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High Schools Tailored to Adults Can Help Them Complete a Traditional Diploma and Excel in the Labor Market†

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Over 18 million adults in the United States lack a high school credential. While some go on to attain the GED, diplomas are potentially more valuable. A network of high schools helps adults graduate by providing tailored curricula, nonacademic coaching, onsite child care, and transportation. After five years, earnings increase by 38 percent more for graduates than nonenrolling applicants. We address selection by conditioning on preapplication earnings and comparing to students who exit after positive shocks. Much of the wage gains can be accounted for by sectoral switching and evidence on credential completions is consistent with a human capital mechanism. (*JEL* I21, I26, J24, J31)

More than 18 million adults in the United States lack a high school credential. Young adults with a high school diploma earn 77 percent more than peers without a high school credential, a gap that increases throughout adulthood.[1] The GED[2] serves as the primary credentialing option for adults who have no diploma, but the effect of the GED on earnings is either negligible (Jepsen, Mueser, and Troske 2016) or mixed (Tyler, Murnane, and Willett 2000), likely because the GED evaluates rather than creates human capital (Heckman, Humphries, and Mader 2011). On the other hand, diplomas have large returns for traditional students (Angrist

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[1] Based on authors' calculations using the 2012–2016 ACS (Ruggles et al. 2020). See Table 1.

[2] The GED refers to the General Educational Development (GED) test. Different states use testing companies with differing names. Throughout the paper, we refer to these tests interchangeably as "GED."

and Krueger 1991; Oreopoulos 2006) mostly due to human capital formation rather than signaling (Clark and Martorell 2014). Few adults earn diplomas though, partly because of public policy—18 states provide no legal path for adults to receive a full high school diploma.

In this paper we estimate the labor market return to high school graduation among adults who dropped out of traditional high school and apply to The Excel Center (TEC), a tuition-free public charter school network for adults. Goodwill of Central and Southern Indiana created TEC in 2010 to help adult learners overcome barriers to graduation by providing an accelerated curriculum tailored to the individual, flexible class schedules, and nonacademic support services like free on-site child care, life coaches, and transportation assistance. The program incorporates professional certificates and community college credits into the traditional high school curriculum. These novel supports are designed to help adults achieve a traditional goal: earning a traditional high school diploma.

Using linked administrative data on earnings and educational attainment, we estimate the return to graduating by comparing the earnings of graduates before and after application to both students who enrolled in TEC but exited before graduating and people who applied but did not enroll. Our identification strategy relies on the assumption that beyond TEC enrollment, earnings of graduates and nongraduates only differ due to preexisting differences in levels and histories of earnings. Similar trends in the five years preceding application support this assumption. Our primary specification controls for time-invariant differences between graduates and nongraduates using individual fixed effects and for differences in earnings and employment prior to application using inverse propensity weights. Results are robust to an alternative identification strategy that narrows our comparison to a set of students who exit TEC for reasons positively related to earnings.

Graduates earn substantially more and are able to access higher-paying sectors than nonenrolled applicants in the years following application. While earnings initially fall, we find large and statistically significant increases in earnings three to five years after application. By year five, quarterly earnings increase $849 among graduates relative to applicants who did not enroll, a 38 percent increase. Results across our alternative identification strategies are similar, suggesting that selection on postenrollment shocks is unlikely to drive the observed difference in earnings. Earnings gains occur alongside greater job stability and consistent employment in the same industry. We find somewhat lower returns for Black women but otherwise similarly high returns for subgroups defined by other socioeconomic characteristics. Finally, we find evidence that the process of receiving a high school diploma helps adult students gain industry-recognized credentials that lead to new careers. Graduates are more likely to earn postsecondary credits and certificates—particularly in health-related programs—and move into healthcare work and out of hospitality work.

We quantify the importance of these earnings gains using the Marginal Value of Public Funds (MVPF) framework (Hendren and Sprung-Keyser 2020) and find TEC generates large benefits relative to the cost of serving students. Under the assumption that gains persist through retirement, the typical TEC enrollee can expect a $34,063 increase in the net present value of their after-tax earnings—with $80,917

in gains accruing to the typical graduate. Accounting for the up-front cost of the program ($7,128) and increased tax revenue, we estimate the MVPF to be 20.7, which exceeds estimates for other programs serving low-wage workers (Hendren and Sprung-Keyser 2020).

This paper contributes to the literature that explores the returns to high school diplomas, the GED, and community college. We find that a high school designed to help adult learners overcome barriers to graduation can meet all the traditional goals of a high school diploma and substantially increase earnings. For comparison, we also estimate the labor market return to both a GED and an associate's degree using a similar estimation strategy, comparing a cohort of people who pass versus fail. Similar to existing studies of the GED (Heckman, Humphries, and Mader 2011; Murnane, Willett, and Tyler 2000; Jepsen, Mueser, and Troske 2016) and community college (Jepsen, Troske, and Coomes 2014; Stevens, Kurlaender, and Grosz 2019; Grosz 2020), we find that the return for the GED is lower and that for an associate's degree is higher. Our results on credentials and sector of employment are consistent with the view that the high school diploma has a greater return than the GED because the GED only signals overall ability while a diploma promotes acquisition of human capital.

We also show how later-life educational interventions can have high returns provided they are sufficiently intense. The returns to many adult vocational training programs have been disappointing relative to the success of many early childhood interventions (Carneiro and Heckman 2003; Almond, Currie, and Duque 2018), and high school graduation rates have not responded to large increases in the return to skills (Goldin and Katz 2009; Murnane 2013). Such facts lead many to infer that the returns to the marginal high school diploma is low. Our results, however, suggest that the marginal diploma has a high return, but students require significant assistance to complete it. The comprehensive supports The Excel Center provides to students bear similarity to successful antipoverty interventions in housing (Bergman et al. 2024), community colleges (Weiss et al. 2019; Azurdia and Galkin 2020; Evans et al. 2020), and self-sufficiency (Evans et al., forthcoming). With supports to address the costs and complexity of returning to high school, adults who previously dropped out can complete a diploma and reap its large labor market returns.

I. Background

A. *Policy and Research Context*

The more than 18 million adults in the United States who lack a high school credential earn substantially less than their peers with a diploma.[3] Table 1 compares the employment and earnings of adults with different levels of educational attainment. Young adults who have a high school diploma as their highest credential earn $15,046 per year (column 1) compared to $8,489 for those with neither a diploma

[3] Population counts and earnings reported in this section are based on the authors' calculations using the 2012–2016 American Community Survey (Ruggles et al. 2020).

Table 1—Select Characteristics of US High School Graduates, Nongraduates, and TEC Applicants

	American Community Survey				
			Less than HS diploma or GED		
	HS diploma	GED	All	IN only	TEC applicants
	(1)	(2)	(3)	(4)	(5)
Employed in past year	0.76	0.68	0.53	0.58	0.62
	(0.43)	(0.47)	(0.50)	(0.49)	(0.49)
Wages in past year	15,046	12,974	8,489	9,799	5,191
	(18,906)	(19,531)	(15,822)	(19,500)	(9,231)
Black	0.20	0.19	0.25	0.18	0.43
	(0.40)	(0.39)	(0.43)	(0.39)	(0.50)
Hispanic	0.18	0.14	0.25	0.07	0.12
	(0.39)	(0.35)	(0.43)	(0.25)	(0.33)
Age	24	25	24	24	25
	(3)	(3)	(4)	(3)	(9)
Female	0.43	0.37	0.41	0.43	0.56
	(0.49)	(0.48)	(0.49)	(0.49)	(0.50)

Notes: Data are from the 2012–2016 American Community Survey (ACS) and TEC application records linked to UI earnings data from the Indiana Department of Workforce Development and high school enrollment records from the Indiana Department of Education. In columns 1–4, the sample is restricted to US-born respondents to the ACS aged 19 to 30, weighted by ACS person weights. The first three columns show, respectively, respondents whose highest educational attainment is a traditional high school diploma, a GED, and less than high school diploma or GED, respectively. The fourth column shows those with less than a high school diploma or GED living in the state of Indiana. The final column shows similar demographics for our primary sample of TEC applicants at the time of application. For these individuals, employment and wages are from the UI earnings data and other demographics come from high school enrollment records prior to TEC application. Average wages include zeros for individuals who did not work in the previous year.

nor an alternative credential (column 2). A large empirical literature demonstrates that much of this difference is due to the causal effect of high school graduation (Angrist and Krueger 1991; Oreopoulos 2006). While technological change has increased the return to skills and thus inequality (Goldin and Katz 2009), high school graduation rates failed to respond, stagnating for decades, though they have increased recently (Murnane 2013).

High school equivalency credentials are the primary educational options for those who have dropped out of high school. For example, the General Educational Development (GED) test is a battery of subject tests consisting of math, reading, writing, science, and social studies. If a student scores sufficiently high on the GED or other similar tests, they receive the credential. These alternative high school credentials represent the highest educational attainment of more than 8 million US-born adults. Figure 1 shows the age profile for educational attainment. Most adults who complete high school do so as teenagers, and the share of adults with no diploma or alternative high school credentials falls rapidly through age 19 (solid navy line). That share continues to fall more slowly throughout the 20s or 30s, while the share of adults with only a GED or other alternative credential rises (gold dashed line). There is not much change in educational attainment beyond those ages.

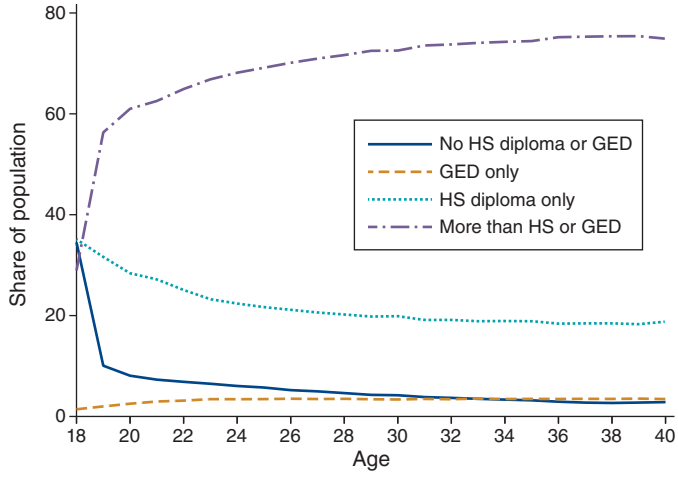

Figure 1. Educational Attainment, by Age

Notes: Data come from the 2008–2019 American Community Surveys (Ruggles et al. 2020). The sample is restricted to US-born adults aged 15–40 at the time of the survey. The figure plots the age fixed effects from an individual-level regression of an indicator for highest level of educational attainment on age fixed effects and year of birth fixed effects, where the constant term is excluded and the 1995 cohort is the reference cohort.

However, the labor market return to the GED is small. Though GED recipients do have greater employment and earnings than those without a high school credential, as shown in columns 2 and 3 of Table 1, this difference is largely due to selection. Conditional on premarket factors like test scores and demographics, GED holders have similar earnings to people without a credential (Heckman, Humphries, and Mader 2011), and a recent study that exploits the GED passing threshold shows little if any labor market benefits for test takers who just barely pass—earnings increase less than 10 percent (Jepsen, Mueser, and Troske 2016). However, there is some evidence that a GED provides a positive labor market benefit to subpopulations with the greatest challenges in the labor market (Murnane, Willett, and Tyler 2000).

