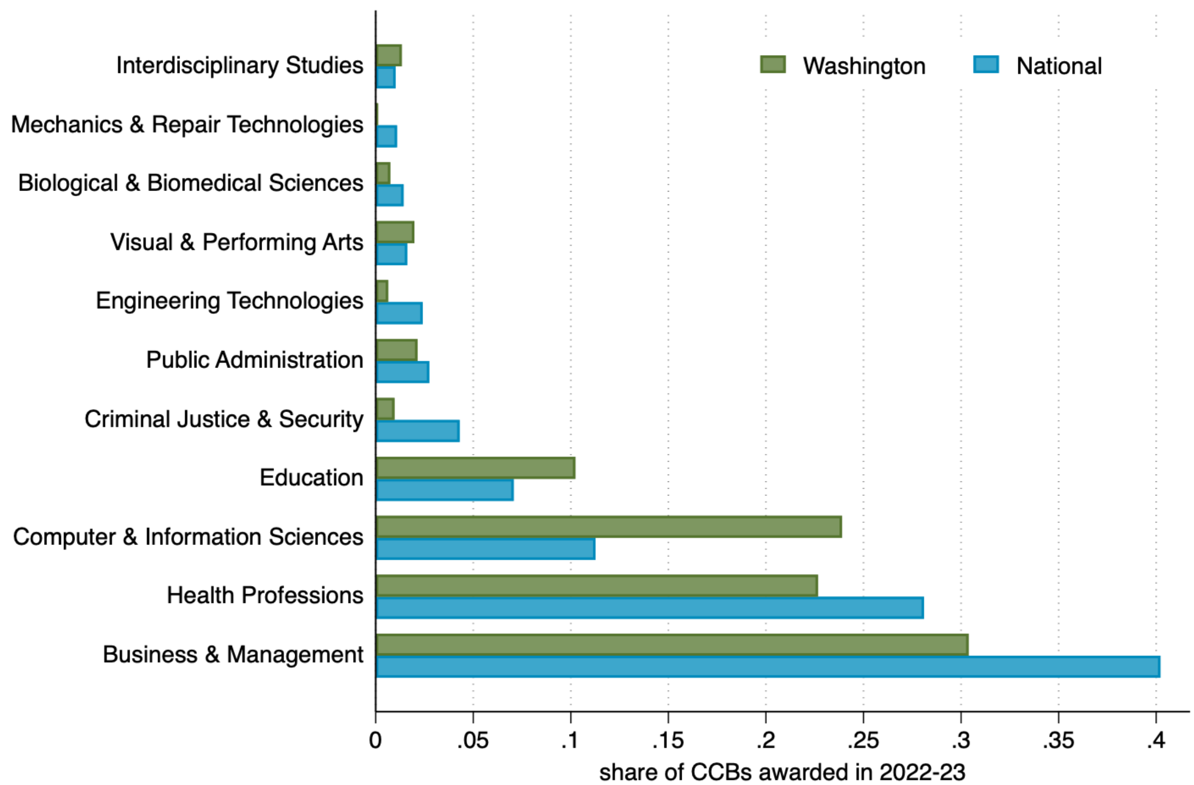
[c] 2023–2024.

Figure A.1: Fall Term Enrollment in Washington State CCB Programs



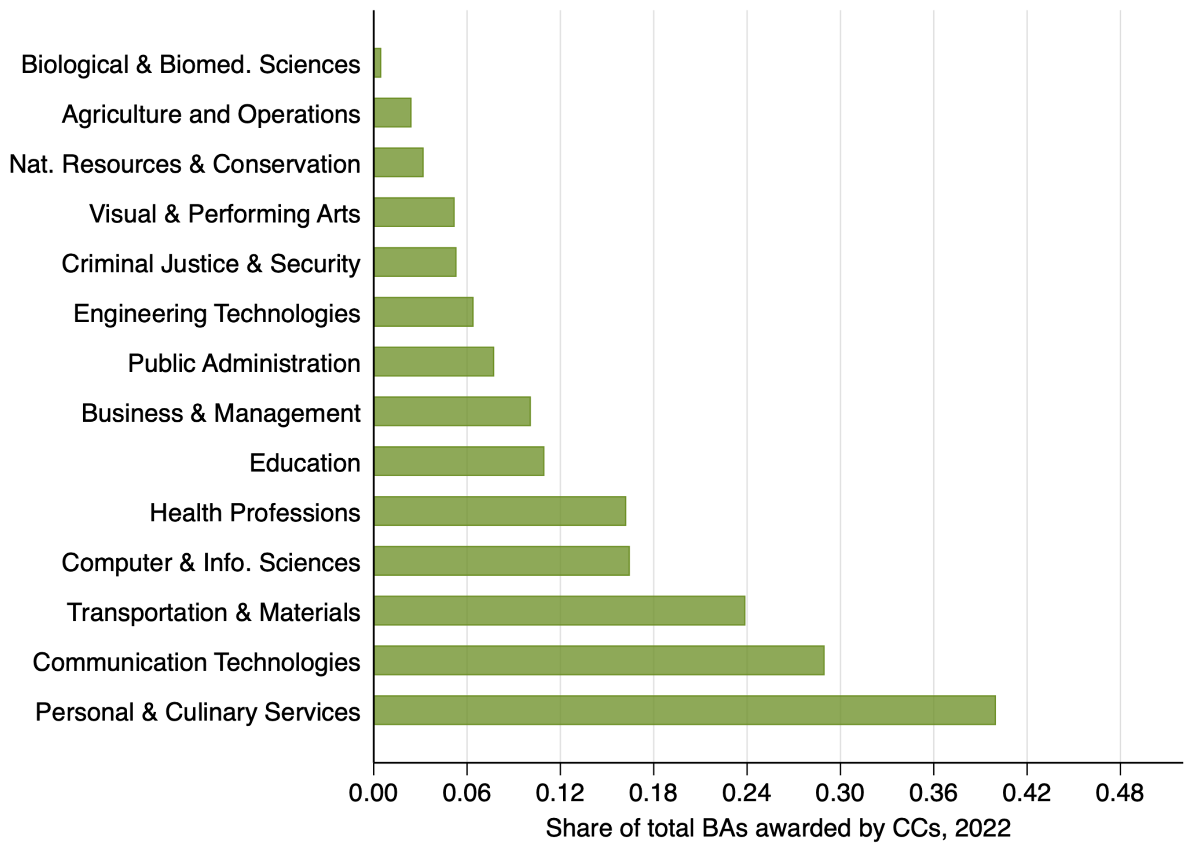
Notes: Panels A and B show full-time equivalent and headcount enrollment counts. These counts come from the Washington State Board for Community and Technical Colleges data dashboards and plot matriculated BAS enrollment across the state in the Fall quarter.

Figure A.2: CCB Field of Study (National vs WA)



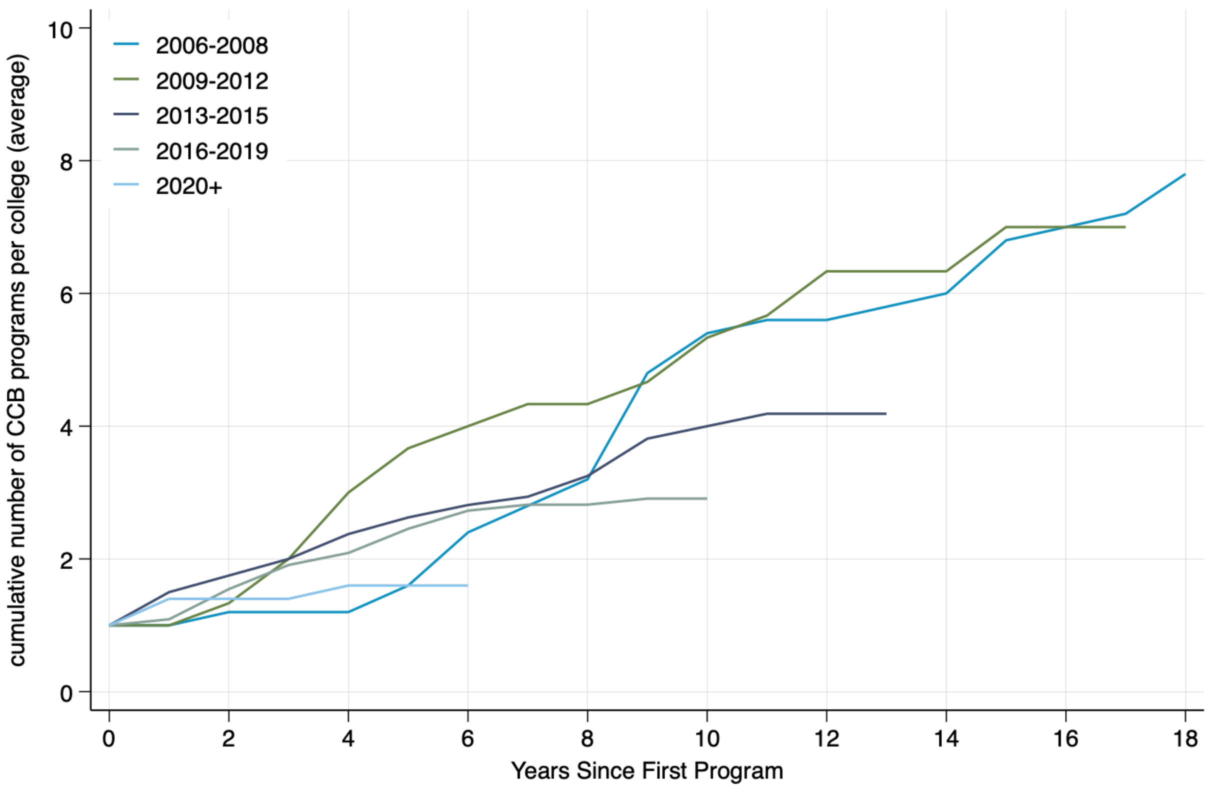
Notes: This figure plots the share of CCB degrees awarded annually across fields of study (defined by CIP2 codes). I use IPEDS data to identify CCB degrees and blue bars plot CCB awarding shares at the national level whereas green bars highlight Washington CCBs. For consistency, CCB programs are bachelor's degrees awarded by public, primarily associate degree or below-awarding institutions.

