Why Do Sectoral Employment Programs Work? Lessons from WorkAdvance

Lawrence F. Katz, *Harvard University and National Bureau of Economic Research*

Jonathan Roth, *Brown University*

Richard Hendra, *MDRC*

Kelsey Schaberg, *MDRC*

This paper examines the evidence from randomized evaluations of sector-focused training programs that target low-wage workers and combine up-front screening, occupational and soft-skills training, and wraparound services. The programs generate substantial and persistent earnings gains (12%–34%) following training. Theoretical mechanisms for program impacts are explored for the WorkAdvance demonstration. Earnings gains are generated by getting participants into higher-wage jobs in higher-earning industries and occupations, not just by raising employment. Training in transferable and certifiable skills (likely underprovided from poaching concerns) and reductions of employment barriers to high-wage sectors for nontraditional workers appear to play key roles.

This paper was prepared for the virtual conference in honor of Alan Krueger, October 16, 2020. We are grateful to David Card, Jeffrey Smith, and the conference participants for insightful comments and suggestions. The WorkAdvance demonstration is registered at the AEA RCT registry as AEARCTR-0001646. Contact the

Submitted December 10, 2020; Accepted October 29, 2021.

Journal of Labor Economics, volume 40, number S1, April 2022.
 https://doi.org/10.1086/717932

I. Introduction

US wage inequality has soared over the past four decades, with rising educational wage differentials playing a major role (Goldin and Katz 2008; Autor 2019; Autor, Goldin, and Katz 2020). A consequence has been the emergence of a large and greatly expanded economic divide between college-educated workers and those with less than a college degree. The real hourly wages of non-college-educated workers have stagnated since 1980, including a decline in real earnings of non-college-educated males (Economic Policy Institute 2020). The pathways to jobs at high-wage employers appear to be increasingly perilous for non-college-educated workers, as seen in a rise in the correlation of firm wage premiums with worker education and worker wage fixed effects (the permanent wage component that persists across employers), both in the United States (Song et al. 2019) and in Europe (Card, Kline, and Heining 2013). The decline in US worker power and institutions supporting the wages of nonelite workers (unions and the federal minimum wage) has also contributed to these trends (Stansbury and Summers 2020; Farber et al. 2021; Fortin, Lemieux, and Lloyd 2021).

One response to the large college wage premium is to expand access to college and expand training opportunities for non-college-educated workers. Credible recent evidence indicates high returns on the margin to increased access to US 4-year public universities using regression discontinuity designs at admission cutoffs (Zimmerman 2014; Smith, Goodman, and Hurwitz 2020) and to access to rationed vocational programs at community colleges in high-demand fields, such as nursing, using admission lotteries (Grosz 2020). In contrast, increases in enrollments at private for-profit colleges in the 2000s (and especially during the Great Recession and its immediate aftermath) appear to have generated low and possibly even negative labor market returns (Cellini and Turner 2019). Noncollege training options and career pathways may be particularly important for individuals who do not thrive in traditional schooling environments (Cass 2019). But US government–sponsored training and employment programs have a mixed record for youth, disadvantaged adults, and dislocated adult workers with limited cases of large persistent improvements in earnings (Stanley, Katz, and Krueger 1998; Greenberg, Michalopoulos, and Robbins 2003; Card, Kluve, and Weber 2018; Naidu and Sojourner 2020).

Sector-focused training programs (also known as sectoral employment programs) have emerged over the past few decades as a promising approach to workforce development for disadvantaged workers (typically without college degrees) that tries to meet the needs of both job seekers and employers

---

corresponding author, Lawrence F. Katz, at lkatz@harvard.edu. Information concerning access to the data used in this paper is available as supplemental material online.

(Schaberg 2020). Sectoral employment programs train job seekers for "high-quality" employment in specific industries and occupational clusters that are believed to have strong current local labor demand and opportunities for longer-term career advancement. Targeted sectors typically have included health care, information technology (IT), and manufacturing. A goal is to open the doors for individuals with nontraditional backgrounds to assist them in attaining high-wage jobs in the targeted sectors. The programs are typically led by community-based organizations, attempt to forge strong employer relationships, do some up-front screening of applicants, combine soft-skills (or work-readiness) training with occupational skills training, are involved in job development and placement, provide wraparound support services to help participants complete the program, and often include follow-up services to participants after program completion and to employers after job placement. Sector-focused programs have training components that often are 6 months or less and fill an important niche for dislocated workers and for individuals who may not thrive in traditional community college programs.

Community-based organizations originated the sectoral approach starting in the late 1980s (Mangat 2007). The promising findings of substantial earnings increases over a 2-year horizon in three mature sector-focused programs using a randomized controlled trial (RCT) in the Sectoral Employment Impact Study (SEIS) of Maguire et al. (2010) increased interest in sectoral approaches. Sector strategies have been integrated into US government–sponsored training and employment policies as a component of the 2014 Workforce Innovation and Opportunity Act (WIOA). Private-sector foundation and investor interest has also expanded for sector-focused programs offering training and wraparound services to individuals facing barriers to education and employment, as seen in the development and funding of Career Impact Bonds by Social Finance, a nonprofit social investment organization, and in the rise of innovative and comprehensive training programs focused on technology sector jobs, such as Pursuit.[1]

In this paper, we seek to better understand the sources of potential effectiveness of sectoral employment programs. We first reexamine the evidence on the impacts of sector-focused programs on earnings from four RCT-based major evaluations—the SEIS, WorkAdvance, Project Quest, and Year Up—of eight different programs/providers (with one provider, Per Scholas, appearing in two different evaluations). Programs are geared toward opportunity youth and young adults (Year Up) or broader groups of low-income (or disadvantaged) adults. Participants are disproportionately drawn from minority groups (Blacks and Hispanics), low-income households, and individuals without a college degree. The sector-focused programs evaluated in these four RCTs generate substantial earnings gains (from 14% to 38%) the

[1] See https://socialfinance.org/up-fund/ and https://www.pursuit.org/.

year following training completion. And all three evaluations with longer-term follow-ups (WorkAdvance for 6 years after random assignment, Project Quest for 11 years, and Year Up for 5 years) show substantial persistence of the early earnings gains (at 12%–34%) in the latest available year, in contrast to the fade-out of treatment impacts found for past training programs. Sector-focused programs appear to generate persistent earnings gains by moving participants into jobs with higher hourly wages rather than mainly by increasing employment rates.

We further probe the mechanisms for the earnings impacts of sector-focused programs using the individual-level data from the MDRC WorkAdvance demonstration of a common program model implemented by four different providers in three different geographic settings (New York City, Tulsa, and Northeast Ohio). We find that WorkAdvance more than doubled the share of treatment group participants working in the targeted sectors relative to the control group 2 years after random assignment. And WorkAdvance substantially served to raise earnings through improved job quality as measured by higher average earnings in the occupations and industries of the treatment group relative to the control group. Changes over time in the service mix from earlier job placements to more up-front occupational skills training at two of the sites (Towards Employment and Madison Strategies) provide suggestive evidence that the occupational and soft-skills training components are crucial and the earnings impacts do not just reflect screening and placement services.

The remainder of the paper proceeds as follows. Section II provides background on the sectoral employment programs assessed in four focal evaluations using RCTs and reexamines the core findings on earnings impacts. Section III discusses the potential role of sectoral employment programs in addressing market failures in the training and job placement markets and the theoretical mechanisms for possible persistent earnings impacts as well as general equilibrium considerations. Section IV uses the data from the WorkAdvance evaluation to explore the proposed mechanisms. Section V concludes.

II. Background on Sectoral Employment Programs and Evaluations

A. Program and Participant Characteristics

Table 1 provides an overview of four focal randomized evaluations of sectoral employment programs.[2] Each RCT randomized access to a sectoral

[2] The focal RCTs cover the eight sectoral employment programs with available medium-term impact estimates (covering 2 years or more after randomization) at the time this project started following the release of the initial impact findings from WorkAdvance in 2016 (Hendra et al. 2016).

employment program among eligible applicants who had passed preenrollment screens. Sectoral employment programs typically serve low-income adults seeking to advance in the labor market. The programs work with local employers in targeted sectors to identify in-demand occupations offering high starting wages and benefits as well as career advancement opportunities. The programs then train participants to fill such jobs and to attain an appropriate postsecondary credential or certification to enhance their employment prospects more broadly. The core idea behind sectoral employment programs is that improvements in employment-related skills strategically directed toward areas of strong (and rising) labor demand combined with intermediaries to break down barriers to employment for workers with nontraditional backgrounds for the targeted jobs should lead to durable earnings gains and advancement in the labor market.[3]

The first evaluation summarized in table 1 covers MDRC's WorkAdvance program implementing a common model across four providers operating in diverse settings: Per Scholas (in New York City) targeting the IT sector, Towards Employment (in Northeast Ohio) targeting health care and manufacturing, Madison Strategies (in Tulsa, OK) targeting transportation and manufacturing, and St. Nicks Alliance (in New York City) focused on environmental remediation.[4] The WorkAdvance evaluation enrolled participants from June 2011 to June 2013.

The common elements of the WorkAdvance model include (i) screening before enrollment to make sure participants can take advantage of the offered skills training, (ii) sector-appropriate preemployment and career-readiness services, (iii) sector-specific occupational skills training, (iv) sector-specific job development and placement services, and (v) postemployment retention and advancement services with providers attempting to maintain close continuing contact with placed participants and their employers. The primary enrollment requirements (used in preenrollment screening by WorkAdvance providers) are summarized in table 1 and include some behavioral requirements (such as passing a drug test) and skill requirements varying from sixth- to tenth-grade math and reading achievement up to a high school degree (or GED), as in the case of Per Scholas. Required attendance at preenrollment interviews and sessions is likely to play a subtler screening role for motivation and possibly other soft skills.

The four WorkAdvance providers are community-based organizations that differed in their previous experience with sector-focused employment programs, with Per Scholas being a mature sector-focused program (and having participated in the earlier SEIS evaluation), St. Nicks Alliance being

[3] The programs may also be attractive to employers to improve workforce diversity in sectors (such as IT) where minorities and women are underrepresented.

[4] Hendra et al. (2016) provides a more detailed description of WorkAdvance and the MDRC evaluation.

Table 1
Overview of Four Randomized Evaluations of Sectoral Employment Programs

Evaluation, Site	Targeted Population	Primary Skill Requirements	Sectors Targeted	Year 2 Effect on Earnings (%)	Long-Term Effect on Earnings (%)	Time Frame for Long-Term Effect
WorkAdvance:						
All sites	Low-income adults (age ≥18) meeting skill requirements	Varied by site (see below)	Varied by site (see below)	14.1***	11.5***	Year 6
Per Scholas	Low-income adults (age ≥18) meeting skill requirements	Test at tenth-grade level + high school/GED	IT	25.9***	19.6***	Year 6
Towards Employment	Low-income adults (age ≥18) meeting skill requirements	Test at sixth- to tenth-grade level (depending on track) + background cheek/drug screen	Health care, manufacturing	14.0*	7.7	Year 6
Madison Strategies	Low-income adults (age ≥18) meeting skill requirements	Test at eighth-grade level + behavioral assessment + mechanical aptitude and manual dexterity exams + driver's license	Transportation, manufacturing	12.4*	3.8	Year 6
St. Nicks Alliance	Low-income adults (age ≥18) meeting skill requirements	Test at ninth-grade level + driver's license + drug screen	Environmental remediation	1.3	12.3	Year 6

SEIS (Maguire et al 2010):						
All sites				29.4***		
Wisconsin Regional Training Partnership	Applicants meeting skill requirements	Test at sixth- to tenth-grade level (depending on track) + driver's license + drug screen	Manufacturing, construction, and health care	27.4***		
Jewish Vocational Service–Boston	Applicants with high school degree meeting skill requirements	Test at sixth- to eighth-grade level (depending on track) + high school/GED	Clerical and medical office occupations	35.0***		
Per Scholas	Applicants with high school degree meeting skill requirements	Test at tenth-grade level + high school/GED	IT	31.8***		
Project Quest (Roder and Elliott 2021)	Applicants with high school degree, early to mid-career	High school degree + 20 years of career ahead of them	Health care	−17.7**	14.9*	Year 11
Year Up (Fein, Dastrup, and Burnett 2021)	Young adults (age 18–24) with a high school diploma	Learning assessment + drug screen/background check	IT and financial services	37.7***	33.5***	Year 5

NOTE.—This table provides background information and earnings results for major randomized evaluations of sectoral employment programs. All of the programs contain the following elements: up-front screening, sector-specific and soft-skills training, relationships with local employers, and job placement assistance. Year 6 for WorkAdvance is calendar year 2018, so from 5 to 7 years after random assignment from June 2011 to June 2013. The WorkAdvance earnings impacts for year 2 are from Hendra et al. (2016, table 5.1 for individual sites and table 6.4 for the pooled impacts) and those for year 6 are from Schaberg and Greenberg (2020, table ES.2 by site and table ES.3 for the pooled results), using administrative state UI earnings records from individual states for the year 2 results and from the NDNH for the year 6 results. The SEIS earnings impacts for year 2 are from Maguire et al. (2010, table 3 for pooled estimates and tables 6, 13, and 17 for the individual programs), using survey data. The Project Quest earnings impacts for years 2 and 11 are from Roder and Elliott (2021, fig. 3), using Texas state administrative UI quarterly earnings records. The Year Up earnings impact estimates for years 2 and 5 are from Fein, Dastrup, and Burnett (2021, exhibit 3-1), using administrative quarterly earnings records from the NDNH.

