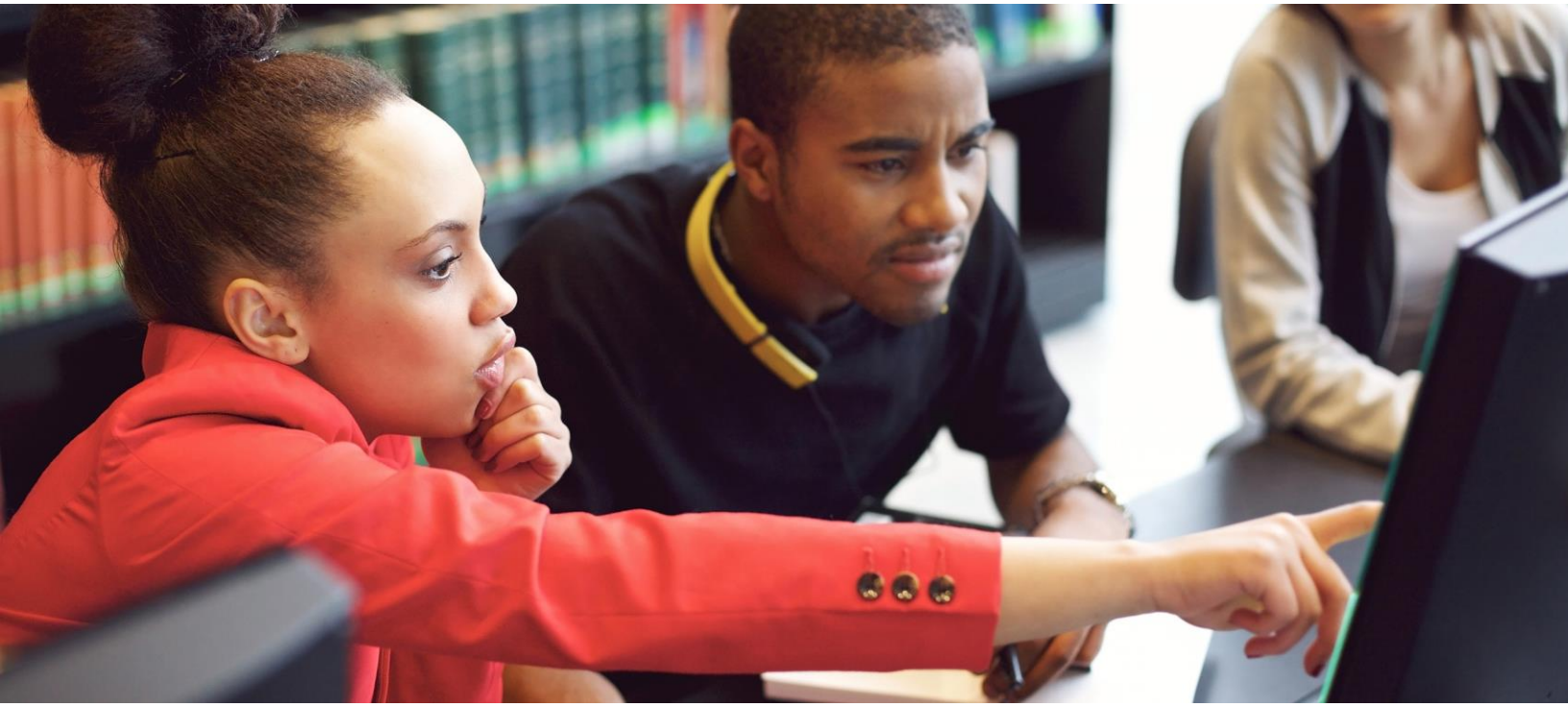

RESEARCH REPORT

New Evidence on Integrated Career Pathways

Final Impact Report for Accelerating Opportunity

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Executive Summary

For most workers, a high school diploma or credential is not sufficient to succeed in the modern economy. Earnings have stagnated for those whose highest level of education is a high school degree. As of 2017, workers with only a high school degree earned 44 percent less than workers with some college education or four-year degrees.[1]

Moreover, even adults who have high school credentials frequently come to college underprepared, with below-college-level skills. By one estimate, community colleges referred approximately 60 percent of first-time enrolling students to at least one developmental math class and about 33 percent to at least one developmental reading class (Bailey, Jeong, and Cho 2010).

The Accelerating Opportunity (AO) initiative was developed to address these issues by giving underprepared students and adults without high school credentials an opportunity to enroll in integrated career pathway programs at community and technical colleges. AO was based on Washington State's Integrated Basic Education and Skills Training (I-BEST) model and lessons from the Breaking Through initiative.[2] AO allowed students scoring in the 6th- through 12th-grade National Reporting System (NRS) educational functioning levels to enter career and technical education (CTE) courses concurrently with high school equivalency (HSE) completion programs through adult education or other skill-building courses. The pathways offered efficient course offerings with paths to multiple stackable, industry-recognized credentials within about 12 credit hours. To promote students' postsecondary success, colleges participating in AO provided team teaching in at least 25 percent of their classes, where a CTE instructor worked alongside an adult education instructor in the classroom, as well as contextualized instruction, accelerated learning, supportive navigation services, and connections with employers and workforce agencies to help students complete their coursework and transition from AO pathways to the workforce.

With support from several foundations, notably the Bill & Melinda Gates Foundation, Jobs for the Future (JFF) partnered with national technical assistance providers to administer AO and provide technical assistance to seven participating states.[3] JFF also specified program elements and performance outcomes. The Urban Institute and its partners at the Aspen Institute and the George Washington University led a rigorous evaluation of AO in four states to inform policymakers and practitioners on the model's potential to improve postsecondary education and employment outcomes for adults with low basic skills.

Impact Evaluation

This final report from the AO impact evaluation presents estimates of how AO career pathway programs affected the educational and employment outcomes of participants in Illinois, Kansas, Kentucky, and Louisiana. The impact analysis examined four key educational outcomes of AO: the

number of credits earned, earning at least 12 academic credits, earning any credential offered by a community college, and the number of credentials earned. The analysis also estimated impacts on two labor-market outcomes: the probability of being employed after enrollment (measured each quarter) and the quarterly earnings of AO participants. These outcomes reflect the principal goal in AO's theory of change: to improve the educational and employment trajectories of underprepared adult learners and thereby increase their employment and earnings (see appendix A).

Using matched comparison groups in each state, the research team conducted a rigorous propensity score matching analysis. This approach matched AO students with a comparison group of non-AO students that were similar in almost every measurable way (including prior labor-market activity, test scores, education history, demographics, and timing of college enrollment) except for their participation in AO. This comparison group provides an estimate of how AO students would have fared in the absence of AO. The difference between the outcomes of AO participants and the outcomes of the comparison group provides an estimate of how much better students fared due to AO enrollment: the impact of AO on the outcomes of interest. The research team tracked students for 2 to 11 semesters after AO enrollment to measure education outcomes and for 3 to 12 quarters after AO enrollment to measure labor-market outcomes, depending on the availability of data. Earlier cohorts of AO students have longer observed follow-up periods than later cohorts.

In Illinois and Louisiana, colleges recruited overwhelmingly from the adult education population, as was envisioned when the AO initiative was developed. In Kansas and Kentucky, colleges recruited both from adult education and from an additional college source: current CTE students in Kansas and developmental education students in Kentucky. The matching analysis was completed separately by recruitment source to account for unmeasured differences among those groups, and the results are reported for each subgroup of students and overall for the state.

This impact analysis presents results for a total of 4,361 students who appeared in college records as having enrolled in at least one credit-bearing course, were not English-language learners, had a valid Social Security Number, and were retained in the matching procedures utilized for the analysis. This represents 63 percent of the 6,946 students flagged as AO participants in the states' administrative records. Many students were excluded from the analysis because they did not take a credit-bearing course and therefore did not have college records, often because of enrollment in noncredit AO programs, which were especially common in Louisiana.