A high school diploma has potential labor market advantages over an alternative credential. First, a diploma involves more intense academic instruction. The median GED taker reports preparing for 30 hours compared with the roughly 1,000 classroom hours during a typical high school year (Heckman, Humphries, and Mader 2011). Second, attending school may build nonacademic soft skills valued by the labor market. Evidence from the early childhood context suggests the returns to education can be large even when achievement remains the same (Belfield et al. 2006). Finally, a diploma and a GED may provide different signals to employers by grouping the job seeker with a different set of peers, though the signaling benefits of a diploma may be limited (Clark and Martorell 2014).

Efforts to reenroll adults who did not finish high school are scarce, despite the potentially high returns. Eighteen states prohibit adults without a diploma from

enrolling in high school beyond a certain age.[4] While nearly half of 19 year olds without a high school credential report attending secondary school, just under 1.2 percent of adults aged 25 or older who lack a high school credential report that they are currently attending secondary school. Instead, workforce, welfare, and criminal justice rehabilitation programs encourage the GED by subsidizing test preparation or designing programs around core GED classes (Cave et al. 1993; Quint, Bos, and Polit 1997). In 2000, the federal government spent about $2 billion on adult education programs (Heckman, Humphries, and Mader 2011).

Most existing evidence on reducing dropout thus focuses on prevention. Alternative schools, which direct at-risk students to a separate public school, focus on academic remediation, provide support services like childcare, and conclude with a full high school diploma. The Alternative Schools Demonstration found mixed effects on graduation and labor market outcomes (Dynarski and Wood 1997), although evidence from a remediation program in Israel shows the merit of intervening with students at risk of dropout (Lavy and Schlosser 2005; Lavy, Kott, and Rachkovski 2022). The published literature on the return to an adult high school diploma is much thinner, though a contemporaneous working paper by Bennett, Blundell, and Salvanes (2021) studies the effects of introducing a stipend for adult women to complete high school in Norway.

B. *The Excel Center*

The Excel Center (TEC) is a tuition-free, public charter high school for adults operated by Goodwill of Central and Southern Indiana. TEC opened in September 2010, and currently Goodwill operates 15 campuses across Indianapolis and other parts of central and southern Indiana.[5] During our study period, TEC funded its operations using the same per student funding from the state received by charter schools for traditional high school students. While the model has been replicated by other Goodwill organizations in Arkansas, Missouri, Northern Indiana, Tennessee, Texas, and Washington, D.C., this paper studies the original Excel Centers in Central and Southern Indiana.

Students are recruited to TEC through Goodwill's presence in the local community. Goodwill maintains relationships with local schools meaning that many students are referred to TEC by their previous high school. Goodwill also recruits students from other Goodwill-sponsored programs (e.g., Nurse-Family Partnership), as well as other community programs that target a similar population.

To enroll, students first complete an application, which is available year-round. Though Goodwill has worked to make the application accessible to all, one common reason for being unable to complete the application is not being able to provide an official transcript from a previous high school.[6] In addition to the transcript requirement, applicants must be an Indiana resident, lack a high school diploma, not be a

[4] Based on the authors' examination of state policies as of summer 2020. See online Appendix Table A1.

[5] Online Appendix Table A2 provides location and opening dates for all of these 15 campuses.

[6] Individuals who come to the US as adults are eligible for the Excel Center. Because they may not have access to their transcripts, these students often start their TEC career with zero credits.

sex offender, and be at least 18 years old, though some age exceptions down to age 16 are made. Once the application is complete, all eligible students are assigned an orientation date. Prior to expanding the number of campuses, some students had to wait months for an orientation, but in recent years orientation typically follows shortly after application. After orientation, students can enroll in the next available term and continue taking classes until they graduate or drop out. Time to graduation varies, depending on a student's prior credits, level of knowledge, and performance in coursework. The typical graduate finishes in just over one year.

Graduates of TEC earn Indiana's Core 40 diploma, the standard credential earned by most high school graduates across the state. The requirements for obtaining a Core 40 diploma from TEC are the same as at a traditional high school: students must pass 40 specific credits of coursework. For example, the Core 40 requires six mathematics credits resulting from passing Algebra I, Geometry, and Algebra II. Typically, students must pass graduation tests in math and English/language arts, though the exact test and rules regarding exceptions have changed over time.

TEC is designed to help students who previously dropped out of high school overcome barriers to graduation and earn a standard high school diploma. To that end, the school has a number of unique features relative to more traditional high schools.

First, students take a set of courses aimed at their individual level of knowledge and existing credits. Using placement test results and existing transcripts, the school assigns the student a course plan that matches courses to the student's actual level in each subject area. Though many TEC students enter having completed a sufficient number of general credits to graduate, students often begin in remedial classes because they start behind in core areas such as math and English.

Second, class schedules are flexible to accommodate nontraditional students who live adult lives with greater family and work obligations. Students can register for full-day or half-day schedules. Rather than a typical semester system, the school operates on a year-round schedule with five eight-week terms. Intensive, frequent terms accelerate the path to graduation for students who are far behind in a particular area.

Third, TEC provides extensive support services targeted at common nonacademic barriers to graduation. TEC provides high-quality, on-site child care at no cost to students. Many students have young children, and TEC allows these students to attend school while their children attend daycare at the same location. Campuses are also located near public transit routes, and students can receive transportation assistance in the form of bus passes or tokens, gas cards, or carpooling options. Finally, students are paired with a life coach who helps them set goals and navigate graduation requirements and provides support for issues that occur beyond the classroom. TEC funds these extensive services using the same funding levels received by other high schools.

Fourth, TEC directly connects students to postsecondary education and training. In recent years, TEC has strongly encouraged students to use elective credits to participate in professional and course certificate programs that provide an entryway to higher-paying jobs such as pharmacy technician, dental assistant, HVAC maintenance technician, and welder. Other students enroll in dual college-credit programs and use the diploma as a step toward attending college.

II. Data

A. *The Excel Center*

We form our sample using administrative data provided by Goodwill. Our primary analysis sample includes all applicants who applied between January 2013 and June 2015 to the Excel Centers operated in Central and Southern Indiana ($N = 11{,}079$). The Goodwill data include information from the application: name, address, date of birth, and date of application. Importantly, the data includes both applicants who went on to enroll at TEC and those who completed an application but did not matriculate. For all, we observe their last enrollment or completion status as of mid-2020: did not enroll, withdrew, or graduated.

Goodwill also provided enrollment and course records, which are limited to those who enrolled. These records denote dates of entry and withdrawal from the school, reason for exit, and information for each completed course (title, term, grade).[7] Of note, we are able to identify students who began their schooling at TEC by completing remedial mathematics or English courses, which provides a proxy for cognitive skills at enrollment.[8] Students placed into remedial courses take at least one course geared at knowledge levels below the ninth-grade level. Because course data are limited to completed courses, we only observe information on remediation for the subsample of individuals who completed at least one course while enrolled at TEC.[9]

B. *State Administrative Records*

We measure labor market and education outcomes using administrative data from the Indiana Management Performance Hub (MPH). The data include records from the Indiana Department of Workforce Development (DWD), the Indiana Department of Education (DOE), and the Indiana Commission for Higher Education (CHE). Supplemental details to this section are in the online Appendix.

Employment and earnings records maintained by DWD come from the unemployment insurance (UI) system. Wages associated with quarterly UI records reflect the sum of all wages earned in a given quarter in UI-covered employment. Our primary outcome is quarterly earnings, including zeros for those without employment. We observe data from the first quarter of 2008 through the first quarter of 2020. This time frame allows us to construct applicants' employment and earnings outcomes for a balanced panel of five years before and after application for our primary sample.[10] We categorize employment by sector using NAICS codes.

[7] Exit reason is missing for less than 0.5 percent of enrolled students. Analysis that relies on exit reason excludes those students from the sample.

[8] As noted above, students are given tests in Mathematics and English upon enrollment. Results of these tests determine which courses students are placed into. Because we do not observe the test scores used for that assignment, we instead rely on placement into remedial classes as a proxy for cognitive skills at enrollment.

[9] Analysis that relies on remedial coursework excludes the roughly 30 percent of enrolled nongraduates who are not present in the course completed data.

[10] Earnings are adjusted for inflation to Q1 2014 levels using the CPI-U Midwest (US Bureau of Labor Statistics 2022). We winsorize earnings at the 99th percentile within each calendar quarter separately for our three comparison groups. Results are similar with no winsorizing. See online Appendix Table A3.

Records maintained by DOE allow us to observe secondary school enrollments that occurred within four years of starting ninth grade. While we can measure enrollment in traditional schooling, which we use to define some baseline controls, we cannot observe adult enrollment in or graduation from secondary school (TEC or otherwise) for older students. We supplement these records with results from the Indiana state Graduation Qualifying Exam (GQE), as well as dates and results from the GED and TASC High School Equivalency test.[11]

Finally, we measure postsecondary training and education outcomes using data on professional and course certificates from DWD and data on college credits earned at public institutions in Indiana from CHE.[12] We directly categorize certificates and credits into industry groups (see online Appendix Tables B1 and B2 for details).[13] Alternatively, we have data on certificates and credits earned by all GED test takers in Indiana (though not all Indiana residents) and use it to categorize certificates/credits empirically by predicting the probability that a person with a given certificate/credit is employed in different sectors.

C. *Data Linking*

MPH matched TEC applicants to their data warehouse using fuzzy matching on name, date of birth, and address collected at application. Table 2 reports the likelihood that an applicant matched to the administrative records. More than three-quarters of applicants (9,465 of 11,079) match to a pre-application record in the MPH data, and match rates are similar across completion status. To reduce the likelihood of endogenous matches, we limit our analysis sample to individuals who have an MPH record from any state agency (i.e., DOE or DWD) that precedes their TEC application date. The resulting primary analysis sample includes 9,465 applicants.

Because data are limited to the state of Indiana, we cannot distinguish between an outcome not occurring and that outcome occurring in another state. For all outcomes, we assume the lack of a record of that outcome occurring as denoting that the outcome did not occur. For example, if an individual does not have reported earnings in a given quarter, we code that individual as having zero earnings in that quarter. This limitation faces any analysis using state-level administrative data, and is likely mild in our context. In consumer address history data from Infutor, only 3.4 percent of TEC applicants live outside Indiana five years after applying, and enrolling at and graduating from TEC do not noticeably change out-of-state move rates; see online Appendix Table A4. More generally, we focus on a metro area in

[11] In 2014, Indiana switched from the GED to the similar TASC High School Equivalency test. We refer to both of these tests as "the GED" and treat taking and passing either test as interchangeable.

[12] Public postsecondary schools in Indiana cover 79 percent of college-going by Indianapolis Public School students, and this coverage rate is potentially higher among our sample of Excel Center applicants, which limits concerns about selection.

[13] Common certificates for our study sample include Preparing for College and Careers; Nutrition and Wellness; Child Development; Applied Digital Application and Responsibilities; and Technical Business Communications. Common college credit programs for our sample include Medical/Health Management and Clinical Assistant/Specialist; Liberal Arts and Science; General Studies; Business Administration and Management; and Criminal Justice/Safety Studies.