* $p < .10$.
** $p < .05$.
*** $p < .01$.

a multiservice organization with 10 years of experience with vocational training programs but not with all of the elements of the WorkAdvance model, and the other two, Towards Employment and Madison Strategies, essentially creating new sector-focused programs for the WorkAdvance evaluation.[5] Career-readiness training in WorkAdvance ranged from 5 to 12 (typically full-day) sessions depending on the provider. Occupational skills training lasted 15 weeks at Per Scholas, lasted from 5 to 12 weeks at St. Nicks Alliance, and ranged across programs from 2 to 32 weeks at Towards Employment and Madison Strategies.

The earlier SEIS evaluation starting in 2003 by Public/Private Ventures studied three mature programs, including an earlier incarnation of Per Scholas focused on computer technician and computer refurbishment training as compared with the broader IT training focus and more extensive postemployment advancement services of Per Scholas in the later WorkAdvance evaluation. The other two programs in the SEIS are Jewish Vocational Service–Boston (JVS-Boston), focused on health care jobs in clerical and medical office occupations with training programs of around 20 weeks, and the Wisconsin Regional Training Partnership (WRTP), an association of employers and unions in Milwaukee that develop training programs of 2–8 weeks to meet specific employer requests targeting construction, manufacturing, and health care (Maguire et al. 2010). The WRTP is distinctive in the central role played by worker representatives in program design, administration, and operation (as emphasized by Naidu and Sojourner 2020).

Table 1 also includes the long-term evaluation of Project Quest in San Antonio by the Economic Mobility Corporation (Roder and Elliott 2018) and the large-scale national evaluation of the Year Up program by Abt Associates as part of the broader set of Pathways for Advancing Careers and Education evaluations (Fein and Hamadyk 2018). Project Quest, founded by a pair of San Antonio community-based organizations in 1992, provides long-term navigation and training services targeted at the health care sector. It supports participants to attend full-time occupational training at local community colleges for nondegree certificates and associate's degrees (such as nursing) lasting 1–3 years with longer durations for students needing to improve basic reading and math skills. Project Quest largely serves a population of Hispanic women. Year Up, founded in Boston in 2000, is a yearlong program for "disconnected" young adults (age 18–24) with a high school degree (or equivalent) that starts with a 6-month learning and development phase of classroom training on occupational skills and career-readiness (soft) skills and then involves a 6-month internship phase with students working in professional entry positions at local employers (often major corporations).

[5] Towards Employment was already running a health care training program but not with the key elements of the WorkAdvance model and expanded its training activities into the manufacturing sector for WorkAdvance.

Year Up has expanded nationally and works with a wide range of employers but focuses on IT and business and financial operations positions.

Table 2 provides summary statistics on the characteristics of the participants of the sectoral employment program evaluations. Year Up serves only young adults. The other programs serve a broader range of low-income and disadvantaged adults. The programs focused on the health care sector (such as Project Quest and JVS-Boston) are majority female, and the programs targeting other sectors (such as IT and manufacturing) are predominantly male. Overall, most (more than 75%) of the program participants are Black or Hispanic. Sectoral-employment training programs largely serve individuals without traditional postsecondary degrees. But almost all of the participants have a high school degree (or GED), and a substantial fraction have some postsecondary schooling experience. Most participants are disconnected from employment at the time of program entry, with Project Quest being the primary exception. The preenrollment screening also means that sector-focused training program participants are likely to be highly motivated and to have stronger math and literacy skills than the typical participants in employment programs targeted at low-income and disadvantaged individuals.

Table 2 also shows that the individual provider (site-level) sample sizes range from 328 for JVS-Boston to 698 for Towards Employment, with the pooled evaluation samples sizes going from 1,014 for the SEIS to more than 2,500 for Year Up and WorkAdvance. The four evaluations combined included 6,465 participants. Random assignment appears to have been well implemented in all four evaluations and at all participating sites, as seen in the balance among the observed characteristics between treatment and control groups (Maguire et al. 2010; Hendra et al. 2016; Fein and Hamadyk 2018; Roder and Elliott 2018).

B. Program Impacts on Labor Market Outcomes

We summarize the impacts of access to a sectoral employment program on an outcome for eligible applicants in each RCT summarized in table 1 through intent-to-treat (ITT) comparisons of the mean outcome of treatment group members (randomized into access to the program) minus the mean outcome of control group members (randomized out of program access).[6] Each of the four evaluations collected data on participant outcomes from follow-up surveys ranging from 18 months after random assignment for Year Up to around 2 years after for WorkAdvance and the SEIS to 6 years after for Project Quest. And three of the evaluations also collected administrative earnings records for longer-term tracking of employment outcomes covering 5 years after random assignment for Year Up, at least 6 years (and up to 8 years) for WorkAdvance, and 11 years for Project Quest.

[6] The reported ITT estimates in the studies summarized in table 1 typically control for baseline covariates.

Table 2
Characteristics of Participants in Four Randomized Evaluations of Sectoral Employment Programs

		SEIS					WorkAdvance					
	Project Quest	Pooled	WRTP	JVS-Boston	PS	Year Up	Pooled	PS	SN	MS	TE	All RCTs Pooled
Female (%)	90	53	48	88	24	41	27	13	15	16	59	40
Race:												
Black (%)	13	60	78	53	50	54	51	45	63	28	71	52
Hispanic/Latino (%)	74	21	4	19	41	31	17	36	23	6	5	26
White (%)	10	12	16	17	3	6	18	5	7	39	18	12
Education:												
Less than high school (%)	0	7	12	8	0	1	6	0	12	6	6	4
High school/GED (%)	94	75	80	74	71	52	38	37	45	36	37	52
More than high school (%)	5	18	8	18	28	48	56	63	43	58	57	44
Currently married (%)	29	18	14	22	17	7	20	18	18	29	16	15
Employed at baseline (%)	84	34	50	23	26	52	20	13	11	27	27	38
Youth (age 18–24) (%)	29	28	28	31	25	100	24	31	16	22	23	55
N	343	1,014	341	328	345	2,544	2,564	690	479	697	698	6,465

SOURCES.—Elliott and Roder (2017, fig. 1); Hendra et al. (2016, table 1.4); Maguire et al. (2010, tables 1, 5, 12, and 16); Fein and Hamadyk (2018, exhibit 3-2).

NOTE.—This table shows the percentage of participants in various demographic categories by site. Each row corresponds with a different demographic variable, and each column corresponds with a different evaluation site. The employment figure for Project Quest is employed at any time during the year before treatment assignment; for the SEIS and WorkAdvance, it is employed at baseline; and for Year Up, it is whether working a positive number of hours at baseline was reported. For Year Up participants, we infer marital status from whether they are living with a spouse/partner. MS = Madison Strategies; PS = Per Scholas; SN = St. Nicks Alliance; TE = Towards Employment.

A first question is the extent to which access to sector programs increased the training and employment services received as well as credential or certification attainment beyond the levels of the control group members (who potentially could use alternative providers, such as community colleges and other training programs, for further education and career services). Schaberg (2020, table 2) shows that all of the programs studied in the four focal evaluations generated substantial and statistically significant increases in credential and certification attainment relevant to the targeted sectors at the time of the follow-up surveys, with ITT impacts ranging from 21 percentage points for Year Up (from 16% to 37%) to around 45 percentage points for Per Scholas in both the SEIS evaluation and the WorkAdvance evaluation (from 8% to 54% in WorkAdvance).[7]

All four WorkAdvance sites produced large expansions in the receipt of any education and training, from 21 percentage points at St. Nicks Alliance to 27 percentage points at Madison Strategies, and even larger increases in the shares receiving career-readiness, job search, and postemployment services (Hendra et al. 2016, table 3.2 and fig. 3.1). Access to Year Up similarly increased the receipt of any education and training by 23 percentage points, the share taking a life skills course by 44 percentage points (from 32% to 76%), and the share receiving career counseling by 33 percentage points (Fein and Hamadyk 2018, exhibits 5.2 and 5.3). Project Quest increased the receipt of any health care certificate by 26 percentage points (from 42% to 68%) and of any education credential by 18 percentage points in the 6 years after random assignment (Roder and Elliott 2018, figs. 11 and 12).

Sectoral employment programs substantially increase training and career services received and lead to increased attainment of educational credentials and certificates, particularly those related to targeted sectors. We next examine whether increased human capital investments and employment services pay off in terms of labor market outcomes.

Table 1 summarizes the ITT impacts on earnings of each program at the common period of year 2 after random assignment and for the latest follow-up period available after year 2. Sector programs typically involve some modest decline in earnings during the period of full-time core service receipt in the first year following enrollment (or through the second year of full-time education in Project Quest). The three programs where training lasted 1 year or less all then generate large earnings increases in year 2, ranging from 14% for WorkAdvance (pooled across all four providers) to 29% for the SEIS (pooled across the three programs) to 39% for Year Up. Per Scholas strikingly yields similarly large year 2 earnings gains of 35% in its earlier version in the

[7] No information was gathered on credential receipt for JVS-Boston in the SEIS evaluation. The WRTP yielded substantial positive impacts on certification in the targeted occupations in health care (certified nursing assistant and certified medical assistant) and in construction (Maguire et al. 2010, table 10).

SEIS for participants entering around 2004 and of 26% in its later incarnation in WorkAdvance for participants entering around 2012. All three SEIS programs in different settings and targeting different sectors led to substantial year 2 earnings impacts ranging from 27% to 35%. The WorkAdvance providers generated a more heterogeneous pattern of year 2 earnings impacts, with three having (at least marginally) significant positive impacts of 12% to 26% and one (St. Nicks Alliance) having little earnings impact.

The short-term earnings gains for both WorkAdvance (pooled) and Year Up are sustained in the longer term. The Year Up earnings impact remains at 41% in year 3, persists at 34% in year 5, and averages 37% for years 3–5 combined (Fein, Dastrup, and Burnett 2021, exhibit 3.1).[8] The WorkAdvance pooled earnings gain persists at 12% in year 3, 11% in years 5 and 6 (calendar year 2017), and 12% in years 6 and 7 (calendar year 2018), as documented in Schaberg (2017, fig. 1) and Schaberg and Greenberg (2020, table 2.5).

Project Quest involves a longer full-time up-front training period than the other training programs, with most participants still in full-time education in year 2. Project Quest earnings impacts using Texas state administrative earnings data are modestly negative in the first 2 years after random assignment, turn positive (but not significantly so) in year 3, and become larger and statistically significantly positive in years 4–6, reaching 21% in year 6 and persisting at 18% in year 9, 17% in year 10, and 15% in year 11 (Roder and Elliott 2021, fig. 3).[9] The Project Quest earnings gains average 17% when pooled from years 3–11.

Sectoral employment programs appear to generate substantial earnings increases in the year following training completion that persist in the evaluations with longer-term follow-up evidence.[10] To what extent do sectoral

[8] An earlier, much smaller-scale RCT evaluating Year Up by Economic Mobility Corporation (with 102 treatment group members and 41 control group members) also found large ITT earnings gains of 64% in year 2 and 34% in year 3 (Roder and Elliott 2014). The earnings impact faded a bit to 12% in year 4. But the dynamic pattern of earnings impacts is difficult to interpret in this evaluation since control group members were allowed to reapply to Year Up after 10 months and about 30% of the control group participated in Year Up in the second and third years after random assignment.