Findings

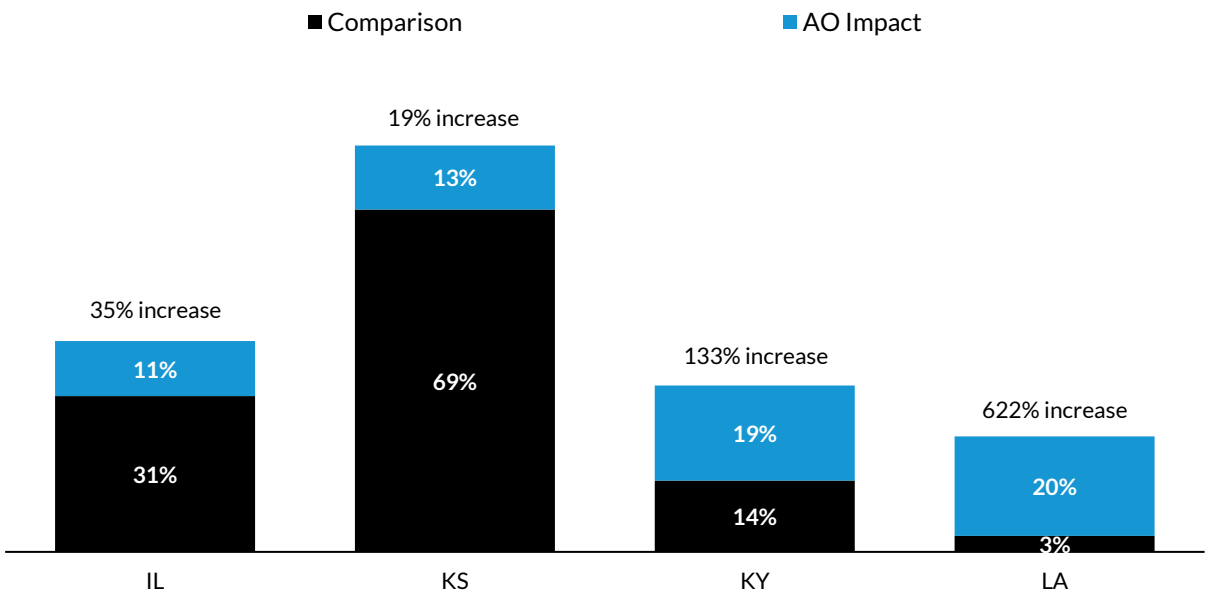
Based on survey data, Anderson and colleagues (2016) reported that colleges counted a total of 8,287 students enrolled in AO in the four states in the first three years of the initiative, which covered calendar years 2012 through 2014 in Illinois, Kansas, and Kentucky and fall 2012 through summer 2015 in Louisiana. The survey results indicated that AO students enrolled in 154 integrated career pathways, primarily in health care and manufacturing.

The college administrative records included over 4,500 AO students with data. For these students, AO colleges awarded over 79,000 credits and nearly 6,800 credentials, producing an average of over 17 credits and 1.5 credentials per AO participant. Examples of credentials included college-awarded certificates for certified nurse aides (CNAs), computer numerical control (CNC) operators, welding technicians, and automotive technicians. One key outcome that JFF specified for each state was that AO participants earn an aggregate of 3,600 occupational credentials through AO pathways.

Based on quasi-experimental propensity score matching analysis on the 4,361 students retained in the sample, the evaluation found that AO had a positive impact on the number of college-awarded credentials earned by almost all students. In most cases, AO students earned more credentials while taking fewer credits, possibly indicating more efficient course-taking and accelerated learning. Figure 1 and figure 2 summarize the credential attainment gains by state. The percent increases, noted above each bar, were much larger in states where the matched comparsion group had low credential attainment, particularly Louisiana. In Louisiana, the 20 percentage-point impact of AO on the likelihood of earning any credential relative to the comparsion group's average of 3 percent likelihood results in a 622 percent increase. Because the comparison group earned zero credentials on average, the percent increase for number of credentials earned is undefinable. In Kansas, the comparsion group had a very high rate of credential attainment. Though they had similar absolute gains to Illinois and Kentucky (a 13 percentage-point gain in likelihood of earning a credential and a 0.6 credential gain in number of credentials earned), the relative increases were smaller.

FIGURE 1

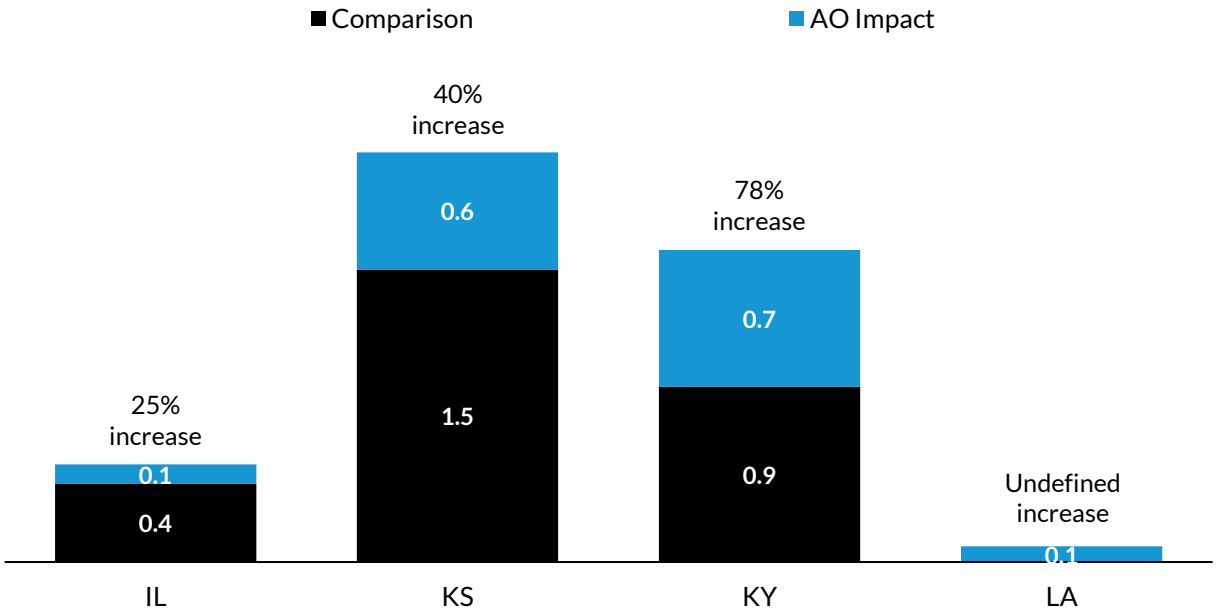
Likelihood that Accelerating Opportunity Students Earned Any Credential, Relative to Matched Comparison Group, by State



Note: This summary figure does not separate the Kansas and Kentucky results by recruitment source.

FIGURE 2

Average Number of Credentials Earned by Accelerating Opportunity Students, Relative to Matched Comparison Group, by State



Note: This summary figure does not separate the Kansas and Kentucky results by recruitment source.

The positive outcomes for credential attainment are notable, though they did not always translate into labor market gains in the observed timeframe. AO had strong and sustained positive impacts on earnings for two subgroups: AO students recruited from adult education in Kentucky and AO students recruited from CTE in Kansas. Adult education students from Illinois, Kansas, and Louisiana and developmental education students from Kentucky did not achieve positive, statistically significant, or enduring gains in earnings during the follow-up period. Table 1 highlights the overall patterns of impact in each state.

The state-by-state results summarize the levels, impact, and percent change in key outcomes and the levels of those outcomes for the treatment and comparison groups. The percent change is measured relative to the comparison group, so comparison groups with very low levels have higher percent changes for the same AO impact. Full results appear in the report body and in appendix C.

TABLE 1

Summary of Accelerating Opportunity Impact Findings from Quasi-Experimental Analysis, by Recruitment Source

	Illinois	Kansas		Kentucky		Louisiana
	Adult ed.	Adult ed.	CTE	Adult ed.	Dev. ed.	Adult ed.
Education						
Credential attainment	+	-	+	+	+	+
Credit attainment (persistence)	◊	-	-	+	+	-
Labor Market						
Short-term employment	-	•	+	-	+	+
Mid-term employment	+	•	+	+	+	◊
Long-term employment	+	N/A	N/A	+	+	◊
Short-term earnings	-	+	+	-	◊	+
Mid-term earnings	+	•	+	+	•	◊
Long-term earnings	•	N/A	N/A	+	◊	-
Accelerating Opportunity Sample Size	**867**	**459**	**1,239**	**122**	**1,234**	**440**

Notes:

+ = significant positive impacts, • = no significant impacts, - = significant negative impacts, ◊ = both positive and negative significant impacts; short-term = quarters 1–3, mid-term = quarters 4–8, long-term = quarter 9 through final observations; N/A = not applicable. Kansas does not have long-term impacts because students are only observed for eight quarters following enrollment. The short-term impacts largely reflect the in-program period, when it may be reasonable to expect negative labor-market impacts because many in training may not be working.