Figure A.3: Share of BAs Awarded by Community Colleges by Field of Study



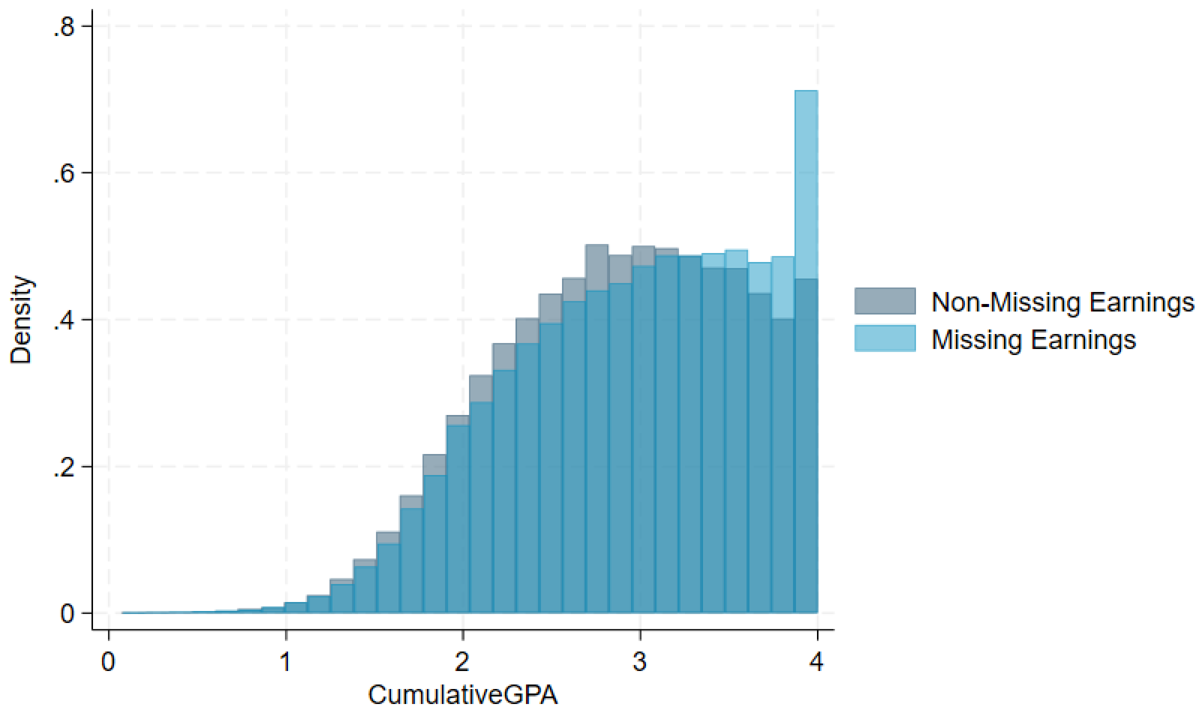
Notes: This figure plots the share of WA state bachelor's degrees awarded by community colleges in each field. Each bar represents the share of total BAs in that field that were awarded by community colleges. This figure uses IPEDS data on completions and institutional characteristics from the 2022-23 school year. Fields of study are characterized at the 2-digit CIP code level.

Figure A.4: Program Growth Over Time by Introduction Year Cohort



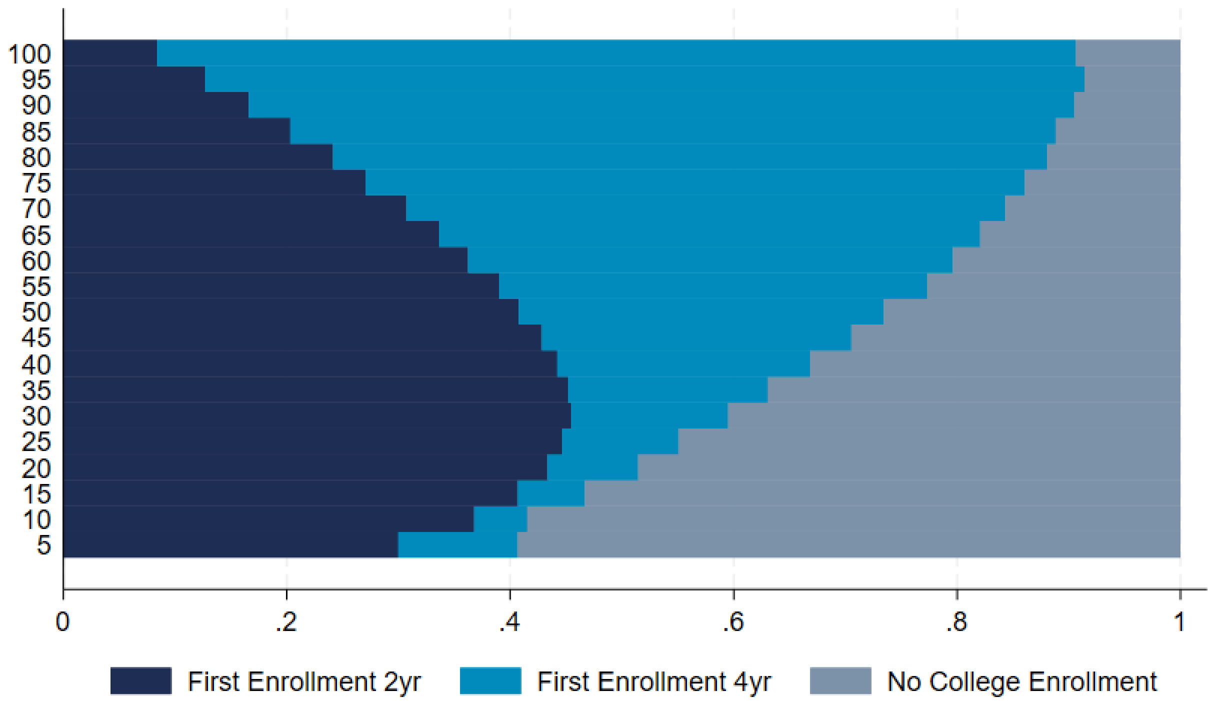
Notes: This figure plots the average cumulative number of CCB programs introduced at each college by year of introduction cohort.

Figure A.5: Distribution of HS GPA Among Missing and Non-Missing Earnings



Notes: This figure plots histograms of HS GPA separately for those who are missing earnings at age 28-30 vs those who are not missing earnings at that age. The 2005-2013 graduation year cohorts are used.

Figure A.6: First Enrollment by High School GPA



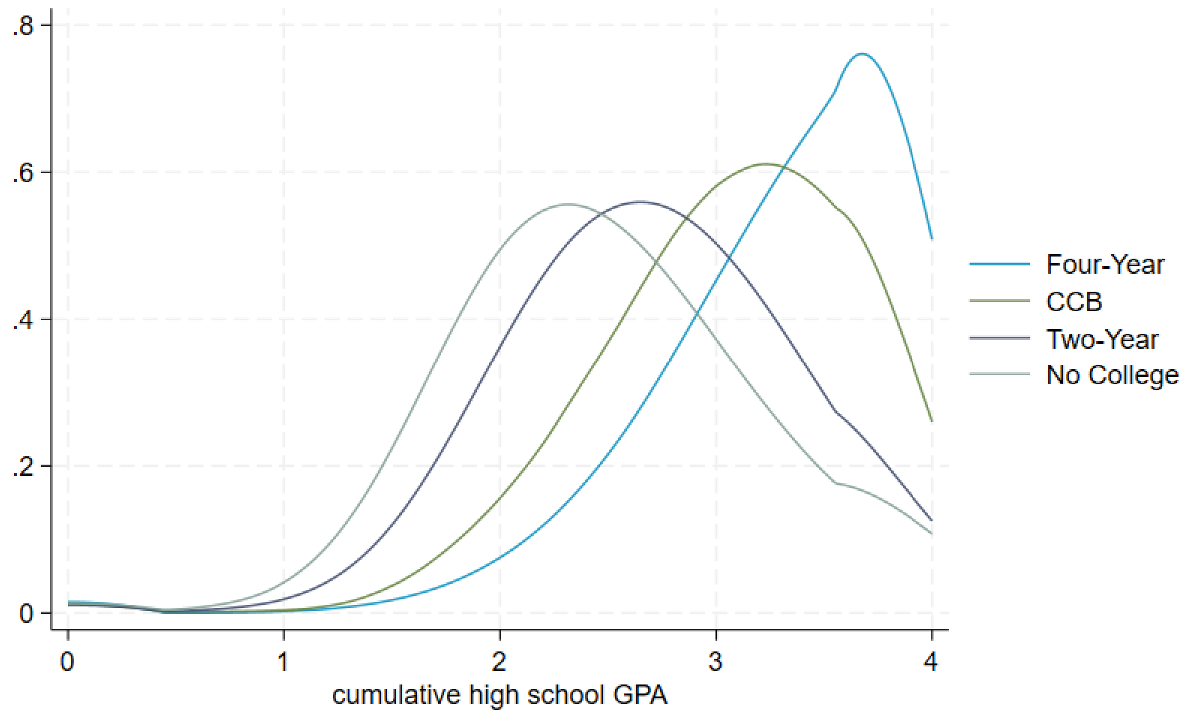
Notes: Initial enrollment is plotted across GPA percentiles. Initial enrollment is described in Section 3.3. GPA percentiles are constructed within graduation year using cumulative high school GPA for WA public high school graduates.

Figure A.7: Age and Cohort Map of Sample

	Calendar Year																				
Graduation Cohort	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Openings			**4**		**3**			**1**	**2**	**4**	**4**	**4**	**4**	**1**	**1**		**1**		**1**	**2**	**1**
2005	**18**	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
2006	17	**18**	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
2007	16	17	**18**	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
2008	15	16	17	**18**	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
2009	14	15	16	17	**18**	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
2010	13	14	15	16	17	**18**	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
2011	12	13	14	15	16	17	**18**	19	20	21	22	23	24	25	26	27	28	29	30	31	32
2012	11	12	13	14	15	16	17	**18**	19	20	21	22	23	24	25	26	27	28	29	30	31
2013	10	11	12	13	14	15	16	17	**18**	19	20	21	22	23	24	25	26	27	28	29	30
2014	9	10	11	12	13	14	15	16	17	**18**	19	20	21	22	23	24	25	26	27	28	29
2015	8	9	10	11	12	13	14	15	16	17	**18**	19	20	21	22	23	24	25	26	27	28
2016	7	8	9	10	11	12	13	14	15	16	17	**18**	19	20	21	22	23	24	25	26	27
2017	6	7	8	9	10	11	12	13	14	15	16	17	**18**	19	20	21	22	23	24	25	26
2018	5	6	7	8	9	10	11	12	13	14	15	16	17	**18**	19	20	21	22	23	24	25
2019	4	5	6	7	8	9	10	11	12	13	14	15	16	17	**18**	19	20	21	22	23	24
2020	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	**18**	19	20	21	22	23
2021	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	**18**	19	20	21	22
2022	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	**18**	19	20	21
2023	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	**18**	19	20
2024	--	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	**18**	19

Notes: This figure shows the approximate age of students in each graduating high school cohort by calendar year observed. Openings correspond to the number of CCB openings in a given calendar year (at the institution level). Cells are highlighted based on inclusion in various samples. Green represents the perfectly balanced sample (cohorts 2005-2015) and blue represents the main analysis sample, which adds 2016, 2017, and 2018 cohorts.