[9] A quite similar pattern of Project Quest impacts on earnings for years 1–6 is found in the survey data from the 6-year follow-up survey (Roder and Elliott 2019, fig. 5). And the Project Quest findings of substantial returns for women of training for higher-wage health positions are comparable to those for community college nursing programs (Grosz 2020) and Workforce Investment Act training (Jacobson and Davis 2017).

[10] Schaberg (2020) summarizes the findings from three other randomized evaluations of sector-focused programs initiated after the focal evaluations summarized in table 1. We discuss the more recent evaluations and contrast their findings to those of the focal evaluations in sec. IV.H.

employment programs lead to persistent earnings increases by raising employment rates, hours worked per week, or hourly wages (through employment in higher-quality jobs)? The sectoral employment programs do seem to noticeably raise employment rates in the period following initial job placement after training completion, as seen in an increase in current employment by 5.3 percentage points at the time of the year 2 survey in WorkAdvance pooled (Hendra et al. 2016, table 6.4), of 5 percentage points in the year 2 employment rate in the SEIS pooled (Maguire et al. 2010, table 3), and of 3–5 percentage points in quarterly employment rates for Year Up in year 2 (Fein and Hamadyk 2018, exhibit 6-3). But program employment impacts faded out in year 3 for Year Up (Fein and Hamadyk 2018, exhibit 6-3) and by years 5 and 6 for WorkAdvance (Schaberg and Greenberg 2020, table 2.5). Project Quest generated little persistent impact on quarterly employment rates (Roder and Elliott 2019, fig. 7). Year Up in year 2 and Project Quest in years 4–6 do generate substantial increases in full-time employment rates, and the SEIS programs lead to substantial increases in monthly hours worked in year 2. But increases in employment rates and hours worked do not appear to be large enough and persistent enough to produce the observed persistent gains in earnings.

The findings from the follow-up surveys for all four evaluations suggest that the earnings gains are substantially driven by increasing the share of participants working in higher-wage jobs. The pooled results indicate that WorkAdvance increased the share of participants employed and with an hourly wage above $15 an hour in year 2 by 5.5 percentage points, from 20.8% to 26.3% (based on table 5.1 of Hendra et al. 2016), with Per Scholas raising the share by 16.2 percentage points. The positive impacts of WorkAdvance on higher-wage employment persist through year 6, with a gain in the share with earnings more than $30,000 being 7.2 percentage points in year 5 and 6.4 percentage points in year 6 (Schaberg and Greenberg 2020, table 2.5). The pooled SEIS result shows that the programs increased the year 2 share with earnings above $11 an hour by 13 percentage points, from 42% to 55%, and the share with earnings above $13 an hour by 8 percentage points, from 13% to 24% (Maguire et al. 2010, table 3). Project Quest increased the fraction earning over $15 an hour in year 6 by 11 percentage points, from 34% to 46% (Roder and Elliott 2018, fig. 8). And Year Up shows the most dramatic impact on high-wage employment in tripling the share at 18 months who are working and earning at least $15, from 15% to 46% (Fein and Hamadyk 2018, exhibit 6-4). Year Up even increased the share of participants earning over $20 an hour by 11.1 percentage points, from 3.5% to 14.6%.

The strong impacts of sector programs on employment in higher-wage jobs are likely to be facilitated by substantial positive impacts on the share of participants gaining employment in the targeted sectors for the occupational skills training and career services. All of the programs with information available generated large treatment impacts on employment in the target sectors at the time of the follow-up surveys. WorkAdvance increased employment in the targeted sectors by more than 12 percentage points at all four providers, including by more than 40 percentage points for Per Scholas (Hendra et al. 2016, fig. 6.1). Project Quest increased the share working in health care by 12 percentage points, from 31% to 43% at year 6 (Roder and Elliott 2018, fig. 10). Year Up increased the percentage of participants working in a targeted occupation by 28 percentage points, from 18% to 46%, and similarly increased the share in jobs requiring at least midlevel skills by 28 percentage points, from 15% to 43% in year 2 (Fein and Hamadyk 2018, exhibit 6-4).

The estimated earnings gains from access to high-performing sectoral employment programs summarized in table 1 are among the largest found in evaluations of US training and employment services programs. The Year Up impact of 40% earnings gains in years 2 and 3 (covering the first 2 years following training completion) compare quite favorably to those of other comprehensive youth and young adult programs. For example, RCTs evaluating the Job Corps, YouthBuild, and New York City's Young Adult Internship Program all yield earnings impacts of under 10% at 3–4 years after random assignment using administrative earnings data (Bloom and Miller 2018; Schochet 2021). Year Up is distinctive in the extent of preenrollment screening and focus on training, internships, and placements in higher-wage positions. The earnings gains of 15% or more 2–11 years after random assignment in the SEIS, Per Scholas in WorkAdvance, and Project Quest are larger than those for traditional programs for adults, such as the Adult and Dislocated Worker programs under WIOA (previously the Workforce Investment Act [WIA]) evaluated in the WIA Gold Standard RCT or the earlier Job Training Partnership Act adult programs (Stanley, Katz, and Krueger 1998; McConnell et al. 2019).

A remaining issue is the extent to which the earnings gains for participants generated by sectoral employment programs outweigh the program costs.[11] Schaberg and Greenberg (2020, chap. 3) provide a detailed benefit-cost analysis of the WorkAdvance program over a 5-year horizon. The net program costs for WorkAdvance (in 2018 dollars) comparing direct program costs to comparable service costs for the control group range from $4,459 for Per Scholas to $7,527 for St. Nicks Alliance. The cumulative estimated earnings

[11] Hendren and Sprung-Keyser (2020) provide welfare analyses of the WorkAdvance, Year Up, and Project Quest programs using a marginal value of public funds (MVPF) approach and the early estimated earnings impacts. Year Up looked particularly promising on an MVPF basis and would look even more favorable after accounting for the observed larger earnings gains persisting beyond year 3 found by Fein, Dastrup, and Burnettt (2021). All three programs are projected to yield an infinite MVPF (with the present value of increased tax payments from the higher earnings of participants being greater than program costs) if the observed medium-term proportional earnings gains persist over the remainder of the participants' careers.

gains from Per Scholas over 5 years of $28,661 are much larger than net (or gross) program costs, and adding in the value of participant fringe benefit gains further improves the net benefits to society from the program. Towards Employment and Madison Strategies also look favorable on the societal benefit-cost measure over 5 years, but St. Nicks Alliance does not. The societal benefit-cost value of WorkAdvance will be more favorable to the extent earnings gains are sustained beyond 5 years. Direct program costs for Project Quest are around $10,500 per participant (not including additional costs of postsecondary institutions), indicating that cumulative earnings gains likely outweigh program costs by year 9 (Roder and Elliott 2018). Fein, Dastrup, and Burnett (2021) perform a benefit-cost analysis of Year Up covering the first 5 years after random assignment. They find societal net benefits of $38,484 (mainly from the large participant earnings gains) that substantially outweigh the net program costs of $23,135, yielding a 1.66-to-1 benefit-cost ratio already at a 5-year horizon.

III. Possible Mechanisms

Sectoral employment programs can potentially play a role in assisting low-wage workers without postsecondary degrees who may not be able to thrive in traditional postsecondary education institutions (at least without additional supports) and may not be considered by employers for positions with training and career advancement prospects.[12] Sector-focused training programs attempt to increase participants' market-valued human capital through occupational skills, soft-skills, and career-readiness training. The programs also help overcome social capital deficits (such as limited job referral networks) and employer discrimination through preemployment services, job development and placement activities, and a brokering and vouching role with employers. The up-front screening for motivation and basic skills by sectoral employment programs may reduce high-wage employers' hesitation to consider nontraditional job candidates. The postemployment follow-up services and continuing connection to participants and communication with employers can help resolve emerging workplace problems and help workers to handle life shocks that otherwise might derail their labor market progress. The postplacement involvement of program staff may also better allow participants to overcome problems of supervisor implicit bias and discrimination against minority and nontraditional employees in work assignments and career advancement opportunities (Glover, Pallais, and Pariente 2017). The

[12] See Hendra et al. (2016, chap. 1) for a discussion of the labor market obstacles facing low-wage workers and how the WorkAdvance model was designed to respond to these barriers to advancement. Enhanced support services for low-income community college students through the Accelerated Study in Associates Programs have been found in two RCTs (in New York City and Ohio) to greatly increase persistence and degree completion rates (Gupta 2017; Miller et al. 2020).

focus on sectors with current and expected strong labor demand and close staff involvement with employers may serve to reduce the misalignment with the labor market that is thought to hinder some publicly sponsored training programs.

We now outline several specific theoretical mechanisms that could potentially explain the promising experimental earnings impacts of sector-focused training programs. We then discuss the distinctive empirical predictions of each of the models.

Static (or persistent) inefficiencies in training provision.—One explanation for why sector-focused training programs may return large gains is that the market may underprovide training in transferable skills useful at multiple employers in particular sectors. Imperfect labor market competition (monopsony power) or labor market frictions leading to wages below marginal products combined with uncertainty about future worker turnover at the time of training investment will generate a "poaching externality," leading incumbent employers to underprovide valuable training in transferable skills, since part of the return will accrue to future employers (Stevens 1994; Acemoglu and Pischke 1999). The key ingredients are as follows. Suppose that certain skills are valuable to multiple firms in a sector. If workers can switch between firms (possibly with some switching cost), then the marginal value for a particular firm of providing its employee with training is lower than the social benefit of training, since the worker may leave the firm and thus some of the benefit of training will accrue to other firms. If workers are credit constrained or face imperfect information and are not able to invest in the training themselves, then training may be further underprovided even though its societal marginal benefits exceed its cost. Intermediaries may also serve to reduce the onboarding costs of employers for newly trained employees. Sector-focused training programs could be effective by increasing the provision of valuable transferable sector-specific skills that are underprovided by employers. The close involvement of sectoral employment program staff with employers in targeted sectors may help staff to recognize the types of training that are underprovided because of poaching concerns but highly valued by employers.

Dynamic adjustments and inefficiencies in training provision.—A second explanation is that sector-focused training providers might be particularly attuned to changes in the demand for different skills in their targeted sectors. Thus, the programs may be able to redesign training offerings to speed up labor supply adjustments and allow participants to realize the (possibly temporary) higher wage premia in expanding occupations. For example, the ability of Per Scholas to shift its training offerings from computer refurbishing and repair in the early 2000s to a wider range of in-demand IT skills in the 2010s may be a key to how the program produced large earnings gains for participants, in both the earlier SEIS and the later WorkAdvance evaluations spanning these two periods of the rapidly changing IT skills market.

Benefits of wraparound services.—A third possibility is that the primary benefits of the programs is not actually the sector-focused training but rather the provision of wraparound services, including life skills training and job placement and retention services. If employers in high-wage sectors do not generally consider candidates with the backgrounds of the typical sector-focused training program participants, even if they are potentially qualified for open positions, then such services may be essential for matching such disadvantaged candidates to appropriate jobs. Occupational skills training and employment services are likely to be complements with the training improving participants qualifications for high-wage positions and the intermediary services breaking down discriminatory barriers.

Predictions of the different explanations.—We now discuss some predictions of each of the models and how one might use these predictions to distinguish between them.

- Both the static underprovision model and the dynamic adjustment model predict that sectoral employment programs should increase the likelihood that participants obtain jobs in higher-wage sectors (industries and occupations). If trainees do not gain increased entry into high-earning sectors and occupations, we would interpret this as evidence against these two models. Wraparound services alone may also help participants gain increased entry into high-earning sectors, but they also could largely speed up job search and improve earnings from increased employment without increased hourly wages.
- A key distinction between the dynamic adjustment model and the static underprovision model is whether the earnings gains should fade over time: in the static model, the earnings gains should be persistent, whereas the dynamic model predicts that may fade as other trainees enter the profession and erode a transitory wage premium.
- If the wraparound services alone model is correct, then workers should realize similar gains if they receive only these services and not the sector-focused training programs. As we discuss in more detail below, the WorkAdvance demonstration provides some evidence for this prediction, since two of the sites began with a placement-first model in which they attempted to place job seekers before providing them with sectoral skills training.

Of course, several of these mechanisms may be at play simultaneously, so finding evidence in favor of one mechanism does not necessarily preclude a role for the others (e.g., sustained earnings impacts do not preclude a role for sectoral programs in reducing dynamic inefficiencies, especially if training geared to short-run high-wage placements also breaks down barriers to longer-run career advancement).