Table 2—Descriptive Differences between Applicants to the Excel Center

	Did not enroll (1)	Exited (2)	Graduated (3)
Record matching sample (*Observations:* 11,079)			
Age at application	27.05	25.88	23.16
Has any UI records	0.68	0.66	0.64
Has any enrollment records	0.43	0.57	0.70
Has any diploma status records	0.24	0.25	0.24
Has any MPH records	0.81	0.87	0.92
Main analysis sample (*Observations:* 9,465)			
Age at application	26.28	25.06	22.62
Any formal sector employment:			
Year before application	0.66	0.60	0.57
Year 1	0.74	0.71	0.66
Year 2	0.74	0.76	0.76
Year 3	0.71	0.74	0.80
Year 4	0.68	0.73	0.79
Year 5	0.65	0.70	0.76
Formal sector earnings:			
Year before application	$5,662	$4,730	$4,359
Year 1	$6,650	$5,520	$4,732
Year 2	$7,979	$7,311	$7,135
Year 3	$8,620	$8,338	$9,868
Year 4	$9,023	$8,917	$11,319
Year 5	$9,558	$9,615	$12,060
Analysis sample with DOE characteristics (*Observations:* 6,370)			
Age at application	19.53	23.32	21.28
Free or reduced price lunch	0.81	0.67	0.72
Homeless	0.09	0.06	0.07
Male	0.51	0.44	0.38
Black	0.46	0.44	0.36
Hispanic	0.10	0.13	0.14
White	0.38	0.38	0.45

Notes: Based on calculations using application data from Goodwill, student records from the Indiana Department of Education (DOE), and unemployment insurance records from the Indiana Department of Workforce Development (DWD). The sample in the top panel includes all TEC applicants from January 2013 through June 2015; the middle panel includes the subset of TEC applicants who link to either employment or K-12 Department of Education records prior to TEC application; and the bottom panel further restricts the sample to applicants with a K-12 school enrollment record prior to TEC application. Missing earnings for a given quarter are assumed to be zero. The columns report sample means for the respective group of applicants.

the middle of a state and a population for whom interstate migration rates are low (Molloy, Smith, and Wozniak 2011).

III. Empirical Strategy

A. *Trends in Earnings, by Enrollment and Graduation Status*

Earnings increase dramatically in the years following application for graduates of TEC. Figure 2, panel A shows quarterly earnings over time. The horizontal axis depicts time relative to application quarter, where quarter zero represents the calendar quarter in which an individual applied to TEC. The average earnings of TEC graduates are plotted as navy circles. In the year prior to applying, graduates earn

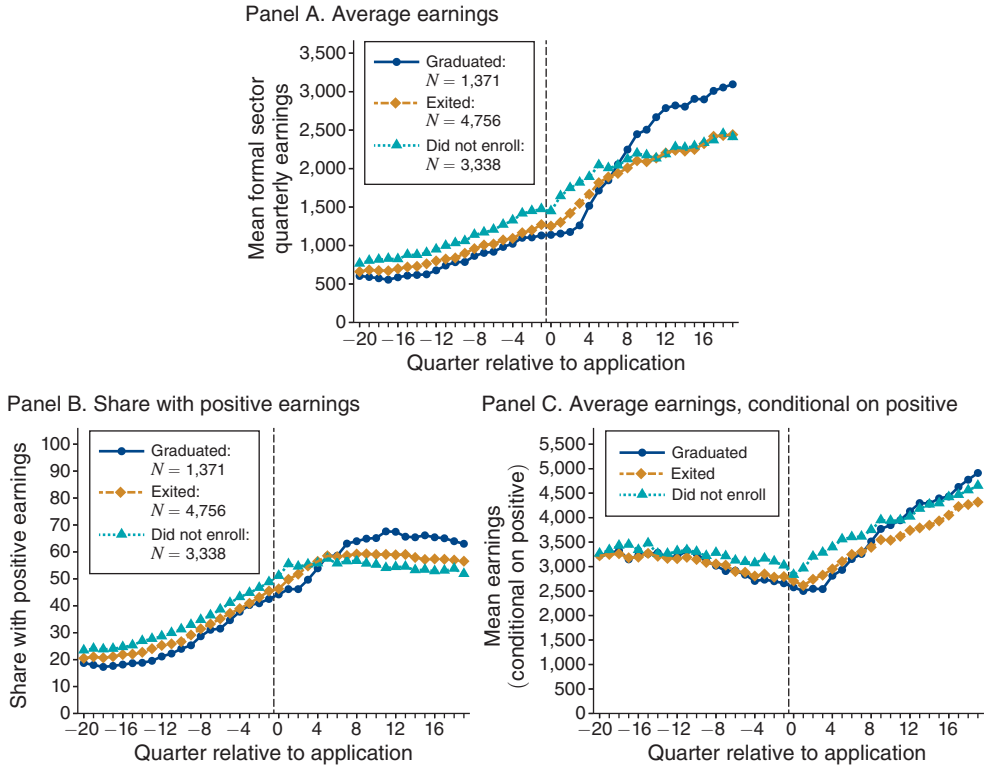

FIGURE 2. EARNINGS TRENDS, BY TEC COMPLETION STATUS

Notes: Data come from TEC application records linked to UI earnings data from the Indiana Department of Workforce Development. The sample includes all TEC applicants from January 2013 through September 2015 with any pre-application MPH record, and is divided into three groups: TEC graduates (navy circles), TEC students who did not graduate (gold diamonds), and TEC applicants who did not enroll (teal triangles). The horizontal axis indicates quarter relative to initial TEC application date, where quarter zero represents the quarter in which an individual applied to TEC. Panel A plots total unconditional earnings (2014:I USD). Panel B plots the percent of each group with positive earnings. Panel C plots average earnings among individuals with positive earnings in that quarter.

just over $1,000 per quarter ($4,333 per year). Five years later, quarterly earnings roughly triple. Both the extensive margin (Figure 2, panel B) and intensive margin (Figure 2, panel C) contribute to this increase.

As a first pass at measuring the labor market return to graduating, we benchmark the earnings gains experienced by TEC graduates against two natural comparison groups. Figure 2 also shows quarterly earnings and employment for applicants to TEC who do not enroll (teal triangles) and TEC students who enroll but do not graduate (gold diamonds). Comparing graduates to the two groups of nongraduates yields four descriptive facts. First, graduates have lower employment and earnings prior to applying to TEC. Second, all three groups experience similar upward trends in earnings prior to applying to TEC. Third, in the year after applying, earnings continue trending upward for applicants who do not enroll but flatten for graduates and, to a lesser extent, students who enroll but do not graduate. Fourth, earnings grow much more

rapidly for graduates in years two through five after applying. Their earnings surpass the other two groups eight quarters after applying.

B. *Estimating the Effects of TEC Graduation*

To formalize this comparison of outcomes across enrollment and graduation status, consider the following simple model:

$$Y_{it} = \sum_{k \in T} \beta_{1k} \mathbf{1}\{t = k\} \times D_i + \tau_{1t} + \epsilon_{1it}. \tag{1}$$

In this equation Y_{it} is an outcome, such as earnings, for person i measured at time relative to application t. D_i is a dummy indicator of treatment status. Relative time fixed effects τ_{1t} make all comparisons within time period. We make comparisons among three groups: graduates, applicants who enroll but exit before graduating, and applicants who do not enroll. We make all three pairwise comparisons among these groups and at times also pool all enrollees (graduates and exiters) to compare to applicants who do not enroll. The sample and definition of D_i determine the comparison being made. When comparing TEC graduates to applicants who did not enroll, for example, the estimation sample is restricted to those two groups, and D_i indicates graduation. If the comparison group appropriately represents the outcome in the untreated counterfactual, then β_{1k} measures the labor market return to education k periods after applying.

Comparing TEC graduates to other TEC applicants accounts for several sources of selection bias. Applicants to TEC have all previously dropped out of high school, are all drawn from the same labor market, and have outcomes measured from the same data source. Applicants select into applying to TEC. TEC applicants are more likely to be Black, Hispanic, and female than others of similar age in Indiana without high school diplomas (Table 1, columns 4–5). Moreover, they all experienced a similar motivation to apply to TEC and earn a diploma. We implicitly control for these forms of selection by making comparisons with nonacademic applicants, as opposed to the general population of high school noncompleters (Bell et al. 1995; Heckman, Ichimura, and Todd 1997).

Making comparisons among TEC applicants, however, will likely lead to biased estimates of the causal effect of TEC education as graduates are further selected among applicants. Section IIIA documents the differences in the levels of earnings and employment in the years before application among the three groups. As shown in Table 2, 57 percent of graduates receive any UI-covered earnings in the year prior to application compared with 66 percent of nonenrolling applicants and 60 percent of enrollees who later exit. Lower employment rates correspond to 20 percent lower baseline earnings for graduates. Additionally, during their prior high school experience, TEC graduates were less likely to be identified as homeless, male, or Black than all nongraduates and less likely to be eligible for free or reduced price lunch as compared with applicants. They are also four years younger than nonenrollees and three years younger than enrollees who exit, on average. Moreover, this selection

likely occurs in unobservable ways through differences in motivation and ability to enroll and persist to graduation.

To overcome this identification challenge, we use longitudinal data on employment and earnings to compare the outcomes of observably similar TEC graduates to nongraduates. We pursue two similar but complementary estimation approaches.

First, we leverage longitudinal data on outcomes to estimate a difference-in-differences model:

$$y_{it} = \sum_{k \in T} \beta_{2k} \mathbf{1}\{t = k\} \times D_i + \tau_{2t} + \psi_{2i} + X_{it}\Gamma_2 + \epsilon_{2it}. \tag{2}$$

In this specification, we include individual fixed effects (ψ_{2i}), which control for time-invariant differences between TEC graduates and other TEC applicants, in addition to relative time fixed effects (τ_{2t}). At times, we also include relative time effects that vary with applicant age ventile and calendar quarter fixed effects, X_{it}, to nonparametrically adjust for observed differences in age between TEC graduates and other TEC applicants and to control for differences in labor market circumstances over time. β_{2k} is thus identified by comparing the changes in earnings over time among the three groups. We also run models that include data from all three groups simultaneously:

$$y_{it} = \sum_{k \in T} \left[\delta_k \mathbf{1}\{t = k\} \times Enrolled_i + \gamma_k \mathbf{1}\{t = k\} \times Graduated_i\right] + \tau_{3t} + \psi_{3i} + X_{it}\Gamma_3 + \epsilon_{3it}. \tag{3}$$

In this case, $Enrolled_i$ is a dummy for those who enroll, both graduates and those who exit, and $Graduated_i$ is a dummy for graduates. Thus, δ_k measures the return only to enrolling while γ_k measures the added value of graduating, above and beyond enrolling. If we omit $Graduated_i$ from this model, then the coefficient on $Enrolled_i$ measures the average return to enrolling, taking into account graduation effects and the probability of graduating.

Interpreting the difference-in-differences estimates as the causal effect of graduating from TEC requires a parallel trends assumption. Figure 2 provides some initial evidence for the plausibility of this assumption. Prior to application, earnings for all three groups proceed roughly in parallel, and we formally test the similarity of pre-trends below as in Borusyak, Jaravel, and Spiess (forthcoming).