Illinois

Key AO recruitment source: Primarily adult education students.

- AO students earned 25 percent **more credentials** than the comparison group and were 35 percent **more likely to earn any credential** than the comparison group. As shown in figure 1 and figure 2, the comparison group's credential attainment rate was fairly high, but the average number of credentials earned was quite low.
- AO students earned **fewer college credits,** suggesting acceleration. They were **more likely to persist beyond 12 credits.**
- AO students had somewhat **higher employment rates** than the comparison group beginning in the 3rd quarter, peaking at a 15 percent gain over the comparison group rate of 54 percent in the 12th quarter after AO enrollment (impact of 8 percentage points).
- AO students had **medium-term earnings gains** in the fifth quarter after enrollment of up to 14 percent over the comparison group average earnings of $2,035 (impact of $293), though these positive impacts **faded out** by the sixth quarter after enrollment.

Kansas

Key AO recruitment source: Primarily CTE students, but also a relatively low-barrier subset of adult education students.

- AO students from both adult education and the CTE recruitment earned **more credentials** than their matched comparison groups. AO students from CTE earned 57 percent more credentials than the comparison group. The gain for AO students from adult education was positive but not significantly different from zero. **AO students recruited from CTE were also more likely to earn any credential** than their matched comparison group, but **AO adult education students were not**.
- AO students from both the adult education and the CTE groups attained more credentials while taking **fewer college credits**, suggesting acceleration.
- The **CTE group experienced large, positive, and persistent impacts on employment and earnings**. The employment gains in the eighth quarter after enrollment were 33 percent higher than the comparison group average earnings of $3,606 (impact of $1,188).
- The **adult education group experienced close to zero impacts on both labor-market measures**. However, it should be noted that this was a particularly low-barrier subset of the adult education population that would likely have had strong labor-market outcomes in the absence of AO (as demonstrated by the comparison group).

Kentucky

Key AO recruitment source: Primarily developmental education students, but also adult education students.

- AO students recruited from both adult education and developmental education experienced **relatively large increases in the number of credentials earned and the probability of earning any credential**. AO students recruited from adult education were over six times more likely to earn any credential. AO students recruited from developmental education earned 80 percent more credentials and were more than twice as likely to earn any credential. These large gains reflect the low levels of credential attainment among the comparison groups.
- AO students recruited from both adult education and developmental education also earned **more credits** and were **more likely to earn 12 credits** than their respective comparison groups. On average, AO adult education students earned additional credits equating to about two more classes, and developmental education students earned credit equating to about 1.5 more classes.

- Students from both recruitment sources experienced **positive impacts on employment rates, with larger impacts among AO students recruited from adult education.** Only **AO students from adult education experienced earnings gains** over the comparison group, reaching a gain of 43 percent over the average comparison group earnings of $1,984 in the ninth quarter after enrollment (impact of $855). For AO students from adult education, substantial gains persisted through the end of the observed period. Modest but significant positive gains appeared only in the 12th observed quarter for students recruited from developmental education.

Louisiana

Key AO recruitment source: Primarily adult education students; program also offered many noncredit pathways that are excluded from the analysis.

- AO students in Louisiana saw **gains in the number of credentials earned.** They also saw **large gains in the likelihood of earning any credential**, with AO students 20 percentage points more likely to earn a credential than the matched comparison group, a 622-percent increase.
- Meanwhile, AO students earned **fewer credits**, equating to more than one fewer classes taken. They were **less likely to persist for 12 credits**, suggesting acceleration.
- AO students saw **gains in employment and earnings through the sixth quarter** after enrollment of up to 38 percent more than the comparison group average of $1,868 (impact of $710), after which they **fell behind** the comparison group on earnings, displaying negative impacts. That may have occurred because of the various similar programs and services available to the comparison group in Louisiana during AO implementation, which would weaken the distinct effect of the AO treatment over what was otherwise available.

Overall, AO helped participants with low academic skills earn more credentials from community college programs than similar non-AO students. AO students often increased their credential attainment while taking fewer credits. Depending on the value of the certificates, this pattern may represent a cost savings in terms of tuition and time dedicated to earning credentials. Labor-market gains for AO participants were mixed. Most AO students were not able to translate added certificates into consistent employment and earnings gains in the observed period. For Kansas CTE students and Kentucky adult education students, however, the earnings impacts were positive and persistent.

Limitations

The analysis did not take into account potential benefits to students, such as self-esteem, family stability, health, or other aspects of personal well-being. In addition, many states and colleges used AO as an opportunity to implement systemic changes to improve opportunities for adult education and

other low-skilled students. Elements of systems change are not captured in this analysis, though some aspects are described in the implementation report (Anderson et al. 2016).

In addition, the AO population is a subset of students that may not represent the broader populations in their states of those in adult education, CTE, and developmental education. For example, the Kansas AO adult education group appears to be particularly advantaged as measured by educational attainment, prior employment, NRS educational functioning levels, and the earnings of the comparison group. The unique characteristics of AO students may limit the generalizability of the findings across larger groups.

Other analysis limitations are discussed in the Methodology section of the report.

Policy Implications of AO Impact Results

AO is a promising approach to help low-skilled adults attain more credentials, potentially more quickly than they would otherwise. But AO alone may be insufficient for generating consistent, positive effects on earnings. Policymakers and administrators considering replication of AO should look closely at how best to translate increases in credential attainment into long-term earnings gains. The evaluation's implementation research (Anderson et al. 2016) indicates that strengthening linkages with employers may be a critical component that was not fully developed in the early implementation period. In addition, further development of the model to improve labor-market outcomes might focus on helping students advance their careers beyond the jobs associated with entry-level credentials.

Overview of Accelerating Opportunity and Prior Research

Accelerating Opportunity (AO) offered underprepared adult learners the opportunity to enroll in career and technical education (CTE) pathways at community and technical colleges even if they did not possess a high school diploma or high school equivalency (HSE), collectively termed a high school credential, or had low test scores that otherwise would have limited their access to for-credit CTE courses. To increase the success of these students in their CTE courses, AO enhanced the supports for participating students by using team teaching, contextualized instruction, and career navigation. At the same time, students could complete their HSE through adult education or remediate low basic skills. The initiative also supported systems changes at the college and state level. These changes encouraged more sustainable and career-focused career pathways by shifting culture to make the colleges and CTE programs more welcoming to students with low initial test scores or without high school credentials and by altering policy conditions to help fund and support underprepared students. The Urban Institute and its partners conducted a mixed-methods evaluation to document AO implementation, estimate its impacts on participants' education and employment outcomes, and assess whether the effort yielded greater benefits than costs over time. This report presents the results of the analysis of AO impacts on students' education and labor-market outcomes.

Launched in 2011, AO aimed to transform how states and community and technical colleges train and educate students with low basic skills. Past research had found that many students with low scores on academic tests spend sometimes considerable time in remedial or developmental education classes and then often do not complete all occupational courses that are required to attain a credential. The AO model offered a new approach based on the Integrated Basic Education and Skills Training (I-BEST) program developed and operated in Washington State. Instead of requiring students with weak academic skills to complete preparatory courses before entering CTE courses, the AO model moved students directly into CTE courses at community and technical college while adding a second teacher who assisted students with basic skills reinforcement in reading and math. The critical team teaching component involved adult education and CTE instructors working together in the same classroom for about 25 percent of the total class time in the pathway. In addition to team teaching, AO incorporated

comprehensive student support services, accelerated learning, and alignment between basic skills instruction and substantive technical concepts.

This report presents findings from a quasi-experimental impact analysis of the effect of AO on participating students' educational outcomes, employment, and earnings.[4] This work complements final reports from the Urban Institute on AO implementation (Anderson et al. 2016) and cost-benefit analysis (Kuehn et al., forthcoming).

The AO evaluation began in 2012 and focused on programming through the end of 2014. Because states varied in the operational aspects of the programs implemented within the AO model, the study examines impacts separately for each of the four participating states: Illinois, Kansas, Kentucky, and Louisiana. AO generally had positive effects on the attainment of CTE credentials awarded by colleges but had mixed effects on college persistence. It also had positive effects on postprogram employment and some limited positive effects on postprogram earnings that persisted over time in a couple of cases, but faded in most other instances. The effects varied across states and student populations, suggesting that AO exerted different impacts depending on the population served, local economic context, and implementation conditions.