General equilibrium considerations.—A concern in the interpretation of evaluations of the impact of employment services programs using individual-level RCTs is that the observed gains in employment and earnings for the treatment group over the control group could partially come at the expense of the control group (or other competing job seekers) through displacement effects if the stock of vacancies is relatively fixed or slow to adjust (Naidu and Sojourner 2020) or through skill price effects in narrowly targeted occupations (Heckman, Lochner, and Taber 1998). Although the existing RCTs do not provide direct evidence on the general equilibrium impact of sectoral training programs, several features of these programs likely mitigate negative general equilibrium impacts.

Crépon et al. (2013) use a clever two-level clustered randomized experiment of job search assistance to young unemployed job seekers in France and find evidence for substantial displacement effects in weak labor markets (with high unemployment and likely job rationing) but not in tight labor markets (with low unemployment), where increased job search effort and placement services might speed up the filling of vacancies and expand employment. Sectoral employment programs are designed to minimize displacement effects by focusing job placement efforts on positions in high demand and rapidly expanding parts of the labor market. Since sector-focused programs appear to raise participant earnings by increasing employment in high-wage jobs, typically with substantial training or postsecondary education requirements, the other workers potentially displaced from such positions are likely well suited to gain employment in comparable outside options.

To the extent that the earnings gains from sectoral employment programs are driven by increased human capital from training, these earnings gains are likely to substantially reflect aggregate earnings (and productivity) gains. Aggregate gains are especially likely if the programs correct market inefficiencies by expanding transferable occupational skills training that is underprovided by employers from poaching externalities. If the training programs are customized too much to the idiosyncratic needs of single employers, one may be more worried about enhancing such employers' monopsony power with possibly negative spillovers on the wages of coworkers in similar jobs. But sectoral programs try to tailor occupational skills training to help participants earn broader industry-recognized credentials to improve outside options and career mobility prospects. Furthermore, the wraparound services, connections to employers, and training provided by sectoral employment programs may help improve the economy's allocational efficiency and contribute to economic growth by reducing the discriminatory barriers to human capital accumulation and employment in high-skill positions for talented underrepresented minority and disadvantaged workers.[13]

[13] Hsieh et al. (2019) provide suggestive evidence from changes in occupational distributions integrated into a general equilibrium growth model that such reductions

IV. Evidence from WorkAdvance

In this section, we use data from the WorkAdvance randomized evaluation as a lens for investigating the mechanisms by which sectoral training programs affect participant labor market outcomes. WorkAdvance attempted to implement a common sector-focused model across four providers: Per Scholas, St. Nicks Alliance, Madison Strategies, and Towards Employment. We present pooled results across the providers and for each individual provider.

A. Data

Our analysis uses the following sources of data, many of which were obtained via a confidential data use agreement with MDRC.

Quarterly unemployment insurance (UI) data.—We obtained quarterly data from the UI agency in each of the three states containing a WorkAdvance experimental site: New York (Per Scholas and St. Nicks Alliance), Oklahoma (Madison Strategies), and Ohio (Towards Employment). The data contain each participant's quarterly earnings subject to UI within the relevant state. The data cover the period from 12 quarters (3 years) before random assignment through 12 quarters (3 years) after random assignment for all sites. For the three sites other than Madison Strategies, the data extend through 20 quarters (5 years) after random assignment. The limitations of the data are the failure to capture out-of-state earnings and earnings from self-employment, gig, and informal work.[14]

Baseline survey data.—All participants in the WorkAdvance experiment were required to fill out a baseline survey before the randomization occurred. The survey provides demographic information, such as age, race, gender, highest level of education, employment status at the time of randomization, and whether the person had worked previously in the targeted sector.

Two-year follow-up survey.—We also obtained data from a follow-up survey conducted by MDRC approximately 2 years after random assignment. The 2-year follow-up survey asked several important questions about the respondent's current or most recent job, including their occupation, the industry of the employer, and whether the work was in the targeted sector. Respondents were also asked to report their income over the previous year. The survey was administered between 18 and 30 months after random assignment, and the average respondent received the survey 22 months after random assignment. The survey achieved an overall response rate of 80%.

in barriers to human capital investment and employment for women and minorities have been a major factor accounting for as much as 40% of aggregate US productivity growth since 1960 but at a declining rate in recent decades.

[14] Schaberg and Greenberg (2020, app. A) find little difference in estimated earnings impacts of WorkAdvance in the individual state UI data and in the more comprehensive National Directory of New Hires administrative UI earnings data covering all states so that one can track earnings outside the baseline state.

The response rate was slightly higher for the treatment group (83%) than for the control group (77%). Hendra et al. (2016, app. A) explore the representativeness of the follow-up survey sample by provider and find little evidence of nonresponse bias and similar employment and earnings impacts using the survey and UI administrative earnings data.

Occupation data.—As part of the 2-year follow-up survey, respondents were asked to describe their current or most recent job since the time of random assignment with the following question: "What kind of work [do/did] you do? That is, what [are/were] your main duties in this job?" We converted the free-form responses to Standard Occupational Classification (SOC) system codes as follows. First, we used the O*NET-SOC AutoCoder software developed by R. M. Wilson Consulting for the Department of Labor to automatically match the free-form responses to six-digit SOC codes.[15] The AutoCoder was able to classify 88% of the survey responses. We then employed workers on Amazon Mechanical Turk (MTurk) to code the remaining 12% of responses for which the SOC AutoCoder could not produce a match. Appendix section A1 provides additional details about the procedure for MTurk workers.

We then used these SOC codes to compute the average annual earnings for workers in the respondent's occupation. Specifically, we used data from the pooled 2013–15 Integrated Public Use Microdata Series (IPUMS) American Community Survey (ACS) samples, which correspond roughly with the timing of the 2-year survey, since WorkAdvance participants were randomized into treatment between 2011 and 2013. We computed the average annual wage income (INCWAGE in IPUMS) in these ACS waves for each SOC code. The SOC codes contained in the ACS data are based on a question about their current or most recent job in the past 5 years; this closely mirrors the question asked to WorkAdvance respondents, with the one difference being that the WorkAdvance respondents were asked about the most recent job since randomization (roughly 2 years). We then matched each WorkAdvance respondent to the most granular SOC code available in the ACS (i.e., six digits if available; if not then five digits, and so on). See table A1 for additional details on the match process. Respondents who were not employed in the time since random assignment are coded as having occupational earnings of zero.[16]

[15] We are grateful to Bob Wilson of R. M. Wilson Consulting for providing us with the AutoCoder results.

[16] We compute occupation-level earnings, without residualizing against average education or other employee characteristics, for two reasons. First, we are trying to measure whether WorkAdvance enables trainees to gain employment in higher-paying occupations either from a high earnings premium relative to education or from high education and training requirements. Second, it is natural to code occupation-level earnings as zeros for participants who were not employed since random assignment. It

Industry data.—We have two sources of data on the industry in which WorkAdvance participants worked. First, the state UI administrative data for Madison Strategies (Oklahoma) and Towards Employment (Ohio) contain the North American Industry Classification System (NAICS) code for the establishment in which the participant worked. Second, respondents to the 2-year follow-up survey were asked to describe the industry of their current or most recent job since random assignment via the following question: "In what kind of business or industry is that employer? What did they make or what service did they provide?" We employed workers on MTurk to match the free-form responses to this question to NAICS industry codes. Finally, we matched these data to data on industry-level earnings in the ACS using a process analogous to that described for occupation-level earnings above. Appendix section A2 provides additional details on this process as well as comparisons of the results from the administrative data and the MTurk coding when both are available.

B. Empirical Specification

We present ITT estimates of the impacts of eligibility for WorkAdvance services from a series of regressions of the form

$$Y_i = Treatment_i\beta + X_i\gamma + \epsilon_i, \qquad (1)$$

where Y_i is an outcome of interest (e.g., earnings, average earnings in occupation), $Treatment_i$ is an indicator for whether individual i was randomized into the WorkAdvance treatment group, and X_i is a vector of control variables. For our main specifications, X_i includes only a constant. The results are not sensitive to including the same baseline control variables as in Hendra et al. (2016) and Schaberg and Greenberg (2020), as illustrated for our main outcomes in table A5. All regressions use White heteroskedasticity-robust standard errors. We report regression results pooling across all sites as well as results disaggregated by site. We focus primarily on the first 3 years after random assignment, for which data are available for all sites; see Schaberg and Greenberg (2020) for longer-run results through 6 years after random assignment.

C. Basic Impacts on Earnings and Employment

Figure 1 reports the pooled ITT effects for quarterly earnings using the state UI data for the first 12 quarters following random assignment (the latest quarter for which data are available for all sites). The regression specification described above is run separately for earnings in each quarter after random assignment. The WorkAdvance program exhibits negative treatment effects

is not clear how earnings for such individuals should be coded if occupation-level earnings are residualized against education status.

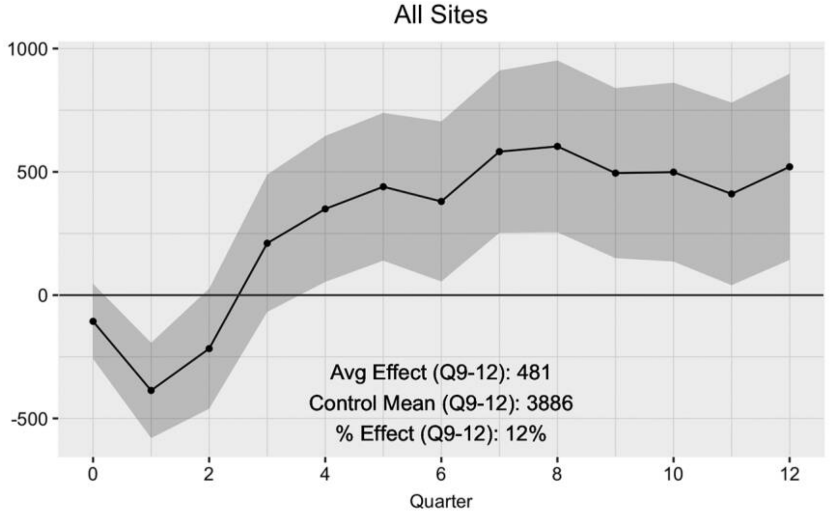

FIG. 1.—Impacts of WorkAdvance on earnings by quarter since random assignment. This figure shows the earnings impacts of WorkAdvance eligibility by quarter since random assignment. The results pool across the four evaluation sites. The black lines show point estimates, and the gray shading represents 95% confidence intervals calculated using White heteroskedasticity-robust standard errors.

in the first 2 quarters after random assignment—the period during which treated individuals were in training—and positive effects thereafter. The estimated treatment effects grow from approximately quarters 3 to 7 after random assignment and are subsequently stable at around $500 per quarter. As shown in the first column of table 3, the program increased mean annual earnings by $1,965 dollars in years 2 and 3 after random assignment, a 13% increase relative to the control mean.

Table 3
Impacts of WorkAdvance on Annual Earnings in Years 2 and 3

	All (1)	PS (2)	MS (3)	TE (4)	SN (5)
Treatment effect	1,965***	4,877***	870	1,532	−90
	(609)	(1,329)	(1,092)	(935)	(1,555)
Control mean	14,636***	15,769***	15,167***	12,309***	15,659***
	(425)	(882)	(779)	(668)	(1,143)
% effect	13.43***	30.93***	5.73	12.44	−.58
	(4.44)	(9.66)	(7.41)	(8.09)	(9.90)
Observations	2,564	690	697	698	479

NOTE.—The dependent variable is average annual earnings in years 2 and 3 after random assignment. White heteroskedasticity-robust standard errors are reported in parentheses. The "% effect" row shows the treatment effect as a percentage of the control mean, with standard errors calculated using the delta method. Results are shown pooling across sites (col. 1) and by site. MS = Madison Strategies; PS = Per Scholas; SN = St. Nicks Alliance; TE = Towards Employment.
*** $p < .01$.