Our second approach flexibly controls for differences in pre-application characteristics by estimating equation (1) using inverse propensity weights (IPW). Specifically, we estimate logit models of the treatment indicator D_i on the full vector of 20 quarters of pre-application employment dummies and quarterly earnings, as well as demographic characteristics.[14] We use the predicted probabilities

[14] Demographic controls include a dummy for any employment in the year prior to applying, application quarter dummies, age, free or reduced price lunch status, homeless status, gender, and race/ethnicity categories. In models with both the $Enrolled_i$ and $Graduated_i$ indicators, we separately model both the likelihood of enrolling

to create inverse propensity score weights and estimate equation (1) with these weights. For additional robustness, we also report results from reestimating the difference-in-differences models in equations (2) and (3) using IPW. In both relying on within-person changes and IPW, this latter estimator is doubly robust. The estimates will be unbiased if either the underlying difference-in-differences model is correctly specified, or if the IPW matching estimator model is correctly specified.

Intuitively, this second approach reweights the sample such that graduates and nongraduates match on both pre-application levels and trends in earnings (Bitler, Gelbach, and Hoynes 2006). Causal interpretation requires a conditional mean independence assumption. Unlike difference-in-differences, this model does not directly adjust for time-invariant differences in unobservable characteristics. Rather, we assume that detailed earnings histories provide a good proxy for characteristics like motivation and ability that both affect post-application earnings and are associated with selection into enrollment and graduation.

Recent work that compares experimental estimates of the returns to education with observational estimates derived from these two approaches suggests the features of our setting may be well-suited to overcome many selection concerns. Experimental estimates of the returns to community college program are similar to observational estimates that leverage the same panel of pre-application earnings as our setting (Grosz 2020; Leung and Pei 2020). While different patterns of selection bias could lead one of our two models to perform better (Chabé-Ferret 2015), we find similar estimates across specifications, potentially because selection does not seem to be based on transitory shocks (Heckman, LaLonde, and Smith 1999; Heckman and Smith 1999).

Moreover, recent critiques of difference-in-differences estimators do not pose a concern in our setting (e.g., Borusyak, Jaravel, and Spiess, forthcoming; de Chaisemartin and d'Haultfœuille 2020; Goodman-Bacon 2021). Because we can benchmark treatment effects relative to a date that can be observed for the control group (application date), we can conduct a classic difference-in-differences analysis with a never treated comparison group that has a known zero date. That makes our estimation different from a TWFE model with staggered adoption and no known zero date for the control.[15]

In the discussion of our results, our preferred specification is the doubly robust estimates that come from estimating the difference-in-differences model (equation 2) with IPW. While results are qualitatively similar across all specifications, this specification performs better in tests of differential pre-trends when limiting the sample to smaller subgroups. When estimating effects for outcomes for which

and the likelihood of graduating, conditional on enrolling. For the latter, we restrict the sample to enrollees only. In this scenario, the weight is given by $\hat{w}_i = \frac{(1 - Enrolled_i)}{(1 - \hat{p}_{Enroll})} + \frac{Enrolled_i(1 - Graduated_i)}{\hat{p}_{Enroll}(1 - \hat{p}_{Grad|Enroll})} + \frac{Enrolled_i(Graduated_i)}{\hat{p}_{Enroll}(\hat{p}_{Grad|Enroll})}$. The propensity scores have very similar support (see online Appendix Figure A1), so we do not limit the sample based on common support. When comparing subgroups of the sample, we reestimate the predicted probabilities specific to the comparison and sample being used.

[15] This point is made by Borusyak, Jaravel, and Spiess (forthcoming) in Section 5.2 of their paper. "Consider conventional DiD designs in which treatment happens at a single date (in the treatment group) or never (in the control group), and the panel is complete. In this case there are no forbidden DiD comparisons, as those require that a unit switches its treatment status in a period when another unit has already been treated. Thus, only admissible comparisons are available, and OLS estimation does not suffer from negative weights. The presence of a never-treatment group also prevents the underidentification problem."

we do not have pre-application measures (e.g., employment stability, postsecondary credits and credentials), we present results that come from estimating equation (1) with IPW.

C. *Selection on Unobserved Post-application Shocks*

Both difference-in-differences and reweighting to account for observable differences in trends would be biased if applicants endogenously decide whether to enroll and to persist to graduation based on unobserved individual-specific shocks. Even a matched difference-in-differences approach will misattribute shocks that both discourage graduation and persistently reduce earnings to the return to graduation. For example, a student may experience a personal or family crisis, such as a death of a loved one, that traumatizes them and leads to antisocial behavior. This trauma could both lead the student to exit school and make it difficult for them to find employment in subsequent years.

We address this concern by using alternative comparison groups that are likely positively selected. First, we focus on students who dropout for reasons positively related to earnings. Our data include the recorded reason for why a student withdrew from TEC. The top four reasons recorded in the data are: lack of interest in the material, failure to show up to school without a reason, work conflicts, and interpersonal problems. The direction of bias likely varies with exit reason. Interpersonal problems might signify negative selection into dropping out, leading to an overestimate. On the other hand, students who exit due to work conflicts are likely selecting on a positive employment shock. Focusing on the latter group likely leads to an underestimate. Similarly, we provide results comparing graduates to TEC students who exit after different lengths of enrollment. With these approaches, we can bound the true treatment effect by examining how the measured return to graduating varies with the reason for and timing of dropping out.

IV. Results

A. *High School Enrollment and Credentials*

Most students who graduate from TEC enroll immediately after application and finish within two years. In the terms immediately after applying, 90 percent of eventual graduates are actively enrolled. This figure drops to 60 percent after one year, 17 percent after two years, and 4 percent after three years. For nongraduates, enrollment rates are similarly high at first but drop more quickly; 80 percent are enrolled in the term after applying, but only 33 percent are enrolled one year later. See online Appendix Figure A2.

Graduating from TEC does not typically displace acquiring a similar credential elsewhere. For students over age 18 during our sample period, the only routes to a high school diploma outside TEC were two other adult high schools: Christel House and Gary Middle College. Online Appendix Figure A3 shows the proportions of TEC applicants who have ever passed an Indiana state Graduation Qualifying Exam as of 2020: 71 percent of TEC graduates, 11 percent of those who exit TEC after

enrolling, and 6 percent of nonenrolling applicants.[16] Even completing the GED is uncommon. Online Appendix Figure A4, panels A and B show that only 7 percent of nonenrollees and 6 percent of exiters pass the GED within five years. These results suggest that most people in our comparison groups earn neither a diploma nor an alternative high school credential.

B. *Earnings*

Main Effects.—Earnings for graduates increase in the long run after dipping in the year after application. Figure 3, panel A displays event study results as in equation (2) using IPW with the level of unconditional earnings as the outcome. This comparison conditions on fixed effects for individual, relative quarter, calendar quarter, and relative quarter interacted with initial age ventile. The reference period is quarter -1, for which the effect is assumed to be zero. The teal triangles compare graduates and nonenrolling applicants. Because of reweighting, graduates and nonenrolling applicants show largely similar earnings trends in the five years prior to applying, though pre-trends are parallel without weights.[17] After the application quarter, graduates experience a "lock-in" effect when earnings take a pronounced dip in the following year but quickly recover. By the second and third year after applying, earnings for graduates are statistically significantly larger than those of nonenrolling applicants. These differences persist through the fifth year.

Figure 3, panel A also decomposes the comparison between graduates and nonenrollees by comparing graduates to students who exited without graduating (navy circles) and students who exited to nonenrollees (gold diamonds). These two comparisons decompose the return to graduating into the components of completing and enrolling, respectively. Pre-application trends in earnings differences continue to look small. The long-term earnings difference between those who exit and those who never enroll is much more muted than the difference between those who graduate and exit, providing a first piece of evidence that labor market returns are closely tied to graduating and receiving a diploma. Finally, the gray squares in Figure 3, panel A show the average return to enrolling, pooling graduates and exiters and comparing to nonenrollees. These gray squares fall between the teal triangles and gold diamonds because the return to enrolling is a weighted average of the return to graduating and the return to exiting.

Table 3 quantifies these results with difference-in-differences and IPW regressions. Column 1 shows a simple difference-in-differences regression that includes fixed effects for person and quarter relative to application. To be concise, we group the 20 post-period quarters into five years. In this first specification, we include interactions between year dummies and dummies for enrolling. Because we do not

[16] During our time period, high school diplomas in Indiana typically required passing the Graduation Qualifying Exam which makes it a good proxy for graduation, though some exceptions were possible that make the TEC value less than 100 percent. Exams provide a longer time horizon than graduation and enrollment data, which only extend to 4 years after beginning traditional high school.

[17] See online Appendix Figure A5 for unweighted event studies. The point estimate for the trend in the unweighted difference in earnings is a slight downward pre-trend of about $100 over five years. To the extent that this trend carries into the future, post-period differences in earnings will slightly underestimate the return to a diploma.

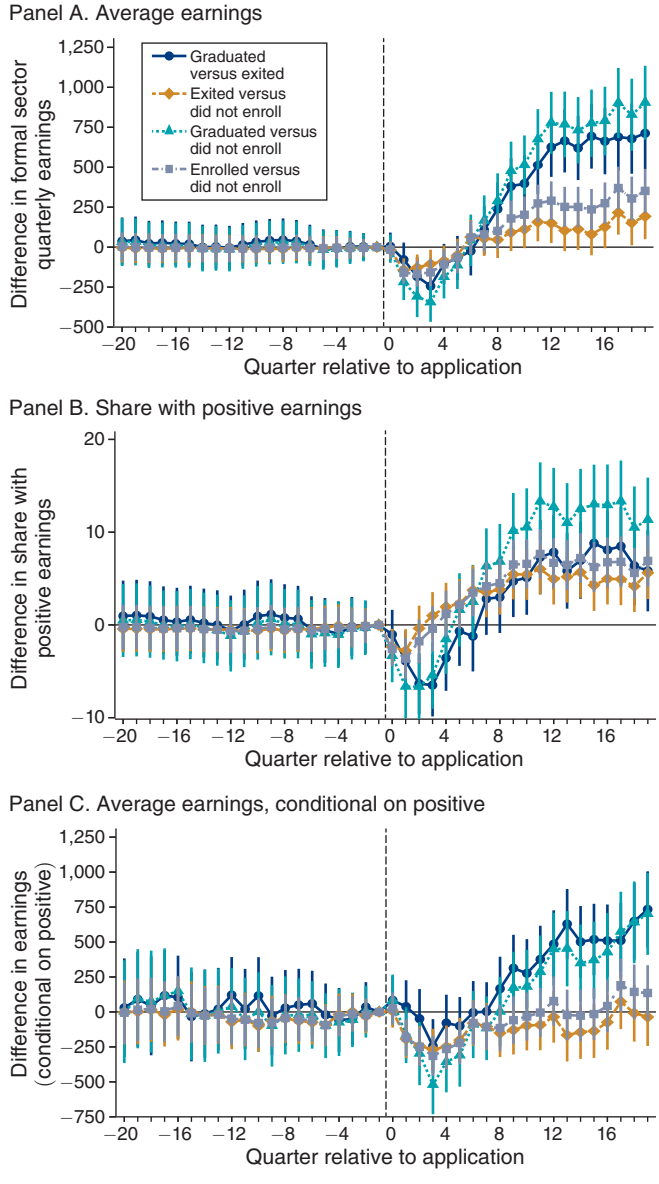

FIGURE 3. EVENT STUDY OF EARNINGS, BY QUARTERS SINCE APPLICATION

Notes: Data come from TEC application records linked to UI earnings data from the Indiana Department of Workforce Development. The sample includes all TEC applicants from January 2013 through June 2015 with any pre-application MPH record. The horizontal axis indicates quarter relative to initial TEC application date, where quarter zero represents the quarter in which an individual applied to TEC. The figure plots the regression coefficients from three event study specifications that compare (1) the employment and earnings of TEC graduates to TEC students who did not graduate (navy circles); (2) TEC students who did not graduate to TEC applicants who did not enroll (gold diamonds); (3) TEC graduates to TEC applicants who did not enroll (teal triangles); and (4) all TEC students to TEC applicants who did not enroll (gray squares), controlling for individual fixed effects, calendar quarter fixed effects, and fixed effects for the interactions of calendar quarter and initial age ventile. Observations are weighted using inverse propensity scores. The outcomes are an indicator for unconditional total earnings (2014:I US dollars) (panel A), positive earnings (panel B), and average earnings among individuals with positive earnings (panel C). The reference quarter is the quarter before application. Vertical bars represent 95 percent confidence intervals, where standard errors are clustered at the individual level.

