

# The Options Multiplier: Decoding the CareerWise Youth Apprenticeship Journey

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### **About the Project on Workforce at Harvard**

The Project on Workforce is an interdisciplinary, collaborative project between the Harvard Kennedy School's Malcolm Wiener Center for Social Policy, the Harvard Business School Managing the Future of Work Project, and the Harvard Graduate School of Education. The Project produces and catalyzes basic and applied research at the intersection of education and labor markets for leaders in business, education, and policy. The Project's research aims to help shape a postsecondary system of the future that creates more and better pathways to economic mobility and forges smoother transitions between education and careers. Learn more at [www.pw.hks.harvard.edu](http://www.pw.hks.harvard.edu).

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# Executive Summary

*As more Americans question the appeal of costly higher education programs, earn-and-learn models, like apprenticeship, are attracting increasing attention from policymakers and employers alike.*

While apprenticeship is widespread in many parts of Europe, apprenticeship models in the U.S. traditionally have faced significant obstacles to scale. Federally registered apprenticeship programs have limited penetration in industries outside the skilled trades. Barriers to adoption have spanned both the supply- and demand-side: Employers struggle to navigate complex regulatory requirements and question the return on investment, while youth and families express skepticism about forgoing the traditional pathway to four-year college often viewed as the north star for economic success.

The CareerWise Colorado program, inspired by Switzerland’s youth apprenticeship system, aims to bridge the gap between high-school and postsecondary credentials by creating an “options-multiplier” model. The vision is a career-focused model from which any student, regardless of future plans, could benefit. Notably, the program emphasizes that apprenticeship is not a diversion from higher education, but rather a multiple pathways approach to both high-paying jobs and further education.<sup>1</sup>

In its operations, the program adopts a dual customer approach, targeting a diverse student population and a broad range of employers in industries and occupations with high demand for skilled workers. CareerWise calls it “a business-led, student-centered model.”<sup>2</sup> Since its launch in Colorado in 2017, the CareerWise model has scaled to New York City and Buffalo (New York), Indiana, Upper Peninsula (Michigan), and Washington D.C. At the time of publishing, CareerWise leaders had advised the efforts of seven cities or regions around the country on how to start and operate modern youth apprenticeship programs. Simply stated, CareerWise is one of the most widely cited youth apprenticeship efforts in the United States today.

However, while youth apprenticeship is both gaining steam across new geographies and party lines, there is surprisingly little research to help guide implementation of new efforts. While some past studies have found promising outcomes for learners and employers alike, most are based on programs outside the United States. Past studies also tell us relatively little about which factors enable program success.

Our research aims to fill in a hole in the evidence base by focusing on the youth apprenticeship journey. We seek to understand the pathways between education and employment that apprentices navigate over the course of a program’s lifecycle. Using internal program data from CareerWise Colorado, we study the rates of apprenticeship retention and completion by occupation, socioeconomic status, and demographics. Better understanding the factors that increase an apprentice’s likelihood to convert into a full-time employee serves two important purposes. First, we can better structure programs to ensure closer fit between participants’ goals and program outcomes. Second, we can increase program completion rates. Improving retention provides the clear benefit of improving the odds that apprentices stay on with their company after the program. But high retention also raises the likelihood that investment in youth apprenticeship yields an attractive return for employers. We believe that realizing that return will be critical if the CareerWise program is to replicate and scale over time and for apprenticeship models more broadly to thrive in America.

## Key Findings

To understand the outcomes of CareerWise youth apprentices, we used a novel dataset from CareerWise to track the journey of the 232 apprentices who started in the CareerWise Colorado 2017 and 2018 cohorts.

**We find that nearly two-thirds (64 percent) of CareerWise students achieve the program’s stated goal of serving as an “Options Multiplier”—they transition on to postsecondary education, employment, or both.**

Overall, 39 percent of apprentices in the 2017–2018 cohort completed their CareerWise apprenticeship—either completing the full three years (including the “13th year” after high school) or receiving and accepting a full-time employment offer with their apprenticeship host site prior to the three-year mark. An additional 26 percent of students did not complete their apprenticeship, but elected to pursue two-year, four-year, or technical degrees.

Analyzing the journey of all students who started in the apprenticeship cohort, we identify five primary categories of outcomes:

- **20 percent of participants become retained apprentices:** They continue working for their CareerWise apprenticeship employer at the end of the program.
- **17 percent become job switchers:** They stay employed in the labor market but work for a different employer that was not their apprenticeship host.
- **27 percent become dedicated postsecondary students:** They pursue a postsecondary credential, but are not employed while enrolled in education.
- **22 percent become high school returners:** They leave the apprenticeship early on in the program and revert to a more traditional high school experience.

Just five percent are neither working nor in school after exiting the program. For eight percent of apprentices, exit outcome data was not collected.

In addition to studying the outcomes for youth apprentices in the CareerWise program, we also sought to understand key drivers of retention and completion. We built a multivariate regression model to understand which factors captured in CareerWise's program data could predict retention. Six key insights emerge:

- **Apprenticeship match and job fit really matter:** Apprentices who indicate an interest in remaining in the same industry or field are 15 percentage points more likely to remain in the apprenticeship for more than two years. They spend two months more on average in the CareerWise program and are eight percentage points more likely to complete the apprenticeship.
- **Registered apprenticeships appear to improve retention rates:** Controlling for other factors, youth apprentices enrolled in Registered Apprenticeships are 26 percentage points more likely to complete the apprenticeship and spend seven more months on average in apprenticeship.
- **Occupational characteristics make a difference:** Apprentices on the Financial Services track are most likely to complete the program and have the highest retention rates. IT track positions (IT Support Technicians) also had above-average retention rates. In contrast, apprentices in the Business Operations and Healthcare tracks were statistically less likely to stay in the program over time.
- **Supportive supervisors increase the likelihood of apprenticeship completion:** We found that, conditional on occupation, those who report a supportive supervisor are 19 percentage points more likely to complete the apprenticeship.
- **Apprentices from high-poverty schools and Black apprentices face additional barriers to completion, especially in the first year:** Students from schools with at least 90 percent of their students on free or reduced lunch were retained five months less on average. Black students were retained six months fewer than White students. Both relationships were statistically significant. The lower retention seems to be driven for both groups by higher apprentice dropout rates in the first year. However, once they are retained past the first year, there is no difference in retention rates. For Black students, the lower retention is driven in large part, but not entirely, by occupational sorting—they are less likely to be enrolled in tracks like Advanced Manufacturing and IT that have high retention rates.
- **Competition from traditional college pathways doesn't explain who stays and who goes:** We find no statistical evidence that students who list an interest in enrolling in college are more or less likely to continue in their apprenticeship.

We also analyzed CareerWise program application data for the 2019 cohort. Our findings for this topic are suggestive, not causal, as we did not perform regression analyses on applications. However, the analysis provides additional insights that could inform the program's evolution, including disparities in applications by race, gender, and schools' socioeconomic status. For instance, while females are under-represented overall in the applicant pool, there is wide variation by industry track, with Healthcare dominated by female applicants (79 percent) and Advanced Manufacturing and IT dominated by males (77 and 75 percent of applications, respectively). Looking at race, Business Operations and Healthcare were the most diverse, whereas Advanced Manufacturing attracted majority-White applicants. Finally, we see some evidence that students from schools with high shares of low-income students fared more poorly in the acceptance process. All of these data points highlight the importance and potential of early interventions during admissions. **Targeted outreach and guidance about apprenticeship opportunities could help increase diversity and improve outcomes.**

Finally, we looked at the experience of the CareerWise apprentices through the lens of productivity (defined by employers' assessments of *the productivity of their apprentice compared to a fully trained, skilled employee in the occupation the apprentice is training towards*). By the end of the apprenticeship, **CareerWise participants appear to score remarkably similar to a benchmark statistic from Switzerland's more established system (74 percent to 75 percent)**. However, we note several reasons for caution in interpreting these scores.

# Introduction

## **This is a moment for an urgent rethinking of the relationship between earning and learning.**

Today, less than half of Americans say they think the economic benefits of a college education outweigh the costs. Young people in particular are increasingly skeptical about traditional higher education—Generation Z and Millennials express the lowest rates of satisfaction with traditional higher education, compared to older peers.<sup>3,4</sup> Meanwhile, after the COVID pandemic, colleges are facing large enrollment declines, driven in part by changing demographics and shifting attitudes towards higher education. At the time of writing, the U.S. undergraduate student body has dropped by nearly 1.4 million students, or 9.4 percent since the pandemic's onset.<sup>5</sup> The U.S. student debt crisis weighs most heavily on our youngest generations.

## **Apprenticeship models, where early-career learners earn a wage while they acquire skills to build their career path, provide a compelling pathway.**

Apprenticeships present a strong value proposition for both learners and employers. For students, learn-and-earn programs provide an opportunity to gain access to good jobs and stable careers without debt or substantial financial burden. For employers, taking a leading role in the training of their workforce brings productivity growth to their firm and earnings growth and promotion for their workers.<sup>6</sup> It reduces the likelihood of mismatches and lessens employers' exposure to risks associated with relying on the "spot market" for talent. Finally, research from the cognitive and learning sciences finds that older students learn best by doing. Training has the best results in applied contexts where learning is directly connected to the task.<sup>7</sup>

## **In the United States, Registered Apprenticeships (RAs) are typically considered the "gold standard" model.**

These programs meet a set of requirements set by the U.S. Department of Labor, including training hours, progression and advancement opportunities, and credentialing requirements. They also have a strong backing in research. For instance, in a study conducted by Mathematica Policy Research, researchers found that program participants who completed a Registered Apprenticeship program earned, on average, over \$240,000 more throughout their careers compared to nonparticipants.<sup>8</sup>

## **In spite of continued interest, RAs have traditionally struggled to scale in the U.S.**

Nationally, RA programs are heavily concentrated

in the construction trades, with a smaller but still sizable proportion in manufacturing occupations.<sup>9</sup> While opportunities exist in other industries, take-up has been limited. In 2019, the share of apprentices in the U.S. labor force was 0.32 percent, lower than the share 70 years ago.<sup>10</sup> Pre-apprenticeships are widely cited as a key entry point for youth, but prevalence is also low. Efforts in the U.S. have paled in comparison to international peers. CareerWise founder Noel Ginsburg widely cites his 2015–2016 site visits to Switzerland as inspiration for the program.<sup>11</sup> In Switzerland, over 70 percent of upper secondary school students participate in apprenticeships. In Germany, the figure is 53 percent.<sup>12</sup> Even in Canada, apprenticeships are much more in the mainstream of the skills development system. Apprentices account for about two percent of the country's workforce and 16 percent of those in postsecondary education.<sup>13</sup>

**However, the tides may be shifting for American apprenticeships.** A new white paper from Apprenticeships for America highlights a number of promising trendlines:

- The number of bills and laws referencing apprenticeship and the number of news stories about apprenticeship in the U.S. doubled from 2007 to 2022.<sup>14</sup>
- Federal funding for apprenticeship went up fivefold from 2015 to 2021.<sup>15</sup>
- In 2020 alone, 3,143 new programs were established in the US, which represented a 73 percent increase from 2009.<sup>16</sup>

**Indeed, prior research from Harvard Business School and Burning Glass, *Room to Grow*, found significant unrealized potential in apprenticeships across many occupations in the U.S. economy.**

For instance, *Room to Grow* identified that the number of occupations filled through apprenticeships in the U.S. could be nearly tripled; and that the number of job openings could be multiplied eightfold, to roughly 3.2 million.<sup>17</sup>

**Intermediaries and programs like CareerWise, however, will be integral if this growth potential is to be realized.**

In Colorado, CareerWise plays an essential role in the youth apprenticeship ecosystem—simply stated, the program built the market for youth apprenticeship in the state. In addition to facilitating the recruitment, application, and program experience for students, CareerWise serves as the bridge between the needs of the



public schools and the employers. CareerWise recruits participating schools and businesses. It also partners with both employers and educators to support program design. The organization's staff provide critical wraparound services to help support the enrolled apprentices.

**CareerWise's early traction in Colorado has captured national attention.** At the time of writing, CareerWise USA had agreed to support expansion to five communities in three additional states and Washington, D.C. In addition, CareerWise leaders have advised seven cities or regions across the country in the development of their own models. CareerWise apprentices are frequently featured in policymaker discourse. CEO Noel Ginsburg recently testified to the U.S. Congress on the expansion of apprenticeship opportunities. All these data points reflect the timeliness and broader applicability of this research.