The Rationale for Accelerating Opportunity

AO aimed to address a major challenge faced in the United States: there are too many adults with low basic skills and few prospects to earn a decent living. About one in six adult Americans (36 million) has low literacy levels, and one in three (18 million) has low numeracy levels (OECD 2013; US Department of Education 2015).

Adults with low basic skills may or may not have high school credentials. Eleven percent of adults lack a high school diploma or HSE, such as a General Education Development (GED) credential. The average unemployment rate in 2015 for adults ages 25 to 64 without high school credentials was 78 percent higher than the unemployment rate among those with some college education or greater.[5] As of 2017, workers with only a high school degree earned 44 percent less than workers with some college or four-year degrees.[6]

Adult education programs, operated by community and technical colleges, school districts, and community-based organizations, help adults obtain a secondary school credential, such as an HSE certificate or adult high school diploma, or help them improve English-language skills. However, such programs typically have few links to postsecondary education or advanced training that yield recognized occupational credentials necessary for well-paying jobs. By one estimate, only 3 to 6 percent of adult education students transition to postsecondary programs and earn any type of certificate (US Department of Education 2013). Thus, few adult education students ever enroll in, much less complete, postsecondary education or advanced training.

Adults who do have high school credentials may be low-skilled as well. Many high school graduates are underprepared for postsecondary education and are placed in developmental education classes when they enroll in college. By one estimate, community colleges referred approximately three-fifths of first-time enrolling students to at least one developmental math class and referred one-third to at least one developmental reading class (Bailey, Jeong, and Cho 2010). Thus, adults with high school credentials often also require remediation.

About three-quarters of the fastest-growing jobs in the next decade will require a high school credential and some postsecondary education or advanced training.[7] Further, as the economy shifts with technological advances, falling oil prices, and other macroeconomic changes, workers will increasingly need higher levels of literacy and numeracy. Innovative approaches to coenrollment and career pathways, such as AO, may help adults access the education necessary for labor-market success.

The Accelerating Opportunity Model

The AO initiative was a state-led effort funded by grants from several foundations, particularly th e Bill & Melinda Gates Foundation, and administered by Jobs for the Future (JFF).[8] State-level teams of community college oversight offices and partners guided and funded a minimum of eight participating community and technical colleges to develop or modify college programs to emphasize career pathways for in-demand occupations and make them accessible to AO participants. Career pathways are sequenced education and training programs for gaining occupational knowledge in in-demand fields; they allow students to quickly earn an initial credential and build on it with additional related credentials later (Clagett and Uhalde 2012; CLASP 2013; Fein 2012). AO career pathways were designed to make participation and completion manageable for low-skilled individuals with family and work commitments and to help students develop marketable occupational skills. In AO, the initial phase of the pathway typically consisted of approximately 12 credits and lasted one academic year or less. This requirement for AO career pathways was based on "tipping point" research, which suggests that once a student completes the equivalent of one full-time semester of college course work, they are more likely to pursue further education and training (Prince 2009).[9] During this phase, a student earned a college-awarded credential or set of credentials that would be meaningful for employment through CTE programs. Subsequent steps on the pathway allowed students to earn additional credentials and degrees to help them qualify for mid- to high-skilled occupations that paid good wages.

Beyond career pathways, other key programmatic components of AO included integrated instruction, where both basic skills and CTE instructors taught in the same classroom with at least 25 percent overlap (known as the "team teaching approach"); a focus on comprehensive student support and navigation services; contextualization of instruction; accelerated learning; and labor-market connections. JFF and its partners derived those approaches from Washington State's I-BEST model and lessons from the Breaking Through initiative.[10] A quasi-experimental impact study of the I-BEST model

found positive effects on students' college credits and credentials earned but no detectible effects on persistence in college and labor-market outcomes (Zeidenberg, Cho, and Jenkins 2010).

These initial findings spurred replication, adaptation, and scale-up of those approaches to new states through AO in an effort to both improve underprepared students' academic outcomes and affect their labor-market success through several enhanced elements. AO's enhanced design included policy changes, partnerships, and culture shifts at the college and state levels to institutionalize the model. This means that JFF expected states and colleges to create and maintain a system of support for low-skill students to access, be accepted in, succeed in postsecondary education, and experience labor-market payoffs. The states involved in the evaluation (Illinois, Kansas, Kentucky, and Louisiana) agreed to adhere to the AO model and the required program elements. Appendix A summarizes the core design elements of the AO model and presents the theory of change, which specifies two- and four-year outcomes for the system and long-term goals for the students.[11] (Note that all appendices appear in a separate document.)

JFF's overall goal for the initiative was for each participating state to award at least 3,600 credentials within the grant period. Participating colleges were required to target recruitment efforts toward students who are within National Reporting System educational functioning levels (NRS functioning levels) 4–6 (6th- to 12th-grade level) on math, reading, or writing or NRS functioning levels 5–6 (high intermediate to advanced) in English-language skills for English-language learners. Eligible students may or may not have had high school diplomas or HSE credentials, though the initiative was designed to focus on adult education students without an HSE or with low English-language skills. Shifts in the target population as states sought to scale over the course of the initiative and the implications for the evaluation are discussed below.

The AO Evaluation

The AO evaluation, conducted by the Urban Institute and its partners, the Aspen Institute and George Washington University, is a comprehensive assessment of the initiative. The goal is to generate valuable evidence for the field and inform public policy on new approaches to serving the education and workforce needs of adults with low basic skills.

The evaluation consists of three major components:

- **Implementation study:** A qualitative study of how AO integrated pathways were undertaken by the states and colleges, scaled, and potentially sustained, as well as an analysis of how well the states and colleges implemented the AO model. Anderson et al. (2016) report the final implementation findings.
- **Impact study:** A quasi-experimental analysis designed to measure the effectiveness of the AO model based on its impact on the education and labor-market outcomes of AO participants, comparing them with similar students who did not participate in AO.

- **Cost-benefit analysis:** A comparison of the costs and benefits for states, colleges, and students engaged in the AO initiative. The final report is forthcoming (Kuehn et al., forthcoming).

This report provides the results of the final impact study, with medium- and long-term impacts on students' education and employment outcomes for all cohorts of AO students. This report intends to answer the following research questions:

- Who were the AO students and how did they differ across states?
- How did colleges' AO pathways and recruitment efforts shape the mix of students in AO?
- How did the characteristics of AO students change over time?
- Did AO students earn more credentials and credits than similar individuals who did not enroll in AO?
- Were some groups of AO students more successful than others in their educational outcomes?
- Did AO students achieve higher employment and earnings levels than similar individuals who did not enroll in AO?
- Were some groups of AO students more successful than others in their labor-market outcomes?

The impact evaluation examined students who enrolled in the first three years of the initiative, which included cohorts enrolling from calendar years 2012 to 2014 in Illinois, Kansas, and Kentucky and cohorts enrolling through summer 2015 in Louisiana. The research team used propensity score matching, a quasi-experimental statistical method that matched treatment and comparison group members on observed characteristics to estimate the impacts of AO on educational and employment outcomes, as described in the Methodology chapter below.[12] In the design phase of the evaluation, the team considered using regression discontinuity design, given the eligibility cut-offs using test scores, but inconsistencies in implementation of eligibility requirements made this method infeasible. Data for the impact evaluation came from state college and earnings administrative records, and measures were therefore limited to what could be observed in these data sources. The implementation findings, derived from site visits, interviews, student focus groups, annual college surveys, and two rounds of student surveys, informed the research team's interpretation of the impact results.

AO Implementation Findings

The AO implementation study has been important for shaping the impact study design and for interpreting of the results.[13] Key findings from the AO implementation report are as follows:

The composition of participating colleges and pathways changed over time as states and colleges scaled the initiative. States were required by the terms of the grant to engage at least eight colleges in

AO. Thirty-four colleges were selected at the start of the initiative across the four states.[14] Kansas and Louisiana began the implementation period with nine colleges, and Illinois and Kentucky started with eight. Over time, the number of AO colleges increased in all states except Louisiana. Kentucky scaled AO up to all 16 colleges in the state by the end of the third year of implementation. Illinois added four more colleges each year, and Kansas expanded to an additional two colleges throughout implementation (though one Kansas college discontinued participation in the second year). Further, colleges made changes to the number and types of pathways offered, growing from 89 to 154 recorded pathways; colleges also changed the nature of team teaching and supportive services in each pathway area. As states and colleges gained experience over the three years, the initiative evolved and grew. The research team has included all participating colleges in the impact study, though the cost-benefit analysis (forthcoming) is limited to colleges that participated in AO for all three years and that provided complete cost data in each year. The section "Cohort Effects" contains impact results for only the colleges involved in the cost-benefit analysis by student cohort year.