Table 3—Effect of Enrollment and Graduation from The Excel Center on Quarterly Earnings

	Fixed Effects (1)	Fixed Effects (2)	Fixed Effects (3)	Weighted (4)	Weighted (5)	Weighted SD (6)
Enrolled × Year 1	−133.84	−111.79	−133.78	−96.11	−89.45	−57.17
	(33.47)	(34.88)	(34.83)	(34.23)	(33.73)	(47.56)
Enrolled × Year 2	15.87	3.74	−36.59	−5.02	5.17	33.93
	(42.96)	(44.73)	(44.73)	(45.94)	(45.49)	(56.10)
Enrolled × Year 3	207.95	100.39	56.36	99.80	111.59	138.74
	(49.39)	(51.08)	(51.15)	(52.72)	(52.29)	(61.31)
Enrolled × Year 4	300.65	144.30	92.90	105.32	119.65	144.27
	(54.98)	(56.78)	(56.68)	(58.24)	(57.61)	(65.32)
Enrolled × Year 5	343.73	184.96	131.23	165.58	179.68	204.52
	(60.10)	(62.28)	(62.09)	(63.56)	(62.99)	(70.37)
Graduated × Year 1		−98.56	−138.78	−141.15	−142.12	−138.48
		(44.93)	(44.31)	(56.25)	(55.11)	(69.52)
Graduated × Year 2		54.20	−14.61	−38.63	−39.72	−35.97
		(59.13)	(58.03)	(67.24)	(65.21)	(79.21)
Graduated × Year 3		480.67	399.78	367.07	365.69	369.74
		(72.68)	(71.95)	(80.89)	(79.06)	(93.01)
Graduated × Year 4		698.74	599.84	637.15	634.60	639.81
		(82.11)	(81.76)	(92.79)	(91.76)	(103.95)
Graduated × Year 5		709.57	604.20	672.32	669.06	674.98
		(89.86)	(89.71)	(101.97)	(101.00)	(111.23)
Relative Quarter FE	X	X	X	X	X	X
Person FE	X	X	X	X	X	
Calendar Quarter FE			X		X	
Age Bin × Rel. Quarter FE			X		X	
Comp. Mean-Year 1	1,662	1,662	1,662	1,476	1,476	1,476
Comp. Mean-Year 2	1,995	1,995	1,995	1,831	1,831	1,831
Comp. Mean-Year 3	2,155	2,155	2,155	1,990	1,990	1,990
Comp. Mean-Year 4	2,256	2,256	2,256	2,120	2,120	2,120
Comp. Mean-Year 5	2,389	2,389	2,389	2,232	2,232	2,232
$\Pr\left(\hat{\beta}^{Pre1-8}_{Enroll} = 0\right)$	0.332	0.267	0.426	1.000	1.000	0.996
$\Pr\left(\hat{\beta}^{Pre1-8}_{Grad} = 0\right)$		0.874	0.534	0.995	0.994	0.995
R^2	0.54	0.54	0.55	0.54	0.55	0.02
Observations	378,600	378,600	378,600	378,600	378,600	189,300
Individuals	9,465	9,465	9,465	9,465	9,465	9,465

Notes: Data come from TEC application records linked to UI earnings data from the Indiana Department of Workforce Development. The sample includes all TEC applicants from January 2013 through June 2015 with any pre-application MPH record. Time is measured in quarters relative to application date, and the data are a balanced panel from quarter −20 to quarter 19. The outcome is unconditional total quarterly earnings (2014:I US dollars), winsorized at 99 percent. Nonemployment is coded as zero earnings. Columns 4–6 are reweighted using inverse propensity score weights. See text for details. Column 6 is a single-difference specification that only includes the 20 post-period quarters. Standard errors clustered by individual are in parentheses.

include graduation dummies, the coefficients on enrolling estimate the total return to enrolling in TEC, averaging across those who graduate and those who exit. For example, the coefficient of −134 on the "Enrolled × Year 1" interaction indicates that quarterly earnings for enrollees (graduates and exiters) dip, on average, by $134 more than nonenrollees during the first year after applying to TEC.

Subsequent models include interactions between graduation and year dummies to decompose the overall enrollment effect into the effects of enrollment itself and the effect of graduating. Results in column 2 indicate that quarterly earnings dip in the

year after applying by $99 more for graduates than for exiters and by $112 more for exiters compared with applicants who do not enroll. Together, these two estimates imply that the total earnings penalty to TEC graduates averages $210 each quarter in the year following application.

Large positive differences in quarterly earnings emerge in the years following this first post-application year. Estimates are positive and statistically significant beginning in the third year following application. For example, the results in column 2 indicate that the return to graduating from TEC is $895 per quarter five years after applying; $710 comes from graduation conditional on enrollment and $185 comes from enrolling.

The remaining columns of Table 3 demonstrate that these results are stable across other specifications. Column 3 adds calendar quarter and application age-relative quarter fixed effects. Columns 4 through 6 reweight the data using IPW based on demographics and earnings history. Column 5 includes calendar quarter and age-time fixed effects, and column 6 estimates a parsimonious simple difference (SD) specification that uses only post-application observations and includes relative quarter fixed effects. The results are quite similar in all cases.[18] Our preferred specification is the "doubly robust" specification in column 5. In this specification, we estimate an $849 increase in quarterly earnings five years after application, a 38 percent increase relative to the weighted average earnings ($2,232) of nonenrolling applicants.[19, 20]

Across all specifications, we fail to reject the null hypothesis of no differential pre-trends among the three subgroups of TEC students. We implement the test of Borusyak, Jaravel, and Spiess (forthcoming) and report it at the bottom of Table 3. We follow their approach and restrict the sample to the 20 pre-application quarters and reestimate the specification used in the given column including relevant group dummies interacted with indicators for each of the eight quarters prior to application. We report *p*-values of the test that all eight interaction terms for the group are equal to zero in the rows titled $\Pr(\hat{\beta}^{Pre1-8}_{Enroll} = 0)$ and $\Pr(\hat{\beta}^{Pre1-8}_{Grad} = 0)$.

Components of Total Earnings.—A high school diploma affects both how likely the student is to be employed and earnings conditional on any employment. Figure 3, panels B and C show event studies that split total earnings into these two components. The probability of being employed increases both with enrollment and with graduation. However, earnings conditional on employment only increase for graduating, not enrolling. These results suggest that upgrading to higher-paying careers is tied to completing the diploma.

[18] We can observe application dates for everyone in the sample and analyze data in relative time, so now-standard critiques of two-way fixed effects models do not apply to our empirical strategy. Even so, our results change very little if we implement a canonical two-way fixed effects model in calendar time or methods that improve upon that approach. See online Appendix Table A5.

[19] These effects persist beyond five years for subsamples for which we can observe a longer time horizon for outcomes. See online Appendix Table A6.

[20] For all results, we use standard errors clustered by individual. While these standard errors do not account for uncertainty in estimating weights, in practice, standard errors are smaller if we bootstrap estimation of the weights.

Table 4—Effect of Enrollment and Graduation from The Excel Center on Employment Stability

	Number of quarters				
	Employed	Continuous employment any	Continuous employment in sector	Continuous employment in industry	Coef. of variation earnings
	(1)	(2)	(3)	(4)	(5)
Graduated	0.50	0.81	0.75	0.89	−0.14
	(0.22)	(0.22)	(0.17)	(0.16)	(0.033)
Enrolled	0.78	0.66	0.21	0.13	−0.12
	(0.16)	(0.16)	(0.11)	(0.10)	(0.027)
Comp. mean	10.62	8.21	5.34	4.72	1.52
R^2	0.00	0.01	0.00	0.01	0.01
Observations	9,465	9,465	9,465	9,465	8,656

Notes: Data come from TEC application records linked to UI earnings data from the Indiana Department of Workforce Development. The sample includes all TEC applicants from January 2013 through June 2015 with any pre-application MPH record. This sample uses one observation per applicant. Outcomes are measured using post-application earnings data in quarter −20 to quarter 19. Column 1 counts the total number of quarters with positive earnings. Column 2 counts the longest string of consecutive quarters of with positive earnings. Columns 3 and 4 narrow to consecutive strings with the same two-digit NAICS code and six-digit NAICS code, respectively. Column 5 measures the coefficient of variation of total earnings across quarters within a person. All specifications measure simple post-period differences, weighted by inverse propensity scores. Standard errors clustered by individual are in parentheses.

Graduation also improves employment stability. Table 4 compares measures of employment stability during the five years following application using the specification from column 6 of Table 3. Graduating increases employment during this period by 1.28 quarters—0.78 from graduation and 0.50 from enrolling. Columns 2–4 report effects on the number of quarters continuously employed in any job, the same two-digit sector, and the same six-digit industry, respectively. While both enrolling and graduating increase employment in any job, only graduating increases continuous employment within a narrowly defined industry. Similarly, the final column of Table 4 shows that graduating decreases the coefficient of variation in earnings. Together, these results indicate that earnings not only increase but become more stable for graduates.

Using Subsets of Students Who Dropout as Comparison Groups.—Students who exit because of work conflicts are positively selected and comparing graduates to them provides a lower bound on the return to graduating. Those who exit because of a work conflict earn nearly 50 percent more than graduates in the year prior to application ($6,380 versus $4,330). After applying, their earnings increase more than other students who withdrew (online Appendix Figure A6, panel A), and this break in trend materializes in the year before exit (online Appendix Figure A7). Because their earnings growth likely overstates the counterfactual trend for graduates, using these nongraduates as a comparison group provides a lower bound for the return to graduating.