**To create more youth apprentices in the United States, apprenticeships need to demonstrate value for three distinct stakeholder groups—** employers, education systems, and students and their families. Our research, focusing on retention and post-apprenticeship outcomes, has important implications for all three groups. Employers want to know that if they make the investment in a youth apprentice, they are likely to realize a return in the form of a productive, retained worker. School systems are looking for assurance that their students can thrive academically, professionally, and personally in such workplace settings. Similarly, families and students want past evidence to confirm that the apprenticeship route is a promising investment in their future. Our hope is that our research serves to support continued refinement of the operational model, towards all three groups' goals.

## The CareerWise Youth Apprenticeship Model

CareerWise modern youth apprentices split their time between their traditional high school classroom and the workplace. They earn a wage while receiving hands-on work experience where they can apply their classroom learning. By the conclusion of the program, students should have:

- Meaningful work experience
- A nationally recognized industry certification
- A professional network
- The opportunity to earn debt-free college credit

The CareerWise model aims to be mutually beneficial for both apprentices and employers. CareerWise emphasizes the value of apprenticeship as a dynamic investment in a company and its workforce. Businesses should receive:

- A productive employee; apprentices are a true team member doing meaningful work
- A talent pipeline of skilled, diverse workers that innovate the workforce
- A valuable connection to the community
- More leadership and growth opportunities for existing staff

### Why an Options Multiplier?

*Any student—regardless of future plans—can benefit from apprenticeship.*

*A student can start as an apprentice and end with a Ph.D., or apprenticeship can train a student to step directly into a bookkeeper position so they can go on to be a CFO. It's a model of education that reveals new, manifold access points to career and higher education.*

*Apprenticeship is not a diversion from higher education—it's a rigorous education option that combines theoretical learning with practical learning that focuses on career and education objectives. It can also be a direct path to high-paying, in-demand jobs in modern fields such as business operations, financial services, advanced manufacturing, technology, and healthcare.*

**Source:** CareerWise Colorado "How It Works"  
<https://www.careerwisecolorado.org/en/howitworks/>

**Accessed:** August 1, 2022



# Methodology

*In this report, we focus on CareerWise’s first and most mature state program, Colorado, to draw out relevant insights for the U.S. youth apprenticeship field at large. Our research links multiple CareerWise Colorado data sources to better understand the lifecycle journey of youth apprentices. We pair data from the top of the funnel, when students first apply to the program, with program and post-program data, including retention differences across apprentice track and occupation, competency evaluation ratings, race, gender, and apprentice school free and reduced lunch rates. In particular, we use this data to better understand: 1) The students and industries served 2) Apprenticeship pathways 3) Drivers of retention and 4) Factors associated with productivity.*

## Data

Unless cited otherwise, all data analyzed in this white paper comes from CareerWise Colorado’s internal program data. To create a holistic view of CareerWise students’ apprenticeship journeys, we merged four distinct datasets provided by CareerWise Colorado (see Figure 1):

Our analysis is focused on two distinct samples: Applications from 2019 to 2021, and apprenticeships that started in 2017 and 2018. For the application sample, CareerWise implemented an applicant tracking system in 2019 which allowed them to more rigorously track which students were applying to the CareerWise program and to individual apprenticeships. However, because it was implemented in 2019, data from 2017 and 2018 is not available for this analysis. As a result, we are unable to assess the application journey for the 2017 and 2018 apprentices who form the primary cohort for our analysis and, instead, we present summary application statistics for the 2019–2021 cohorts. We focus our analysis of applications on the 2019 application cycle only due to the potential impact of the COVID-19 pandemic on 2020 and 2021 applications.

For the apprenticeship sample, we focused on apprentices who joined the CareerWise program in 2017 or 2018. We chose these cohorts for two reasons: First, it allowed us to observe apprentices throughout the full apprenticeship journey, as students who start their apprenticeships in 2017 and 2018 would typically finish in 2020 and 2021 respectively. Second, these cohorts were the least

**Figure 1: Summary of Data**

Dataset Name	Description	Year	Key Data Fields
<b>Application Information</b>	Information collected by CareerWise on all applications to the CareerWise program and to individual apprenticeships	2019 2020 2021	Demographics; Application, interview, offer & acceptance status; Industries and occupations applied to
<b>Apprenticeship General Information</b>	Programmatic information collected by CareerWise on student apprenticeships and post-apprenticeship outcomes	2017 2018 2019 2020 2021	Demographics; Employer and field; Time in apprenticeship; Completion status and reason for non-completion; Education and employment exit outcomes
<b>Competency Evaluation</b>	Subjective supervisor evaluations of apprentice productivity and competency attainment (78% completion rate in 2020)	2018 2019 2020 2021	Supervisor evaluations of apprentice productivity
<b>Annual Apprentice Survey</b>	Online survey administered to apprentices annually (47% response rate in 2020)	2018 2019 2020	Challenges faced; Interaction and strength of relationship with supervisor

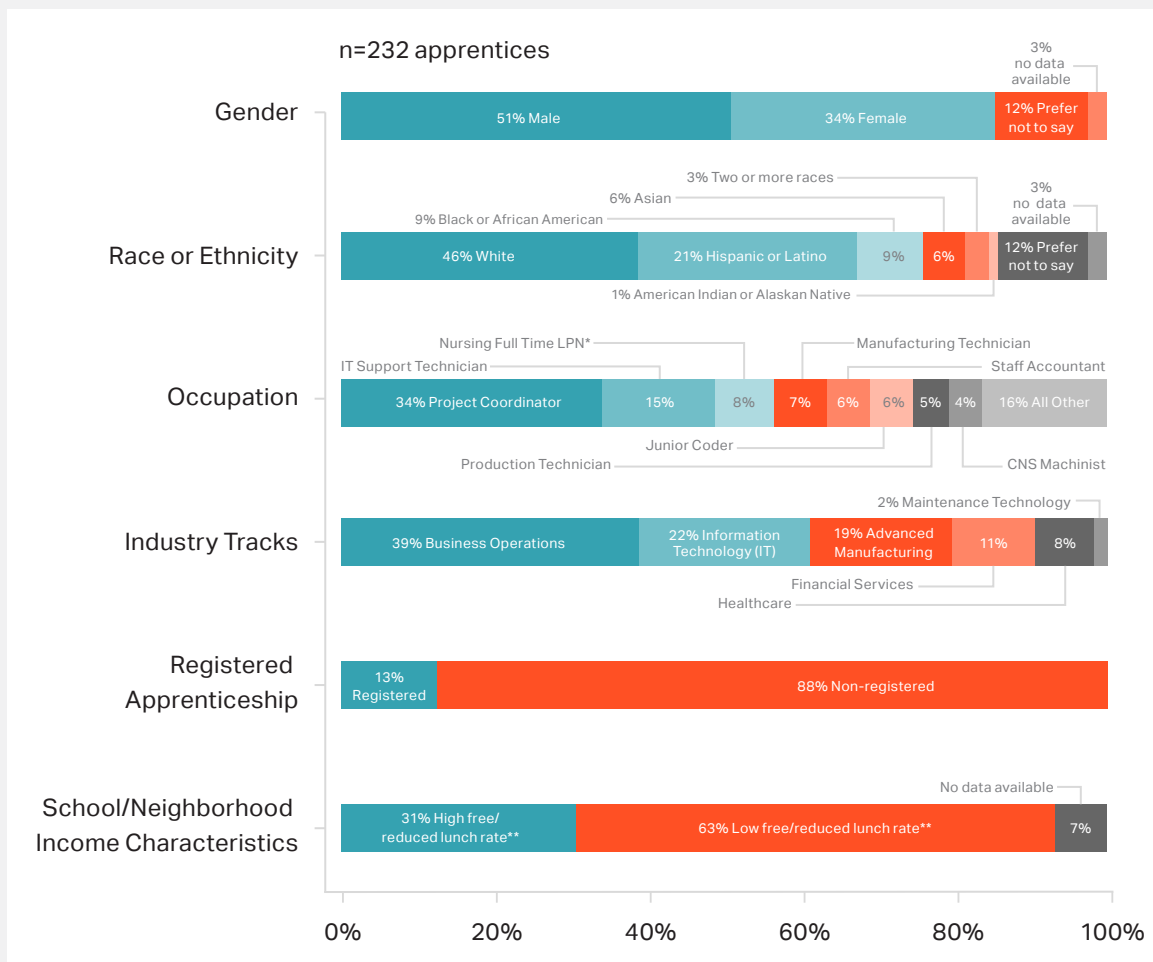
impacted by the COVID-19 pandemic and, as a result, learnings from these participants should be more generalizable to the field at large. Summary statistics for the 2017 and 2018 cohorts are included in Figure 2, below.

Throughout our analysis of the 2017 and 2018 apprentice cohorts, we focus on two primary outcome variables. The first is **retention**, which is defined as **how many years and months apprentices participate in the CareerWise program**. The second is **completion**, which is defined as the number of apprentices that either a) **complete three years of the CareerWise program** or b) **receive and accept a full-time**

**employment offer** with their apprenticeship host site prior to the three-year mark.

To address our research questions, we analyzed descriptive statistics across sub-groups and time in apprenticeship. In addition, based on our hypotheses, we ran linear regressions to identify what factors are predictive of time in program and completion. These factors include occupation choice, size of apprentice employer cohort, supervisor performance ratings, apprentice survey responses, gender, race, and school's free and reduced lunch. We then quantify the uncertainty associated with these differences by using the regression coefficient p-values.

**Figure 2: Summary Statistics for Apprentices in the 2017–2018 Cohorts**



\* CareerWise has discontinued offering the Nursing — Full Time LPN option.

\*\* We define a high free/reduced lunch rate as any school with more than 50 percent of their student population eligible for free and reduced lunch. A low free/reduced lunch rate is defined as any school with less than 50 percent of their student population eligible for free and reduced lunch.

# Overview of Apprentices Journey

## Application Process

**Note:** *CareerWise Application Cohort Composition*

Our application analysis focuses on the 2019 applicant journey. We selected the 2019 cycle because of lack of comprehensive application data for the 2017 and 2018 cohorts and the potential impact of the COVID-19 pandemic on the 2020 and 2021 cycles. Note, however, that later sections of this paper analyze outcomes for the 2017 and 2018 cohorts of apprentices.

## 2019 Application Insights

The first stage of the CareerWise apprentices journey is the application process. In Colorado, this process includes both application and interview components. If a candidate is selected to move forward, they may receive an offer(s) that they must accept to become an apprentice. Applicants may apply to multiple roles within a single occupation or across multiple occupations, depending on interest and fit. While CareerWise facilitates the application process, advises applicants, and may help select candidates for interviews, employers conduct the interviews and make the final decisions on offers. Figure 3, on the following page, shows the 2019 cohort applicant data by race, gender, and school socioeconomic composition.

## Applicant Insights

Looking at the demographic composition of all applicants to the 2019 CareerWise cohort we observe a few differences worth noting. First, there are gender disparities in the applicant pool that appear to impact gender balance in the eventual apprentice cohort. The male-female split in applicants (51 percent male/41 percent female) is consistent across both applicants and accepted apprentices. Second, we see differences in applications by schools' socioeconomic status. More students applied in 2019 from schools with less than 52 percent of students eligible for free or reduced (F/R) lunch (which we refer to as "low-poverty") than schools with more than 50 percent of F/R eligible (referred to as "high-poverty") (56 vs. 39 percent).<sup>1</sup> In this case, the variation actually widened during the application process—by the time apprentices accepted offers, the distribution was 62 percent to 33 percent.

Finally, looking at race and ethnicity, the 2019 CareerWise applicant pool somewhat closely matches the population of Colorado's public-school system.<sup>18</sup> For instance, while 34.3 percent of students statewide in Colorado in 2019–2020 were Hispanic/Latino, Hispanic/Latino students comprised 33 percent of CareerWise applicants. Asian students comprise five percent of applicants vs. 3.2 percent of students statewide that year. White students appear to be a smaller share of CareerWise applicants than their percentage statewide (39 percent vs. 53 percent). However, it is worth noting that racial/ethnic data is not reported for 10 percent of CareerWise applicants, whereas the statewide data is comprehensive. White students were slightly more likely to be offered and accept apprenticeships, but without controlling for other factors, we can't discern any statistical significance. Overall, the composition of students accepting apprenticeships was more diverse in 2019 than in the 2017–2018 cohorts analyzed in subsequent sections.