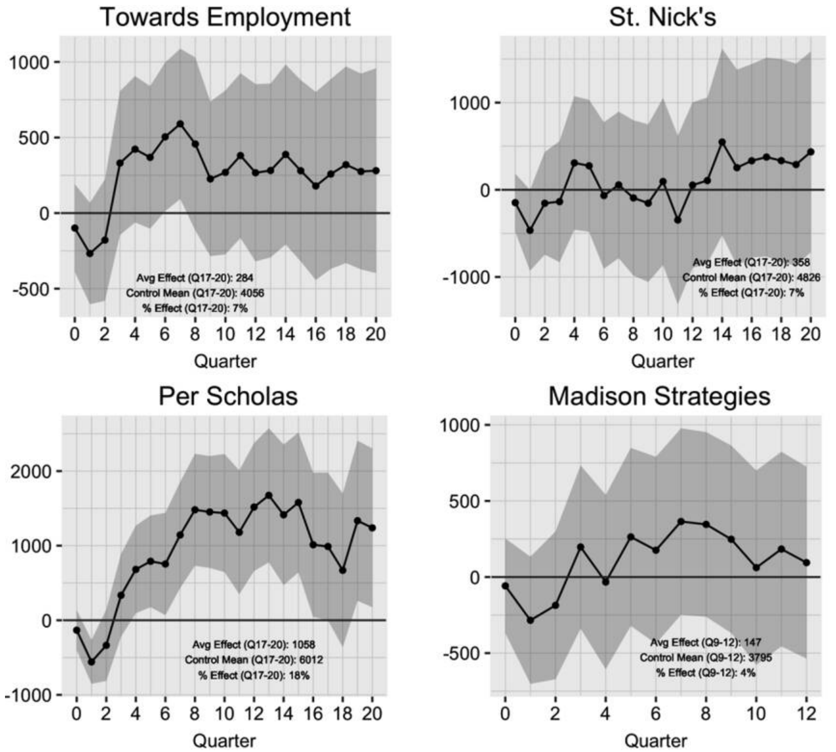

FIG. 2.—Impacts of WorkAdvance on earnings by quarter since random assignment, by site. This figure shows the earnings impacts of WorkAdvance eligibility by quarter since random assignment for each of the four WorkAdvance sites. The black lines show point estimates, and the gray shading represents 95% confidence intervals calculated using White heteroskedasticity-robust standard errors.

Figure 2 disaggregates the quarterly earnings results by site and extends the results through quarter 20 for the sites with longer-run data. The results are strongest for Per Scholas, which has quarterly earnings impacts of around \$1,500 in the third year after random assignment. The point estimates for Towards Employment and Madison Strategies are also positive after the initial training period, although they are smaller in magnitude than those for Per Scholas and not always statistically significant. The estimates for St. Nicks Alliance indicate treatment effects close to zero in most quarters and are never statistically significant. Table 3 presents results by site for the mean annual earnings ITT effects for years 2 and 3 after random assignment, showing a 13% earnings gain overall ranging from essentially no impact for St. Nicks Alliance to a 31% gain for Per Scholas.

Table 4 shows the impact of WorkAdvance eligibility on the number of quarters with positive earnings in years 2 and 3, a proxy for employment.

Table 4
Impacts of WorkAdvance on Quarters with Positive Earnings in Years 2 and 3

	All (1)	PS (2)	MS (3)	TE (4)	SN (5)
Treatment effect	.25**	.56**	.03	.36	−.05
	(.12)	(.22)	(.23)	(.23)	(.29)
Control mean	5.03***	4.92***	5.25***	5.06***	4.80***
	(.09)	(.17)	(.16)	(.17)	(.20)
% effect	4.93**	11.44**	.53	7.20	−1.12
	(2.44)	(4.84)	(4.32)	(4.75)	(5.94)
Observations	2,564	690	697	698	479

NOTE.—The dependent variable is the number of quarters with positive earnings in years 2 and 3 after random assignment. White heteroskedasticity-robust standard errors are reported in parentheses. The "% effect" row shows the treatment effect as a percentage of the control mean, with standard errors calculated using the delta method. Results are shown pooling across sites (col. 1) and by site. MS = Madison Strategies; PS = Per Scholas; SN = St. Nicks Alliance; TE = Towards Employment.
** $p < .05$.
*** $p < .01$.

Pooled across site, the WorkAdvance program had a positive effect of 0.25 quarters, which is 5% of the control mean. The magnitude of this effect (5%) relative to the effect on earnings (13%) suggests that it is unlikely that the earnings effect of WorkAdvance can be attributed only to increasing the number of quarters worked. Indeed, if this were the case, then participants would have had to earn about 1.5 times as much (13/5) in the marginally induced quarters of work than the average for the control group, which seems implausible. We conclude that WorkAdvance likely substantially increased earnings for participants who would have worked anyway, in addition to modestly increasing the employment rate.

Table 5 shows the impact of WorkAdvance eligibility on the probability that an individual has average annual earnings above a given threshold in years 2 and 3 after random assignment. Specifically, we use the thresholds $10,000, $20,000, and $30,000, which correspond roughly with the median, 70th percentile, and 85th percentile of the control distribution. Pooling across sites, we find that treatment group participants are respectively 5 percentage points (10%), 7 percentage points (23%), and 4 percentage points (27%) more likely to earn above the three thresholds. Per Scholas generated the largest impact in getting participants into high-wage jobs, increasing the share earning more than $30,000 by 9 percentage points (50%).

D. Impacts on Working in the Targeted Sector

Table 6 shows the impact of WorkAdvance eligibility on whether an individual's current or most recent job was in the targeted sector, as reported on the 2-year follow-up survey.[17] Overall, the program increased work in the

[17] The targeted sector was described as "information technology" for Per Scholas; "pest control," "hazmat commercial driver," or "environmental remediation" for

Table 5
Impacts of WorkAdvance on Having Annual Earnings Above a Given Threshold in Years 2 and 3

	All (1)	PS (2)	MS (3)	TE (4)	SN (5)
	Impacts on Having Annual Earnings Above $10,000 in Years 2 and 3				
Treatment effect	.05***	.11***	.01	.07*	.01
	(.02)	(.04)	(.04)	(.04)	(.05)
Control mean	.51***	.53***	.54***	.47***	.51***
	(.01)	(.03)	(.03)	(.03)	(.03)
Observations	2,564	690	697	698	479
	Impacts on Having Annual Earnings Above $20,000 in Years 2 and 3				
Treatment effect	.07***	.14***	.04	.05	.04
	(.02)	(.04)	(.04)	(.03)	(.04)
Control mean	.30***	.31***	.33***	.25***	.29***
	(.01)	(.03)	(.03)	(.02)	(.03)
Observations	2,564	690	697	698	479
	Impacts on Having Annual Earnings Above $30,000 in Years 2 and 3				
Treatment effect	.04***	.09***	.04	.03	.005
	(.01)	(.03)	(.03)	(.02)	(.04)
Control mean	.15***	.18***	.15***	.09***	.18***
	(.01)	(.02)	(.02)	(.02)	(.03)
Observations	2,564	690	697	698	479

NOTE.—The dependent variable in each column is an indicator variable for having average annual earnings above selected thresholds in years 2 and 3 after random assignment. White heteroskedasticity-robust standard errors are reported in parentheses. Results are shown pooling across sites (col. 1) and by site. MS = Madison Strategies; PS = Per Scholas; SN = St. Nicks Alliance; TE = Towards Employment.
* $p < .10$.
*** $p < .01$.

targeted sector by 24 percentage points relative to the control mean of 21 percentage points, an increase of more than 100%. The effects are large and statistically significant across all four WorkAdvance sites, with magnitudes following the pattern of earnings impacts being largest for Per Scholas (42 percentage points) and smallest for St. Nicks Alliance (11 percentage points).

We note that if WorkAdvance eligibility affected earnings (in year 2) only through employment in the targeted sector (as of the year 2 survey), then instrumental variable (IV) estimates would imply that working in the targeted sector increases annual earnings by about $10,500. For comparison, within the control group individuals who work in the targeted sector earn about $5,000 more than those who do not.[18] We would expect the cross-sectional

St. Nicks Alliance, depending on the training received; "health" or "manufacturing" for Towards Employment; and "manufacturing" or "transportation or aerospace manufacturing" for Madison Strategies. Table A4 shows similar results using the alternative in-sector measure used in Hendra et al. (2016).

[18] To make the most direct comparison, we calculate these numbers using earnings in year 2 only, since the in-sector variable is measured as of the year 2 survey. We

Table 6
Impacts on Working in Targeted Sector

	All (1)	PS (2)	MS (3)	TE (4)	SN (5)
Treatment effect	.24***	.42***	.23***	.18***	.11***
	(.02)	(.04)	(.04)	(.04)	(.04)
Control mean	.21***	.18***	.21***	.31***	.10***
	(.01)	(.02)	(.03)	(.03)	(.02)
Observations	2,034	549	551	554	380

NOTE.—The dependent variable is an indicator variable for working in the targeted sector, as reported on the year 2 survey. White heteroskedasticity-robust standard errors are reported in parentheses. Results are shown pooling across sites (col. 1) and by site. MS = Madison Strategies; PS = Per Scholas; SN = St. Nicks Alliance; TE = Towards Employment.
*** $p < .01$.

relationship in the control group to overstate the earnings premium of working in the targeted sector if more advantaged individuals are more likely to obtain such jobs. It therefore seems unlikely that the WorkAdvance earnings gains operate only through increasing employment in the targeted sector at the types of jobs control group members can attain. WorkAdvance may also improve the quality of positions attained in the targeted sectors (perhaps through placements into higher-wage employers in those sectors). It might also increase earnings for treatment group members working outside the targeted sector by improving transferable skills and improving opportunities in the targeted sector (outside options).[19] In other words, WorkAdvance likely increased earnings for some participants for whom treatment status did not affect whether they worked in the targeted sector (either "always takers" who would have worked in the targeted sector regardless of treatment or "never takers" who would have not worked in the targeted sector regardless of treatment status).[20]

E. Impacts on Occupation-Level and Industry-Level Earnings

We next examine the effects of WorkAdvance eligibility on the quality of one's occupation and industry, as measured by the average annual earnings for individuals in that occupation or industry in the ACS.

For initial context, we report in table 7 the two most common occupations among WorkAdvance participants in the treatment group who report working in the targeted sector. The table highlights the types of occupations that

also restrict attention to survey respondents. See table A3 comparing earnings impacts for the full sample and survey respondents.

[19] Hendra et al. (2016, chap. 6) provide more detailed descriptive evidence on the characteristics of jobs of treatment group members in the target sector vs. nontarget sectors.

[20] An alternative explanation could be that the "in-sector" variable is measured with error, in which case the cross-sectional relationship for the control group would be attenuated but the IV estimates would not.

Table 7
Most Common In-Sector Occupations for Treated WorkAdvance Participants by Site

Site, SOC Code	Occupation Description	Average Earnings (ACS)
Per Scholas:		
15-1151	Computer user support specialists	48,959
15-1142	Network and computer systems administrators	62,944
St. Nicks Alliance:		
37-2021	Pest control workers	27,193
47-4041	Hazardous materials removal workers	32,838
Madison Strategies:		
53-3032	Heavy and tractor-trailer truck drivers	30,464
53-3033	Light truck drivers	30,464
Towards Employment:		
39-9021	Personal care aides	13,026
31-1014	Nursing assistants	18,803

Note.—This table reports the two most common six-digit SOC codes among treated WorkAdvance participants who report working in the targeted sector. We restrict to participants whose survey responses were successfully autocoded or for which there was a consensus among the MTurk coders. The average earnings column reports the average earnings in the ACS for participants in the relevant six-digit SOC code or in a coarser five-digit or four-digit SOC code if six-digit granularity is not available in the ACS (explaining the identical average earnings for the two occupations listed for Madison Strategies).

modal participants may receive if they are successfully placed in the targeted sector. Reassuringly, the modal occupations appear to align with the industries targeted by each site, as reported in table 1. There is also a notable range in the average occupation-level earnings as reported in the ACS, with network and computer systems administrators (the second most common occupation for Per Scholas) earning more than \$60,000 per year and personal care

Table 8
Impacts of WorkAdvance on Average Occupation-level Earnings

	All (1)	PS (2)	MS (3)	TE (4)	SN (5)
Treatment	4,789***	12,592***	2,467**	2,212*	218
	(763)	(1,694)	(1,249)	(1,291)	(1,587)
Control mean	25,264***	27,748***	27,506***	21,160***	24,713***
	(528)	(1,258)	(898)	(893)	(1,048)
% effect	18.96***	45.38***	8.97*	10.45	.88
	(3.31)	(7.76)	(4.76)	(6.42)	(6.45)
Observations	2,037	545	557	556	379

Note.—This table shows the control mean and the treatment effect of WorkAdvance eligibility for the average annual earnings in one's occupation. Column 1 shows results pooling across sites, and the remaining columns disaggregate by site. White heteroskedasticity-robust standard errors are reported in parentheses. The "% effect" row shows the treatment effect as a percentage of the control mean, with standard errors calculated using the delta method. See sec. IV.A and app. sec. A1 for details on how average occupation-level earnings are calculated. MS = Madison Strategies; PS = Per Scholas; SN = St. Nicks Alliance; TE = Towards Employment.
* $p < .10$.
** $p < .05$.
*** $p < .01$.