Figure A.8: High School GPA by Type of Enrollment

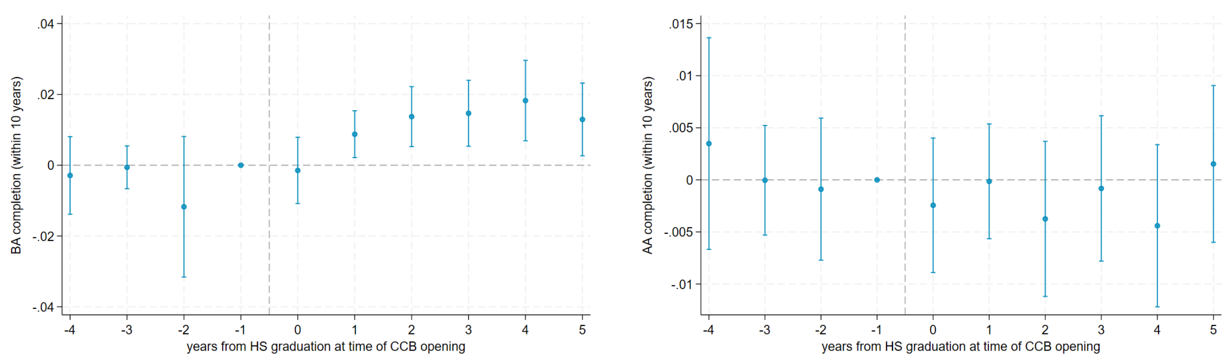


Notes: This figure plots the distribution of High School GPA by students' highest level of enrollment. High school data files are used for graduates of WA state public high schools. Cumulative high school GPA is missing for less than 1 percent of the sample. These students are dropped from the analysis.

Figure A.9: Main Results Using Balanced Panel (2009 Introductions Only)

Panel A: BA Completion

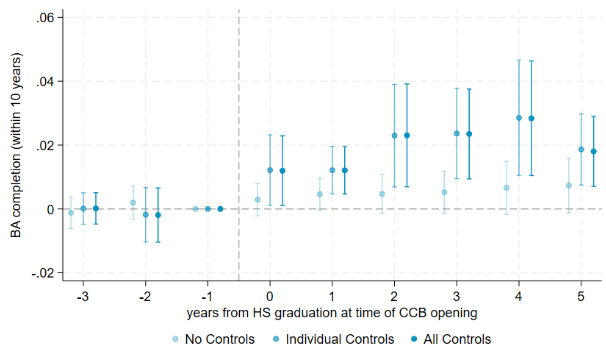
Panel B: AA Completion



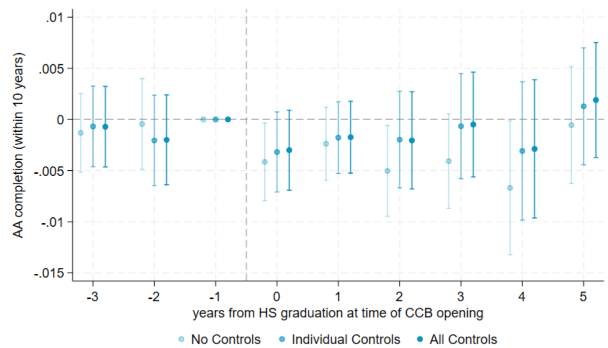
Notes: This figure shows the effect of CCB program introduction on individual outcomes using a perfectly balanced panel. Panels (a) and (b) show effects on bachelor's degree and associate degree completion. Both panels use NSC and SBCTC data for outcome variables. Each event study uses CCB program introductions in the year 2009 to allow for four years of pre-introduction observation and 5 years of post-introduction observation. High school graduation cohorts between 2005 and 2014 are used in this analysis.

Figure A.10: Effect of CCB Program Introduction Across Control Sets

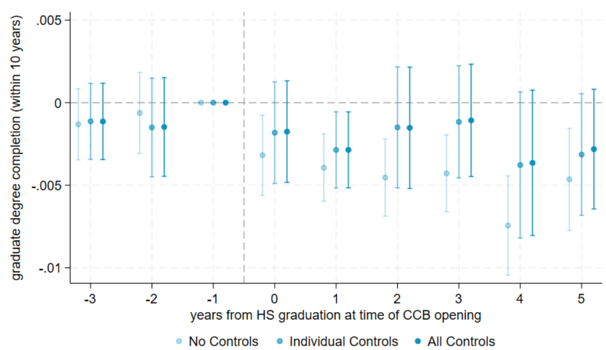
(a) BA Completion



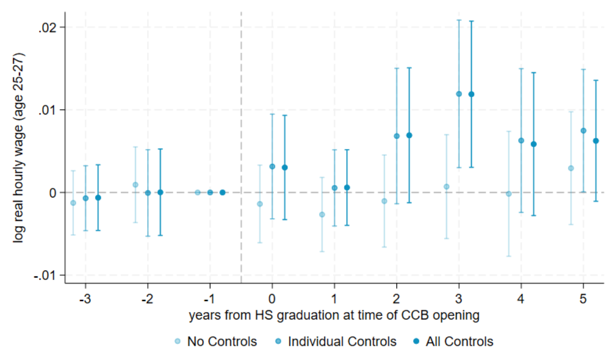
(b) AA Completion



(c) Graduate Degree Completion

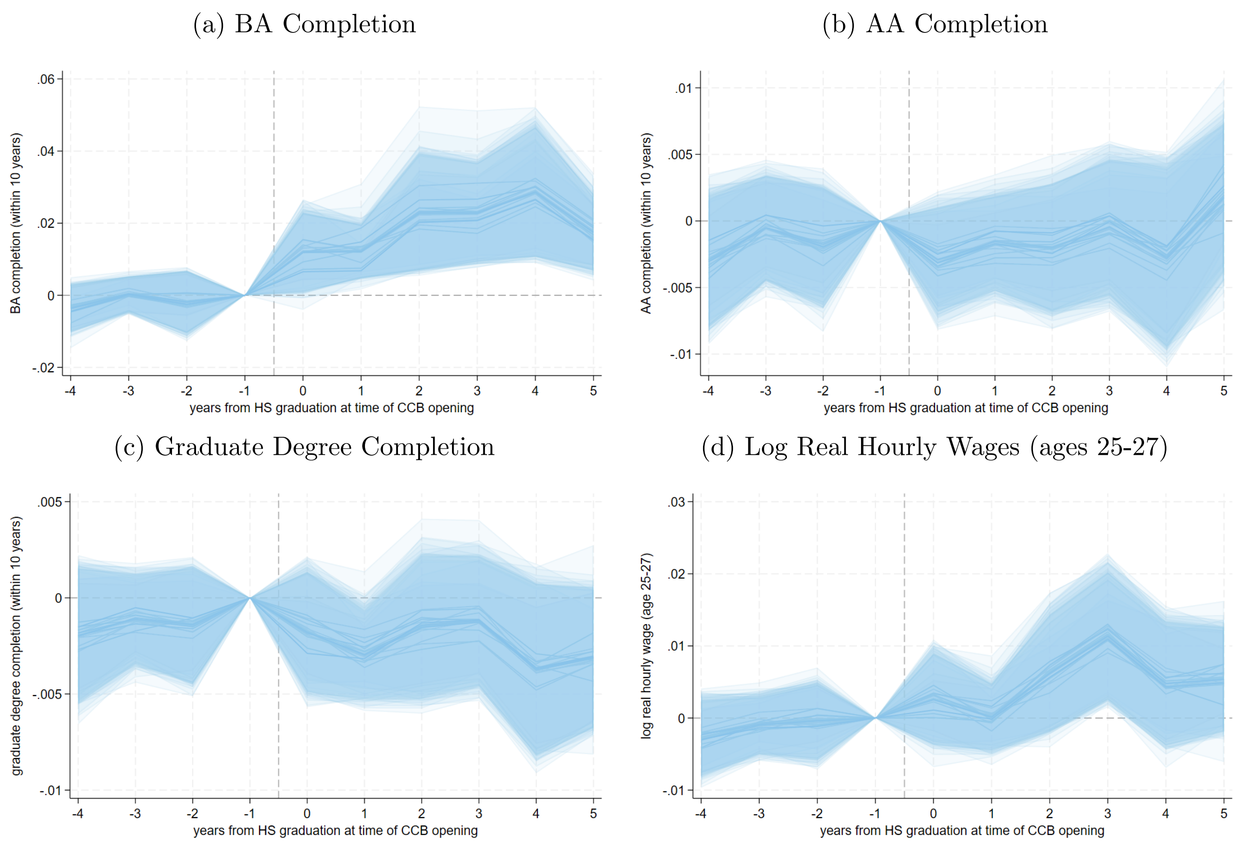


(d) Log Real Hourly Wages (ages 25-27)



Notes: Panels (a)–(d) show the effect of CCB program introduction on individual outcomes. Panels (a), (b), and (c) show effects on bachelor's degree, associate degree, and graduate degree completion, and panel (d) shows effects on log real hourly wages between ages 25 and 27. Panels (a), (b), and (c) use NSC and SBCTC data for outcome variables, panel (d) uses ESD data for outcomes. Each event study uses CCB program introductions between 2007 and 2015 (16 introductions) and high school graduating cohorts between 2005 and 2018. Specifications with no controls, individual controls (gender, race/ethnicity, FRPL status, number of AP courses taken, and high school GPA), and all controls (all individual controls plus a neighborhood quality index).