<sup>1</sup> In this context, we define "high-poverty" schools as those that serve over 50 percent of students that are eligible for free or reduced lunch. "Low poverty" schools are defined as schools that serve less than 50 percent of students eligible for free or reduced-price lunch.

**Figure 3: Summary Statistics for 2019 CareerWise Applicants**

	<b>Metric</b>	<b>2019 Applicants</b>	<b>2019 Interviews</b>	<b>2019 Offered an Apprenticeship</b>	<b>2019 Accepted Apprenticeship</b>
<b>Gender</b>	Male	52%	53%	50%	51%
	Female	41%	41%	43%	41%
	Prefer not to answer	1%	1%	2%	2%
	Other	1%	0%	0%	0%
	No data	5%	5%	6%	6%
<b>Race or Ethnicity</b>	White	39%	39%	42%	42%
	Hispanic or Latino	33%	34%	33%	32%
	Black or African American	8%	7%	8%	8%
	Asian	5%	4%	3%	3%
	Two or More Races (Not Hispanic or Latino)	4%	4%	3%	3%
	American Indian or Alaskan Native	2%	2%	2%	2%
	Prefer not to say	3%	3%	3%	3%
	No data	7%	7%	7%	7%
<b>School/ Neighborhood Income Characteristics</b>	High free/ reduced lunch rate	39%	35%	34%	33%
	Low free/ reduced lunch rate	56%	60%	61%	62%
	No data	5%	4%	6%	5%
	<b>Total Number</b>	<b>566</b>	<b>308</b>	<b>190</b>	<b>177</b>

**Figure 4: Industry Track Splits, 2019 CareerWise Applicants**

Industry Track	Submitted application for an apprenticeship	Offered an apprenticeship	Accepted an apprenticeship
Business Operations	32%	27%	28%
Advanced Manufacturing	20%	20%	21%
Information Technology	16%	20%	20%
Financial Services	15%	15%	14%
Healthcare	13%	11%	10%
Education*	4%	7%	7%
Total Applications	825	294	276

**Notes:** Hospitality excluded due to small sample size. Maintenance Technology did not accept apprenticeship applications in 2019.

\* Education is not explicitly referenced in this analysis due to small sample size amongst subgroups.

### Industry Track Splits by Gender, Race and School District Characteristics

We also took a deeper look at the 2019 applications numbers by industry track and other characteristics. Note that there are more applications than applicants because individual applicants can apply, interview, and receive offers for multiple roles across different industries. We don't have aggregate information about the number of roles posted. Therefore, we cannot state with certainty whether differences in raw application numbers are due to applicant preference or a greater availability of roles within these tracks during the 2019 application cycle. In addition, for each category, some applicants chose not to disclose demographic information and are excluded from each of the splits due to small sample size.

#### Gender

The CareerWise data shows disparities by gender in applications for some industries, most notably in Healthcare, Advanced Manufacturing, and Information Technology (IT). These differences appear to correspond closely to the distribution of offers by gender. For example, female applicants represented 73 percent of the total applications to the Healthcare field and 70 percent of Healthcare offers. Conversely, for Advanced Manufacturing, male applicants represented 72 percent of

applications and 68 percent of offers. The IT track had a similarly wide gender disparity in applications. Males represented 73 percent of applications received and 68 percent of offers.

There was more gender parity in the Business Operations and Financial Services tracks with 42/51 male-female application split and 46/50 male-female application split, respectively. Both industry tracks were also relatively consistent in the number of male and female candidates who made it through each stage of the application process with 40 percent of offers made to males and 56 percent to females in both the Business Operations and Financial Services tracks.

These findings imply the occupational segregation by gender we see in the economy at large starts early on with youth. Differences in interest in entry-level roles can lead down the road to divergence in representation by gender in the industry.

#### Race/Ethnicity

The application data implies some differences in industry interest by race and ethnicity. Healthcare (42 percent Hispanic or Latino, 23 percent White, 11 percent Black, 9 percent Asian) and Business Operations (39 percent Hispanic or Latino, 32 percent White, 11 percent Black, 4 percent Asian) attracted the most diverse applicant pools. In contrast, White applicants appear

over-represented relative to overall composition of applicants in Advanced Manufacturing (45 percent of applicants are White) and IT (43 percent of applicants are White).

Applicants from different racial and ethnic groups also appear to fare differently in the interview and acceptance process by industry. For example, in Financial Services and Advanced Manufacturing, White applicants appear more likely to receive an offer—they represent a larger share of total offers relative to their share of the applicant pool. However, in Healthcare, Hispanic or Latino applicants appeared to fare the best by that measure. In 2019, Hispanic or Latino individuals represented 42 percent of the total Healthcare applicant pool but received 48 percent of the total Healthcare offers made in 2019.

Across all tracks, however, it is important to note that we did not control for other factors and, therefore, cannot determine statistical significance.

Both the applicant pool and the application process may influence the racial diversity of apprentices who accept an offer in a given industry. Interventions such as exposing applicants of color to new industries prior to the application cycle may help further diversify the applicant pool. In addition, intentional engagement with industry partners may help to reduce the likelihood of racial bias affecting the hiring process.

### **School Characteristics**

All industry tracks received more applications from low-poverty schools. While these students represented the majority of the 2019 applicant pool, they also seem to fare better during the application process compared to peers from schools with higher shares of low-income students. For most CareerWise industry tracks, students from low-poverty schools received a higher share of offers than the corresponding share of applicants from those schools. One outlier is the IT track, which maintained approximately the same composition of applicants to offers on school socioeconomic status metrics. Again, it is important to note that we did not control for other factors and, therefore, cannot determine statistical significance. However, in aggregate, these figures imply that more advising and support during the application process for schools with high shares of low-income students may help improve socioeconomic diversity in the program.

### **Implications of COVID-19 Pandemic on Later Cohorts**

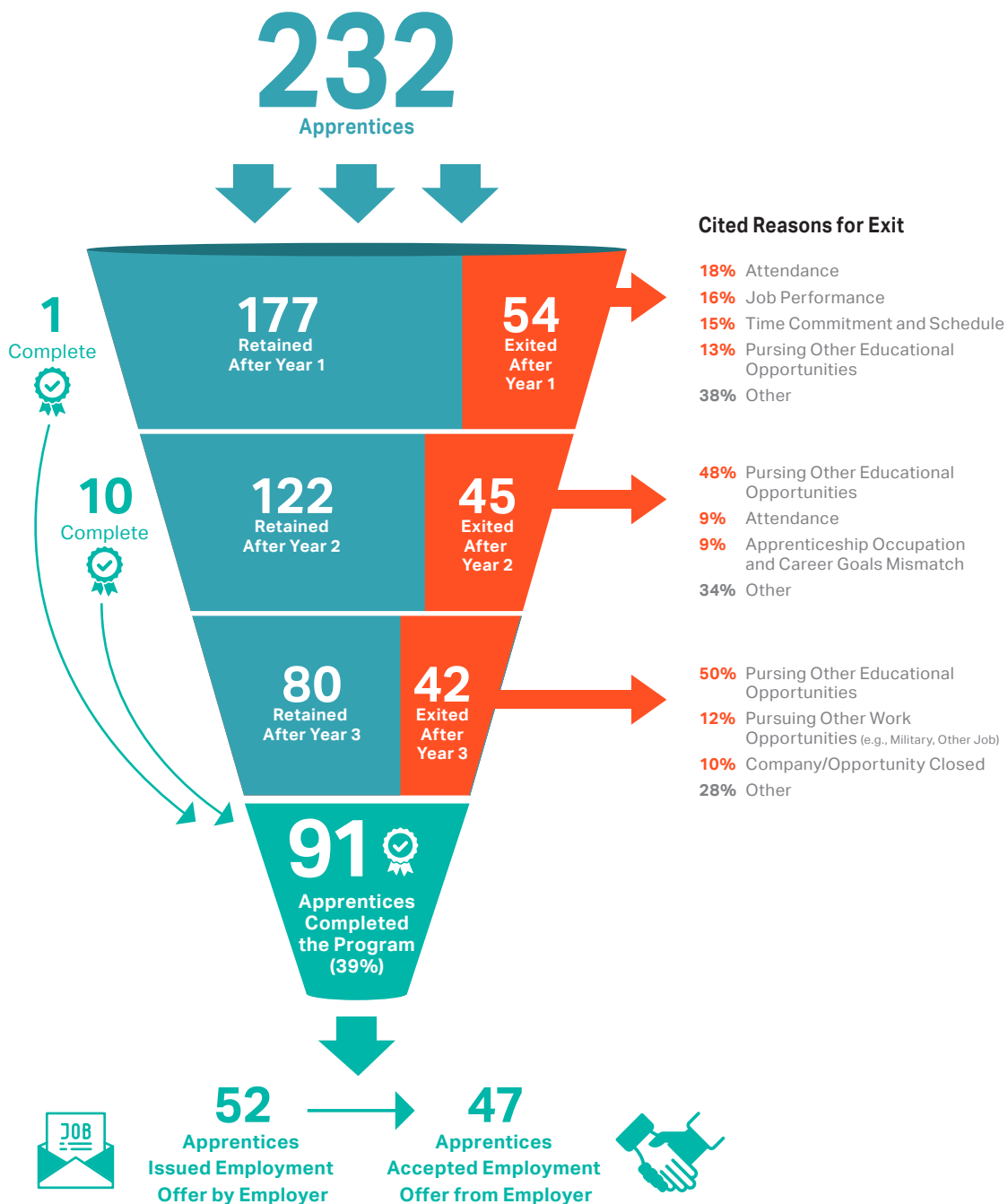
We chose to exclude 2020 and 2021 application trends from our analysis due to the potential impact of the COVID-19 pandemic on the CareerWise application cycle. In year-over-year analysis, 2020 and 2021 both saw fewer applicants, interviews, and offers than 2019. There were less than half the number of offers in 2020 compared to 2019. However, in 2021 there was a rebound in cohort size, interviews, and offers. The 2021 data provides reason to believe that the 2020 declines were a pandemic-induced outlier and applicant growth will continue in subsequent years.

# Retention Journey

In this section, we analyze what happens to CareerWise apprentices from the 2017–2018 cohorts after they are accepted into the program. The following subsections describe the share of

apprentices that are retained during subsequent stages of the program. In addition, we use CareerWise program data to posit potential explanations for why some apprentices depart.

**Figure 5: Retention Journey for 2017–2018 Apprentice Cohorts**





## Completes (Y1 to Y3/Hire)

The CareerWise youth apprenticeship experience begins once an applicant receives and accepts an offer. The full program spans three years. Participants are full-time high school students who commit to part-time employment with their apprenticeship host, normally beginning their junior year of high school. Students engage in an applied-learning environment with businesses in high-wage, in-demand occupations.<sup>19</sup>

In the first part of our analysis, we seek to illustrate both the three-year journey and outcomes of apprentices who complete, while examining shifts in year-over-year exit survey data for apprentices in our sample who failed to complete the program. We define completion as an apprentice who finishes the three-year CareerWise program<sup>i</sup> or an apprentice who receives and accepts a full-time employment offer with their apprenticeship host site prior to the three-year mark.

Overall, 39 percent of apprentices completed their CareerWise apprenticeship. An additional 26 percent of students did not complete their apprenticeship, but elected to pursue two-year, four-year, or technical degrees and are considered successful outcomes according to the CareerWise definition of "options multiplier" for programmatic success.

Of the 91 apprentices who completed the program, 57 percent received an offer from their employer and 59 percent were hired in the same industry as their apprenticeship training occupation. Fifty seven percent of students pursued two- or four-year degrees. The majority of those students chose to pursue a four-year degree (75 percent, or 39 of 52 students). Forty one percent of completers reported working full-time and 26 percent reported working at a part-time capacity.

## First Year Retention—Junior Year

**Seventy six percent of apprentices remain in the program after the first year, with one student completing the program and converting to full-time employee.<sup>ii</sup>**

The majority of participants begin their apprenticeship journey in their junior year of high school. Regardless of occupation, each first-year apprentice works 16 hours per week during the school year. Most occupations do not have a credential component in the first year, with the exception of the Manufacturing Technician and CNC Machinist occupations in the Advanced Manufacturing industry track.