Table 5 reports results that limit the comparison group to students with different exit reasons. Within five years of applying, graduates experience statistically significant

Table 5—Effect of Graduation from The Excel Center on Quarterly Earnings Compared to Enrollees with Different Exit Reasons

	Any	Lack interest	No show	Work conflict	Interpersonal
	(1)	(2)	(3)	(4)	(5)
Graduated × Year 1	−113.22	−87.04	−43.66	−263.54	−93.40
	(50.92)	(49.03)	(76.45)	(71.24)	(102.08)
Graduated × Year 2	−5.68	18.77	117.37	−298.69	147.18
	(62.51)	(61.71)	(94.23)	(91.48)	(137.11)
Graduated × Year 3	388.24	437.13	531.85	−19.36	668.75
	(75.71)	(75.82)	(105.34)	(108.99)	(160.35)
Graduated × Year 4	652.02	677.45	738.01	376.29	821.20
	(88.51)	(88.04)	(116.46)	(120.56)	(157.87)
Graduated × Year 5	681.69	693.57	748.30	458.85	726.20
	(96.55)	(96.17)	(138.67)	(133.89)	(179.47)
Relative quarter FE	X	X	X	X	X
Person FE	X	X	X	X	X
Calendar quarter FE	X	X	X	X	X
Age bin × rel. quarter FE	X	X	X	X	X
$\Pr\left(\hat{\beta}_{Grad}^{Pre1-8} = 0\right)$	0.997	0.998	0.999	1.000	0.991
R^2	0.54	0.54	0.55	0.55	0.55
Observations	243,920	203,000	76,960	87,600	67,680
Individuals	6,098	5,075	1,924	2,190	1,692

Notes: Data come from TEC application records linked to UI earnings data from the Indiana Department of Workforce Development (DWD) and TEC enrollment records from Goodwill. The sample includes all TEC applicants from January 2013 through June 2015 with any pre-application MPH record and an enrollment spell in the TEC enrollment records. The sample excludes students who are missing an exit reason. Time is measured in quarters relative to application date, and the data are a balanced panel from quarter −20 to quarter 19. The outcome is quarterly earnings (2014:I US dollars), winsorized at 99 percent. Nonemployment is coded as zero earnings. The treatment group in all columns is comprised of graduates. The comparison group changes across columns, with each column limited to individuals who were ever identified as dropping out for the listed reason. All columns report the results of a "doubly robust" specification that includes person, calendar quarter, and relative quarter-age ventile fixed effects and reweights using inverse propensity score weights. See text for details. Standard errors clustered by individual are in parentheses.

increases in earnings compared to all groups of those who exit. Comparing to those who exit because of a work conflict creates a deeper and more sustained temporary dip in earnings, but even that decrease disappears within four years. Graduates earn nearly $500 more each quarter five years later.

We find similar results comparing graduates to students who were enrolled for different lengths of time before dropping out. Students who stay enrolled for several terms may be more similar to graduates, though they may also gain some human capital, which makes this comparison a lower bound. The return to graduation persists even when comparing to students who enroll for multiple years. See online Appendix Table A7 and online Appendix Figure A8, panels A and B. These results suggest selection into graduation does not likely drive our estimates, and the return to TEC depends more heavily on graduating than on gradual human capital accumulation from taking classes.

Heterogeneous Effects.—We first show that the labor market return to TEC graduation is similar among older and younger applicants. One potential concern with our identification strategy is that pre-application earnings for younger applicants

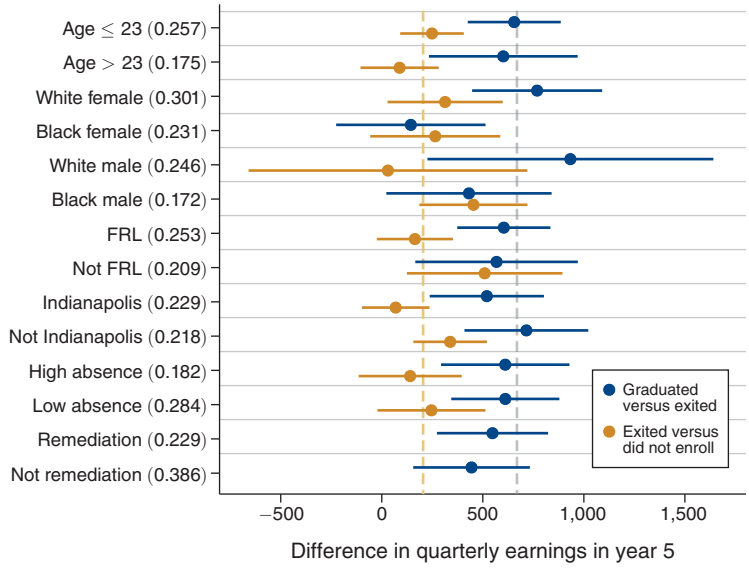

FIGURE 4. DIFFERENCE IN EARNINGS IN YEAR 5, BY SUBGROUP

Notes: Data come from TEC application records linked to UI earnings data from the Indiana Department of Workforce Development, TEC enrollment records from Goodwill, and high school enrollment records from the Indiana Department of Education. The sample includes all TEC applicants from January 2013 through June 2015 with any pre-application MPH record and a pre-application high school enrollment record. The outcome is quarterly unconditional UI-covered earnings (2014:I US dollars), winsorized at 99 percent. The navy blue circles plot for each listed subgroup the difference in average quarterly earnings in year five between TEC graduates and TEC students who did not graduate. The navy dashed line shows the full sample effect. Gold circles and lines compare students who did not graduate and applicants who did not enroll. Each pair of estimated differences comes from an event study specification estimated on the listed subsample but otherwise identical to the specification in Figure 3 panel A, which uses inverse propensity score weights and controls for individual fixed effects, calendar quarter fixed effects, and fixed effects for the interactions of calendar quarter and initial age ventile. Horizontal bars represent 95 percent confidence intervals, where standard errors are clustered at the individual level.

are not as useful in predicting post-application earnings. If results remain similar among older workers, this concern is less applicable. Younger applicants (23 and younger) earn less than $1,000 in the quarter before application and have experienced a relatively rapid increase in earnings in the five years preceding application (online Appendix Figure A9, panel A). Older applicants receive more stable earnings that are nearly twice as large (online Appendix Figure A10, panel A).

Online Appendix Figure A9, panel B and Figure A10, panel B present event study results among younger and older applicants, respectively. These figures have three important takeaways. First, any preexisting difference in earnings between graduates and other applicants disappears when conditioning on age. Second, both younger and older graduates experience substantial gains in earnings relative to their observationally similar nonacademic peers. Point estimates in year 5 are similar in magnitude to the main results. Finally, while long-term effects are similar, older workers do experience larger and more prolonged lock-in effects than their younger peers. The top two rows of Figure 4 shows these effects in year 5, and online Appendix Table A8 shows the full regression results.

Effects are remarkably stable across a number of other subgroups defined by pre-application characteristics.[21] Figure 4 shows year-5 differences between graduates and exiters (gold) and exiters and nonenrollees (blue) using the specification from column 5 of Table 3 estimated on the listed subsample.[22] We also report the graduation rate for each subgroup in parentheses next to the group label. As above, returns to younger and older students are nearly identical. Similarly, confidence intervals for subgroups defined by free/reduced lunch status, urban location, high school absenteeism, and placement into remediation at TEC include the full sample effect.

On the other hand, some differences by race and gender appear. Black women appear to have lower returns to graduating. Figure 4 shows similar returns to graduating for White females, White males, and Black males (though Black males have a lower graduation rate). On the other hand, Black female students have lower returns to both enrolling and graduating. Online Appendix Table A9 indicates that Black female graduates only earn $143 more than their peers who do not graduate, and the 95 percent confidence interval rules out differences larger than $513. We investigate the potential causes of this gap below when discussing mechanisms.

V. Discussion

A. *Costs and Benefits of Adult Education*

In this subsection we benchmark the large economic benefits accruing to graduates of TEC to the cost of operating the schools. To compare TEC to a broader set of workforce and education programs, we estimate the marginal value of public funds (MVPF) of TEC (Hendren and Sprung-Keyser 2020).[23] Then, to contextualize the return to a diploma, we directly estimate the benefits of receiving the GED or an Associate's degree in Indiana.

MVPF of Enrolling at TEC.—We take the willingness to pay (WTP) for TEC to be the change in after-tax earnings gains of TEC students that occur over the 5 to 40 years after application.[24] The average enrollee experiences a $2,559 increase in

[21] While age is observable for all applicants (calculated based on date of birth and application date), our additional heterogeneity analysis requires linking individuals to their secondary school DOE record to observe sociodemographic characteristics used to construct other subgroups. Online Appendix Table A8, column 3 reports the weighted single-difference results for the subsample for whom we observe baseline demographic information ($N = 6{,}242$).

[22] For each subgroup, we reestimate inverse propensity score weights that ensure pre-application earnings, employment, application quarter, and age are balanced across graduates and nongraduates within each subgroup.

[23] The MVPF of a policy intervention equals the ratio of the willingness to pay for the program and the cost of providing the intervention net any fiscal externalities. Unless otherwise noted, we follow the procedures of Hendren and Sprung-Keyser (2020) when they estimate the MVPF of programs designed to increase educational attainment and make identical assumptions about parameter values.

[24] For this analysis, we estimate the gains (and losses) from enrolling and graduating in the first 20 quarters after applying by estimating equation (1) with IPW. We then follow Hendren and Sprung-Keyser (2020) in assuming that the relative return in years 6–40 is equal to the year-five return, and model the lifecycle evolution of earnings for the nonenrolled group using population average incomes of high school noncompleters by age in the 2015 ACS. This assumption is reasonable given the effects we estimate for years six and seven on the smaller subsample of earlier TEC cohorts and what we know about the earnings gains associated with high school graduation across the life cycle (Bhuller, Mogstad, and Salvanes 2017). Earnings gains for graduates come from summing the coefficients from both the enrolled and graduated time interactions. We discount future earnings with an annual discount

the net present value of after-tax earnings within five years of application (online Appendix Table A10, column 1). We focus on a primary scenario in which effects persist through retirement—an additional 35 years—and find enrolling in TEC yields a $34,063 increase in the net present value of lifetime after-tax earnings (column 4). This average return to enrolling is split among graduates, who experience a $80,917 increase, and those who enroll but exit without a diploma, who gain $20,556. These returns are less pronounced if we assume a greater discount of 5 percent or that impacts persist in constant (not relative) terms (columns 5 and 6).

The lifetime present value of the labor market return to attending TEC is much greater than the net fiscal cost. In 2014, the State of Indiana paid adult charter high schools a $6,600 payment per student per year. Unlike traditional schools, TEC does not offer school-funded sports, music, or extracurriculars; nor does TEC offer specialized courses in noncore areas (e.g., art or physical education). Savings from these areas allow TEC to offer services more relevant to students with demanding life obligations—most notably, childcare. The average student in our data attends TEC for 1.08 years, and graduates attend TEC longer (1.49 years) than exiters (0.96 years). While the up-front cost of enrolling an additional student is $7,111–$9,850 for graduates and $6,321 for exiters—the net cost of providing a high school education is lower as students pay additional taxes throughout their working career, particularly during their highest earning midcareer years. Accounting for this additional tax revenue reduces the net cost of educating the typical student to $1,648 (online Appendix Table A10, column 4). Importantly, we estimate graduates generate more new tax revenue than the up-front cost of educating them, making their net cost negative (−$6,956).

We use these costs and benefits to construct an estimate of the MVPF for TEC (Hendren and Sprung-Keyser 2020). This measure is given by the ratio of the aggregate willingness to pay for a particular policy and the net cost to provide that policy. Unsurprisingly, the magnitude of the MVPF depends on the length of time that effects persist. Because the program affects educational attainment, we assume gains persist through retirement. Under this assumption, the MVPF of enrolling a typical TEC student is 20.67 (95 percent CI of 6.78 to 498.67). This estimate is sensitive to how we assume effects persist into the future. For instance, if the year-5 effect persists in levels rather than as a proportion of the comparison group average earnings, then the estimated MVPF is 6.28 (95 percent CI of 3.37 to 10.93).