Figure A.11: Leave-One-Out Estimates of the Effect of CCB Program Introduction



(a) BA Completion

(b) AA Completion

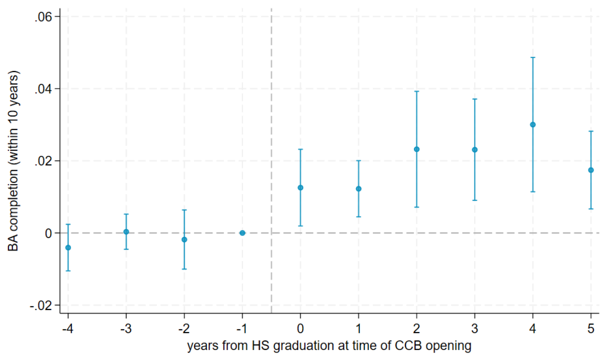
(c) Graduate Degree Completion

(d) Log Real Hourly Wages (ages 25-27)

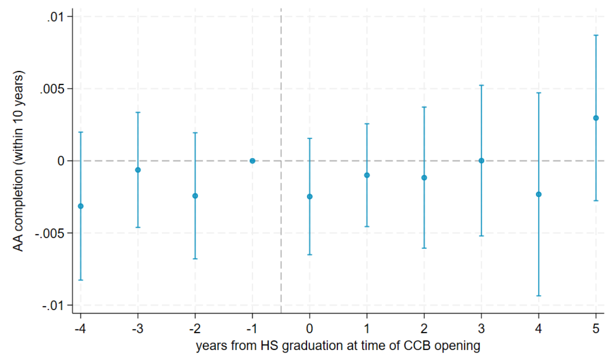
Notes: Panels (a)–(d) show the effect of CCB program introduction on individual outcomes, with each run leaving out one single CCB introduction. Panels (a), (b), and (c) show effects on bachelor's degree, associate degree, and graduate degree completion, and panel (d) shows effects on log real hourly wages between ages 25 and 27. Panels (a), (b), and (c) use NSC and SBCTC data for outcome variables, panel (d) uses ESD data for outcomes. Each event study uses CCB program introductions between 2007 and 2015 (16 introductions) and high school graduating cohorts between 2005 and 2018.

Figure A.12: Effect of CCB Program Introduction (No Top Performers)

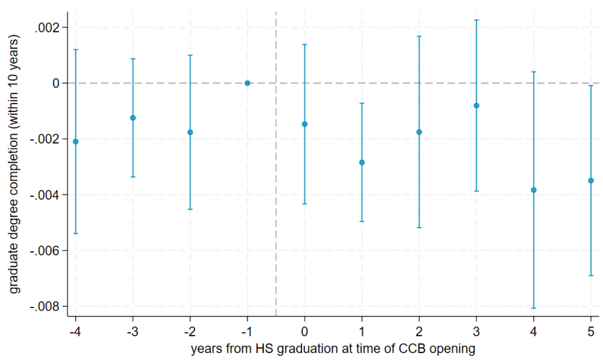
(a) BA Completion



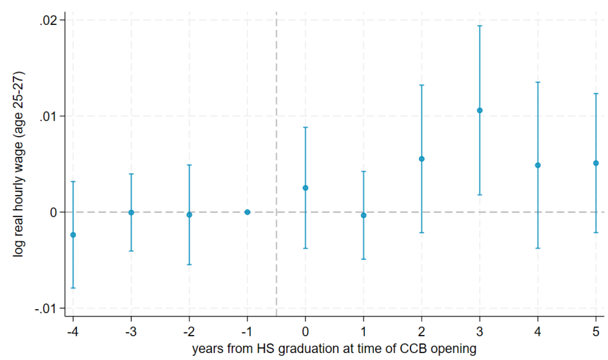
(b) AA Completion



(c) Graduate Degree Completion



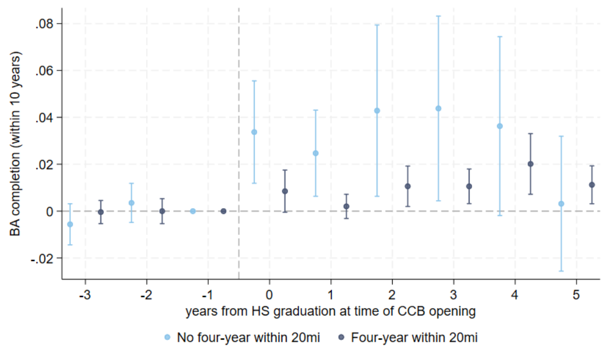
(d) Log Real Hourly Wages (ages 25-27)



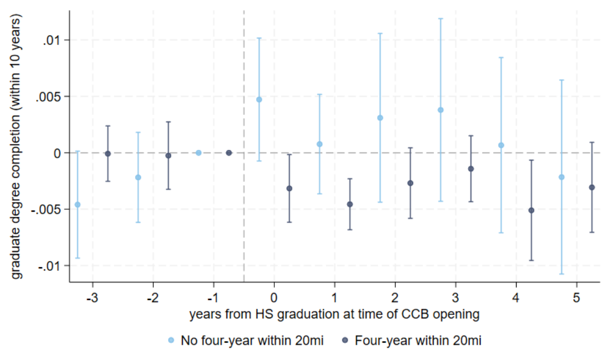
Notes: Panels (a)–(d) show the effect of CCB program introduction on individual outcomes for a sample that drops the top 10 percent of performers in terms of high school GPA in order to account for missing earnings. Panels (a), (b), and (c) show effects on bachelor's degree, associate degree, and graduate degree completion, and panel (d) shows effects on log real hourly wages between ages 25 and 27. Panels (a), (b), and (c) use NSC and SBCTC data for outcome variables, panel (d) uses ESD data for outcomes. Each event study uses CCB program introductions between 2007 and 2015 (16 introductions) and high school graduating cohorts between 2005 and 2018.

Figure A.13: Effect of CCB Program Introduction by Access to Four-Year Institution

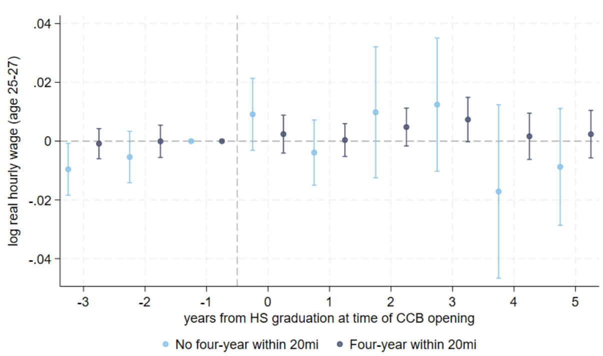
(a) BA Completion



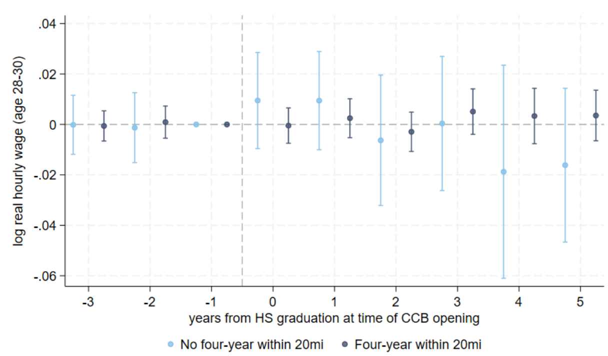
(b) Graduate Degree Completion



(c) Log Hourly Wages (ages 25-27)

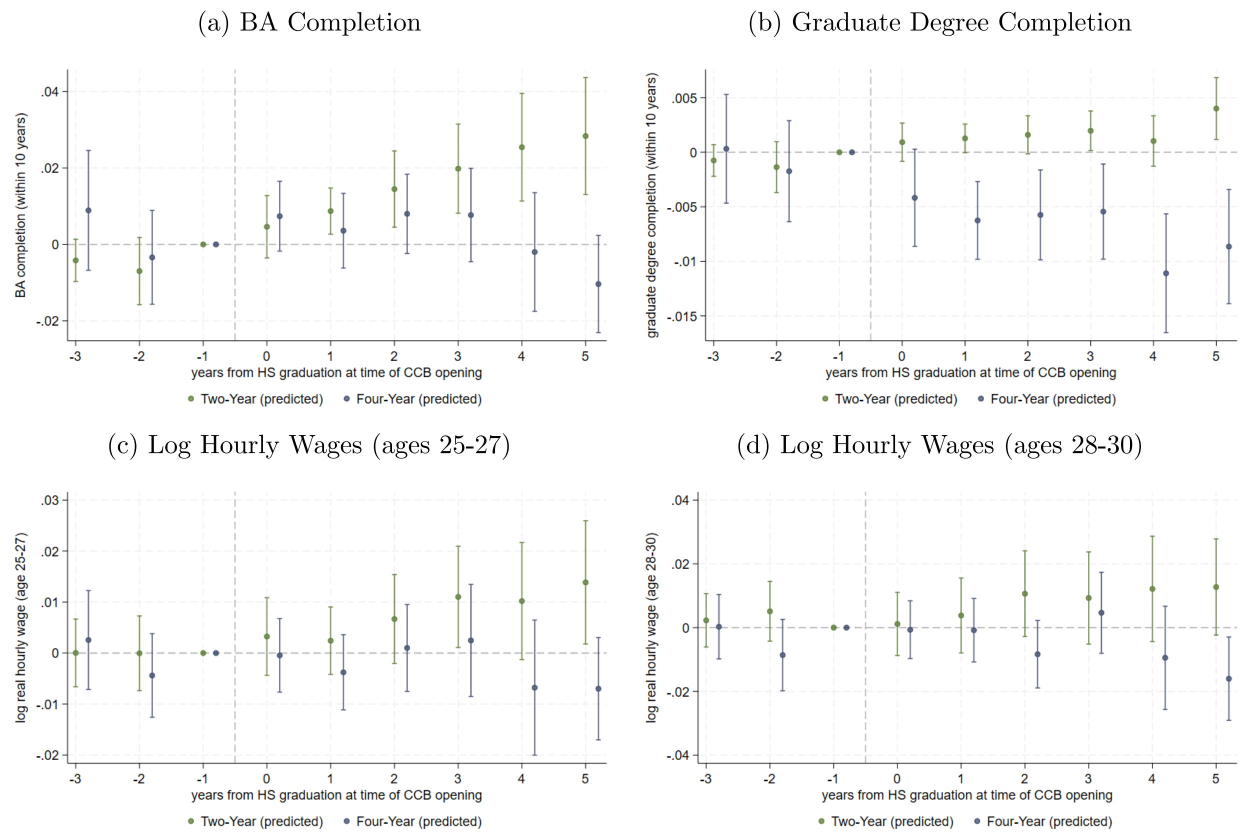


(d) Log Hourly Wages (ages 28-30)