Apprentices who exit during their first year may face financial and external pressures that affect their apprenticeship experience, performance, and ultimate programmatic retainment. Nearly half (49 percent) of first-year apprentice non-completers report performance, attendance, or time commitment and scheduling concerns as the top reason for leaving in exit surveys. Furthermore, the top barriers cited in first-year student feedback surveys conducted over the summer between their first and second year were scheduling and wages. Although the majority of first-year non-completers did not complete the feedback survey, their exit survey results suggest that they may have encountered similar barriers.

<sup>i</sup> Note: The average completion time for apprentices in our study is 2.6 years. This is likely due to rolling admission for apprentices over the Summer and Fall months of their first year, and that some apprentices may receive and accept a full-time offer prior to the program's third year completion date.

<sup>ii</sup> According to CareerWise, there are rare cases in which a student may complete the program in less than the three-year timeframe. This is likely caused by some apprentices getting hired early and some instances of business-specific agreements for a two-year apprenticeship

## Second Year Retention—Senior Year

**Just over half (53 percent) of apprentices who start an apprenticeship remain in the program for at least two years, with 10 students completing during their second year.**

The second year of the apprenticeship journey includes both an increase in work hours and more rigorous academic programming for some occupations. Students across all industry tracks are required to work 24 hours per week and specific occupations in the Business Operations, Hospitality, and Advanced Manufacturing industry tracks require credential coursework in addition to their high school academic requirements. Additionally, most second-year apprentices are seniors and are determining and finalizing their postsecondary plans. The combination of challenges that many second-year apprentices face may impact retention.

While the retention of some second-year apprentices is affected by concerns about time commitment and performance concerns, the most common reason for exiting the program during the second year is the pursuit of other educational opportunities. In sharp contrast with first year apprenticeship non-completers, nearly half (48 percent) of apprentices who exit during their second year cite pursuing other educational opportunities as the principal reason for leaving the program. Attendance or time commitment and scheduling concerns were the second most common reasons for second year exits. They were cited by 15 percent of second-year non-completers. Surveys conducted at the end of the second year provide additional insight into potential challenges second year apprentices may face. In particular, students who self-reported challenges with the apprenticeship experience, high school coursework, or time commitment and scheduling were associated with lower second year retention rates, compared to apprentices who reported other challenges.

## Third Year Retention—Final Year

**Thirty nine percent of all apprentices who started an apprenticeship in our sample complete their apprenticeship journey.<sup>i</sup> Nearly half depart to pursue other educational opportunities.**

In their third and final year, apprentices are expected to have graduated from high school and have the opportunity to continue their apprenticeship while pursuing further educational opportunities or work full time at their site. The expected number of hours increases to between 30 and 40 per week, with opportunities to enroll or take up to five higher education courses. Specific occupations suggest enrollment in at least one higher education course in alignment with industry recommendations. At the end of the third year, most apprentices will have successfully completed the program.<sup>ii</sup>

Nearly half of apprentices (50 percent) who exit during their third (and final) year of their apprenticeship cite pursuing other educational opportunities as the top reason for leaving. Again, student surveys conducted at the end of the third year illustrate that participants who reported challenges with coursework or apprenticeship expectations had a larger drop-off in third year retention than those who reported other barriers.

<sup>i</sup> Note: This percentage includes the one complete in the first year and the ten completes in the second year of the apprentice journey.

<sup>ii</sup> According to CareerWise, there are rare cases in which some apprentices complete the apprenticeship before the three-year mark. See "Note" on page 20.

# Predictors of apprenticeship retention and completion

*In this section we examine which factors seem to predict the length of participation in the program and completion. We find that the length and completion rates vary across occupations, as well as demographic groups.*

In this section, we use the IT track and the IT Support Technician occupation as the reference group for analysis. We use them because they make up a large percentage of the apprenticeship population—22 percent of all apprentices are in the IT industry track, of whom 65 percent are in the IT Support Technician occupation. Apprentices in this track also perform only slightly above the sample average—44 percent of apprentices in this track complete the apprenticeship compared to the sample average of 39 percent. All comparisons in this section refer back to IT track apprentices.

Retention in the CareerWise program seems to vary across industry tracks and occupations. Apprentices in the Business Operations and Healthcare tracks seem to be retained, on average, for fewer months than those in the IT track. They are retained four ( $p=0.05$ ) and six ( $p=0.07$ ) fewer months, respectively. Apprentices in the Healthcare track are also 22 percentage points ( $p=0.07$ ) less likely to complete the apprenticeship. When looking closer at differences across occupations, we find that those in the Production Technician, CNC Machinists, and Project Coordinator occupations are retained fewer months, on average. Apprentices in these occupations are retained seven ( $p=0.01$ ), six ( $p=0.06$ ), and five ( $p=0.06$ ) months less, respectively, relative to those in the IT Support Technician occupation. For those in the Production Technician occupation, they are also 41 percentage points ( $p < 0.001$ ) less likely to complete the apprenticeship.

In terms of apprenticeship type, we find those in Registered Apprenticeship are 26 percentage points ( $p < 0.001$ ) more likely to complete the apprenticeship and spend seven more months ( $p=0.007$ ) on average in apprenticeship. We hypothesized whether this could be partially explained by participating in a larger cohort, which could imply stronger support structures. However, the number of apprentices in a cohort with an employer does not seem to predict retention rates. We hypothesize that employers' previous experience in onboarding and managing apprentices through pre-existing programs may help

explain this result; however, we did not have data on prior experience to test this claim.

The apprenticeship experience might also vary across demographic groups. We find that students from schools with 90 percent of their students on F/R lunch are retained five months less on average, relative to students from schools with zero percent of their students on F/R lunch ( $p=0.045$ ). The lower retention seems to be driven by higher apprentice dropout rates in the first year. Students from higher F/R lunch schools are 27 percentage points ( $p=0.01$ ) less likely to be retained past the first year, but once they are retained past the first year, they are no more or less likely to be retained for more than two years. However, we don't find any evidence of a difference in apprenticeship completion rates by school F/R lunch rate. Sorting across occupations only partially explains the lower retention rates—retention is still four months ( $p=0.10$ ) lower conditional on occupation choice. Students from higher F/R lunch schools are 10 percentage points ( $p=0.09$ ) more likely to sort into the Business rather than IT industry track, which has a lower retention rate.

We also find that Black students are retained six months fewer than White students ( $p=0.04$ ). This difference drops to four fewer months ( $p=0.14$ ) when considering sorting across tracks and schools' F/R lunch school rate. Black students are eight percentage points ( $p=0.04$ ) less likely to sort into Advanced Manufacturing relative to the IT track. Advanced Manufacturing has a similarly high retention rate as that in the IT track. Within high F/R lunch schools, Black students are more likely to not be retained past the first year (by 25 percentage points ( $p=0.03$ ), 21 percentage points conditioning on school's F/R lunch ( $p=0.08$ )), but once they are retained past the first year, there is no difference in retention rates.

Male apprentices are retained three months more on average ( $p=0.04$ ). This drops to two months fewer and is no longer significant once we account for sorting across occupations ( $p=0.2$ ). Male apprentices are less likely to sort into the Business industry track (by four percentage points,  $p=0.08$ ) relative to other apprentices. The Business track has lower retention rates, on average. Enrollment in the Advanced Manufacturing track seems to be predictive of lower completion rates, conditional on demographic characteristics as shown in Figure 7.

We then examine the impact of enrollment in a Registered Apprenticeship, which seems to have the most predictive value of time in apprenticeship and apprenticeship completion, conditional on other factors. Figures 6 and 7 shows that the relationship holds even while controlling for student demographics and occupation.

Survey responses could also give us some early signals of retention likelihood.<sup>i</sup> Apprentices who list an interest in remaining in the same industry are 15 percentage points more likely to remain in the apprenticeship for more than two years ( $p < 0.001$ ). They spend two months more on average in apprenticeship ( $p < 0.001$ ) and are eight percentage points more likely to complete the apprenticeship ( $p = 0.02$ ). Apprentices who indicate they are likely to accept a job offer at the apprenticeship are eight percentage points ( $p = 0.03$ ) more likely to be retained past the second year and nine percentage points ( $p = 0.02$ ) more likely to complete the apprenticeship. We do not find evidence that those who declare an interest in enrolling in any college are more or less likely to continue in apprenticeship.<sup>ii</sup>

Survey respondents' listed challenges are also predictive of apprenticeship completion likelihood. Apprentices who cite money as a challenge are 24 percentage points ( $p = 0.09$ ) less likely to complete the apprenticeship. We also find that, conditional on occupation, listing a supervisor as more supportive is associated with a 19 percentage points ( $p = 0.009$ ) higher likelihood of completing the apprenticeship.<sup>iii</sup>

Looking at productivity ratings, we might be concerned that we are losing high productivity apprentices to college. We do not find evidence of a difference in months in the program by productivity rating.<sup>iv</sup> That said, we find first year career and occupational readiness supervisor ratings are predictive of completion. A one-point higher career readiness rating<sup>v</sup> is associated with a 27-percentage point ( $p = 0.002$ ) higher likelihood of completion. A one-point higher occupational rating is associated with a 13 percentage points ( $p = 0.06$ ) higher completion rate, conditional on apprentice occupation.

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<sup>i</sup> Based on survey responses from the summer after Year 1.

<sup>ii</sup> Seventy five percent of responders list intending to enroll in college.

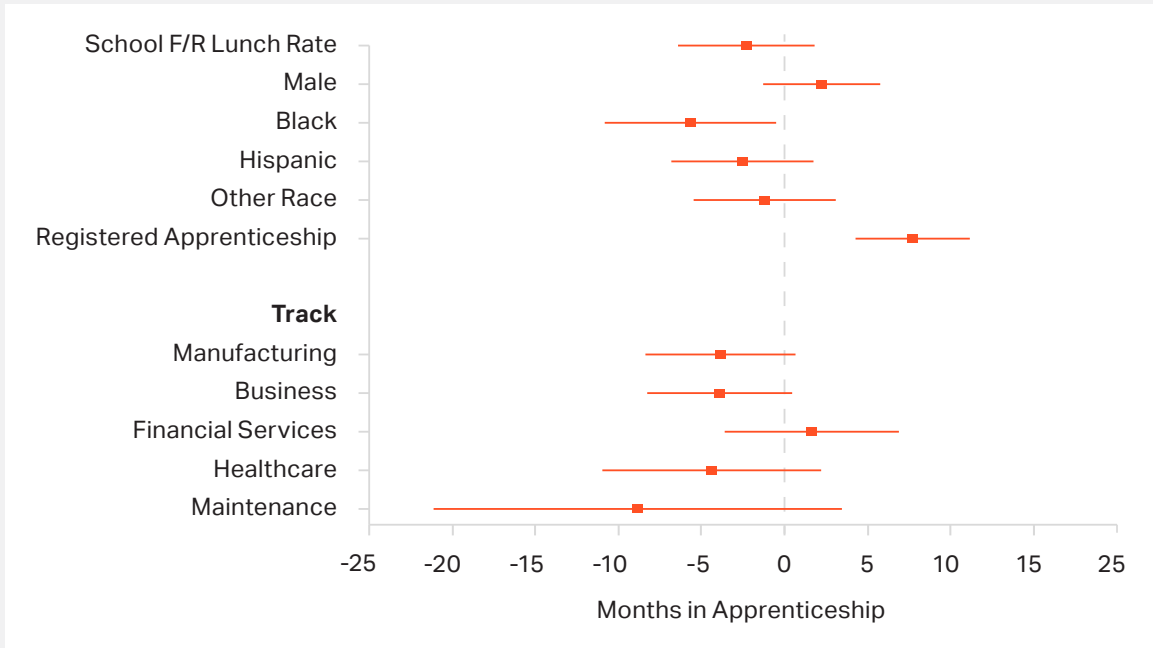
<sup>iii</sup> Based on a survey that asked apprentices to rank their supervisor as "1: Not as all supportive; 2: Somewhat supportive; 3: Moderately supportive; 4: Completely supportive; 5: Very supportive."

<sup>iv</sup> This is based on the 2018 cohort sample of students with first year productivity evaluations (55 percent of sample).

<sup>v</sup> Based on CareerWise's competency evaluation that asked supervisors to assess apprentices' proficiency in career-ready competencies.