Table 9
Impacts of WorkAdvance on Average Industry-Level Earnings

	All (1)	PS (2)	MS (MTurk) (3)	MS (UI) (4)	TE (MTurk) (5)	TE (UI) (6)	SN (7)
Treatment	3,372***	9,503***	964	−385	2,497*	3,877***	−914
	(818)	(1,763)	(1,468)	(1,306)	(1,439)	(1,221)	(1,630)
Control mean	32,039***	33,629***	36,096***	30,982***	28,522***	25,700***	29,133***
	(580)	(1,235)	(1,111)	(961)	(1,033)	(866)	(1,134)
% effect	10.52***	28.26***	2.67	−1.24	8.76*	15.08***	−3.14
	(2.69)	(6.01)	(4.13)	(4.19)	(5.28)	(5.12)	(5.51)
Observations	2,046	551	558	697	557	698	380

NOTE.—This table shows the control mean and the treatment effect of WorkAdvance eligibility for the average annual earnings in one's industry. Column 1 shows results pooling across sites, and the remaining columns disaggregate by site. Columns 4 and 6 show results using administrative data for the two sites where it is available; the remaining columns use NAICS classifications coded by MTurk workers. White heteroskedasticity-robust standard errors are reported in parentheses. The "% effect" row shows the treatment effect as a percentage of the control mean, with standard errors calculated using the delta method. See sec. IV.A and app. sec. A2 for details on how average industry-level earnings are calculated. MS = Madison Strategies; PS = Per Scholas; SN = St. Nicks Alliance; TE = Towards Employment.

* $p < .10$.
*** $p < .01$.

aides (the most common occupation for Towards Employment) earning only $13,000.

Table 8 shows the results for the causal impact of WorkAdvance eligibility on the average earnings in one's occupation. Pooling across sites, individuals in the treatment group were in occupations with average earnings $4,789 dollars higher than in the control group, a 19% increase over the control mean of $25,264. When disaggregating by site, the results are largest for Per Scholas (around $12,600, or 45%) but are positive for the other sites and statistically significant at the 10% level for Madison Strategies and Towards Employment, each of which have estimated effects around $2,000 (or about 10%).

Table 9 shows the analogous results for the impact of WorkAdvance eligibility on the average earnings in one's industry. Pooling across sites, those in the treatment group were in industries with average earnings $3,372 higher than in the control group, an 11% increase relative to the control mean. The results are concentrated primarily in Per Scholas ($9,503, or 28%) and Towards Employment (around 12% averaged across the two approaches to coding industry); we do not find significant impacts on average industry earnings for Madison Strategies or St. Nicks Alliance.

Interestingly, both the treatment effect and the control mean for average industry-level and occupation-level earnings are higher than the corresponding treatment effect and control mean for actual earnings for WorkAdvance participants. The implication is that WorkAdvance participants tend to have lower-than-average earnings within their industry/occupation. This finding suggests that the WorkAdvance treatment could increase the absolute impacts on earnings to the extent individuals remain and move up the career ladder in similar industries/occupations, converging closer to the industry- or occupation-level averages over time.[21]

To understand how well the impacts of WorkAdvance eligibility on occupation/industry quality explain the earnings impacts, it is again instructive to consider the implied IV estimates if we thought that this was the only channel by which WorkAdvance eligibility impacted earnings. If increasing occupation-level earnings (in year 2 after random assignment) were the only channel by which WorkAdvance eligibility increased earnings (in year 2 after random assignment), IV estimates would suggest that an additional dollar of occupation-level earnings translates to 56 cents of annual earnings.[22] For

[21] Schaberg and Greenberg (2020) find only limited evidence for such a pattern in longer-run analyses of WorkAdvance earning impacts by provider through 5 years after random assignment using state UI data. But the findings for calendar 2018 from National Directory of New Hires (NDNH) data do indicate larger absolute earnings impacts 5–7 years out for the pooled sample and for Per Scholas and St. Nicks Alliance.

[22] All IV estimates in this section use year 2 earnings, since our measures of industry and occupation quality are based on the year 2 survey. These numbers also restrict attention to survey respondents. See table A3 for a comparison of earnings impacts for the full sample and for survey respondents.

comparison, among control units a dollar of occupation-level earnings is associated with only 23 cents of earnings. Likewise, if increasing industry-level earnings were the only channel by which WorkAdvance eligibility increased earnings, IV estimates would suggest that an additional dollar of industry-level earnings translates to 74 cents of annual earnings, whereas the cross-sectional coefficient is only 27 cents. The fact that the IV estimates are so much larger than the cross-sectional estimates is suggestive that the WorkAdvance treatment likely operates through increasing occupation/industry-level earnings as well as other mechanisms. However, measurement error in the occupation/industry-level earnings measure, which would attenuate the cross-sectional relationship, could also contribute to the gap between the IV and cross-sectional estimates.

How much can the impacts of WorkAdvance on occupation and industry quality be explained by increasing the share of work in the targeted sector? Tables 10 and 11 show cross tabulations of average occupation-level and industry-level earnings by treatment status, respectively, and whether one reported working in the targeted sector. Once we condition on in-sector status, the average occupation-level and industry-level earnings are generally quite similar for treatment and control groups (both pooling

Table 10
Occupation-Level Earnings by Treatment and In-Sector Status

	Not in Sector (1)	In Sector (2)	All (3)
All sites:			
Control	23,637	31,208	25,246
Treated	24,273	36,960	30,035
Per Scholas:			
Control	23,329	48,207	27,748
Treated	27,709	48,747	40,302
Madison Strategies:			
Control	27,138	28,561	27,445
Treated	26,275	34,571	29,943
Towards Employment:			
Control	19,922	24,080	21,222
Treated	20,148	26,603	23,341
St. Nicks Alliance:			
Control	24,022	29,516	24,590
Treated	23,403	30,820	24,982

Note.—This table shows the average occupation-level earnings for WorkAdvance participants by treatment status and whether the participant worked in the targeted sector as of the year 2 survey. The control means in col. 3 differ slightly from those reported in table 7, since a small number of observations did not respond to the in-sector question on the survey.

Table 11
Industry-Level Earnings by Treatment and In-Sector Status

	Not in Sector (1)	In Sector (2)	All (3)
All sites:			
Control	29,235	42,008	31,948
Treated	27,716	44,579	35,369
Per Scholas:			
Control	29,431	52,658	33,582
Treated	27,124	53,939	43,119
Madison Strategies:			
Control	34,340	41,560	35,891
Treated	32,544	42,693	37,031
Towards Employment:			
Control	24,146	38,454	28,617
Treated	22,549	39,385	30,907
St. Nicks Alliance:			
Control	28,487	32,353	28,887
Treated	27,747	30,062	28,237

NOTE.—This table shows the average industry-level earnings for WorkAdvance participants by treatment status and whether the participant worked in the targeted sector as of the year 2 survey. The control means in col. 3 differ slightly from those reported in table 8, since a small number of observations did not respond to the in-sector question on the survey.

across sites and site by site).[23] However, occupation-level and industry-level earnings are higher for individuals working in the targeted sector. One needs to be cautious in interpreting these numbers, since in-sector status is endogenously determined. Nevertheless, we interpret this as suggestive evidence that the impacts of WorkAdvance treatment on occupation and industry quality operate largely through increasing work in the targeted sector.

Table 11 also offers one explanation for why St. Nicks Alliance appears to have relatively small earnings impacts despite having substantial impacts on working in the targeted sector (pest control or environmental remediation): average industry-level earnings are similar for individuals working in and out of the targeted sector. Furthermore, comparing across providers in tables 10 and 11, we see that the gap between in-sector earnings for the treated group and the average earnings for the control group is largest for Per Scholas (IT), medium for Towards Employment (health care or manufacturing) and Madison Strategies (transportation or manufacturing), and smallest for St. Nicks Alliance, which is in line with the earnings impacts. The WorkAdvance findings thus suggest larger earnings impacts from programs focused on higher-wage target sectors. The even larger 38% earnings impact from Year Up (table 1) and its targeting of high-wage IT, business, and finance sector positions similarly fits this pattern.

[23] One exception to this is Madison Strategies, for which in-sector treated individuals have larger occupation-level earnings than in-sector controls.

Table 12
Treatment Effects and Control Means on Annual Earnings in Years 2 and 3 by Cohort

	All (1)	PS (2)	MS (3)	TE (4)	SN (5)
Treatment:					
Early	1,458*	6,339***	−923	625	−1,748
	(803)	(1,757)	(1,499)	(1,142)	(1,853)
Late	2,429***	3,141	2,633*	2,142	1,570
	(909)	(2,012)	(1,563)	(1,421)	(2,544)
Control mean:					
Early	13,019***	13,750***	14,360***	10,019***	14,362***
	(557)	(1,134)	(1,110)	(810)	(1,418)
Late	16,366***	18,164***	15,901***	14,667***	17,263***
	(641)	(1,362)	(1,092)	(1,041)	(1,857)
p-value: treatment early = treatment late	.42	.23	.1	.41	.29
Observations	2,564	690	697	698	479

NOTE.—This table shows treatment effects and control means for the effect of WorkAdvance eligibility on average annual earnings in years 2 and 3 after random assignment. The results are disaggregated on the basis of whether participants were in the early or late cohort. White heteroskedasticity-robust standard errors are reported in parentheses. The table presents p-values for the hypothesis that the treatment effects are the same for the early and late cohorts. MS = Madison Strategies; PS = Per Scholas; SN = St. Nicks Alliance; TE = Towards Employment.
* $p < .10$.
*** $p < .01$.

F. Comparison of Early and Late Cohorts

Table 12 shows a comparison of the earnings impacts of WorkAdvance when disaggregating by whether a participant was in the early or late assignment cohort, where, following Hendra et al. (2016), participants are classified as being in the early cohort if they were randomly assigned to treatment/control in or before the third quarter of 2012. The motivation for examining results separately by cohort is twofold. First, the three WorkAdvance sites other than Per Scholas were new to sectoral training, so examining cohort effects sheds light on whether the program impacts grow over time as the sites gained experience. Second, Madison Strategies and Towards Employment both initially implemented a “mixed model” in which they attempted to place half of the participants in jobs prior to providing training. Anecdotally, the providers found that the placement-first approach had subpar results, and they largely abandoned this model for the later cohort, almost all of whom received training before placement. Differences between the earlier and later cohorts for these two sites may therefore be indicative of the relative merits of the placement-first and training-first regimes. (Unfortunately, the choice of training-first or placement-first was not randomly assigned, nor was it recorded in the data.) The pooled point estimates indicate somewhat larger treatment effects for the later cohorts, and the point estimates are also larger for three of the four sites (Per Scholas being the exception). The differences are not statistically significant at conventional levels, however (the difference for Madison Strategies is marginally significant at $p = .1$). We thus find this suggestive but inconclusive evidence regarding whether program strength increased over time and the relative merits of the placement-first versus training-first models.

G. Longer-Run Outcomes

Our analysis so far has focused on outcomes in the first 3 years after random assignment, since UI data are available for all sites for this period and our measures of occupation and industry come from the year 2 survey. As shown in table 1, Schaberg and Greenberg (2020) find that WorkAdvance continues to have a significant 12% impact on earnings in year 6 after random assignment, using data from the NDNH.

We complement the analysis in Schaberg and Greenberg (2020) by evaluating how well earnings and occupation/industry quality in year 2 proxies for longer-run outcomes. In table 13, we report regressions of annual earnings in years 4 and 5 on earnings in year 2 and either occupation- or industry-level earnings as derived from the year 2 survey. We find that earnings and occupation/industry quality in year 2 together explain a substantial share of the variation in longer-run outcomes, with an R^2 of around 0.4. Additionally, industry/occupation quality remains a significant predictor of long-run outcomes even after controlling for year 2 earnings. We interpret this as suggestive evidence that improving industry/occupation quality in the short run is a mediator for improving long-run outcomes.