Our analysis omits some items that could be important for a comprehensive cost-benefit analysis of subsidizing adult high school. While TEC students have greater income than nonenrollees, their incomes are sufficiently low that increased earnings would not pay for the program through increased tax revenue. The public finance implications of the program likely depend instead on whether it reduces criminal justice system involvement, increases coverage of private health

rate of three percent. In estimating the impacts of the program on taxes and transfers, we use CBO estimates linked to the 2016 federal poverty threshold for a household of two ($16,151). See Appendix Table G.I in Hendren and Sprung-Keyser (2020). Finally, we construct 95 percent confidence intervals by drawing 10,000 bootstrap samples and reestimating weights and treatment effects.

insurance, or reduces other public benefits for participants. Additionally, effects on participants' children likely matter for a long-term cost-benefit analysis. For participants, we also omit many difficult-to-measure costs and benefits including nonwork activities displaced by employment and education. We also do not incorporate into the WTP the value of benefits, such as childcare and transportation assistance, received while an Excel Center student. Finally, we cannot account for general equilibrium effects, for example whether TEC students displace other workers in the labor market.

Comparing the Returns to TEC versus the GED and Community College.—We can use similar data on GED takers in the state of Indiana to compare the return to TEC to the return to a GED. The existing literature suggests the labor market return to a GED is relatively small. For example, the point estimate for the difference in quarterly earnings between those who barely pass and barely fail is about $250 per quarter (Jepsen, Mueser, and Troske 2016). While we do not have a sufficient sample to replicate their regression discontinuity strategy in the Indiana data, we employ a difference-in-differences strategy that compares changes in earnings before and after the test for those who pass and those who fail on their first attempt.[25]

The return to a GED in our data appears similar to results previously found in the literature. Online Appendix Figure A11 shows that earnings pre-trends are similar between those who pass and fail. GED passers have slightly lower earnings in levels and a somewhat smaller Ashenfelter dip prior to the test. After taking the test, earnings increase more for those who pass than for those who fail, but these differences are small and sensitive to controlling for baseline differences. The top panel of Table 6 summarizes the results. With only person and relative quarter fixed effects, there is a statistically significant difference in earnings in years 1–5 at the 1 percent level, and the magnitude is between $250–500 per quarter. However, this difference shrinks when we control for baseline earnings trends using inverse propensity weights in columns 3–5. In our preferred specification in column 4, the return to a GED ranges between $154 to $360 per quarter throughout years 1–5, which is consistent with Jepsen, Mueser, and Troske (2016).

On the other hand, the literature suggests that the return to community college can be quite large. Estimates of the average return to community college ranges widely, from 7 percent to more than 50 percent, with healthcare programs having greater returns (Jepsen, Mueser, and Troske 2016; Stevens, Kurlaender, and Grosz 2019; Leung and Pei 2020). For example, Grosz (2020) finds that about half of students who enroll in a nursing associates program after winning an enrollment lottery complete the program, and enrolling increases earnings by 49 percentage points.

In data from Indiana we find results on the higher end, indicating a greater return to completing community college than completing a high school diploma. We use a similar identification strategy: among students enrolled in an associate's program at Indiana's network of community colleges, comparing earnings between those who

[25] We limit our analysis window to February 2014 to September 2014 for data quality reasons. We also restrict the sample to those matching to DOE records in order to construct propensity weights based on demographic information.

Table 6—Effect of Passing the GED and Completing Community College on Quarterly Earnings

	Fixed effects (1)	Fixed effects (2)	Weighted (3)	Weighted (4)	Weighted SD (5)
Panel A: GED					
Passed GED × year 1	268.27	227.18	151.76	154.16	171.90
	(66.32)	(66.59)	(66.88)	(66.32)	(88.27)
Passed GED × year 2	343.11	295.11	232.76	234.86	252.89
	(88.34)	(88.81)	(93.30)	(92.89)	(108.97)
Passed GED × year 3	413.45	349.69	284.99	286.73	305.13
	(100.40)	(100.64)	(106.22)	(104.90)	(120.55)
Passed GED × year 4	488.61	417.39	358.96	360.01	379.10
	(107.80)	(107.94)	(113.44)	(111.80)	(128.21)
Passed GED × year 5	441.70	356.10	284.20	286.69	304.34
	(117.65)	(117.71)	(126.08)	(123.88)	(138.97)
Relative quarter FE	X	X	X	X	X
Person FE	X	X	X	X	
Calendar quarter FE		X		X	
Age bin × relative quarter FE		X		X	
Comp. mean-year 5	2,634	2,634	2,682	2,682	2,682
$\Pr\left(\hat{\beta}^{Pre1-8}_{Passed} = 0\right)$	0.286	0.595	1.000	1.000	1.000
Observations	170,600	170,600	170,600	170,600	85,300
Individuals	4,265	4,265	4,265	4,265	4,265
Panel B: Community college					
Earned degree × year 1	−312.27	−205.49	156.51	167.03	309.35
	(133.69)	(131.58)	(173.51)	(164.23)	(223.27)
Earned degree × year 2	−116.87	−2.88	552.17	550.81	705.02
	(165.30)	(166.11)	(298.52)	(269.21)	(351.41)
Earned degree × year 3	516.10	656.02	996.88	994.15	1,149.73
	(192.62)	(194.22)	(274.67)	(256.80)	(308.78)
Earned degree × year 4	996.47	1,154.01	1,458.13	1,463.25	1,610.97
	(222.81)	(225.62)	(318.79)	(301.87)	(346.11)
Earned degree × year 5	1,334.48	1,496.68	1,952.99	1,948.13	2,105.83
	(248.95)	(250.40)	(363.18)	(342.58)	(403.37)
Relative quarter FE	X	X	X	X	X
Person FE	X	X	X	X	
Calendar quarter FE		X		X	
Age bin × relative quarter FE		X		X	
Comp. mean-year 5	2,967	2,967	2,967	2,967	2,967
$\Pr\left(\hat{\beta}^{Pre1-8}_{Degree} = 0\right)$	0.051	0.081	0.926	0.858	0.770
Observations	137,440	137,440	137,440	137,440	68,720
Individuals	3,436	3,436	3,436	3,436	3,436

Notes: Data come from statewide records of GED takers linked to UI earnings data from the Indiana Department of Workforce Development. In panel A, the sample includes all GED takers who attempted the test between February and September 2014. For people with multiple test dates, relative time and pass status are for the person's first GED test. In panel B, the sample includes all GED takers who enrolled in an associate's degree program for the first time between 2013 and 2015; relative time is compared to date of first enrollment. For both samples, the post period includes quarters 0 to 19. The outcome is quarterly earnings (2014:I US dollars), winsorized at 99 percent. Nonemployment is coded as zero earnings. Columns 3 through 5 are weighted by inverse propensity scores. Column 5 reports results from a single-difference specification that only includes post-period quarters. Standard errors clustered by individual are in parentheses.

graduate and those who do not. We limit the sample to students who previously took the GED exam, both because this sample is more similar to TEC students and because this is a limit of the data. The bottom panel of Table 6 displays the results. Across various specifications, graduates of community colleges earn greater wages than students who do not graduate. In our preferred specification in column 4, graduates

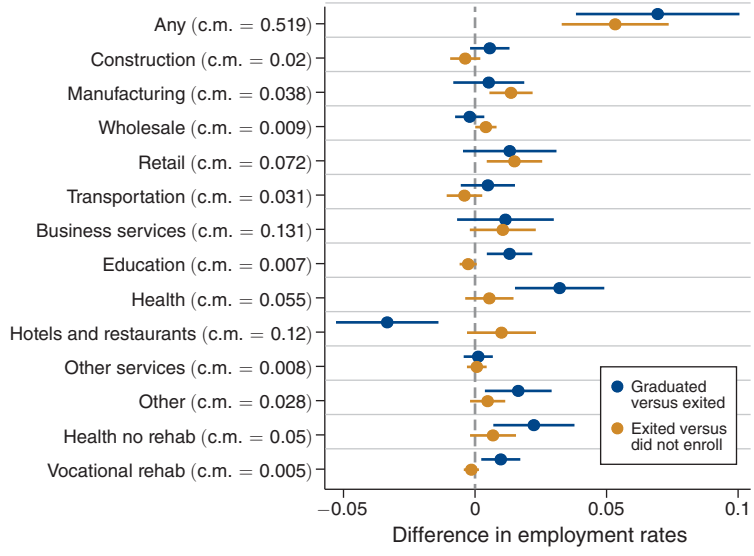

FIGURE 5. DIFFERENCE IN SECTOR OF EMPLOYMENT IN YEAR 5

Notes: Data come from TEC application records linked to UI earnings data from the Indiana Department of Workforce Development. The sample includes all TEC applicants from January 2013 through June 2015 with any preapplication MPH record. Each row shows the coefficients on "enrolled" and "graduated" in year 5 from a specification identical to column 5 of Table 3. In each row, the outcome is an indicator for quarterly employment in a listed sector. The comparison group mean (c.m.) reports the year-five employment rate of the TEC applicants who did not enroll. Horizontal bars represent 95 percent confidence intervals, where standard errors are clustered at the individual level.

receive $1,948 (66 percent) greater earnings per quarter than nongraduates. Overall, we find that the return to a high school diploma among adults is between the return to a GED and the return to an associate's degree.

B. *Mechanisms*

A high school diploma may provide greater labor market returns than a GED due to either human capital accumulation or signaling. Proponents of a traditional high school degree argue that it provides both nonacademic soft skills not provided by the GED, as well as a larger dose of academic skills. However, it could also be the case that high school diplomas are more costly to obtain than the GED, and therefore diploma completion signals ex ante higher ability. Distinguishing between these two channels is important in determining whether subsidizing high school completion increases productivity or dilutes the signalling value of a high school diploma.

While we cannot fully determine the active mechanisms, we observe two findings consistent with the idea that graduation from TEC provides new skills for participants. First, TEC graduates switch industries after graduating. The biggest changes are toward healthcare and away from hospitality. Second, TEC graduates are more likely to earn professional and academic credentials, and the types of credentials

that TEC graduates earn align closely with the changes in industries of employment. These results suggest that a high school diploma helps students acquire skills that open doors to new types of jobs. They are not consistent with the idea that the diploma only signals overall ability, though they might also be rationalized by sector-specific signaling.

Sector of Employment.—We observe that TEC graduates switch to higher-skilled industries after graduating. We replicate our main specification using employment in a particular industry as the outcome. Figure 5 displays the difference in probabilities of employment in a given sector between TEC graduates and exiters (navy) and exiters versus applicants (gold) during year 5. Each row lists the sector, the control mean for the employment rate in the sector (denoted "c.m."), and plots the estimate and 95 percent confidence interval. See online Appendix Table A11 for full results. As discussed previously, graduates are 6.9 percentage points more likely to be employed at all than exiters. Yet, sector of employment also noticeably shifts. Compared to exiters, graduates are 3.2 percentage points (53 percent) more likely to be employed in the health sector. Employment also increases noticeably in the education and retail sectors, and roughly a third of the increase in retail comes from employment at pharmacies. While TEC graduates shift toward employment in higher-wage health and education sectors, employment actually falls in the hotel and restaurant sector despite the overall increase in employment. Declines in these sectors are primarily driven by falling employment at limited-service restaurants and temporary employment agencies. Graduates shift away from these lower-wage employers, which are more common among nongraduates. Students who enroll but do not graduate increase employment rates but do not experience a similar shift to higher-paying industries.