Early implementation of the AO pathways was challenging, but colleges became more strategic about the pathways offered. Early in the AO implementation period, colleges worked intensively to roll out pathways quickly and build the necessary infrastructure and supports to deliver integrated instruction, contextualized curriculum, and team teaching. When selecting the occupational areas that pathways would target, many colleges evaluated local labor-market data in addition to prioritizing institutional factors, such as building the support of CTE faculty for the AO model or modifying enrollment requirements for certain pathways. By the second and third years of the initiative, states and colleges had more experience with the AO model and could be more strategic about how pathway offerings could match the needs of both students and local employers. Manufacturing and health care remained the most common occupational areas, at 39 and 32 percent, respectively, for career pathways. With guidance from AO state teams, many colleges reemphasized labor-market demand in selecting pathways rather than institutional priorities and recalibrated some of their pathway offerings. Given that the majority of pathways and students fell within the manufacturing and health care sectors, the impact analysis categorizes AO students who are not in one of these two pathway areas in "other" sectors.

The instructional methods used and the experience of the teaching teams varied over time. During the first year of the initiative, colleges prioritized training the first teams of CTE and adult education faculty in integrated instruction, including contextualized instruction and team teaching methods. By the end of the first year, all colleges in the four states had begun team teaching, implementing diverse styles across colleges and classrooms. As with pathway selection, the initial decision on how and in which courses to implement team teaching depended greatly on the support of CTE faculty and staff. In the second and third years, colleges continued to bring new faculty into the initiative and train them in team teaching and integrated instructional approaches.

Colleges and teaching pairs implemented team teaching in different styles, ranging from an approach in which the CTE and adult education instructors share teaching duties to an approach in which the CTE teacher is responsible for instruction while the adult education instructor circulates

around the classroom, monitoring student needs in real time. Variations in students' team teaching experiences may explain some of the variation in impacts. It was not possible to track team teaching intensity or approach in the data used for the impact study.

In Kansas and Kentucky, many colleges recruited individuals with high school diplomas or HSEs and struggled to recruit adult education students. One reason for this focus on students with high school credentials was that students without high school credentials lost access to federal Pell grants (known as the "ability-to-benefit" provision) to pay for program tuition soon after the initiative started in July 2012. The change in federal rules meant these students could no longer qualify for federal financial aid. The requirement meant that non-HSE students enrolling into most AO programs would need to pay for their own college tuition costs and work with AO college staff on strategies to finance their education. This federal policy change affected colleges' efforts to recruit students lacking high school credentials, who typically are enrolled in adult education programs. As a result, many AO colleges in Kentucky and Kansas heavily recruited students who met the AO test score targets, meaning the students qualified for AO at the allowable skill level but already had high school credentials and thus could qualify for Pell grants. These students came from the colleges' developmental education or CTE programs. Some stakeholders explained in interviews that they did not see focusing on students already in developmental education or CTE programs as an issue. They pointed out that AO could significantly improve education and earnings outcomes for students with and without high school credentials, giving them the ability to succeed in college courses through the provision of additional supports, particularly team teaching. Because colleges heavily recruited students outside of adult education in Kansas and Kentucky, the research team divided AO students by recruitment source in those two states and matched to comparison group students from the same source. This is discussed in more detail below.

Although scores were a primary determinant of eligibility, colleges used several screening methods to enroll qualified students. When recruiting students for AO, colleges considered not only a student's adult basic skills or English-language proficiency test scores but also their level of commitment to the program and potential barriers to completion, such as lack of transportation and funding issues. In order to meet program requirements and maximize the chance of student success, many colleges screened students based on criteria other than test scores, such as by requiring interviews, recommendations, background checks, or proof of citizenship. In the first year of AO, 85 percent of colleges used some additional screening mechanism (Anderson et al. 2014). AO colleges had a mix of experiences in recruiting AO students in the first year, but many college coordinators expected that they would see increased enrollment numbers as awareness of the program grew and they could prepare more students to enter into pathways.[15] The determination of eligibility based on factors beyond test scores complicates the impact study because the propensity score matching approach used in the impact analysis can only rely on characteristics that are observable in the data. If student motivation or personality characteristics are not well-captured by the available variables, then a mismatch (bias) will occur between the treatment and comparison groups. For this reason, the research team included a wide range of characteristics, including prior earnings and test scores, in the matching model.

Colleges engaged employer partners as a part of AO, but many faced challenges in creating and sustaining meaningful relationships. AO programs with strong connections with CTE departments often leveraged existing employer advisory boards to connect employers directly with students, create opportunities for work-based learning, or promote or support the AO program in other ways. About 35 percent of AO students engaged in work-based learning over the three years, according to participating colleges. The percentage increased from 28 percent in the first year to 42 percent in the third year of AO. As those numbers suggest, the relationships between AO programs and employers often developed over time. Employer engagement was particularly weak in the early implementation period. Further, the level of employer engagement varied widely across states, colleges, and even pathway occupational areas throughout the implementation period. That variation may have had some bearing on students' labor-market outcomes after completing the initial AO pathway and may be reflected in the modest employment and earnings impacts found in this report, which reflect the longest-term outcomes for the earliest AO cohorts.

The remaining report chapters provide information on the characteristics of AO participants and the education and labor-market impacts of each state program. The discussion explains how known information about AO implementation can help explain the impacts on AO students' educational and earnings outcomes. The appendices present detailed participant characteristics, the results of the analysis of AO impacts on education, and the labor-market outcomes of AO participants.

Methodology

This impact analysis aims to answer the question, "What happened to AO students compared to what would have happened to these students in the absence of AO?" To estimate that alternative scenario (the counterfactual), this report uses a quasi-experimental technique called propensity score matching, an approach that identifies a comparison group of individuals similar to AO students but who were not exposed to AO. The propensity score is the predicted probability that any individual in the dataset could be an AO participant. Using the propensity score, the research team matched the students who participated in AO (the treatment group with students who have the same or similar propensity scores who did not have the opportunity to participate in AO (the comparison group). The comparison groups were drawn from the same recruitment source as AO students: adult education, developmental education, or CTE.

The matching between treatment and comparison groups is at the individual level. Thus, every member of the treatment group is matched with one or more people in a comparison group drawn from the same recruitment source (adult education, developmental education, or CTE) who did not have the opportunity to participate in AO.[16] The procedure creates matches so that the treatment and comparison groups are as similar as possible with respect to characteristics observed in the data. **The outcomes for the matched comparison groups serve as the best possible estimate of what AO students would have experienced in the absence of AO.**[17] For example, the adult education comparison group in Kentucky experienced close to zero earnings growth while the adult education comparison group in Kansas had particularly strong earnings growth. Those experiences represent the likely trajectories of AO students from those respective student populations (given their characteristics and the local labor market) if they did not have access to AO.

Overall, 4,966 students were enrolled in AO who were matched to postsecondary records and thus had enrolled in a for-credit course at an AO college in the calendar year 2012 to 2014 implementation period in Illinois, Kansas, and Kentucky and the fall 2012 to summer 2015 implementation period in Louisiana. That number is smaller than was reported in the implementation research because it excludes students in noncredit programs (who were particularly common in Louisiana). Administrative data analysis commonly yields smaller numbers of participants than those self-reported by programs because of timing, definitional differences, or data deficiencies. Ultimately, 4,760 AO students remained in the treatment group after matching to earnings records and other modest sample adjustments; these students were then matched to students in a much larger comparison pool based on the variables listed in box 1.[18]

BOX 1

Variables Used for Matching

The research team used the following extensive set of variables to estimate propensity scores. In addition, indicators of missing variables were included where applicable.