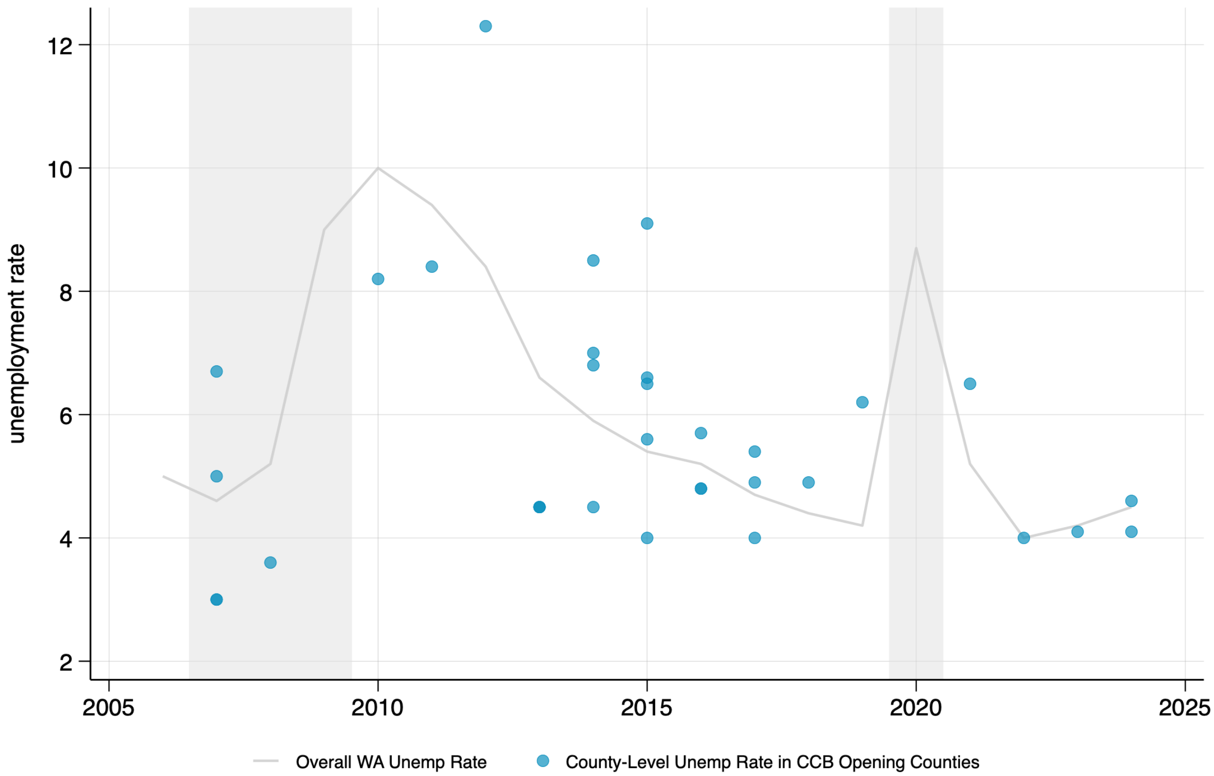
Notes: Panels (a)–(d) show the effect of CCB program introduction on student outcomes separated by four-year institution availability. Students are defined as having access to a four-year college if they live within 20 miles of a four-year school. Panels (a) and (b) show effects on bachelor's degree and above-BA degree completion, and panels (c) and (d) show effects on labor market outcomes average real hourly wages between ages 25-27 and 28-30. Panels (a) and (b) use NSC and SBCTC data for outcome variables, panels (c) and (d) use ESD data for outcomes. Each event study uses CCB program introductions between 2007 and 2015 (16 introductions) and high school graduating cohorts between 2005 and 2018. All panels include all controls as described in Section 5.1.

Figure A.14: Effect of CCB Program Introduction by Counterfactual Enrollment (Alternative Assignment Rule)



Notes: Panels (a)–(d) show the effect of CCB program introduction on student outcomes separated by predicted counterfactual enrollment as described in Section 7.1.1, using a classification scheme in which an enrollment choice must have at least a 10 percentage point higher predicted probability than the next closest choice. Panels (a) and (b) show effects on bachelor's degree and above-BA degree completion, and panels (c) and (d) show effects on average real hourly wages between ages 25 and 27 and ages 28 and 30. Each event study uses CCB program introductions between 2007 and 2015 (16 introductions) and high school graduating cohorts between 2005 and 2018. All panels include all controls as described in Section 5.1.

Figure A.15: County Unemployment Rates at CCB Program Introduction



Notes: This figure shows the county-level unemployment rates in areas that saw a CCB opening in a given year. County-level unemployment comes from the Bureau of Labor Statistics Local Area Unemployment Statistics (LAUS). Grey bars indicate recession and overall state unemployment is also plotted.

B Data Construction

This appendix details the construction of the variables and samples used throughout the paper. Section B.1 describes the SBCTC program approval process from which CCB introduction dates are collected, Section B.2 details the distance calculations, Section B.3 details the harmonization of enrollment spells across data sources, Section B.4 defines transfer and time in school, and Section B.5 describes the neighborhood quality index.

B.1 CCB Program Approval and Introduction Dates

Washington community colleges seeking to introduce a new bachelor's degree program must follow a three-stage approval process overseen by the State Board for Community and Technical Colleges (SBCTC). First, institutions notify SBCTC and the higher education community by submitting program details to be placed on the Inter-Institutional Committee on Academic Program Planning (ICAPP) grid. Second, colleges submit a comprehensive proposal addressing program information, labor market demand, curriculum design, and industry partnerships; SBCTC staff review the proposal and notify other institutions, who have 30 days to raise concerns. Finally, the SBCTC Board votes on the proposal, and when colleges receive final Board approval they can begin implementing the program.

Two features of this process are relevant to the identifying assumptions discussed in Section 6.3. First, proposals are reviewed internally and approved by the Board before any public announcement of enrollment availability, which limits students' ability to anticipate and respond to upcoming openings. Second, approval is granted at the level of the individual program in a specific field rather than at the level of the institution, which is what permits the program-level design used in Section 7.2.

B.2 Distance Calculations

Distances are calculated between the latitude and longitude coordinates of each Washington public high school, taken from the Washington State Report Card, and those of each postsecondary campus, taken from IPEDS. For the several institutions with missing location information in IPEDS or the College Scorecard, I locate the street address of the institution on the institution website and convert the address to coordinates using Google Maps.

Several four-year public universities in the state report operating multiple campuses—take, for example, the University of Washington at Bothell and the University of Washington at Tacoma campuses—but report data for those multiple campuses under one IPEDS observation *or* report one address only in IPEDS. In these cases, I supplement IPEDS coordinates with individual campus locations collected from PCHEES, again converting street addresses using Google Maps. I only count secondary campuses when they offer a reasonable approximation of the same degree programs offered by the main campus. For example, Western Washington University operates several specialized campuses including a location in Anacortes that is designed specifically for the study of marine biology and ecosystems; given the specialized nature of these campuses, I do not treat them as viable alternatives available to students. Given these restrictions, only the University of Washington and Washington State University operate multiple campuses in my setting.[45]

I additionally calculate the average driving time between each high school and college in Washington using Open Route Services and QGIS (HeiGIT and OpenStreetMap contributors 2024; QGIS Development Team 2024). Driving is the dominant mode of transportation in Washington, with 90 percent of workers commuting by car and only 5 percent using public transportation.[46] The main analyses use straight line distances; the two measures are highly correlated and my main results are not sensitive to which is used.

B.3 Harmonizing Enrollment Spells

Enrollment spells are reported inconsistently across the three enrollment data sources, so in each dataset I calculate quarters of schooling as follows. In the NSC, exact enrollment start and end dates are given, so I calculate months between start and end and aggregate up to a quarterly measure of enrollment length. The SBCTC data come in quarterly format, so I take these enrollment spells as given. The PCHEES provides semester-level enrollment, so I count each semester (Fall and Spring) as 1.5 quarters of enrollment and Summer as 1 quarter.

NSC enrollment spells require several additional cleaning steps. First, there are several instances

[45] The University of Washington operates campuses in Seattle (flagship), Bothell, and Tacoma. Washington State University operates relevant campuses in Vancouver, Richland (Tri-Cities), and Pullman (flagship). The WSU campus in Spokane is dropped as that location operates exclusively health-related programs.

[46] U.S. Census Bureau, 2024 ACS 1-Year Estimates, Table B08101.

of duplicate enrollment spells with the same start date. For example, an individual may appear to have one enrollment spell beginning in September 2010 through December 2010 and a second spell from September 2010 through May 2011. In this case, I take September 2010 as the start date and keep the maximum end date. Next, I fix a small number of negative enrollment spells where it appears that the enrollment spell ended before it began; in most of these cases the start and end dates appear to have been switched, so I switch them back. This occurs in less than 0.1 percent of cases. Finally, there are a very small number of unrealistically long consecutive enrollment spells, for example over 300 months in total at a given school. I therefore cap the number of months a student can spend at a given school at 120, which changes only 165 enrollment spells and accounts for less than 0.001 percent of the sample.

B.4 Transfer and Time in School

Transfers are defined in two parts. First, a student is counted as having successfully transferred if they earn an associate degree for transfer, specifically indicated in the SBCTC data, *and* they appear within two years as enrolled in a bachelor's degree program in the NSC data, inside or outside of Washington. Second, a student is counted as having completed a transfer BA if they meet the definition of successful transfer and ultimately complete a BA. As with all other completion measures in the paper, this metric is measured within a 10-year window from high school graduation. Time in school is measured as total quarters of schooling, summed across institutions using the harmonization described in Section B.3.

B.5 Neighborhood Quality Index

I construct an index of neighborhood quality by combining measures of median household income and the percent of households under the poverty line with high school-level percent eligible for free or reduced price lunch into a one-factor model, then normalizing this neighborhood factor to within-cohort percentiles.

My measures of median household income and poverty levels come from the U.S. Census Bureau's Small Area Income and Poverty Estimates (SAIPE) program. SAIPE provides annual estimates of income and poverty for all U.S. counties and school districts, designed specifically to support education funding allocation under Title I. While the American Community Survey has limited coverage for small areas in early years, SAIPE offers consistent annual estimates for all geographic units beginning in 2005. I link all Washington public high schools to SAIPE data at two geographic levels for 2005–2024: median household income and poverty rates are available at the county level, and poverty rates for children aged 5–17 are available at the school district level. Schools are matched to counties using geocoded coordinates (100 percent match rate) and to school districts using standardized name matching (93.6 percent match rate).

C Event Study Assumptions: Supporting Tests

This appendix reports in full the tests summarized in Section 6.3.

C.1 Sensitivity to Violations of Parallel Trends

I implement the sensitivity analysis of Rambachan and Roth (2023), which allows for inference under restricted violations of parallel trends and quantifies the magnitude of violation that would make the estimated effect statistically insignificant at the 5 percent level. The breakdown value M^* indexes the maximum magnitude of post-treatment violations of parallel trends, scaled relative to the largest pre-treatment deviation consistent with the pre-treatment estimates and their standard errors. The largest estimated pre-period deviation in my main BA attainment result is 0.4 percentage points, and the Honest DiD approach accounts for estimation error in the pre-trends when computing the breakdown value. Using this approach, I estimate that the effect on BA attainment is robust to post-treatment violations of parallel trends up to 47 percent as large as the bound implied by the pre-treatment estimates, suggesting that a substantial divergence between treated and control areas would be required to overturn the conclusions presented in the main text.