Graduates access more attractive portions of the health sector as well. Increases in healthcare employment include some increase in vocational rehab employers (1.0 percentage points), which could include direct employment by Goodwill. However, most of the increase in healthcare related employment comes from other subsectors, including a 0.7 percentage points increase in individual and family health employment and a 0.8 percentage points increase in general medicine employment (see online Appendix Table A12). Overall, TEC graduates make a major shift within the service sector toward employers with both greater potential for earnings growth and greater skill requirements.

Credentials.—Graduates earn more formal professional and course certificates and community college credits than nongraduates. Figure 6, panels A and B display the difference in the probability of earning certificates and credits in different fields. Compared to TEC students who did not graduate, graduates are 43 percentage points more likely to earn a certificate (on a base of 25 percentage points) and 21 percentage points more likely to have earned any college credit (on a base of 8.9 percentage points). The vast majority of the latter increase reflects credits at community college.

Graduates are particularly more likely to complete healthcare-related credits and certificates. Figure 6, panels A and B further break down the overall change in certificate

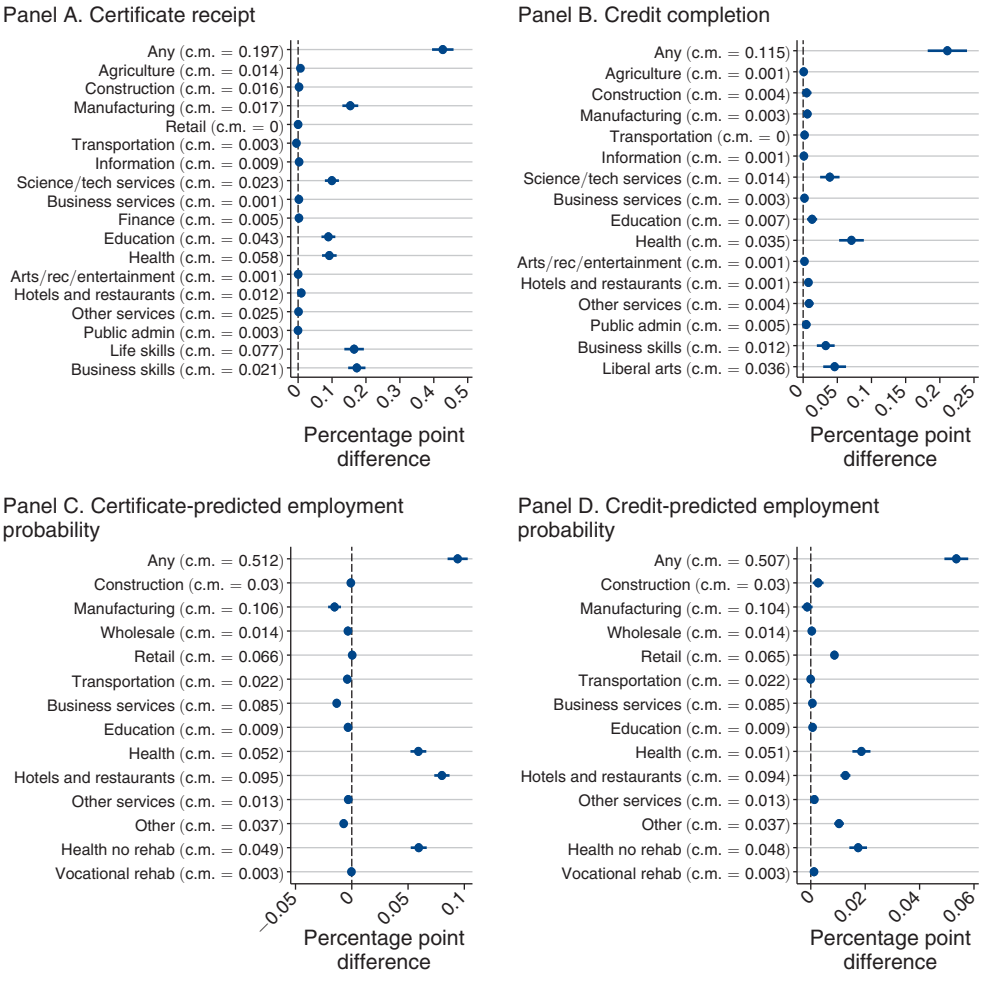

Figure 6. Differences in Credentialing, Graduated versus Enrolled but Exited

Notes: Data come from TEC application records linked to UI earnings data from the Indiana Department of Workforce Development. The sample includes all TEC applicants from January 2013 through June 2015 with any preapplication MPH record. Each panel reports effects on a different set of outcomes: indicators for certificate completion (panel A), indicators for any post-secondary credit completion (panel B), certificate-predicted employment rates (panel C), and credit-predicted employment rates (panel D). The figures plot simple weighted differences in the outcomes between TEC graduates and TEC students who did not graduate. Observations are weighted by inverse propensity score weights. The same regression is estimated for the program or sector denoted in each row. The comparison group mean (c.m.) reports the average outcome among TEC students who did not graduate. Horizontal bars represent 95 percent confidence intervals, where standard errors are clustered at the individual level.

and college credits by type of credential.[26] See online Appendix Tables A13 and A14 for full results. Notably, graduates are 9.2 percentage points more likely than enrollees

[26] We manually link titled certificates and college credits to NAICS two-digit industry codes based on DOE course descriptions of certificates and CHE's descriptions of credit programs found in the National Center for Education Statistics' Classification of Instruction Programs. See the data section for more details.

to earn certificates in a health-related program (on a base of 7.3 percentage points). Similarly, graduates are 7.1 percentage points more likely than enrollees to earn any college credit in a health-related field (on a base of 2.7 percentage points). TEC also increases the likelihood of gaining a certificate in manufacturing, science/technical services, education, life skills, and business skills, as well as the likelihood of obtaining credits in the liberal arts, science/technical services, and business skills. Earning these credits and certificates might explain roughly half of the difference in earnings between graduates and nonenrolled applicants in year 5. If we reestimate the primary specification reported in column 5 of Table 3 but control for the types of certificates and credits people earn (interacted with post-application year dummies), the magnitude of the total earnings gains of graduates in year five decreases from $849 to $493.

TEC graduates earn credentials that, in a similar population, are associated with employment in healthcare. For the general population of GED test-takers, we compute predicted probabilities of employment in different sectors for each credit program and credential. We assign these predicted employment probabilities to people in our main sample based on the credentials they complete. The resulting measure estimates the extent to which the credentials they complete do in fact typically imply shifts in sector of employment.[27] Figure 6, panels C and D show the results of using the predicted sector of employment based on credits and certificates, respectively, as the outcome in our main specification. See online Appendix Tables A15 and A16 for full results. Compared to students who enroll but do not graduate, a TEC graduate earns professional and course certificates that increase their predicted probability of being employed in the health sector by 5.9 percentage points (on a base of 5.5 percentage points). Similarly, a TEC graduate earns program credits that increase their predicted probability of being employed in the health sector by 1.9 percentage points (on a base of 5.0 percentage points). These effects are of similar magnitude to the actual shift into employment in healthcare. Together, these findings suggest that TEC helps its graduates accumulate credentials that enable graduates to switch to higher-earning employment sectors.

The certificate and credit data also predict an increase in hospitality employment that did not materialize. Some TEC graduates get general credentials or earn dual credits that are not associated with degree courses. These credentials predict higher employment generally, of which hospitality is a large component. Actual hotel and restaurant employment, however, falls. One interpretation of these results is that TEC graduates gain credentials that allow them to access hospitality jobs but the diploma allows them to choose more preferred career paths.

Heterogeneity.—Industry shifting varies widely by race and gender groups. Online Appendix Tables A17 to A20 show the extent of industry switching by subgroup. White women largely drive the shift into healthcare employment. Similarly, online Appendix Table A21 shows that White women similarly drive the tendency of graduates to gain more stable employment. Meanwhile, Black women, who show smaller increases in earnings, show only a fleeting shift into healthcare that disappears by

[27] See the data section for more details on how we calculate the outcome.

the fifth year.[28] White men tend to shift into manufacturing, while Black men appear more in retail and healthcare. Most groups show shifts in credentials that align with their industries of employment. Online Appendix Tables A22 to A29 show treatment effects for credentials and college credit by subgroup. White women tend to get healthcare credentials. White men are more likely to gain certificates related to manufacturing.

The results for Black women, though, suggest that this group is more likely to experience broken links in the chain that connects skill acquisition to better careers. Online Appendix Tables A22 and A26 show that Black female graduates of TEC do obtain more healthcare credentials, but these credentials do not typically turn into employment in healthcare. We cannot directly identify what links in the chain are broken. Lower returns to skill could result from labor market discrimination, differences in average skills actually acquired during school, or many other mechanisms.

VI. Conclusion

This paper documents the labor market return to a high school diploma for adults who have previously dropped out of high school. Using strategies that compare graduates to nongraduates, conditional on past earnings, we find that graduates earn 38 percent more ($849) per quarter five years after applying. These results are robust to a variety of specifications, including comparisons with positively selected nongraduates. These earnings gains result from increases in both intensive and extensive margins. Graduates have more stable earnings and stay more consistently employed in the same industry. We find evidence that graduates acquire credentials for particular skills, which drives increased earnings. Graduates are 53 percent more likely than nongraduates to be employed in the high-earning healthcare sector, which requires a unique set of technical skills. Similarly, we observe that graduates are more likely to obtain credentials in healthcare fields that facilitate this shift in sector of employment. Effects are similar for most subgroups, though Black women experience smaller earnings gains and do not transition into health fields at the same rate despite experiencing similar gains in credentials.

We estimate the expected benefits of a high school diploma among adult learners to be large—a more than $80,000 increase in discounted lifetime after-tax earnings—and graduates more than pay for the cost of their education throughout their working life. Even after accounting for the fact that not all students graduate, we estimate the MVPF for funding The Excel Center to be 20.67. This estimate suggests that the program generates $20 in benefits for each dollar spent (accounting for additional tax revenue) and exceeds that of other training programs that work with low-wage, low-education trainees. Our estimate exceeds the long-term (until age 65) MVPF estimates for JobCorps (0.18), the National Supported Work Demonstration youth (0.55), and the Job Training Partnership Act Youth program (< 0) (see Hendren and Sprung-Keyser 2020, online Appendix Table C.I). Sector-specific training programs that recruit highly motivated candidates with somewhat

[28] The difference in healthcare employment between graduates and students who dropped out is 0, and the 95 percent confidence intervals rules out increases larger than 4.9 percentage points.

higher educational attainment at program start have similar or higher returns than our estimated returns to TEC—WorkAdvance (8.85), Year Up (∞), and Project QUEST (∞)—as do reductions in the costs of community college tuition (29.46–349.51) (Hendren and Sprung-Keyser 2020).

Our results suggest that interventions that provide educational opportunities to people who have dropped out of high school could be more ambitious. Most existing efforts focus on alternative training and credentials, such as the GED, which show disappointing results. TEC instead provides a school environment that is designed for adult students but gives a path to complete a traditional diploma. While our data focuses on one set of schools, the Excel Center model has been replicated outside Indiana, and more states are allowing a legal path to a diploma for adults. A full high school degree could be a feasible option for many adults without high school credentials, and the traditional diploma likely encourages greater human capital development than the alternatives. Graduates acquire specific skills, complete credentials, and make different career choices. As a result, earnings increase. Our findings show that adults who dropped out of high school can benefit from a high school diploma that leads to success in the labor market.

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