- Local area unemployment rate for the metropolitan statistical area
- Semester of enrollment in AO (treatment group) or start of most recently observed college spell (comparison group)
- Credential: Indicator variables for if a student earned an HSE credential before enrollment, if a student earned a high school diploma before enrollment, and if a student earned greater than an HSE credential or high school diploma before enrollment (such as an associate's or bachelor's degree)
- Student had prior postsecondary experience
- Student had prior adult education experience
- Age and age squared
- Female
- Race or ethnicity: white, black, Hispanic, other race, or missing race
- Single parent
- Student received a Pell grant
- Instructional area of enrollment based on Classification of Instructional Program (CIP) code: Health care, manufacturing or mechanic trades, other AO occupational area, other non-AO occupational area
- NRS functioning levels based on adult skills test (adult education students only): Indicator variables for scores of 1 or 2, 3, 4, 5, 6
- Postsecondary test scores (non–adult education students only): Standardized postsecondary score (COMPASS, ACT, SAT, ACCUPLACER) and standardized postsecondary score squareda
- Total number of quarters employed in eight quarters before enrollment
- Total earnings in eight quarters before enrollment measured in the following four variables: fifth to eighth quarters before, third and fourth quarters before, second quarter before, first quarter before
- Employed in two quarters before enrollment: second quarter before and first quarter before
- Predicted probability of college (adult education only)

[a] Scores are standardized to have a mean of zero and a standard deviation of one.

After matching students using propensity scores, the research team estimated the effects of AO participation on educational and earnings outcomes. Appendix D contains the balancing tests after matching, which show that in each state and subpopulation, the treatment and comparison groups are fairly well matched by the propensity score analysis alone. Most baseline characteristics are balanced after the match, although several remain unbalanced. Because not all baseline conditions are balanced,

the impact estimates control for all baseline characteristics in a regression. A regression approach adjusts for any remaining observable differences in the treatment and comparison groups and increases the precision of the estimates. This approach may not account for unobserved differences between the groups, such as intrinsic motivation or strength of workforce-readiness skills. However, matching individuals based on each person's test scores and employment and earnings history likely aligns students on many of those difficult-to-measure characteristics.

Assuming the groups are well-matched on characteristics before AO participation and all baseline characteristics are included in the regression, the regression coefficient on the AO participation yields the estimated impacts of AO on educational and earnings outcomes.

Data Sources

This analysis used administrative data from at least three sources in each state: the state adult education program data system, the state's college data system, and the state unemployment insurance earnings records. States coded each individual in the datasets as being an AO participant or not an AO participant. Records were collected for students who enrolled in AO programs, college programs, or adult education programs in the first three years of the grant period, which began in the spring 2012 in Illinois, Kansas, and Kentucky and fall 2012 in Louisiana. AO programming was relatively new during this observed period, and the most robust follow-up data are available only for the earliest cohorts. Therefore, this is an **early look** at the impacts of AO. The impacts may change as the initiative matures, but that cannot be observed in this analysis. Students were tracked through the latest available date, which was often early in calendar year 2016. That provided an opportunity for up to 12 quarters (three years) of follow-up for the earliest cohorts and at least 3 quarters of follow-up for the latest cohorts. Although those periods of follow-up were sufficient to obtain substantively useful results, a longer observation period for more cohorts would strengthen the analysis and confidence in the conclusions.

One drawback of unemployment insurance data is that they only capture earnings in covered employment covered by unemployment insurance within the state. Although the data provide earnings records for the vast majority of workers,[19] they do not capture earnings for workers who are employed across state lines, for some religious and government entities (including the military), for railroads, as sole proprietors, or "off the books." Although relying on unemployment insurance records may produce too low of an estimate of employment and earnings, the exclusion of records from some groups is unlikely to cause a bias in the impact estimates because the less-than-complete coverage of earnings are unlikely to affect AO and non-AO students differently.[20]

The state offices administering the AO grant worked with the Urban Institute and the state labor agency to link education and earnings data and then de-identify the records of AO and comparison group members so that the research team did not receive students' personally identifiable information.[21] Instead, the research team received records with a unique identifier that was not a Social Security number or college identification number, and that identifier allowed for linking across files.

Analysis Sample

Table 2 summarizes the steps taken to produce the final analysis sample included in this report. The first row of table 2 provides the starting AO sample. This is the number of students in each state's dataset that were flagged as AO students. This number may include students who enrolled before or after the three-year analysis period, which ran from the beginning of spring 2012 through the end of fall 2014 in Illinois, Kansas, and Kentucky and from the beginning of fall 2012 through the end of summer 2015 in Louisiana.

TABLE 2

Sample Sizes for AO and Comparison Group Students, by State

	Illinois		Kansas		Kentucky		Louisiana	
	AO	Comp	AO	Comp	AO	Comp	AO	Comp
Starting AO sample	1,220	7,474	2,210	40,375	1,372	330,374	2,144	226,389
Sample linked to postsecondary records	952	4,456	1,733	29,466	1,372	229,019	556	8,587
Sample linked to postsecondary and UI records	931	4,131	1,704	28,889	1,362	20,226	440	3,015
Sample before matching	867	4,129	1,699	12,595	1,360	18,791	440	3,015
Sample after matching	867	4,129	1,698	12,595	1,356	18,547	440	3,015

Note: AO = Accelerating Opportunity initiative; comp = comparison group; UI = unemployment insurance.

The research team only analyzed students with postsecondary education records who enrolled in at least one credit-bearing class during the analysis period. As a result, "no-shows," or students who signed up for AO but never enrolled in college during the observed period, are excluded from the analysis, as are individuals in the comparison group who did not take a college course.[22] Also excluded are students who were missing critical identifying information in their adult education records, making it impossible for the state office to locate them in the college data even if they did enroll in a course. In Louisiana, about 58 percent of the AO sample is not part of the analysis because they were enrolled in noncredit postsecondary programs. The exclusion of noncredit programs is appropriate because 1) a core element of AO was that AO pathways award "some college-level professional-technical credits, which must be recorded in a transcript the quarter or semester in which they are earned" (JFF 2015); and 2) Louisiana tracks progress in noncredit programs using a different data system that could not reliably match individuals to earnings data because adequate identifying information was not available to the research team.

After linking cases with postsecondary records, the next step was to remove students who were not eligible for the analysis. Many such removals were from the comparison group. Students in the comparison group in classes with at least four AO students who were within their first four courses were removed because it was assumed that these non-AO students were taking classes that were part of an AO pathways program.[23] The implementation research revealed that non-AO students taking classes within AO pathway areas in AO colleges received many of the same services as AO students,

including exposure to team teaching and support of an AO navigator, who usually extended their services to non-AO students in AO classes.

Another adjustment to the sample before linking the data files was to remove the small number of remaining English-language learner students from AO and the comparison group.[24] These students have different characteristics from adult education students in their education and labor-market trajectories,[25] and it would be better to match them to an English-language learner comparison group. However, the small number of English-language learner students in each state made this analysis infeasible. In addition, test scores for English-language learner students were not directly comparable to the test scores used to measure adult basic skills, further complicating a pooled analysis.

The next step was to link students with unemployment insurance administrative data, which has quarterly earnings records for nearly all workers in a state.[26] The only reason that a student would not match to unemployment insurance records (other than not having any earnings) is if they worked for an employer not covered by unemployment insurance (as discussed above) or did not have a valid Social Security number.[27] If a student did have a valid Social Security Number but did not match to earnings records, the research team assumed that he or she did not have any employment history in a job covered by unemployment insurance during the relevant period. Because unemployment insurance records are collected at the state level, it is also possible that students who do not match to the earnings records in one or all of the study quarters were employed in another state, as noted previously.

After developing the final linked dataset, the research team matched the AO students to comparison group cases. Some comparison group cases did not match to any treatment cases and dropped out of the analysis. In Kentucky, four AO students dropped out of the analysis because there were not comparable non-AO cases, but such a change to the dataset was too small to have any effect on the estimates produced. In the end, 4,361 AO students were retained in the analysis across the four states.

Adjustment for Comparison Group's College Enrollment

This analysis compares adult education–recruited AO students to adult education students who enrolled in at least one college course. The research team chose this comparison group for three reasons: 1) AO students are motivated and low-barrier enough to express an interest in college and enroll in AO, 2) much of the necessary data for the analysis are in the college files, and 3) it followed the precedent of the I-BEST research.

If all AO students would likely have enrolled in college if AO did not exist, then comparing AO students to adult education students who took a college course of their own accord would be sufficient because both groups had an interest in and motivation to enroll in college CTE courses. However, AO may also promote access to college among adult education students who otherwise would not have enrolled because of academic, motivational, or financial barriers, which the program may have

alleviated. In the AO implementation research, several students who were interviewed stated that they did not think college was an option for them until they heard about AO, which indicates that AO played a role in college access, at least for some students. If many AO students who came from adult education would not have enrolled in college if not for AO, then comparing them to adult education students who were able to access college without the assistance of a program such as AO (and therefore were both particularly motivated and had relatively low barriers to college access[28]) may lead to underestimates of the impacts of AO. AO students are probably realistically in the middle between a "typical" non-college-going adult education student and a very motivated, low-barrier adult education student who enrolls in college on their own.