C.2 Timing of CCB Introduction and Local Labor Market Conditions

Causal interpretation requires that the timing of CCB program introduction is not driven by pre-existing trends in outcomes among exposed students. This assumption may be of particular concern given the SBCTC approval process described in Section B.1, during which program proposals are evaluated primarily on the basis of employer demand and workforce alignment.

Appendix Figure A.15 shows the county-level unemployment rates of areas that saw a CCB introduction over time. Compared to the overall state unemployment rate between 2007 and 2024, the counties that saw CCB openings did not face systematically higher or lower unemployment in the year of a CCB opening. In other words, overall county-level labor market conditions do not appear to be driving the CCB openings. To formalize this, I estimate a hazard model in which the dependent variable is equal to one in the year of CCB adoption and zero in all prior years, restricting the sample to the pre-adoption period in treated counties. I regress this outcome on one-, two-, and five-year lags of county-level unemployment rates. If counties introduced CCB programs in response to struggling labor markets, lagged labor market conditions should predict adoption timing, but I find no evidence of this. Lagged unemployment rates are small and statistically indistinguishable from zero, and the joint F-statistic on the lagged unemployment terms is 0.77 ($p = 0.52$), consistent with CCB introduction timing being unrelated to pre-existing labor market trends.[47]

Because labor market conditions relevant to a CCB program may operate at the level of the specific occupational field rather than (or in addition to) the county as a whole, I repeat this exercise using industry-specific labor market indicators. For each CCB opening, I match on both county and the NAICS code associated with the program field of study.[48] This restricts the comparison set in the stacked design to county $\times$ CIP cells in the same field. I then estimate analogous hazard models using one- and two-year lags of log establishment counts, log employment levels, and log total annual wages within that county-industry cell from the Quarterly Census of Employment and Wages (QCEW). As reported in Appendix Table A.5, none of these measures predict adoption timing: the joint F-statistics range from 0.45 to 0.49, with p-values between 0.62 and 0.64. This suggests that sector-specific labor market trends—in addition to overall county unemployment—are not driving the timing of CCB introductions.

Finally, Appendix Table A.6 shows the financial state of the institutions at the point of CCB introduction, split by early, middle, and late adopters. There are no significant differences in institutions' financial positions at the point of CCB introduction, suggesting that institutional capacity was not a driver of CCB introduction timing.

[47] These results are comparable using a variety of models including only one- and two-year lags to preserve sample size as well as a three- and five-year lag to better capture the longer timeline.

[48] I use a CIP-NAICS crosswalk to restrict to relevant 2-digit NAICS codes based on the 2-digit CIP code associated with the program.

D Net Price Case Study: Methodology and Results

To provide suggestive evidence of net price differences between two- and four-year institutions in Washington State, I construct four financial "profiles" for fictitious students. These profiles are meant to be illustrative of low, middle, and high-income students eligible for in-state tuition in Washington State as well as an independent student working part-time. Using these profiles, which include consistent, common background details (family size, number of children in college, age, marital status, etc.) and varying levels of income (roughly 100 percent, 250 percent, and 500 percent of the Federal poverty line), I use net price calculators available on Washington public colleges' websites to estimate a net price for each student type.[49] The net price calculators provide a breakdown of total cost of attendance, which includes estimates for room and board, books, and supplies, and tuition and fees, as well as an estimate of the grant aid a student is likely to receive. These estimates are not a guarantee of funding, but they are representative of the cost a student is likely to face for a year of college enrollment. The detailed data collection protocol underlying these estimates is described in Section D.1 below.

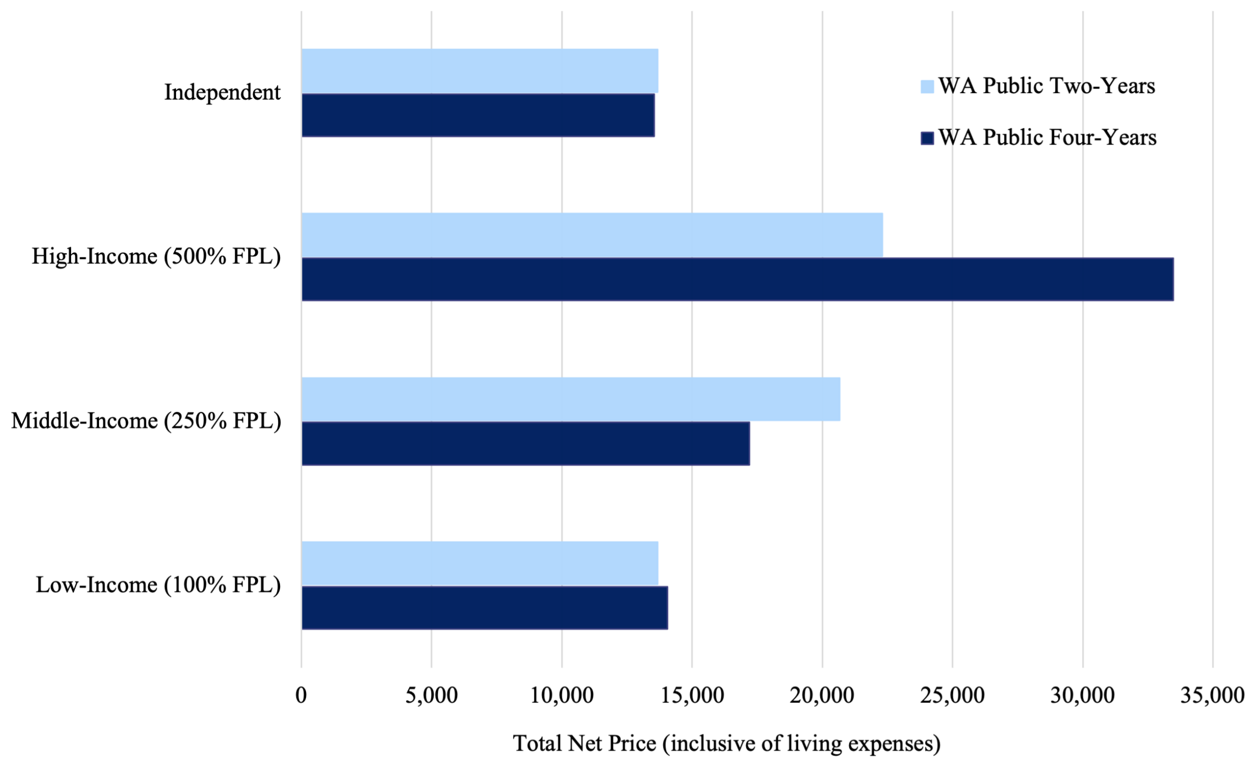
Figure D.1 shows the results of this case study. The bars represent the average net cost for a year of study (two-year colleges in light blue and four-year colleges in navy), estimated separately for each type of student using institutions' net price calculators. To make these estimates comparable, I assume that students are *not* using University housing, which is typically only offered at four-year institutions; these net prices are *inclusive of living expenses.*[50] Table A.7 shows a more detailed breakdown of these prices, separately by living arrangements and location of the college.

These estimates indicate that although listed tuition and fees tend to be higher at Washington four-year public colleges, the institutional aid available at those institutions means that the true cost for students is much lower. Take, for example, the cost for high-income students versus for middle-income students. The cost for a year of study faced by high income students is near the listed sticker price and is thus much higher than a year of attendance at a public two-year for a comparable student. Even someone whose family earns roughly 250 percent of the federal poverty

[49] All Washington institutions had a net price calculator available. Several of the community colleges shared a calculator. For example, the Seattle Community Colleges (North Seattle, Seattle Central, and South Seattle) all used the same calculator without an option to select which college the student plans on attending. In this case I use the same price, aid, and net cost estimate for all three institutions.

[50] In the language of the calculators, these prices assume students are living "off-campus, alone or with a roommate."

Figure D.1: Estimated Net Prices at Two- and Four-Year Institutions



Notes: This figure shows the estimated net price of one year of full-time study at the average WA public two-year and four-year institution. Net prices are estimated using online net price calculators by inputting a common set of criteria for each "type" of student. Prices reflected here are inclusive of living expenses and assume a student lives off-campus. A detailed breakdown of costs, aid, and net prices can be found in Table A.7.

line (approximately $82,000 gross income) sees their net cost for a four-year institution drop to less than half of what the high-income student pays. In comparison, those two students see comparable costs at the two-year institutions in Washington, and the two-year cost is roughly $5,000 more per year than the four-year cost. Finally, keep in mind that all but one of the net price calculators offered by community colleges in Washington only offer cost estimates for traditional two-year students (AA-level students). The costs shown in Figure D.1 and Table A.7 are a significant *underestimate* of the cost faced by CCB students, whose tuition and fees will be significantly higher in their third and fourth years of study than those faced by AA-level students.

D.1 Data Collection Methodology: Washington Net Price Calculators

This section describes in detail the procedure used to collect net price estimates from the official Net Price Calculators (NPCs) of every public college and university in Washington State. Under the

Higher Education Opportunity Act of 2008, all Title IV-eligible institutions are required to publish an NPC on their websites. These tools estimate the out-of-pocket cost of attendance for a prospective student after subtracting institution-specific grant aid and scholarships.

Data were collected from all 42 public institutions in Washington State: 8 four-year universities and 34 community and technical colleges. Several institutions share a common calculator platform (e.g., the Seattle Colleges district); in these cases, the shared calculator was run once per profile per housing scenario, and results were attributed to each member institution individually where the calculator permitted school-level differentiation.

The data collection protocol was designed to maximize comparability across institutions. Every institution received identical inputs across an identical set of hypothetical student profiles. No institution-specific assumptions were made. Inputs that a given calculator did not request were omitted from that run; no imputation was performed.

D.2 Student Profiles

Each institution's calculator was run using four distinct household income profiles, selected to be representative of the income distribution of Washington State undergraduates. Table D.1 summarizes the defining characteristics of each profile.

Table D.1: Standardized Student Income Profiles

Profile	Gross HH Income	Est. After-Tax Income	HH Size	Student Type
Low Income	$33,600	$33,160	4	Dependent, age 18
Mid Income	$82,000	$76,130	4	Dependent, age 18
High Income	$165,600	$145,500	4	Dependent, age 18
Independent	$15,000	$14,960	1	Independent, age 22

Notes: After-tax income estimates are computed using 2024 federal income tax brackets. Dependent profiles use the married filing jointly schedule; the independent profile uses the single filer schedule. Washington State levies no personal income tax. Gross income was used as the primary input to each calculator; after-tax figures were substituted only when a calculator explicitly requested net or after-tax income.

Each of the three dependent profiles represents a first-time, full-time freshman entering directly from high school, residing in a four-person household with married parents. The independent profile represents a 22-year-old student who meets federal criteria for independent status, residing alone.