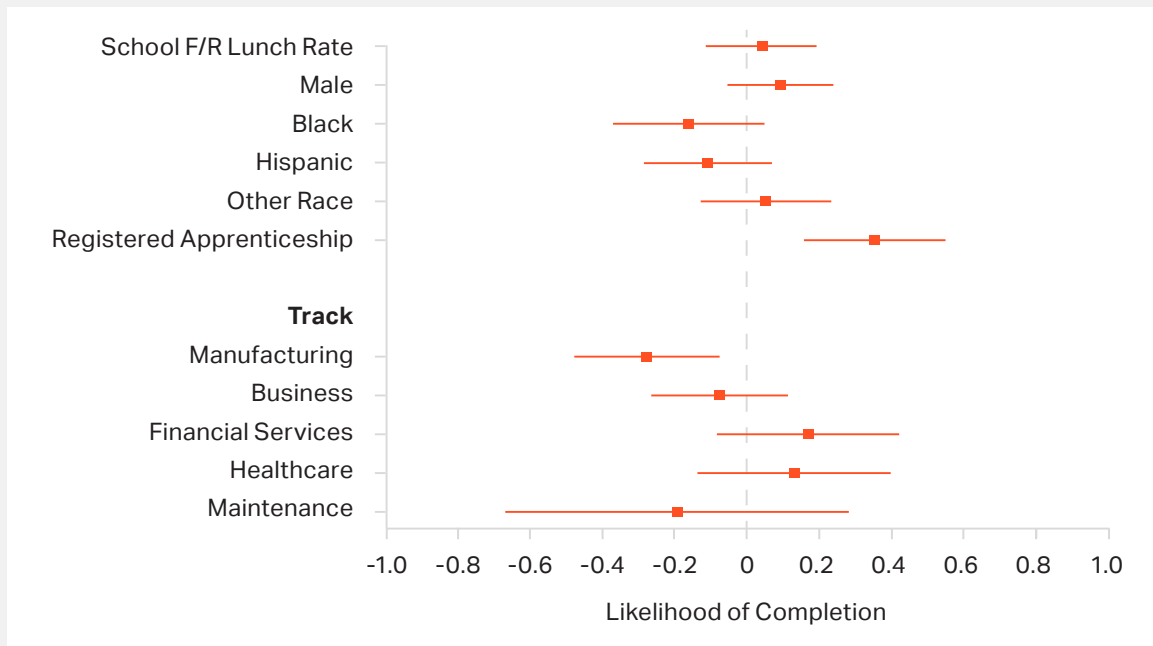
To calculate the average, we converted the ratings to a 1–5 scale e.g., (1=Not Yet Trained, 2=Novice, 3=Emerging, 4=Meets Expectations/Proficient, 5=Exceeds Expectations/Advanced)

**Figure 6: Months in Apprenticeship by Track and Student Demographics**



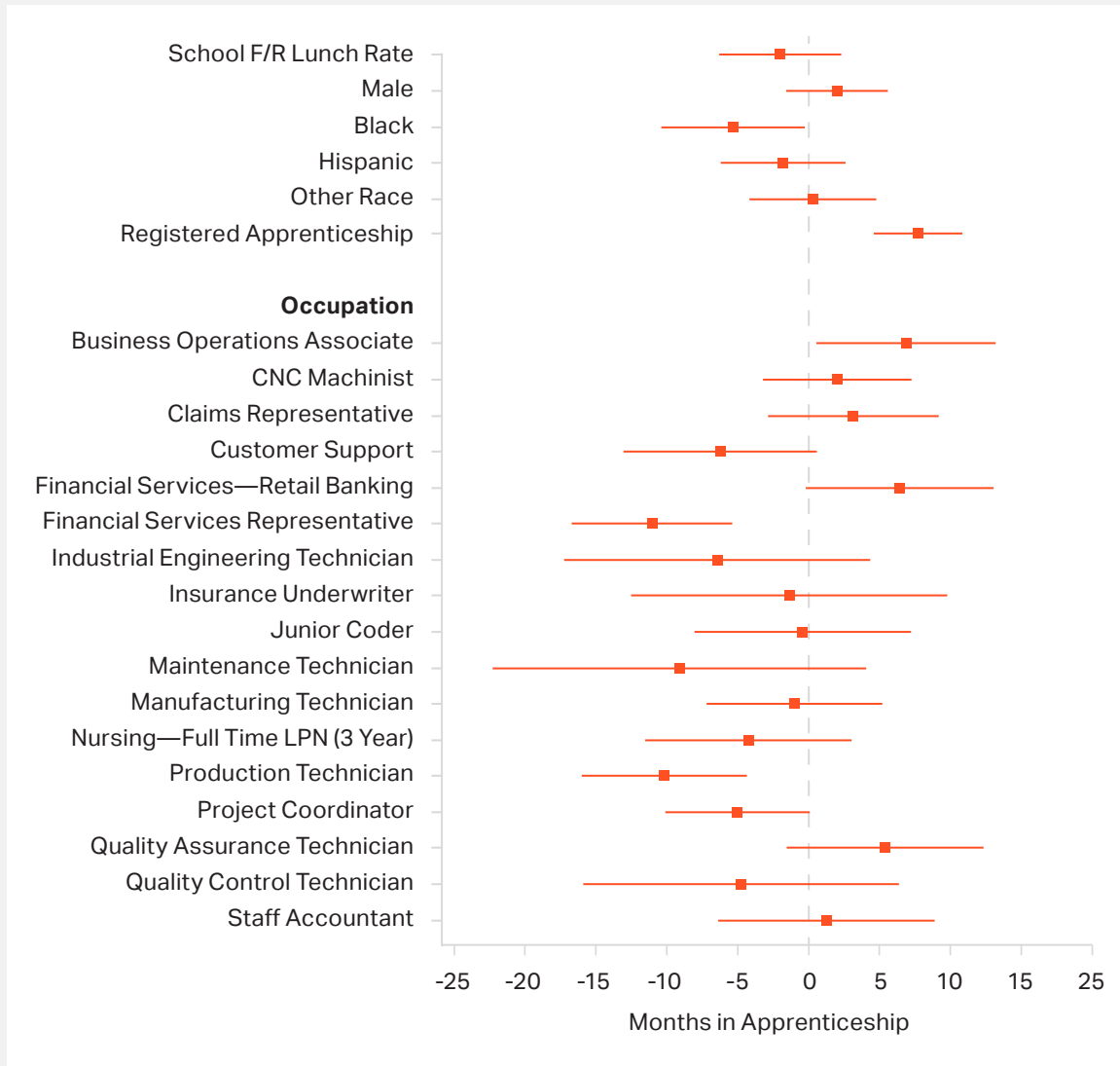
**Note:** Estimates based on a multivariable regression with a continuous measure of months in apprenticeship as the outcome. The 90% confidence intervals are shown in the plot. The scale captures the difference in number of months in apprenticeship associated with a one unit change in any of the variables, holding all other variables constant. Rate of schools' free/reduced lunch status was standardized so that 0 is having an average level of school free/reduced lunch and 1 is having a one standard deviation higher proportion of students on free/reduced lunch status.

**Figure 7: Completion Likelihood by Track and Student Demographics**



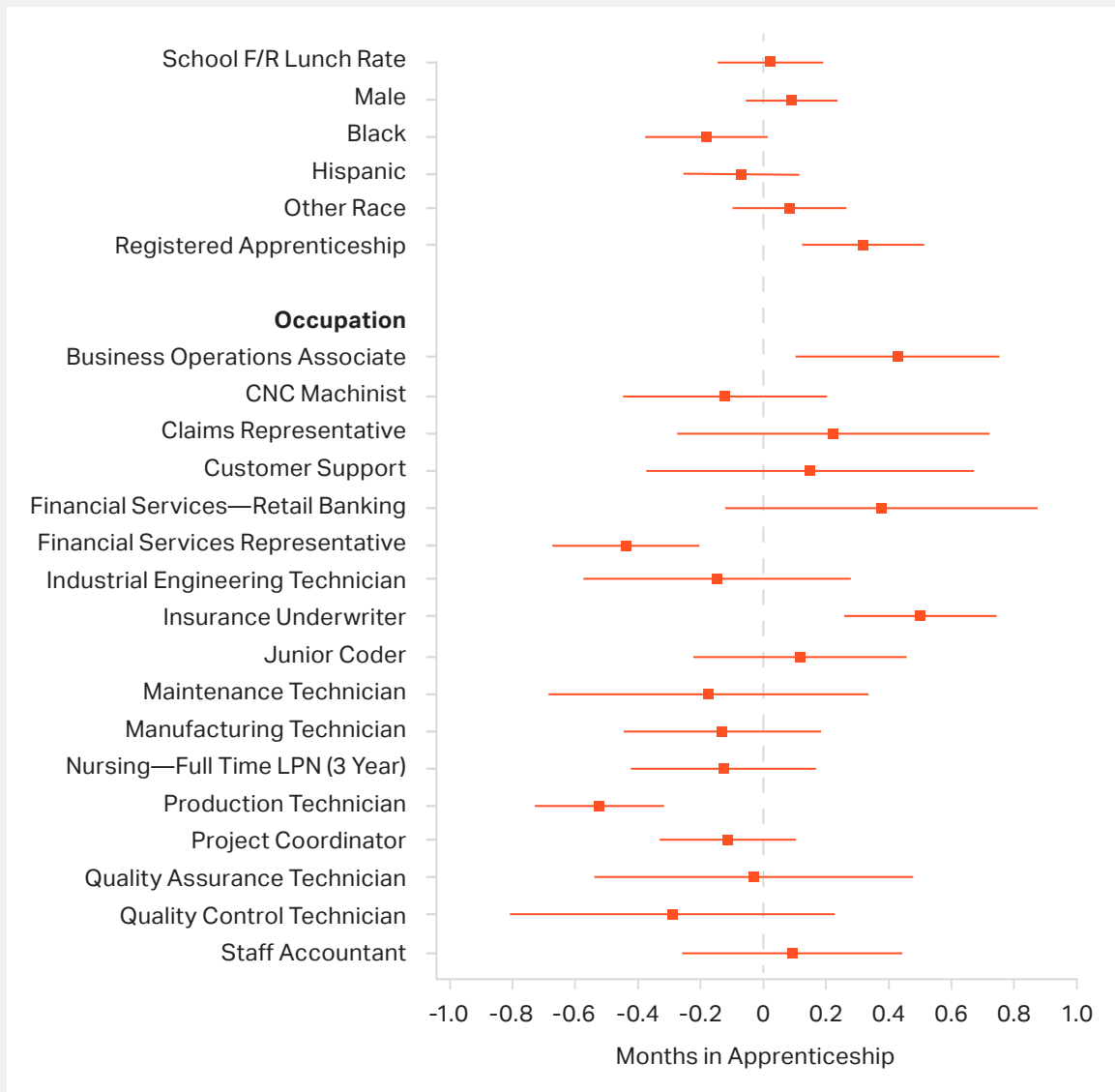
**Note:** Estimates based on a multivariable regression with a continuous measure of months in apprenticeship as the outcome. The 90% confidence intervals are shown in the plot. The scale captures the difference in number of months in apprenticeship associated with a one unit change in any of the variables, holding all other variables constant. Rate of schools' free/reduced lunch status was standardized so that 0 is having an average level of school free/reduced lunch and 1 is having a one standard deviation higher proportion of students on free/reduced lunch status.

**Figure 8: Months in Apprenticeship by Occupation and Student Demographics**



**Note:** Estimates based on a multivariable regression with a continuous measure of months in apprenticeship as the outcome. The 90% confidence intervals are shown in the plot. The scale captures the difference in number of months in apprenticeship associated with a one unit change in any of the variables, holding all other variables constant. Rate of schools' free/reduced lunch status was standardized so that 0 is having an average level of school free/reduced lunch and 1 is having a one standard deviation higher proportion of students on free/reduced lunch status.

**Figure 9: Completion Likelihood by Occupation and Student Demographics**



**Note:** Estimates based on a multivariable regression with a continuous measure of months in apprenticeship as the outcome. The 90% confidence intervals are shown in the plot. The scale captures the difference in number of months in apprenticeship associated with a one unit change in any of the variables, holding all other variables constant. Rate of schools' free/reduced lunch status was standardized so that 0 is having an average level of school free/reduced lunch and 1 is having a one standard deviation higher proportion of students on free/reduced lunch status.