The research team attempted to address this issue by estimating a "predicted probability of college" measure for the adult education population and included this measure in the propensity score matching analysis. The team estimated this probability by implementing a logistic regression analysis for the entire adult education population (except for AO students), both those who enrolled in college and those who did not, to see which characteristics within that population predict college enrollment. This analysis excluded AO students because AO is an extra support that may confound the results. The research team used a scaled down model to predict college enrollment based on the availability of the variables in the adult education datasets. The variables used were adult education enrollment date, receipt of a high school credential, age, gender, race or ethnicity, and single-parent status.

After modeling college enrollment for the entire adult education population, the research team used the model to predict college enrollment for the AO and comparison groups. This predicted probability of college enrollment was then included in the matching model for the adult education population so that AO participants were matched with members of the comparison group who had a similar likelihood of going to college.

Though the measure of predicted probability of attending college may not address all conditions that cause an adult education student to enroll in college, it does help alleviate some of the issue that members of the AO treatment group and the adult education comparison group have different propensities to attend college. Addition of the probability of attending college as a matching variable does not substantively change the results from earlier analyses that did not use this variable.

Separation by Recruitment Source

Though the analysis accounts for many measured characteristics, it is also important to try to align the unmeasured differences between students. One way to do this is to account for AO participants' recruitment source. Some students came to AO through the adult education system; others enrolled in AO while participating in developmental education or while enrolled in CTE (but with low initial basic skills test scores). Adult education students tend not to have high school diplomas or HSE credentials and face particular challenges accessing postsecondary education. Students with low basic skills in CTE or developmental education programs tend to have secondary school credentials and have fewer

barriers accessing college, but they may struggle to succeed in college-level courses. Students recruited through different sources are likely to differ in unmeasured student characteristics. Therefore, the analysis matches AO students who were recruited from adult education with non-AO adult education students; those recruited from developmental education and from CTE are matched with similar students from those sources, respectively.[29] The impact results are reported for AO students (matched to the appropriate comparison group) by state and recruitment source. The impacts by recruitment source capture different effects of the AO model for different populations.

Outcomes Measured

This report examines students' education and labor-market outcomes. The education outcomes are

- the number of credentials earned through the college,[30]
- whether the student earned any credential earned through the college (yes/no),
- the number of credits earned,[31] and
- whether the student earned more than 12 credits (yes/no).

The labor-market outcomes are

- the student's employment in each of the 12 quarters following enrollment (or for as long as data are available), and
- the student's earnings in each of the 12 quarters following enrollment (or for as long as data are available).

The labor-market outcomes are predicted for each quarter following enrollment. Labor-market data on all students were available for 3 to 12 quarters of postenrollment earnings. Education data were available for 2 to 11 semesters following enrollment. Time censoring limited the data observed for later cohorts. As a result, the sample size decreases beyond the third or fourth quarter, and the longer-term outcomes reflect the experiences of the earlier AO cohorts.[32] The section "Cohort Effects" provides results for each cohort at colleges that will be part of the cost-benefit analysis.

The outcomes have a few important caveats. First, the research team recognizes that credits, credentials, and labor-market outcomes do not represent the full range of potential benefits of a program such as AO. A larger goal of AO (and many similar programs) is to help students live better, more fulfilling lives. Although education and labor-market outcomes contribute to quality of life, the analysis does not account for potential benefits such as self-esteem, family stability, health, or other aspects of personal well-being. Further, many states and colleges used AO as an opportunity to implement systemic changes to improve opportunities for adult education and other low-skill students.

Elements of systems change are not captured in this analysis, though some aspects are described in the implementation findings (Anderson et al. 2016).

Second, the credentials counted are college credentials that may or may not have value in the labor market. Though some states, such as Illinois, attempted to track third-party-awarded credentials (such as industry licenses), tracking was not consistent enough across states to include such credentials in the analysis. The cross-state variation in credentials is another reason the research team did not pool results across states. College-awarded credentials vary widely; a six-week certified nurse aide (CNA) certificate is a credential as is a two-year associate's degree. The research team did not attempt to categorize credentials but instead presumed that more valuable credentials would be reflected in students' labor-market outcomes. Therefore, the "counting" of credentials should be interpreted with appropriate caution.

Finally, the research team determined it was not possible to measure skill gains, though this was a measure of interest in the previous I-BEST research. Many college staff members noted that it was often difficult to convince AO students to return to adult education to take basic skill exams once the students began in college classes. That is reflected in the data, where posttest scores are lacking for many AO students. Because differences between students who did retest and those who did not could introduce bias, the research team could not reliably measure the impact of AO on changes in basic skill scores.

Description of AO Students

AO served adults from diverse backgrounds, education levels, and recruitment sources. This chapter opens with a description of AO recruitment across states. It then describes AO student characteristics across the initiative based on administrative data and the recruitment practices in each state.[33] (Appendix B contains detailed characteristics of AO students in each state.) It closes with an examination of the achievements of students by occupational area to provide additional insight into AO implementation and helps contextualize the impact results.

State Recruitment Practices

Illinois and Louisiana recruited entirely from adult education programs or similar populations, as described by Anderson and colleagues (2016). That strategy was closer to the original intent of AO to focus on adult education students, and the states worked diligently to recruit this often hard-to-serve population. Therefore, in Illinois and Louisiana, AO students were matched only to similar adult education students, and the AO impact results in those states are reported only for the adult education population.

Kansas and Kentucky, however, took different approaches to AO recruitment in that each had two primary recruitment sources. The impact analysis matched AO students from each source with comparison group members from the same recruitment source to correct for inherent differences between adult education and other college students that are not reflected in their measurable personal characteristics. The following descriptions of recruitment practices in Kansas and Kentucky provide a deeper explanation of the context and recruitment strategies.

Kansas AO Recruitment

Kansas recruited AO students from both adult education (27 percent of the treatment group) and college sources, particularly CTE classes (73 percent of the treatment group).[34] The state and colleges were motivated to draw on the college population in addition to the adult education population for two reasons: 1) staff saw low-skilled AO-eligible college students as a group that could benefit from the extra services AO would provide; and 2) staff were motivated to reach the target of 3,600 credentials but challenged by the termination of the ability-to-benefit provision in Pell grants, which had allowed those without high school diplomas or HSEs to receive federal financial aid to support tuition costs.

After the AO grant, the state refocused recruitment into AO on the adult education population, supported by new funding from the state legislature (Anderson et al. 2016).

Recruitment from these two primary sources varied. Although staff guided adult education students without high school credentials into AO based on their own assessment of the student's workforce readiness skills and motivation, staff enrolled many CTE students into AO by going into already-formed relevant CTE classrooms and testing all students to determine AO eligibility. According to staff at several Kansas colleges, most CTE students had basic skills deficiencies and therefore met AO eligibility requirements, even though most had high school credentials. In those cases, AO staff gave AO resources (including a team teacher) to the whole classroom, including those who tested above AO eligibility.[35]

This report presents separate analyses for each recruitment source in Kansas because the characteristics that predicted AO participation and the nature of the AO intervention differed substantially for students from each recruitment source. For the CTE group, the AO intervention generally consisted of the introduction of team teaching into their classes and the extra support offered by a college or career navigator. Conversely, for adult education students, AO staff may have played a role in addressing obstacles to college enrollment and success and staff included more intensive coaching and barrier remediation. Discussions with staff and administrators during the implementation research supported the notion that adult education students usually have higher barriers to college entry than the CTE group. The section "Adjustment for Comparison Group's College Enrollment**Error! R eference source not found.**" describes one adjustment for possible differences in college access among the adult education treatment and comparison groups by modeling the likelihood of attending college for the entire adult education population in the state and including the predicted probability of college as a variable for matching between the adult education treatment and comparison groups.

Kansas did not provide an explicit flag identifying AO students who were recruited from CTE classes. Instead, this population was approximated using a strategy developed in consultation with the state. Staff at the colleges were required to enroll all Kansas AO students in the adult education data system. If the date of college enrollment for an AO student preceded the date they were enrolled in the adult education data system, the research team assumed that that student was recruited into AO from a CTE class or another college source (shortened to "CTE" because that characterizes the majority of non–adult education students). If, however, the AO student was enrolled in college after their enrollment into the adult education data system, then the research team assumed that student was recruited from adult education and only subsequently enrolled in college after starting AO.