D.3 Calculator Runs and Housing Scenarios

Each income profile was run twice: once selecting an off-campus, non-parental housing arrangement and once selecting an off-campus, with-parents arrangement. This yields 8 total calculator runs per institution, which together capture the full range of Cost of Attendance (COA) estimates that a given institution reports across housing types. Formally, for institution i and income profile $p \in \{1, 2, 3, 4\}$, two observations are recorded:

$$\{(\text{COA}_{i,p,h},\ \text{Grant}_{i,p,h},\ \text{NetPrice}_{i,p,h}) : h \in \{\text{OffCampus},\ \text{WithParents}\}\} \tag{3}$$

where $\text{COA}_{i,p,h}$ is the institution-reported total cost of attendance, $\text{Grant}_{i,p,h}$ is estimated grant and scholarship aid (excluding loans and work-study), and $\text{NetPrice}_{i,p,h} = \text{COA}_{i,p,h} - \text{Grant}_{i,p,h}$ is the estimated net price. When the calculator displayed net price directly, that figure was recorded; when it was not displayed, it was computed from the two component figures.

D.4 Standardized Input Protocol

To ensure that results are comparable across institutions, a common set of answers was applied to every calculator field. The full input protocol is reproduced in Table D.2. For any calculator field not covered by this protocol, numerical fields were set to zero and categorical fields were set to the most generic or neutral option available, with the deviation noted in the data records.

Table D.2: Standard Calculator Input Protocol

Field / Question	**Standard Input**	**Scope**
First-time freshman	Yes	All profiles
Enrollment status	Full-time	All profiles
Washington State resident	Yes	All profiles
Citizenship status	U.S. citizen	All profiles
Living arrangement	See Section D.3	All profiles
Student age	18 (dep.) / 22 (ind.)	By profile

Continued on next page

Table D.2 – *continued*

Field / Question	**Standard Input**	**Scope**
Independent student status	No (dep.) / Yes (ind.)	By profile
Grade level entering	First year / Freshman	All profiles
High school GPA	3.0 (4.0 scale)	All profiles
SAT score (if requested)	1050	All profiles
Student earned income	$0	All dependent profiles
Student other/untaxed income	$0	All profiles
Student assets (all fields)	$0	All profiles
Receipt of public benefits	No	All profiles
Parent marital status	Married, filing jointly	Dependent profiles
Household size	4	Dependent profiles
HH members in college	1 (student only)	Dependent profiles
Parent AGI / income	$33,600 / $82,000 / $165,600	By dependent profile
Parent after-tax income	$33,160 / $76,130 / $145,500	By dependent profile
Parent savings and checking	$0	Dependent profiles
Parent investment accounts	$0	Dependent profiles
Independent gross income	$15,000	Independent profile
Independent after-tax income	$14,960	Independent profile
Independent assets (all fields)	$0	Independent profile

Below I detail the reasoning behind several choices made in the protocol described above:

Income year. Most NPCs request income from the prior-prior tax year (i.e., two years before the projected enrollment year), consistent with the FAFSA timeline. The standardized income figures were entered regardless of the labeled tax year, to maintain cross-institutional consistency.

Parental assets. All parent asset fields—including savings and checking accounts, investment portfolios, home equity, and business or farm assets—were set to zero. This eliminates asset-driven variation in estimated aid and focuses the analysis on the income-to-aid relationship.

Merit-based fields. Where calculators requested SAT or ACT scores, a score of 1050 (SAT) was entered, commensurate with the 3.0 GPA entered for all profiles and intended to reflect a near-median student rather than a merit-scholarship candidate.

Program of study. When requested, the most general undeclared or exploratory option was selected (e.g., "Undecided," "General Studies," "Liberal Arts"). This avoids program-specific cost differentials that would not be comparable across institutions.

D.5 Data Points Recorded

Three values were extracted from each calculator run and recorded in the primary dataset:

1. **Estimated Total Cost of Attendance (COA):** The full, institution-reported cost of attendance for the applicable housing scenario, inclusive of tuition, mandatory fees, books and supplies, housing, meals, transportation, and personal expenses.

2. **Estimated Grant Aid:** The total estimated grant and scholarship aid. Loans (subsidized, unsubsidized, and PLUS) and Federal Work-Study are explicitly excluded, as these forms of aid are not cost-reducing transfers. When a calculator reported a combined "total aid" figure that bundled grants with loans, the breakdown was sought on the same results page. If a disaggregated figure was available, the grant-only portion was recorded; if not, the combined figure was recorded and flagged in the notes field of the dataset.

3. **Estimated Net Price:** The estimated out-of-pocket cost, defined as COA − Grant Aid. When the calculator displayed this figure directly, the displayed value was recorded. When it was not displayed, net price was computed from the two figures above.

D.6 Scope, Limitations, and Non-Standard Calculator Behavior

This data collection exercise is necessarily limited in its scope; several limitations of the procedure are noted below.

First, NPC estimates are self-reported by institutions and reflect each institution's own aid-awarding model. They are not guaranteed to correspond to actual aid packages that any particular student would receive. They do, however, represent the institution's best public-facing estimate under standardized assumptions, and what the student would see if using the calculator to make decisions about enrollment.

Second, by zeroing all asset fields, this analysis captures only the income dimension of financial aid determination. Families with identical incomes but different asset levels may receive materially different aid offers; this analysis abstracts from that heterogeneity.

Third, the protocol does not account for institution-specific merit aid beyond the baseline GPA and SAT score inputs provided. Institutions with large merit aid programs may produce estimates that are sensitive to these inputs; the values selected here are intended to represent a near-median student rather than a high-achieving one.

Fourth, NPC outputs reflect a single academic year's aid model and are updated periodically. All data in this study were collected in March 2026; results may differ from estimates produced in subsequent or prior periods.

Finally, a small number of institutions' calculators deviated from expected behavior. The following decision rules were applied consistently:

- Housing not distinguished: Some community college calculators apply a single standardized COA regardless of housing selection, and do not present a housing choice. In these cases, four runs (one per income profile) were completed instead of eight. The resulting estimates were recorded identically in both housing columns, with a notation in the data.

- SAI/EFC shortcut: Several calculators offer an option to bypass income questions by entering a pre-computed Student Aid Index (SAI) or Expected Family Contribution (EFC) directly. This option was not used. Instead, the income-based path was selected in all cases to ensure that raw income inputs are identical across institutions.

- High income bugs: Two of the two-year institution net price calculators contain a bug in which entering an income above $100,000 causes the tool to revert to the lowest available income bracket. For these institutions, high-income estimates (intended to reflect roughly $165,000, or 500 percent FPL) were obtained using the $90,000–$99,000 income category, the highest usable option. Grant aid for the high-income group at these institutions may therefore be slightly overstated, and net price slightly understated.

D.7 Data Availability

The complete dataset of NPC outputs, the underlying PDF records, and the data collection tracking log are available upon request from the corresponding author.

E CCB Program Funding and Institutional Finances

This appendix expands on the funding structure described in Section 2.2 and reports estimates of the effect of CCB adoption on institutional finances. Because CCB programs alter both the revenue mix and cost structure of adopting institutions—introducing higher per-credit tuition alongside potentially significant upfront expenditures—I study whether program introduction produced detectable changes in institutional finances. As discussed in the main text, I find largely null effects across revenue and expenditure outcomes.

E.1 The Funding Structure in Detail

Similar to other community college systems around the country, the funding structure for Washington's community and technical colleges is based on enrollment. The Legislature appropriates a lump sum to the SBCTC, which distributes operating funds to the state's 34 colleges using a formula based primarily on full-time equivalent (FTE) enrollment, with roughly ten percent of the allocation reflecting performance measures such as degree and certificate completion rates (State Board for Community and Technical Colleges 2024). Under this framework, the SBCTC treats "state-supported courses," which are funded by a combination of legislative appropriation and student tuition, as unique from "student-funded" courses, which are covered entirely by student fees (State Board for Community and Technical Colleges 2024).

CCB programs are in the state-supported category: upper-division courses count toward a college's FTE enrollment and generate state allocation via the standard formula. However, upper-division coursework typically carries higher delivery and accreditation-driven costs than lower-division coursework.[51] Because the uniform state allocation per FTE covers a smaller share of these costs, the primary mechanism for closing that gap is an elevated tuition rate, as described in Section 2.2. The result is that launching a CCB program does not automatically yield a dedicated new appropriation; higher per-credit revenue from upper-division students is instead the main mechanism for covering

[51] SBCTC-required CCB proposals cite expenses including new faculty lines, smaller class sizes, curriculum development, and advising/coordination staff. In addition, many programs require investments in instructional resources: nursing programs purchase simulation equipment to meet accreditation standards, technical programs may need equipment or ongoing service contracts for advanced computing services, and baccalaureate-level courses require expanded library resources under accreditation requirements.

a program's added costs.[52]

These dynamics are consistent with patterns documented in the nascent literature on CCB adoption. Using difference-in-differences designs and national IPEDS data, Ortagus and Hu (2020) finds that CCB adoption is associated with a shift in community colleges' revenue mix away from public appropriations and toward tuition and fees, with no significant effect on total institutional revenue (see also Ortagus and Hu 2019 on institution-wide tuition increases). Similarly, Wright-Kim (2022) finds suggestive evidence of upfront spending increases at adoption and, although total revenue is unaffected, substantial declines in per-FTE revenue post-adoption, driven by enrollment growth that outpaces incoming revenue and leaving institutions serving more students with fewer resources per student. These dynamics connect to a broader concern in the literature about "mission drift" and resource stress: Levin (2004) characterizes CCB adoption as a potential source of strain as institutions accommodate four-year programming alongside existing two-year functions, and Romano (2012) warns that community colleges risk spreading resources too thin when new roles do not generate sufficient revenue to cover their costs.

E.2 Data

IPEDS. Institutional-level financial and staffing data are drawn from IPEDS for Washington State degree-granting postsecondary institutions, accessed via the Urban Institute Education Data Portal API.[53] Finance data cover the following revenue categories: gross tuition and fees, state appropriations, federal appropriations, local appropriations, and gifts, grants, and contracts. Expenditure categories include total instructional expenditures, instructional salaries, academic support, student services, and total current expenditures. All dollar-denominated variables are deflated to 2016 dollars using the Consumer Price Index. In addition to institution-level totals, I construct per-FTE versions of each financial outcome by dividing by reported FTE enrollment, which allows me to assess whether changes in revenues or expenditures are attributable to enrollment growth or to changes in per-student resource levels.

[52] The extent to which CCB program introduction brings "net" new students into the institution could result in larger state appropriations overall. Additionally, the mechanical effect of CCB programs increasing enrollment by two extra years (as these programs require four instead of two years of study) should result in an increase in enrollment-based appropriations.