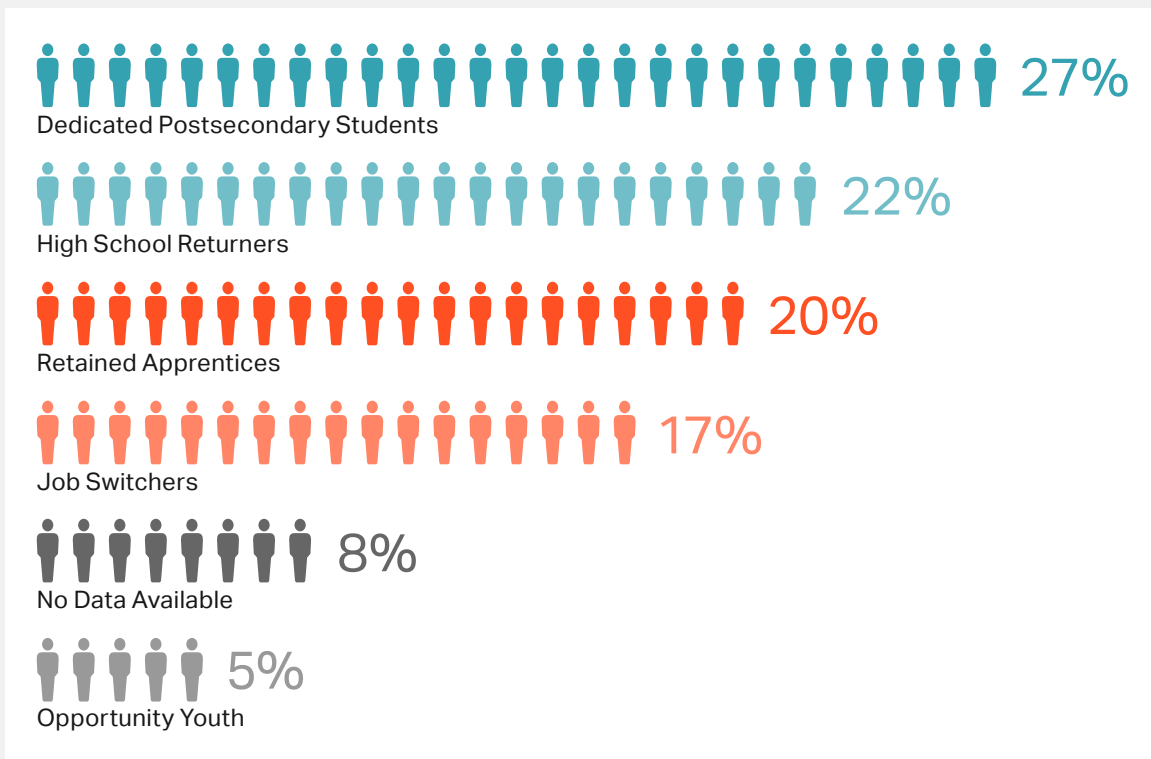


# Exit Outcomes







*In this section, we summarize employment and education exit outcomes for the 232 apprentices from the 2017–2018 CareerWise cohorts. Outcomes were captured at the point-in-time when students exit the program, which could be after just one year for students who leave the program early or after three years for students who complete the full program. Therefore, all outcomes should be interpreted as exit outcomes rather than overall program outcomes.*

The following four outcomes represent 87 percent of apprentices in the cohort and are mutually exclusive. Excluded are five percent of apprentices who are neither working nor in school after exiting the program, and eight percent of apprentices for whom exit outcome data was not collected. For each outcome group, we analyzed key characteristics of the apprentices who achieve these outcomes and provided more granular detail on the outcomes themselves.

**Figure 10: Apprentice Outcomes After Exiting the Program, 2017–2018 Cohorts**



**Definitions**

-  **Dedicated Postsecondary Students**—Apprentices who are pursuing a postsecondary degree or certification and are not employed
-  **High School Returners**—Apprentices who left the program early to return to high school
-  **Retained Apprentices**—Apprentices who continue working for CareerWise employer
-  **Job Switchers**—Apprentices who work for a different employer
-  **No Data Available**—Missing data on these apprentices
-  **Opportunity Youth**—Apprentices who are neither working nor in school

## Retained Apprentices (20%)

47 apprentices in the 2017–2018 CareerWise cohorts continue to work for their apprenticeship employer after completing the program. Of these students:

- 66 percent work full-time and 34 percent work part-time
- 30 percent are concurrently pursuing a full-time college degree and 43 percent are pursuing a part-time degree or certification

Twenty percent of students in the 2017–2018 cohorts achieve the traditional goal of apprenticeship programs, securing a permanent position with that employer. The share of apprentices that convert to longer-term employees should be highly correlated with whether the employer achieves an acceptable return on investment and, thus, to their business case for participating in apprenticeship programs. We analyzed the data to better understand the composition of students that stay on with their apprenticeship employer after completing the CareerWise program.

Demographically, apprentices who joined their sponsor companies are more likely to be male (57 percent vs 51 percent of the full 2017–2018 cohorts) and White (51 percent vs. 46 percent of the full 2017–2018 cohorts). They are also less likely to be from schools with more than 50 percent of students eligible for F/R lunch programs (19 percent vs. 31 percent of the full 2017–2018 cohorts).

From an industry perspective, Retained Apprentices are more likely to work in IT, Advanced Manufacturing, or Financial Services (68 percent vs. 52 percent of all students). This suggests the possibility that these more specialized, technical industries may be more conducive to continued employment after the end of an apprenticeship than more generalist career paths like Business Operations.

It is also notable that 72 percent of Retained Apprentices are concurrently pursuing a postsecondary degree or certification. Fifty three percent of these are pursuing a four-year degree, 24 percent are pursuing a two-year degree, and 21 percent are pursuing a technical degree or non-degree certificate. This is in line with CareerWise's vision of youth apprenticeship as not a diversion from higher education, but rather an 'options multiplier' for students.<sup>20</sup>

## Job Switchers (17%)

39 apprentices in the 2017–2018 CareerWise cohorts go to work for a different employer after leaving or completing the program. Of these students:

- 33 percent complete the full CareerWise program and the average time in program is 2.2 years
- 43 percent continue working in their apprenticeship industry despite changing employers
- 44 percent work full-time and 56 percent work part-time
- 46 percent are concurrently pursuing a full-time college degree and 21 percent are pursuing a part-time degree or certification

Seventeen percent of students in the 2017–2018 cohort continue working after leaving or completing the program, only with a different employer. Over 40 percent of these Job Switchers are continuing to pursue a career in their apprenticeship industry and, similar to the previous group, 67 percent are concurrently pursuing a postsecondary degree or certification.

Demographically, Job Switchers are again more likely to be White (56 percent vs. 46 percent of the full 2017–2018 cohorts) and less likely to be from schools with more than 50 percent of students on F/R lunch programs (18 percent vs. 31 percent of the full 2017–2018 cohorts).

While Job Switchers look fairly similar to retained apprentices demographically, they are more likely to work in Business Operations (38 percent vs. 21 percent for retained apprentices), and less likely to work in IT, Advanced Manufacturing, or Financial Services (51 percent vs. 68 percent for retained apprentices). That suggests the specific industry and/or employer may exert a strong influence on whether an apprentice continues to work with their sponsoring employer or switches jobs after completing the program.

## Dedicated Postsecondary Students (27%)

63 apprentices in the 2017–2018 CareerWise cohorts pursue a postsecondary degree or certification and do not work after leaving or completing the program. Of these students:

- 29 percent complete the full CareerWise program and the average time in program is 2.0 years
- 90 percent are full-time college students and 10 percent are part-time
- 87 percent are pursuing four-year degrees

Twenty seven percent of students in the 2017–2018 cohorts are not working when they leave the program, but are pursuing a postsecondary credential. CareerWise considers this to be a successful program outcome, in line with their view of youth apprenticeship as an 'options multiplier' for students.

Demographically, Dedicated Postsecondary Students are more likely to be female (41 percent vs. 34 percent of the full 2017–2018 cohorts) and less likely to be Hispanic (16 percent vs. 21 percent of the full 2017–2018 cohorts). This is in line with broader nationwide trends, which show that female high school graduates are 15 percentage points more likely to enroll in college than men, and that Hispanic/Latino high school graduates are two percentage points less likely to enroll in college than White students.<sup>21</sup>

From an industry perspective, Dedicated Postsecondary Students are more likely to work in the IT industry (35 percent vs. 22 percent of the full 2017–2018 cohorts). This, combined with the disproportionate share of IT apprentices who continue working with their CareerWise employer, suggests that IT apprenticeships do a particularly good job of generating successful outcomes for both students and employers.

### Program Success Rate

By combining Retained Apprentices, Job Switchers, and Dedicated Postsecondary Students, we create a summary statistic that describes the success of the CareerWise program in its early years.

**Sixty four percent of students in the 2017–2018 cohorts achieve a successful outcome, as defined by CareerWise—they are enrolled in postsecondary education and/or employed in the labor market.**

Looking across these three outcomes and accounting for overlaps (e.g., students who are both working and pursuing education), 38 percent of students who participated in this program are employed when they leave the program, and 53 percent of students are pursuing a postsecondary degree or certification of some kind.

## High School Returners (22%)

52 apprentices (22 percent) in the 2017–2018 CareerWise cohorts leave the program early and return to high school. Because these students leave the program so early, there is not enough information available on their post-high school employment and educational outcomes. That said, of these students:

- The average time in program is 0.6 years
- 34 percent do not complete due to termination (vs. 24 percent of all those who do not complete)

Twenty two percent of students in the 2017–2018 cohorts leave the program to return to a traditional high school education. As noted in the earlier section on retention, students who leave the CareerWise program during their first year have several distinct characteristics. To briefly summarize, demographically, they are more likely to be from school districts with more than 50 percent of students on F/R lunch programs (53 percent of high school returners vs. 31 percent of the full 2017–2018 cohorts) and are less likely to be White (35 percent of high school returners vs. 46 percent of the full 2017–2018 cohorts). From an industry perspective, they are more likely to work in an apprenticeship in the Business Operations or Healthcare tracks.

When looking at the reasons High School Returners and CareerWise staff gave for why these students exited the program, there are four primary factors cited: Attendance (26 percent of students), time commitment and scheduling (20 percent of students), job performance (18 percent of students), and a mismatch between the apprenticeship and students' career goals (8 percent of students).

# Apprentice Productivity

Our primary focus in this paper has been on apprentice retention and post-program employment and educational outcomes. However, another critical measure of success for students and employers is apprentice productivity. Productivity is particularly relevant to employer return on investment, as it measures how much output an apprentice is producing relative to a full-time employee.