Table 13
Year 2 Outcomes as a Proxy for Earnings in Years 4 and 5

	Dependent Variable: Annual Earnings in Years 4 and 5			
	(1)	(2)	(3)	(4)
Occupation-level earnings (year 2)	.292***	.108***		
	(.031)	(.027)		
Industry-level earnings (year 2)			.310***	.108***
			(.029)	(.027)
Earnings (year 2)		.800***		.806***
		(.038)		(.039)
Constant	12,452.800***	5,753.059***	10,473.200***	5,182.012***
	(867.829)	(705.072)	(934.100)	(787.489)
Observations	1,480	1,480	1,488	1,488
R^2	.065	.395	.077	.404

Note.—This table shows regressions of annual earnings in years 4 and 5 on earnings in year 2 and our measures of occupation- or industry-level average earnings derived from the year 2 survey. The regressions are pooled across the three sites for which long-run UI data are available (all sites except Madison Strategies) and are restricted to observations for which we have information on industry- or occupation-level earnings. White heteroskedasticity-robust standard errors are reported in parentheses.

*** $p < .01$.

H. Implications for Mechanisms

We now discuss the implications of our analysis as they relate to the possible mechanisms discussed in section III.

First, our analysis demonstrates clearly that WorkAdvance treatment gets participants into higher-earning industries and occupations, and these gains appear to be primarily associated with increased work in the targeted sector. These findings are thus highly consistent with the static and dynamic inefficiency models, where the primary mechanism is getting trainees into better-paying industries and occupations.

Second, the sustained positive earnings gains from WorkAdvance through year 6 after random assignment—and for Year Up through year 5 and Project Quest through year 11—suggest that the gains from sectoral training programs are not merely the result of smoothing over transitory shocks in labor demand, at least if transitory is defined on the timescale of 5–10 years. This points in favor of the static, rather than dynamic, inefficiency model. Nevertheless, we cannot fully rule out that the gains from sectoral training may fade out over even longer horizons as the demand for the trained skills diminishes. Moreover, the results are consistent with a modified version of the static inefficiencies model, in which training participants in high-demand skills allows them to overcome barriers to entry to high-paying sectors with greater career advancement opportunities.

Third, we interpret both the anecdotal and empirical evidence from the early cohorts at Madison Strategies and Towards Employment, in which some participants were provided wraparound services without sectoral training, as suggestive evidence against the hypothesis that the wraparound services are the main component of the earnings gains from these programs. This evidence must be interpreted with caution, however, given that the placement-first model was not randomly assigned and the differences across cohorts are imprecisely estimated. Still, persistent earnings gains from programs emphasizing human capital accumulation in addition to support services as compared with those more focused on job search assistance and early job placement is a systematic pattern documented in the cross-country meta-analysis of active labor market program evaluations by Card, Kluve, and Weber (2018). Even if we conclude that wraparound services alone are not sufficient to generate the earnings gains in high-performing sectoral employment programs, it remains plausible that these services are an important complement to the sectoral skills training.

Several additional randomized evaluations of sector-focused programs have released results following the initial findings from WorkAdvance and the other focal programs summarized in table 1. The more recent evaluations have a somewhat mixed pattern of findings. The Accelerated Training for Illinois Manufacturing program targeted high-wage manufacturing positions and generated a 55 percentage point increase in certificate attainment and a 28% earnings increase in year 2, almost identical to the earnings gain found in the WRTP with a similar focus (Betesh et al. 2017). The Pathways to Health Care Program of Pima Community College, focused on longer-term postsecondary degree programs for health, led to large increases in postsecondary credentials but not to detectable earnings gains by year 3, echoing the early findings for Project Quest (Litwok and Gardiner 2020). But three recent evaluations of health-focused programs with medium-term training (6–8 months)—the Health Professional Opportunity Grants (Peck et al. 2018), San Diego Workforce Partnership's Bridge to Employment (Farrell et al. 2020), and Seattle-King County Health Careers for All (Glosser and Judkins 2020) programs—also have not generated detectable earnings gains through 3 years following random assignment. In contrast to the large increases in receipt of training and education found for the focal sectoral employment programs, these more recent health-focused programs generated little gains in training for the treatments relative to the controls and appear to have targeted relatively lower-wage health care occupations than Project Quest.

V. Conclusion

This paper reviewed the evidence from four RCTs evaluating US sectoral employment programs. We outlined several possible mechanisms behind the substantial earnings gains generated for participants in these programs and used data from the WorkAdvance demonstration as a lens for evaluating these mechanisms. Although not entirely conclusive regarding the mechanisms, the evidence shows that sectoral training programs operate in large part by getting participants into higher-wage jobs in higher-earning industries and occupations rather than just by increasing employment rates. A combination of up-front screening of applicants on basic skills and motivation, both occupational skills (targeted to high-wage sectors and leading to an industry-recognized credential) and soft-skills/career-readiness training, wraparound support services for participants, and strong connections to employers characterize the sector-focused training programs producing the largest and most persistent earnings gains, such as Year Up, Per Scholas, the WRTP, and Project Quest. The support services may be particularly important for participants subject to repeated life course shocks and for participants who may find it difficult to thrive in more traditional postsecondary educational institutions.

Training for transferable skills valued by many firms in a sector may be underprovided through on-the-job training by individual employers given poaching concerns. Sectoral employment programs appear to be able to play a role in filling this gap. The transferable and certified nature of the skills imparted in occupational skills training by sector-focused training programs may be a key element of the durability of the observed earnings gains for participants and in helping minority workers gain opportunities in high-wage sectors. Alfonsi et al. (2020) similarly find in an RCT for disadvantaged youths and young adults in Uganda that up-front vocational training leading to certified and transferable sector-specific skills generates more persistent earning gains than idiosyncratic firm-provided training of the same duration. The provision of both technical skills and soft-skills training may also be essential as seen in an RCT of a vocational training program in Colombia by Barrera-Osorio, Kugler, and Silliman (2020).

Sectoral employment programs have proven successful in improving the earnings trajectories for low-wage workers without college degrees but with sufficient motivation and basic skills (testing at a sixth- to tenth-grade level and with a high school degree or GED) to gain program entry. An issue going forward is the extent to which the sectoral training model can be effective if expanded to cover a broader population of disadvantaged workers by weakening the up-front screening criteria. It might be possible to create pathways for more disadvantaged individuals unable to initially pass the preenrollment screens to progress from youth development programs (such as YouthBuild) or transitional (subsidized) jobs into a sector-focused program, as proposed by Bloom and Miller (2018).

Sector-focused training programs, such as Per Scholas and Year Up, have responded to the COVID-19 pandemic through speeding up the implementation of remote (online) versions of their training and support services (Lohr 2020). Crucial research questions going forward are how effective are remote as compared with in-person versions of sectoral employment programs and whether remote versions will allow the more rapid and lower-cost scaling up of successful evidence-based training programs.

Appendix

A1. Details on Coding of Occupations and Calculation of Occupation-Level Earnings

We now provide additional details on the coding of occupations used to calculate occupation-level earnings. As described in section IV.A, 88% of (nonblank) survey responses were automatically coded using the O*NET-SOC AutoCoder. The remaining 12% were coded using MTurk. For the MTurk coding, we assigned each survey response to three master MTurk workers and asked them to match the survey response to a six-digit SOC code. We then selected the most granular SOC code at which at least two of the three workers agreed. If at least two workers agreed on a six-digit SOC code, then we would use a six-digit code; if not, then we would check whether at least two workers agreed on the first five digits; if they did not, we checked whether they agreed on the first four digits. A majority of MTurk workers agreed up to at least four digits in 76% of cases. For the remaining cases, we used the average of the earnings for each of the codes provided by the workers. We then matched the derived SOC codes to average annual earnings in the ACS. Not all six-digit SOC codes appear in the ACS, so we again started by matching on six-digit SOC codes, and if there was no match, we tried five-digit and then four-digit codes. Survey respondents who did not work since random assignment were assigned occupation earnings of zero. A small fraction (<1%) of survey respondents worked since random assignment but did not answer the question describing their job; these respondents had occupational earnings set to NA (analogous to survey nonrespondents).

Table A1
Determination of Occupation-Level Earnings

SOC Code Match Type	N	Percentage	Cumulative Percentage
1. Autocoded—matched using six-digit SOC	862	42	42
2. Autocoded—matched using five-digit SOC	725	35	77
3. Autocoded—matched using four-digit SOC	52	3	80
4. MTurk coded—matched using six-digit SOC	87	4	84
5. MTurk coded—matched using five-digit SOC	75	4	88
6. MTurk coded—matched using four-digit SOC	16	1	88
7. MTurk coded—No consensus; used average of codings	57	3	91
8. Not employed; occupational earnings set to 0	163	8	99
9. Employed, did not answer survey question; occupational earnings set to NA	16	1	100
10. Other	1	0	100

A2. Details on Coding of Industries and Calculation of Industry-Level Earnings

The process for computing industry-level earnings is similar to that used for the occupation-level earnings. As discussed in section IV.A, we used MTurk workers to classify the industries of respondents to the 2-year follow-up survey. For two of the sites, Madison Strategies and Towards Employment, we also have NAICS codes from the UI agencies.

The process of coding the industry responses using MTurk was similar to that described for occupations. We provided respondents' descriptions of their job and the industry of their employer to three master MTurk workers. We then selected the most granular NAICS code at which at least two of the workers agreed. If there was not consensus up to at least two digits, we computed the average industry-level earnings across the codes provided by the three MTurk workers. We then matched these NAICS codes to the corresponding industry-level earnings in the ACS. Survey respondents who did not work since random assignment were assigned industry-level earnings of zero. A small fraction (<1%) of survey respondents worked since random assignment but did not answer the question describing their job; these respondents had industry-level earnings set to NA and were removed from the analysis (analogous to survey nonrespondents). Table A2 shows a breakdown of how the NAICS code was determined for survey respondents.

For Madison Strategies and Towards Employment, the UI agencies provided quarterly data with the earnings and NAICS code of each establishment in which the individual worked. To facilitate comparison between the industry results obtained using the UI data and the MTurk codings of the survey data, we examined the job held by an individual 2 years (8 quarters) after random assignment or, if the individual did not hold a job in that quarter, the most recent job held since the time of random assignment. For participants with multiple jobs in the relevant quarter, we selected the one with the highest earnings. This selection process mimics as closely as possible the results of the 2-year follow-up survey, which asked respondents about their current or most recent job since the time of randomization. The timing does not align perfectly, however, as the survey was administered approximately 2 after random assignment but may not have been administered exactly at 24 months. Nonetheless, there is moderately high agreement between the NAICS codes obtained via MTurk and those from the UI data. Among participants where NAICS codes are available from both data sources and the MTurk workers reached a consensus of at least two digits, the first two digits of the MTurk consensus matched the first two digits from UI data in 47% of cases. The correlation between average earnings at the industry level computed using the MTurk data and average earnings at the industry level using the UI data is 0.43 in the sample where both are available.

Table A2
Determination of Industry-Level Earnings

NAICS Code Match Type	*N*	Percentage	Cumulative Percentage
1. Matched using four-digit NAICS	710	35	35
2. Matched using three-digit NAICS	602	29	64
3. Matched using two-digit NAICS	357	17	81
4. No consensus; used average of MTurk codings	214	10	92
5. Not employed; industry earnings set to zero	163	8	100
6. Employed, did not answer survey question; industry earnings set to NA	8	0	100

Table A3
Earnings Impacts for the Full Sample and Survey Respondents

	Dependent Variable			
	Earnings in Year 2		Annual Earnings in Years 2 and 3	
	(1)	(2)	(3)	(4)
Treatment	2,005***	2,411***	1,965***	2,512***
	(606)	(685)	(609)	(683)
Control mean	13,726***	14,124***	14,636***	14,896***
	(424)	(485)	(425)	(479)

Table A3 (*Continued*)

	Dependent Variable			
	Earnings in Year 2		Annual Earnings in Years 2 and 3	
	(1)	(2)	(3)	(4)
% effect	14.61***	17.07***	13.43***	16.87***
	(4.74)	(5.28)	(4.44)	(4.98)
Sample	Full	Survey	Full	Survey
Observations	2,564	2,058	2,564	2,058

NOTE.—This table shows the treatment impacts of WorkAdvance eligibility on earnings in year 2 and mean earnings in years 2 and 3 after random assignment. Columns 1 and 3 report results for the full sample, whereas cols. 2 and 4 report results for survey respondents. White heteroskedasticity-robust standard errors are reported in parentheses. The "% effect" row shows the treatment effect as a percentage of the control mean, with standard errors calculated using the delta method. Our analysis of industry and occupation quality uses the survey sample, after dropping a small number of observations for which industry/occupation could not be classified; see app. secs. A1 and A2 for details.
*** $p < .01$.