[53] Data were retrieved using the `educationdata` package for Stata from the Urban Institute. Finance data from IPEDS are available through 2017, so financial outcomes are measured through 2017.

CCB adoption timing. CCB program approval years are hand-collected from administrative records maintained by the SBCTC, as described in Section B.1. Each institution is assigned a treatment year corresponding to its first enrolled CCB students. As financial data are limited to pre-2017, only 23 of 34 total introductions are used. Any institution that introduced its first CCB post-2017 is considered a control school.

Sample. The analytic sample is restricted to public, active, degree-granting two-year institutions in Washington State. Institutions identified as private or inactive in the IPEDS directory are excluded. The final sample consists of 34 institutions observed over 18 years (2000-2017), yielding 594 institution-year observations for financial outcomes. Never-adopting institutions—those that did not introduce a CCB program during the sample period—serve as the comparison group throughout.

E.3 Empirical Approach

Using the same approach as in the main results, I estimate staggered event studies using the stacked regression estimator from Deshpande and Li (2019) and Cengiz et al. (2019). The estimating equation takes the form:

$$Y_{ct} = \sum_{\tau \neq -1} \alpha_\tau I_{ct}^{\tau} + \mu_c + \delta_t + \varepsilon_{ct}, \tag{4}$$

where Y_{ct} is the outcome of interest for institution c in year t; μ_c are institution fixed effects; δ_t are year fixed effects; and the $\hat{\alpha}_\tau$ coefficients trace the dynamic treatment effects at event-time τ relative to the omitted reference period $\tau = -1$. For financial outcomes, the event window spans $\tau \in [-6, +8]$, yielding five pre-period and nine post-period indicators. Standard errors are clustered at the institution level throughout.

The identifying assumption is that, absent CCB adoption, the financial trajectories of adopting and never-adopting institutions would have evolved in parallel. This assumption can be assessed visually using the pre-period event-study estimates. As shown in Figure E.1, pre-period coefficients are uniformly small and statistically indistinguishable from zero across all outcomes, providing no evidence of differential pre-trends.

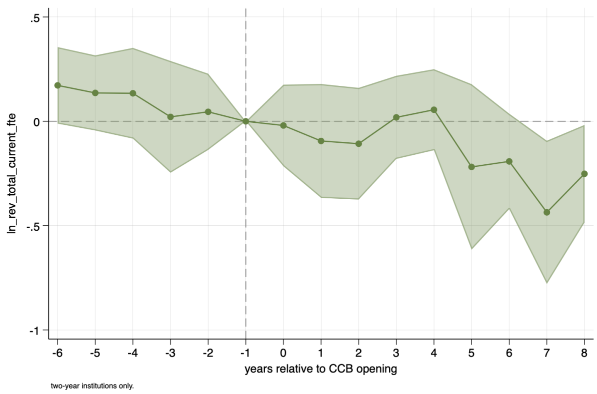
E.4 Results

Figure E.1 displays event-study estimates for revenue and expenditure outcomes, both in levels (2016 dollars) and in logs, as per-FTE equivalents. Across all specifications, estimated coefficients are small in magnitude and statistically indistinguishable from zero. In particular, I find no evidence of a post-adoption shift in total current revenues or expenditures on a per-FTE basis. On the expenditure side, estimates for total instructional spending, academic support, and student services are similarly centered near zero in all periods following program adoption. The use of per-FTE equivalents could be obscuring a shift in aggregate revenues due to increased enrollment from CCB introduction. When I repeat this exercise with aggregate revenues I find a suggestive increase in total revenues (Figure E.2) that is statistically indistinguishable from zero.

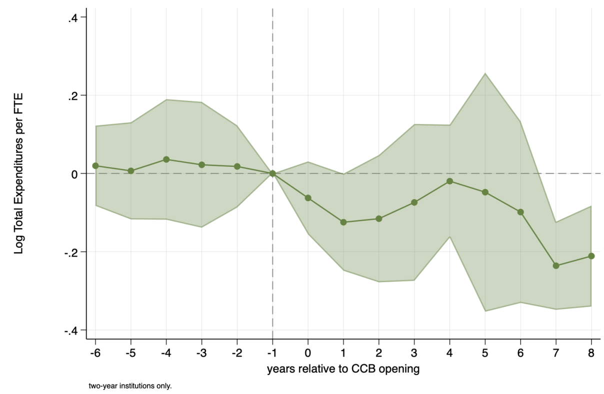
These results are consistent with either the absence of a meaningful financial effect of CCB adoption or with effects that are too small relative to baseline institutional revenues and expenditures to be detectable given the available sample of Washington community colleges. Given the modest scale of CCB programs in their early years, null effects on aggregate institutional finances are not surprising. These findings do not necessarily rule out more localized resource reallocation within institutions that are not captured in IPEDS data, such as shifts across departments or changes in the composition of instructional staff. The results are consistent with national evidence in Ortagus and Hu (2020), who similarly find no significant effect of CCB adoption on total institutional revenue in a national IPEDS sample, and with Wright-Kim (2022), whose point estimates of per-FTE revenue declines may also be too modest for detection in a state-level sample. Both possibilities point to the potential for CCB adoption to spread existing resources thin, with consequences for community college students more broadly. Future work should further explore the within-institution financial changes that accompany CCB introduction.

Figure E.1: Effect of CCB Introduction on Institutional Finance Outcomes

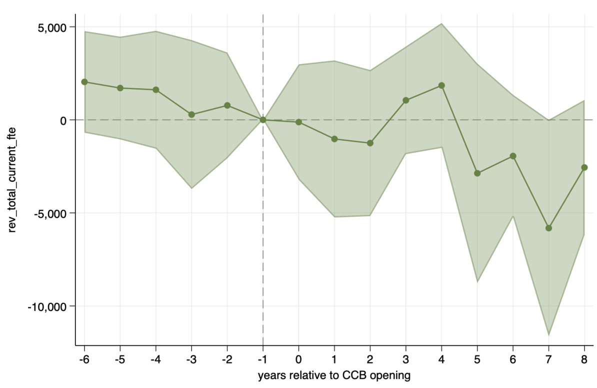
(a) Revenues per FTE (logs)



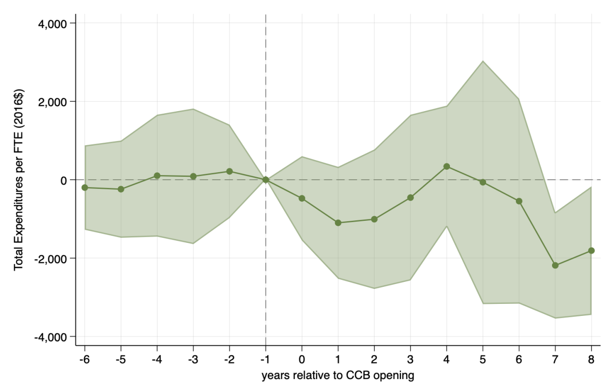
(b) Expenditures per FTE (logs)



(c) Revenues per FTE (levels)

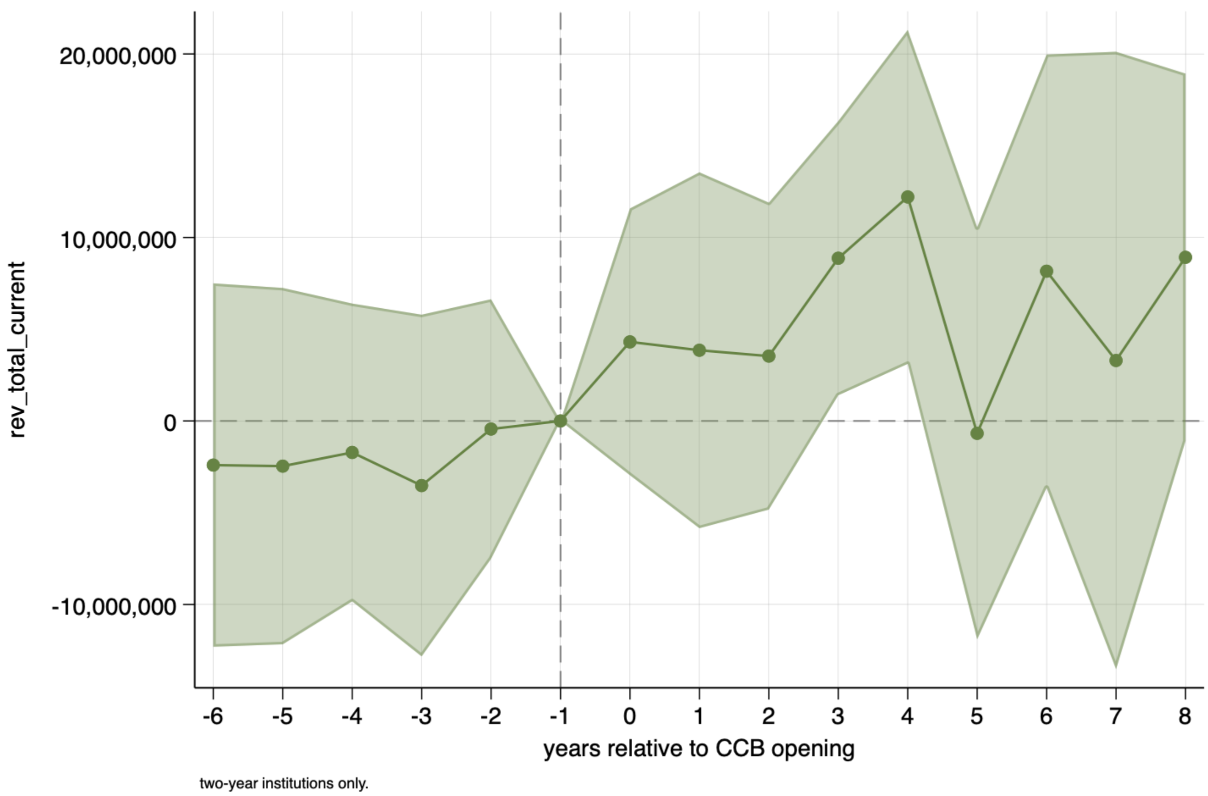


(d) Expenditures per FTE (levels)



Notes: Panels (a)–(d) show the effect of CCB program introduction on institutional finance outcomes. Panels (a) and (b) show effects on log revenue and expenditures, and panels (c) and (d) show effects on real revenue and expenditure levels. All panels use IPEDS finance data for outcomes. Each event study uses CCB program introductions between 2007 and 2016 (23 introductions).

Figure E.2: Effect of CCB Introduction on Aggregate Total Revenues



Notes: This figure shows the effect of CCB program introduction on aggregate revenues using IPEDS finance data for outcomes. The event study uses CCB program introductions between 2007 and 2016 (23 introductions).