CareerWise started measuring the productivity of apprenticeships in 2018, according to the following methodology:

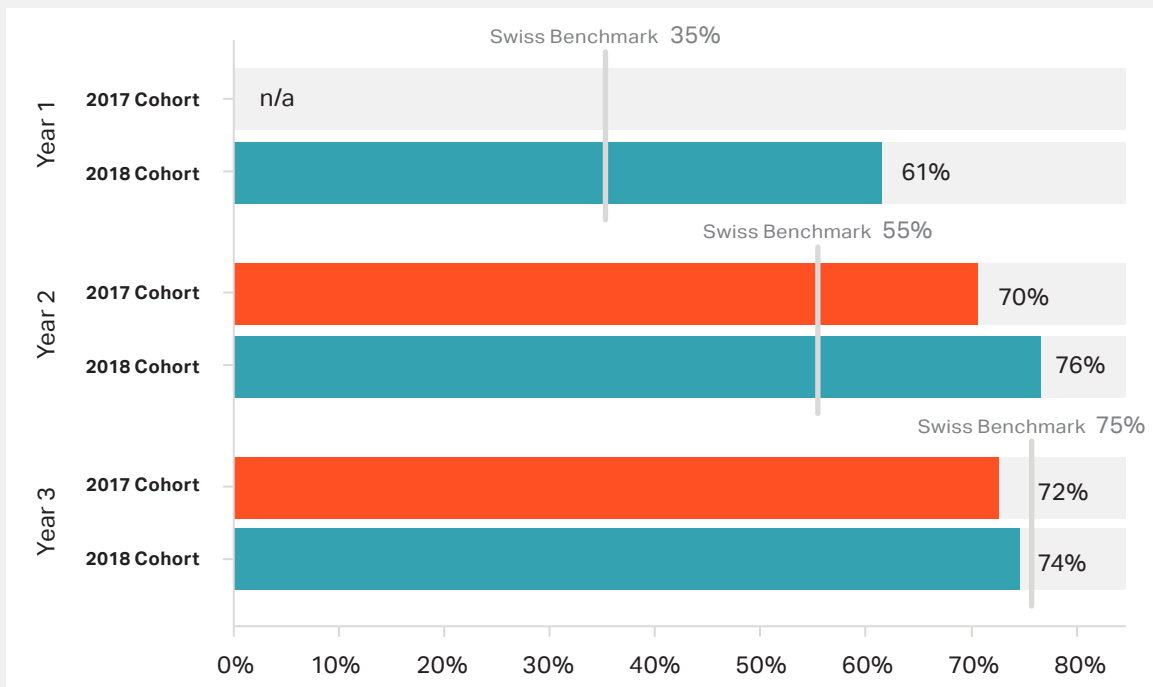
*“CareerWise asks supervisors to evaluate, from zero to 100 percent, the productivity of their apprentice compared to a fully-trained, skilled employee in the occupation the apprentice is training towards. This is a very basic measure, but provides a sense of how an apprentice is performing against the supervisors’ expectations of a notional “standard” employee.”<sup>22</sup>*

Their methodology is similar to that used in a series of cross-section firm-level surveys that measured the average productivity of apprentices in Switzerland’s more established high school apprenticeship program:

*“Employers are asked in the questionnaire to assess the productivity of apprentices relative to skilled workers for each year of the apprenticeship training. Although a subjective measure, this is certainly the only measure of quality of apprenticeship training that allows a comparison across the almost 200 different training occupations in our sample.”<sup>23</sup>*

The similarity of those two approaches allows us to make high-level comparisons of the relative productivity of apprentices in the CareerWise and Swiss models. However, when interpreting the results that follow, it is important to remember that ultimately these are both subjective measures of

**Figure 11: Productivity Ratings for the 2017-2018 Cohorts**



\*Evaluations were administered to supervisors in 2019, 2020, and 2021. As a result, students who started the program in 2017 were not evaluated until 1.8 years into the program on average.

Note: Of the 232 students in the 2017–2018 cohorts, only 141 received a supervisor evaluation (61%). Most students who did not receive an evaluation left the program early, with an average of 1.0 years in the program, and therefore were not included in the annual supervisor evaluations. There were also several instances in which supervisor evaluations left the productivity rating blank, and were therefore excluded in this analysis.

productivity. As a result, any differences in reported productivity could be due to systemic differences in how supervisors rate productivity in the CareerWise program compared to the Swiss apprenticeship system, rather than true differences in productivity. In addition, it is also worth noting that apprentices typically start out earning less than the “fully-trained, skilled employee” benchmark. The lower cost of apprentices relative to incumbent employees should be an important factor in any employer’s return-on-investment calculation.

## Descriptive Statistics

As can be seen in Figure 11, the average productivity of the 2018 CareerWise cohort was rated as 61 percent of a full-time equivalent (FTE) in Y1 of the apprenticeship. This is quite high relative to the Swiss Y1 average productivity benchmark of 35 percent. However, it is important to note that in the CareerWise model many apprentices exit the program in the first year before they are evaluated, and one would expect these students to be less productive. In contrast, 70 percent of young Swiss participate in apprenticeship programs and the exit rate is much lower, reducing this source of survivor bias.<sup>24</sup> Therefore, this Y1 estimate should be interpreted with caution.

From Y1 to Y2, average productivity increases measurably from 61 percent to 76 percent for the 2018 cohort. However, some of this increase could be due to less productive apprentices dropping out of the program. To try and account for this effect, we isolated 30 apprentices who received a supervisor productivity evaluation in both Y1 and Y2. On average, this group increased their productivity by seven percentage points, considerably less than the average increase of 15 percentage points. That suggests survivor bias does skew these results. But, even after accounting for this, productivity still increases from Y1 to Y2.

When compared to the Swiss benchmark, the 2018 cohort’s average Y2 productivity of 76 percent remains noticeably higher than the Swiss average of 55 percent. The seven-percentage point increase in productivity is lower than the 20-percentage point increase in the Swiss benchmark; however, it is coming off a higher base and still represents material progress over the course of one year.

From Y2 to Y3, average productivity appears to plateau for the 2018 cohort, dropping from 76 percent to 74 percent. That brings productivity for the CareerWise cohort in-line with Y3 productivity in the Swiss benchmark. One potential cause of this is that higher productivity apprentices might exit the

CareerWise program after Y2 to attend college. To try and test that hypothesis, we isolated 12 apprentices in the 2018 cohort who received a supervisor productivity evaluation in both Y2 and Y3. On average, this group increased their productivity by two percentage points. While this is an improvement over the average decline of two percentage points for the full 2018 cohort from Y2 to Y3, it lags behind the gains realized from Y1 to Y2. That suggests that the plateau effect is real, rather than an artifact of survivor bias.

The plateau effect could help explain why so many students who continue working for their CareerWise employer after completing the program are also pursuing a postsecondary degree or certification. A certification may be required to continue increasing productivity past a certain threshold. That said, this inference is based on a sample size of just 12 apprentices and should be interpreted with caution.

## Productivity Scores by Gender, School District, Race, and Industry

In addition to the overall trends described above, we also analyzed productivity scores from one year to see how they vary by key demographic and programmatic factors. We analyzed results from the 2019 evaluation for both the 2017 and 2018 cohorts, since that provided the largest sample size. The sample included a total of 126 evaluations, with an average productivity score of 66 percent.

### Gender

Within this sample, female apprentices were rated as somewhat more productive than male apprentices (68 percent vs. 63 percent for male apprentices). But, interestingly, women have lower retention rates and are less likely to continue working for their apprenticeship employer after completing the CareerWise program. **This suggests that the cause is not performance related and that employers could increase equity and return on investment by adjusting their programs to improve retention for female apprentices.**

### School District

Students from schools with more than 50 percent of students on F/R lunch programs were similarly rated as somewhat more productive (68 percent vs. 64 percent for students from schools with fewer than 50 percent of students on F/R lunch programs). But, students from these schools have lower retention rates and are less likely to continue working for their apprenticeship employer. That suggests that the cause is not performance-based. Targeted

support could improve retention, particularly in Y1, for students from high-poverty schools and could increase both equity and return on investment.

### **Race**

Assessing how productivity varies by race was difficult due to low sample sizes of many minority populations. That in and of itself points to the need to do more to ensure high school apprenticeship programs are accessible and meet the needs of students of color. While Hispanic or Latino students had productivity scores in-line with the average for the rest of the cohort, we did find that Black and Asian students had lower productivity scores on average. That suggests the possibility of specific barriers or patterns of barriers plague these populations. They might include individual circumstances (e.g., lack of resources), environmental factors (e.g., lack of public transportation), or systemic issues (e.g., discrimination within schools or by supervisors). That said, these results should be taken with caution given the small sample sizes. There were only eight Black students and six Asian students in the productivity score dataset.

### **Industry**

Lastly, we found that productivity ratings were higher in the Advanced Manufacturing (73 percent) and Financial Services (70 percent) tracks than in Business Operations (63 percent) or IT (62 percent). This is another signal that more specialized industries may be more conducive to the apprenticeship model than more generalist sectors like Business Operations. The low productivity ratings for apprentices in the IT sector seem to be an outlier. But it might help explain the high rates of college matriculation for apprentices who work in IT, who may view additional educational credentials in this field as the route to unlock greater opportunity.



# Policy and Programmatic Implications

Successful youth apprenticeship models require multi-stakeholder, cross-sector relationships. In this section, we highlight takeaways for six key stakeholder groups—the K–12 system, higher education, employers, caregivers and apprentices, apprenticeship intermediaries, and policymakers.

## K–12 system

Our research notes the critical role of making good matches in the admissions and placement process. We find that apprentices with a pre-existing interest in their industry placement are more likely to remain in the apprenticeship.

This points to an important role that the K–12 education system ought to play in ensuring exposure to career opportunities and promoting earlier interventions that target career navigation. School systems should put more of a priority on helping students learn about career paths, build career readiness skills, and identify their long-term interests. Poor program outcomes may be linked to poor matches between the student and industry, or lack of preparation from the K–12 system with respect to professional skills and interactions in the workplace. By investing in career exploration and career readiness, K–12 stakeholders can increase the likelihood of career success after students leave the K–12 system.

In addition, the K–12 system has an important role to play in facilitating access to wraparound services for apprentices, especially those with caregiving or other responsibilities outside of the apprenticeship.

## Higher Education

CareerWise apprentices generally scored strongly in employer ratings on key metrics of career readiness and performance. CareerWise employers rated their Year 3 apprentices at 74 percent of fully trained, skilled employee productivity. The relative success of CareerWise apprentices in demonstrating job-relevant skills presents a clear challenge and opportunity to the traditional higher education system. In contrast, employers often complain about the skills of the candidates available to them from postsecondary institutions. For example, less than 40 percent of employers indicate that candidates coming out of community colleges have the skills they require.<sup>25</sup>

Higher education leaders would benefit from integrating and incorporating elements of the

CareerWise approach into their own offerings. This could include competency-based models, as well as new partnerships with employers. Colleges should be looking to support and scale work-based learning programs in which students receive credit for skills demonstrated, rather than just time in a seat.

Our findings also indicate that some apprentices struggle with juggling the competing commitments inherent in apprenticeships, especially when they are taking college-level courses while they are working on-site with an employer. Higher education partners can play an important role in building flexible arrangements that facilitate paid employment and work-based learning. That could include scheduling more classes outside of business hours, rationalizing course sequences to align with employer feedback in the field, or providing transportation, counseling, and other wraparound supports. Such accommodations help not just youth apprentices, but all working learners seeking to access advancement pathways through educational credentials.

## Intermediaries

Intermediaries serve an integral function in youth apprenticeship models, starting with the application process all the way through to program completion and placement. Organizations like CareerWise have the expertise, resources, and capacity to connect learners and employers. In addition to a strong community-based network, they provide the infrastructure necessary to scale apprenticeship opportunities—ranging from data systems to learning and evaluation to employer recruitment.

Our research presents a number of important implications for intermediaries responsible for design and implementation of youth apprenticeship programs.

First, our findings highlight an important role for federally Registered Apprenticeships. CareerWise apprentices enrolled in Registered Apprenticeships were 26 percentage points more likely to complete the apprenticeship, controlling for other factors. That suggests other earn-and-learn programs should consider seriously how they can create more Registered Apprenticeship opportunities in partnership with employers.

Second, our research demonstrates the importance of a supportive supervisor. Intermediaries have an important supporting role to play alongside employer partners. While employers must identify strong

supervisors willing to provide attentive advice and guidance, intermediaries can also provide resources and training that better equip supervisors who may be managing young, diverse, entry-level talent for the first time. This confirms findings in other recent research about the centrality of frontline supervisors in the experience of middle skills workers.<sup>26</sup>

Third, our work emphasizes the first year of an apprenticeship as a critical time for retaining students from disadvantaged backgrounds. We find that students from schools with 90 percent of their students on F/R lunch are retained five months less on average, and Black students are retained six months fewer than White students. For both groups, the disparity seems to be driven in large part by higher apprentice dropout rates in the first year, suggesting a need for targeted interventions to help struggling students during that critical period. Working alongside partners in K–12 and non-profits, intermediaries should focus on prioritizing intensive advising supports that can increase retention during that first year, especially for under-represented groups.

Fourth, intermediaries can play an important role in boosting diversity, both in applications and in offers. While the applicant pool of students in 2019 closely mirrored the diversity of Colorado’s public-school system at large, there were racial and socioeconomic disparities in both the applications across industry tracks and the success rates in receiving an offer. Because different tracks have different outcomes, these differences are meaningful. To help combat these disparities, our findings suggest that students from high-poverty schools and students of color could benefit from additional support at the onset of the application process. Working alongside partners in the K–12 system to increase exposure to opportunities in occupations with strong outcomes may encourage more racially and socioeconomically diverse students to apply for them.

## Employers

Employer buy-in will be absolutely critical if the United States is to build a stronger and more scalable apprenticeship ecosystem. Employers provide both the work-relevant training to upskill apprentices and create the work environments where young talent can learn and grow.