Table A4
Impacts on Working In Targeted Sector—Alternative Measure

	All (1)	PS (2)	MS (3)	TE (4)	SN (5)
Treatment effect	.23***	.42***	.15***	.18***	.13***
	(.02)	(.04)	(.04)	(.04)	(.04)
Control mean	.31***	.20***	.49***	.33***	.19***
	(.01)	(.02)	(.03)	(.03)	(.03)
Observations	2,044	551	557	555	381

NOTE.—This table shows treatment impacts of WorkAdvance eligibility on working in the targeted sector using the alternative measure of working in the targeted sector used in Hendra et al. (2016). Their alternative measure combines information from the year 2 survey question used in the main text with the free-form responses to the questions describing the occupation and industry. White heteroskedasticity-robust standard errors are reported in parentheses. MS = Madison Strategies; PS = Per Scholas; SN = St. Nicks Alliance; TE = Towards Employment.
*** $p < .01$.

Table A5
Comparison of ITT Estimates With and Without Covariate Adjustment

	Dependent Variable					
	Annual Earnings (Years 2 and 3) (1)	Annual Earnings (Years 2 and 3) (2)	Occupational Earnings (3)	Occupational Earnings (4)	Industry Earnings (5)	Industry Earnings (6)
Treatment	1,965***	1,831***	4,789***	4,555***	3,372***	3,058***
	(609)	(553)	(763)	(727)	(818)	(781)
Controls?	No	Yes	No	Yes	No	Yes
Observations	2,564	2,564	2,037	2,037	2,046	2,046

NOTE.—This table compares the ITT estimates obtained from eq. (1) when the covariate vector X_i includes only a constant (as in the main text) and when it includes the full set of covariates used in Hendra et al. (2016) and Schaberg and Greenberg (2020). We pool results across the four WorkAdvance sites. White heteroskedasticity-robust standard errors are reported in parentheses.
*** $p < .01$.

References

Acemoglu, Daron, and Jörn-Steffen Pischke. 1999. Beyond Becker: Training in imperfect labour markets. *Economic Journal* 109, no. 453:F112–F142.

Alfonsi, Livia, Oriana Bandiera, Vittorio Bassi, Robin Burgess, Imran Rasul, Munshi Sulaiman, and Anna Vitali. 2020. Tackling youth unemployment: A labor market experiment in Uganda. *Econometrica* 88, no. 6:2369–414.

Autor, David. 2019. Work of the past, work of the future. *AEA Papers and Proceedings* 109:1–32.

Autor, David, Claudia Goldin, and Lawrence F. Katz. 2020. Extending the race between education and technology. *AEA Papers and Proceedings* 110:347–51.

Barrera-Osorio, Felipe, Adriana D. Kugler, and Mikko I. Silliman. 2020. Hard and soft skills in vocational training: Experimental evidence from Colombia. NBER Working Paper no. 27548, National Bureau of Economic Research, Cambridge, MA.

Betesh, Hannah, Hui Kim, Deborah Kogan, Rachel Lindy, and Anne Paprocki. 2017. *Evaluation of Accelerated Training for Illinois Manufacturing (ATIM): Impact report*. Oakland, CA: Social Policy Research Associates.

Bloom, Dan, and Cynthia Miller. 2018. *Helping young people move up: Findings from three new studies of youth employment programs*. New York: MDRC.

Card, David, Jörg Heining, and Patrick Kline. 2013. Workplace heterogeneity and the rise of West German wage inequality. *Quarterly Journal of Economics* 128, no. 3:967–1015.

Card, David, Jochen Kluve, and Andrea Weber. 2018. What works? A meta-analysis of recent labor market program evaluations. *Journal of the European Economic Association* 16, no. 3:894–931.

Cass, Oren. 2019. *The workforce training grant: A new bridge from high school to career*. New York: Manhattan Institute.

Cellini, Stephanie R., and Nicholas Turner. 2019. Gainfully employed? Assessing the employment and earnings of for-profit college students using administrative data. *Journal of Human Resources* 52, no. 4:342–70.

Crépon, Bruno, Esther Duflo, Marc Gurgand, Roland Rathelot, and Philippe Zamora. 2013. Do labor market policies have displacement effects? Evidence from a clustered randomized design. *Quarterly Journal of Economics* 128, no. 2:531–80.

Economic Policy Institute. 2020. State of Working America Data Library: Wages by education. https://www.epi.org/data/#/?subject=wage-education&g=*.

Elliott, Mark, and Anne Roder. 2017. *Escalating gains: Project QUEST's sectoral strategy pays off*. New York: Economic Mobility Corporation.

Farber, Henry, Daniel Herbst, Ilyana Kuziemko, and Suresh Naidu. 2021. Unions and inequality over the twentieth century: New evidence from survey data. *Quarterly Journal of Economics* 136, no. 3:1325–85.

Farrell, Mary, Randall Juras, David Judkins, and Samuel Dastrup. 2020. *The San Diego Workforce Partnership's Bridge to Employment in the Healthcare Industry program: Three-year impact report*. OPRE Report no. 2020-105. Washington, DC: US Department of Health and Human Services.

Fein, David, Samuel Dastrup, and Kimberly Burnettt. 2021. *Still bridging the opportunity divide for low-income youth: Year Up's longer-term impacts*. OPRE Report no. 2021-56. Washington, DC: US Department of Health and Human Services.

Fein, David, and Jill Hamadyk. 2018. *Bridging the opportunity divide for low-income youth: Implementation and early impacts of the Year Up program*. OPRE Report no. 2018-65. Washington, DC: US Department of Health and Human Services.

Fortin, Nicole, Thomas Lemieux, and Neil Lloyd. 2021. Labor market institutions and the distribution of wages: The role of spillover effects. *Journal of Labor Economics* 39, no. S2:S369–S412.

Glosser, Asaph, and David Judkins. 2020. *Workforce Development Council of Seattle–King County's Health Career for All program: Three-year impact report*. OPRE Report no. 2020-112. Washington, DC: US Department of Health and Human Services.

Glover, Dylan, Amanda Pallais, and William Pariente. 2017. Discrimination as a self-fulfilling prophecy: Evidence from French grocery stores. *Quarterly Journal of Economics* 132, no. 3:1219–60.

Goldin, Claudia, and Lawrence F. Katz. 2008. *The race between education and technology*. Cambridge MA: Belknap.

Greenberg, David H., Charles Michalopoulos, and Phillip K. Robins. 2003. A meta-analysis of government-sponsored training program. *ILR Review* 57, no. 1:31–53.

Grosz, Michel. 2020. The returns to a large community college program: Evidence from admissions lotteries. *American Economic Journal: Economic Policy* 12, no. 1:226–53.

Gupta, Himani. 2017. *The power of fully supporting community college students: The effects of CUNY's Accelerated Study in Associates Programs after six years*. New York: MDRC.

Heckman, James J., Lance Lochner, and Christopher Taber. 1998. General equilibrium treatment effects: A study of tuition policy. *American Economic Review* 88, no. 2:381–86.

Hendra, Richard, David H. Greenberg, Gayle Hamilton, Ari Oppenheim, Alexandra Pennington, Kelsey Schaberg, and Betsy L. Tessler. 2016. *Encouraging evidence on a sector-focused advancement strategy: Two-year impacts from the WorkAdvance demonstration*. New York: MDRC.

Hendren, Nathaniel, and Benjamin Sprung-Keyser. 2020. A unified welfare analysis of government policies. *Quarterly Journal of Economics* 135, no. 3:1209–318.

Hsieh, Chang-Tai, Erik Hurst, Charles I. Jones, and Peter J. Klenow. 2019. The allocation of talent and U.S. economic growth. *Econometrica* 87, no. 5:1439–74.

Jacobson, Louis, and Jonathan Davis. 2017. The relative returns to workforce investment act-supported training by field, gender, education, and ways to improve trainees' choices. *Journal of Labor Economics* 35, no. S):S337–S375.

Litwok, Daniel, and Karen Gardiner. 2020. *Pima Community College's Pathways to Healthcare program: Three-year impact report*. OPRE Report no. 2020-43. Washington, DC: US Department of Health and Human Services.

Lohr, Steven. 2020. Gaining skills virtually to close the inequality gap. *New York Times*, June 7.

Maguire, Sheila, Joshua Freely, Carol Clymer, Maureen Conway, and Deena Schwartz. 2010. *Tuning in to local labor markets: Findings from the Sectoral Employment Study*. Philadelphia: Public/Private Ventures.

Mangat, Ravinder. 2007. *Sector snapshots: A profile of sector initiatives*. Oakland, CA: National Network of Sector Partners.

McConnell, Sheena, Peter Schochet, Dana Rotz, Kenneth Fortson, Paul Burkander, and Annalisa Mastri. 2019. Providing public workforce services to job seekers: Findings from a nationally representative multi-armed randomized controlled trial. Unpublished manuscript, Mathematica.

Miller, Cynthia, Camielle Hedlam, Michelle Mano, and Dan Cullinan. 2020. *Increasing community college graduation rates with a proven model: Three year results from the Accelerated Study in Associates Program (ASAP) Ohio demonstration*. New York: MDRC.

Naidu, Suresh, and Aaron Sojourner. 2020. *Employer power and employee skills: Understanding workforce training programs in the context of labor market power*. Unpublished manuscript, Roosevelt Institute.

Peck, Laura R., Alan Werner, Eleanor Harvill, Daniel Litwok, Shawn Moulton, Alyssa Rulf Fountain, and Gretchen Locke. 2018. *Health Profession Opportunity Grants (HPOG 1.0) Impact Study interim report: Program implementation and short-term impacts*. Washington, DC: US Department of Health and Human Services.

Roder, Anne, and Mark Elliott. 2014. *Sustained gains: Year Up's continued impact on young adult earnings*. New York: Economic Mobility Corporation.

———. 2018. *Escalating gains: The elements of Project Quest's success*. New York: Economic Mobility Corporation.

———. 2019. *Nine year gains: Project QUEST's continuing impact*. New York: Economic Mobility Corporation.

———. 2021. *Eleven year gains: Project QUEST's investment continues to pay dividends*. New York: Economic Mobility Corporation.
Schaberg, Kelsey. 2017. *Can sector strategies promote long-term effects? Three-year impacts from the WorkAdvance demonstration*. New York: MDRC.
———. 2020. *Meeting the needs of job seekers and employers: A synthesis of findings on sector strategies*. New York: MDRC.
Schaberg, Kelsey, and David H. Greenberg. 2020. *Long-term effects of a sectoral advancement strategy: Costs, benefits, and impacts from the WorkAdvance demonstration*. New York: MDRC.
Schochet, Peter Z. 2021. Long-run labor market effects of the Job Corps Program: Evidence from a nationally representative experiment. *Journal of Policy Analysis and Management* 40, no. 1:128–57.
Smith, Jonathan, Joshua Goodman, and Michael Hurwitz. 2020. The economic impact of access to public four-year colleges. NBER Working Paper no. 27177, National Bureau of Economic Research, Cambridge, MA.
Song, Jae, David J. Price, Fatih Guvenen, Nicholas Bloom, and Till von Wachter. 2019. Firming up inequality. *Quarterly Journal of Economics* 134, no. 1:1–50.
Stanley, Marcus, Lawrence F. Katz, and Alan B. Krueger. 1998. Developing skills: What we know about the impacts of American employment and training programs on employment, earnings, and educational outcomes. G8 Economic Summit briefing.
Stansbury, Anna, and Lawrence H. Summers. 2020. The declining worker power hypothesis: An explanation for the recent evolution of the American economy. *Brookings Papers on Economic Activity*, no. 1:1–96.
Stevens, Margaret. 1994. A theoretical model of on-the-job training with imperfect competition. *Oxford Economic Papers* 46, no. 4:537–62.
Zimmerman, Seth. 2014. The returns to college admission for academically marginal students. *Journal of Labor Economics* 32, no. 4:711–54.