When executed well, apprenticeship models present substantial advantages for employers. Apprenticeships allow firms and organizations to create a direct, targeted talent pipeline for key roles and to grow young employees steeped in their company’s culture. Prior research finds that

apprenticeships can offer an internal rate of return of approximately eight percent.<sup>27</sup> There are also strong signals from our work that youth apprenticeships can become a reliable and consistent recruiting source. We find a 90 percent acceptance rate for CareerWise apprentices offered a full-time job offer after program completion. However, to fully realize their return on investment, an employer needs to invest in success throughout the apprenticeship lifecycle.

First, employers have the ability to ensure that apprenticeship roles are attractive relative to other employment opportunities. Apprentices who exit during their first year cite financial challenges as a top barrier to continuing with the apprenticeship. To increase retention, our research indicates that employers should stay apprised of other opportunities in the market and ensure apprentices salaries remain competitive with other opportunities available to young learners and workers.

Second, employers should also be aware of and acknowledge the life realities of student apprentices. For example, specific occupations in the Business Operations, Hospitality, and Advanced Manufacturing tracks require credential coursework in addition to academic requirements. Our research suggests that employers should consider ways to be flexible in scheduling if the apprentice indicates that they are struggling to balance both.

Third, our research suggests that employers should prioritize matching strong supervisors with apprentices early in their apprenticeship, given the statistically significant relationship between a supportive supervisor and retention. Supportive supervisors can help identify individuals who might be struggling early on and provide critical guidance and attention to keep them on track. Employers may also consider more training and support for supervisors, especially those new to managing a young person or employees from diverse backgrounds.

Fourth, our research shows that specialized, technical occupations may be more conducive to successful youth apprenticeships. When employers are deciding what tracks to offer apprenticeships in, they should consider prioritizing more specialized occupations over generalist job categories.

Finally, from an equity perspective, employers should prioritize efforts to cultivate an inclusive environment. Many youth apprentices are entering environments in which few people who look like them have worked in the past. To support and retain diverse talent, employers must work to develop and implement diversity, equity, and inclusion strategies.

They also have an important role to play working alongside intermediaries and trusted community partners, to expand access to wraparound supports, and to increase engagement and recruitment from diverse communities. Some historically underserved communities may be skeptical of the apprenticeship model, especially given the history of vocational education being used for “tracking” and as a means to perpetuate racial inequality in the American school system.<sup>28</sup> Employers can play a critical role in adding credibility to the programs and making sure students of all backgrounds are aware of apprenticeships and have equal opportunity to benefit from them.

## Caregivers and apprentices

Caregivers and apprentices represent the demand-side for apprenticeships. Our research provides compelling evidence that more young people and their caregivers should increasingly consider apprenticeship as an attractive option. To date, many U.S. families still hold the mistaken impression that enrolling in an apprenticeship represents a rejection of the college pathway. We believe that this analysis supports CareerWise’s description of their program as an “options multiplier.” We find that at least 53 percent of students who entered the CareerWise program are pursuing a postsecondary credential after high school. Caregivers play a critical role in ensuring that students consider apprenticeships, have good information about their options, and are able to choose the best-fit pathway.

Our research also highlights other areas where students’ families and caregivers play crucial roles, including:

- Ensuring access to career exposure and information about different industries.
- Scheduling and time management support to help the apprentice understand how to manage the dual enrollment commitment.
- Transportation and other types of wraparound supports to increase attendance and retention.

However, from an equity perspective, not all caregivers have the time and resources to provide those kinds of supports for their child. Intermediaries, the K–12 system, and employers should prioritize collaborative ways to work together and step in and fill these roles when caregivers are unable to do so.

## Policymakers

Given the promising findings from our research, state and federal policymakers should seriously consider policies that facilitate more access to apprenticeships for more young people in America. Doing so means a focus on quality, equity, and funding.

To promote apprenticeship quality, policymakers can prioritize the expansion of Registered Apprenticeships. We found that CareerWise apprentices in Registered Apprenticeship positions were 26 percentage points more likely to complete the apprenticeship and spend seven more months on average in apprenticeship. To make Registered Apprenticeships an attractive option for new employers and industries, policymakers must focus on improving the process for establishing and maintaining Registered Apprenticeships so that it is more straightforward and seamless for employers, intermediaries, and education partners.

Finally, while the federal government and states have started to invest more resources into funding apprenticeships, policymakers should continue to look for ways that public funding can support the sustained expansion of youth apprenticeships. Employers must play the central role in formulating job descriptions, providing effective supervision and training, and offering wages that are attractive relative to other positions available to candidates. Yet when leveraged well, government funding can play a complementary and catalytic role in the system. Four priority areas for public support include:

- Funds to support the seeding of new programs in emerging industries or regions.
- Support for the critical functions provided by intermediaries, including awareness raising, learning and evaluation, and technology systems.
- Better data systems to track the career success of apprentices over time and demonstrate return on investment.
- Resources for wraparound services that can enhance equity and encourage apprentices to complete the program and successfully convert into full-time, productive employees.

## Appendix

### Mapping Occupation Type to Industry Track

Occupation Type	Industry Track
Project Coordinator	Business Operations
IT Support Technician	Information Technology
Manufacturing Technician	Advanced Manufacturing
Nursing – Full Time LPN	Healthcare
Production Technician	Advanced Manufacturing
Staff Accountant	Financial Services
Junior Coder	Information Technology
CNC Machinist	Advanced Manufacturing
Business Operations Associate	Business Operations
Quality Assurance Technician	Information Technology
Maintenance Technician	Maintenance Technology
Claims Representative	Financial Services
Financial Services – Retail Banking	Financial Services
Industrial Engineering Technician	Advanced Manufacturing
Quality Control Technician	Advanced Manufacturing
Insurance Underwriter	Financial Services
Customer Support	Business Operations
Logistics Technician	Advanced Manufacturing
Financial Services Representative	Financial Services
Marketing Coordinator	Business Operations
Digital Marketing Specialist	Business Operations
Sales Coordinator	Business Operations
Human Resource Associate	Business Operations
Graphic Designer	Business Operations
Clinical Healthcare	Healthcare
Automotive Technician	Maintenance Technology
Facilities Operation Coordinator	Maintenance Technology
Mechanical Engineering	Advanced Manufacturing
CAD Drafter	Advanced Manufacturing
Commercial Loan Officer	Financial Services
UX/UI Designer	Information Technology
Data Analyst	Information Technology
Cybersecurity Technician	Information Technology
Database Administrator	Information Technology
Hospitality Management	Hospitality
Teacher	Education
Estimator	Construction
Residential Property Manager	Real Estate Management
Sous Chef	Hospitality
Healthcare Financial Services Representative	Healthcare
Medical Assistant	Healthcare

## Notes

- <sup>1</sup> "An Options Multiplier." CareerWise USA. "CareerWise." Accessed September 13, 2022. <https://www.careerwiseusa.org/>.
- <sup>2</sup> Ibid.
- <sup>3</sup> Fishman, Rachel, Elin Johnson, and Sophie Nguyen. "Varying Degrees 2021." New America, May 25, 2021. <http://newamerica.org/education-policy/reports/varying-degrees-2021/>.
- <sup>4</sup> Schleifer, David, Will Friedman, and Erin McNally. "America's Hidden Common Ground on Public Higher Education: What's Wrong and How to Fix It." Public Agenda, July 11, 2022. <https://www.publicagenda.org/reports/americas-hidden-common-ground-on-public-higher-education/>.
- <sup>5</sup> National Student Clearinghouse. "Undergraduate Enrollment Falls 662,000 Students in Spring 2022 and 1.4 Million During the Pandemic," May 26, 2022. <https://www.studentclearinghouse.org/nscblog/undergraduate-enrollment-falls-662000-students-in-spring-2022-and-1-4-million-during-the-pandemic/>.
- <sup>6</sup> Osterman, Paul. "How American Adults Obtain Work Skills: Results of a New National Survey." ILR Review 75, no. 3 (May 1, 2022): 578–607. <https://doi.org/10.1177/00197939211018191>.
- <sup>7</sup> Bell, Bradford S., and Steve W. J. Kozlowski. "Toward a Theory of Learner-Centered Training Design: An Integrative Framework of Active Learning," January 1, 2009. <https://ecommons.cornell.edu/handle/1813/75128>.
- <sup>8</sup> "The Benefits and Costs of Apprenticeship: A Business Perspective." Case Western Reserve University and the U.S. Department of Commerce, November 2016. <https://files.eric.ed.gov/fulltext/ED572260.pdf>.
- <sup>9</sup> U.S. Department of Labor. "FY 2021 Data and Statistics," September 30, 2021. <https://www.dol.gov/agencies/eta/apprenticeship/about/statistics/2021>.
- <sup>10</sup> Lerman, Robert. "The State of Apprenticeship In the US: A Plan for Scale." Apprenticeships for America, July 2022. <https://static1.squarespace.com/static/61f1c7ff7041697cc1eff1bd/t/62d5b4981261b74803071036/1658172568403/planforscale.pdf>.
- <sup>11</sup> Abdelal, Rawi, Joseph Fuller, and Matthew Preble. CareerWise Colorado. HBS Case No N1-319-001. March 19, 2019. Harvard Business School Publishing.
- <sup>12</sup> Federal Institute for Vocational Education and Training. "Apprenticeship System." Accessed September 18, 2022. <https://www.bibb.de/en/147679.php>.
- <sup>13</sup> Lerman, Robert. "The State of Apprenticeship In the US: A Plan for Scale." Apprenticeships for America, July 2022. <https://static1.squarespace.com/static/61f1c7ff7041697cc1eff1bd/t/62d5b4981261b74803071036/1658172568403/planforscale.pdf>.
- <sup>14</sup> Ibid.
- <sup>15</sup> Ibid.
- <sup>16</sup> Jones, Janelle, Alexander Hertel-Fernandez, and Christopher DeCarlo. "Equity Snapshot: Apprenticeships in America." U.S. Department of Labor Blog (blog), November 4, 2021. <https://blog.dol.gov/2021/11/03/equity-snapshot-apprenticeships-in-america>.
- <sup>17</sup> Fuller, Joseph B., and Matthew Sigelman. "Room to Grow: Identifying New Frontiers for Apprenticeships." Burning Glass Technologies and Harvard Business School, November 20, 2017.
- <sup>18</sup> Colorado Department of Education. "2019–2020 Pupil Membership." Accessed September 18, 2022. <https://www.cde.state.co.us/cdereval/2019–2020pupilmembership>.
- <sup>19</sup> CareerWise Colorado. "A Shift in Thinking." Accessed September 18, 2022. <https://www.careerwisecolorado.org/en/a-shift-in-thinking/>.
- <sup>20</sup> CareerWise Colorado. "A Shift in Thinking." Accessed September 18, 2022. <https://www.careerwisecolorado.org/en/a-shift-in-thinking/>.
- <sup>21</sup> US Bureau of Labor Statistics. "College Enrollment and Work Activity of High School Graduates," April 26, 2022. <https://www.bls.gov/news.release/hsgec.t01.htm>.
- <sup>22</sup> Internal report provided by CareerWise, "2020 CWC Evaluation of Apprentice Experience and Learning."
- <sup>23</sup> Jansen, Anika, Mirjam Strupler Leiser, Felix Wenzelmann, and Stefan C Wolter. "Labour Market Deregulation and Apprenticeship Training: A Comparison of German and Swiss Employers." European Journal of Industrial Relations 21, no. 4 (December 2012): 353–68. <https://doi.org/10.1177/0959680115580687>.
- <sup>24</sup> Hoffman, Nancy, and Robert Schwartz. "Gold Standard: The Swiss Vocational Education and Training System." Center on International Education Benchmarking, March 2015. <http://ncee.org/wp-content/uploads/2018/09/SWISSVETSep2018web.pdf>.
- <sup>25</sup> The State of Collaboration between Community Colleges and Business Survey, Harvard Business School Managing the Future of Work project and the American Association of Community Colleges, publication pending.
- <sup>26</sup> Fuller, J., Raman, M., (January 2022). Building From the Bottom Up, Published by Harvard Business School.
- <sup>27</sup> "The Benefits and Costs of Apprenticeship: A Business Perspective." Case Western Reserve University and the U.S. Department of Commerce, November 2016. <https://files.eric.ed.gov/fulltext/ED572260.pdf>.
- <sup>28</sup> McCardle, Todd (2020) "A Critical Historical Examination of Tracking as a Method for Maintaining Racial Segregation," Educational Considerations: Vol. 45: No. 2. <https://doi.org/10.4148/0146-9282.2186>.



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