Kentucky AO Recruitment

Kentucky colleges recruited from both adult education and developmental-education programs at community colleges. As in Kansas, colleges tended to recruit students with a high school credential for AO primarily because of difficulties finding financial assistance for students without high school

credentials after the termination of the Pell grant's ability-to-benefit provision in July 2012. Those funding challenges are discussed by Anderson and colleagues (2016). Further, state administrators indicated that the change in the GED test in January 2014 made it more challenging to recruit adult education students because they had to put more concentrated energy toward completing their HSE and were more hesitant to coenroll in college. The state office reports that it has increased its focus on the adult education population following the end of the evaluation period.

This analysis deals separately with students recruited from adult education and those recruited from developmental education. As in Kansas, the observed characteristics that predicted AO participation differed substantially between the two groups. Moreover, because all students in developmental education had already enrolled in college or were at the point of college enrollment when they were recruited into AO, the research team expects that AO would have little or no impact on the ability of the treatment or comparison group to access college. For AO students recruited from developmental education, the AO intervention generally consisted of allowing students to enroll in for-credit courses instead of primarily noncredit developmental courses, supported by team teaching and a college navigator. For adult education students, AO staff may have played a larger role in addressing obstacles to college enrollment and success, and the treatment and comparison groups may have differed in motivation. See the discussion below of the "predicted probability of college" measure, which the research team developed to partially address potential differences in college access for the adult education treatment and comparison groups.

The dataset provided by Kentucky did not contain an identifier of student recruitment source. Consultations with state officials suggested that all or nearly all students recruited from developmental education had a high school credential at AO entry. Moreover, the officials suggested that, given the pressure on adult education students to complete their HSEs before enrolling in AO in order to qualify for financial aid, students without an HSE at entry or who earned an HSE in the semester immediately before AO enrollment were most likely recruited from adult education programs. Because of the absence of data on recruitment source in Kentucky, groups are separated by education status at AO entry.[36] According to state officials, the education distinction largely captures the difference in recruitment source. Using this approach, about 9 percent of participants were recruited from adult education, and the remaining 91 percent were recruited from developmental education. The analysis results are reported for each of these populations and for the weighted average of all AO students.

Selected Characteristics

Table 3 presents descriptive information about AO students overall and in key occupational areas. To determine the occupational areas in which students were enrolled, the research team used course and credential data to classify AO students into three broad categories: health occupations (53 percent), manufacturing occupations (36 percent), and other or unidentifiable occupations (12 percent).[37] Figure

3 displays some differences in key characteristics among states. Appendix B includes full student characteristics for each state.

TABLE 3

Selected Variables for AO Students, by Occupational Pathway

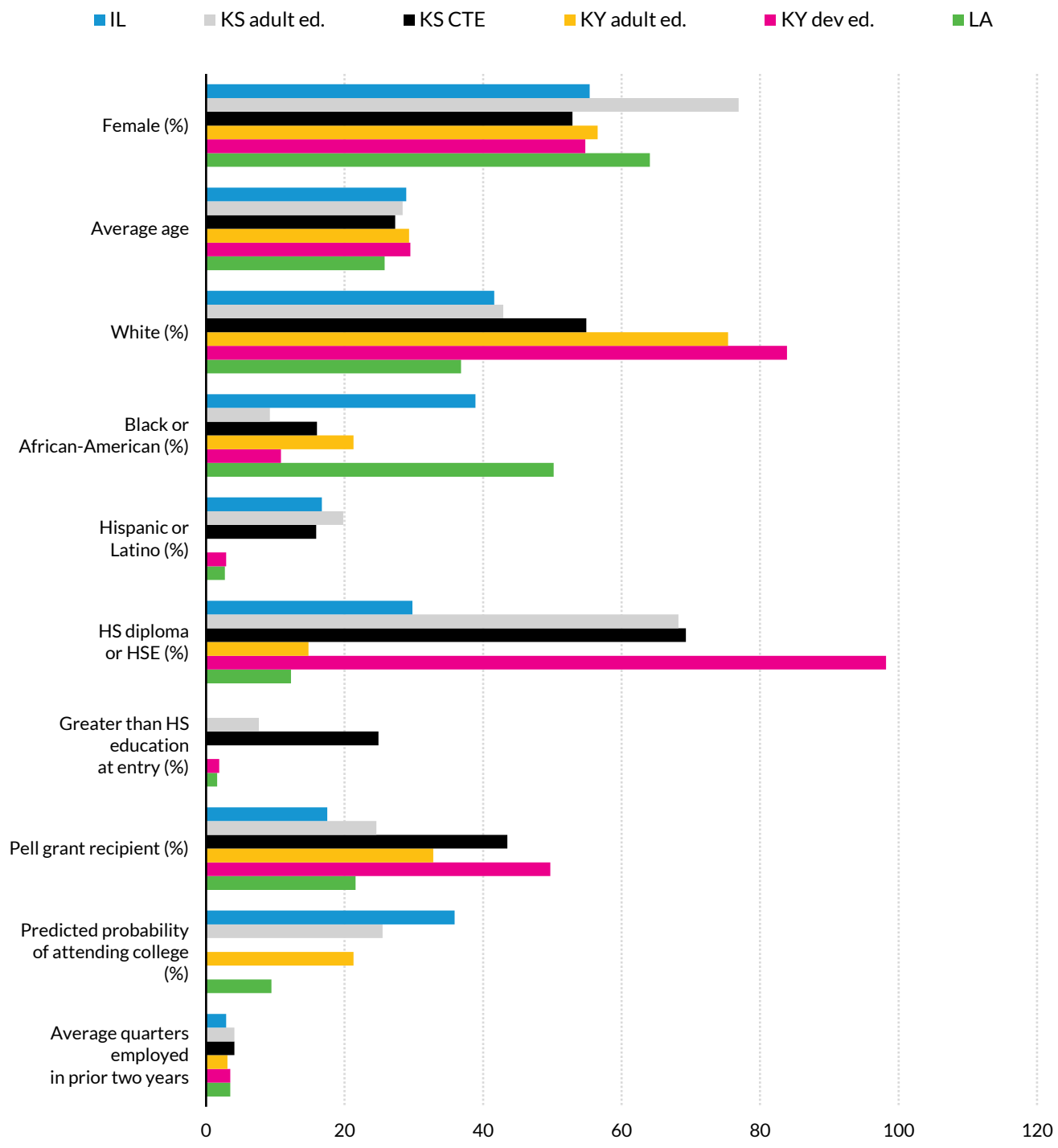
	AO students	AO students in health pathways	AO students in manufacturing pathways	AO students in other or unidentifiable pathways
Female (%)	57.7	88.1	12.2	58.2
Average age at intake	28.3	28.2	28.4	28.0
White (%)	57.9	59.8	59.2	45.1
Black or African American (%)	22.0	19.4	21.0	35.1
Hispanic or Latino (%)	11.0	10.2	11.9	12.5
High school diploma or HSE at entry (%)	62.2	64.0	67.9	37.8
Greater than high school at entry (%)	8.6	12.0	5.4	1.6
Pell grant recipient (%)	35.6	33.2	42.4	26.3
Predicted probability of attending college (%)[a]	26.3	27.7	23.3	28.3
Average quarters employed in prior two years	3.6	3.9	3.4	2.6
Sample size	4,361	2,293	1,555	513

Note: HSE = high-school equivalency.

[a] Adult education students only.

FIGURE 3

A Comparison of Selected AO Student Characteristics across States



Notes: Adult ed. = adult education; CTE = career and technical education; dev ed. = development education; HS = high school; HSE = high school equivalency.

As shown in table 3, over half (58 percent) of AO students across all states were women. In each state, the share of female students was much higher in health pathways (88 percent) and much lower in manufacturing pathways (12 percent). Fifty-eight percent of AO students were white, 22 percent were black or African American, 11 percent were Hispanic or Latino, and the remainder were identified as "other race/ethnicity." Across the states, 63 percent of AO students had a high school credential and 9 percent had a prior postsecondary credential, though the percentage in each state and from different recruitment sources varied widely. Over one-third (36 percent) of AO students received Pell grants. It is surprising that Pell grant receipt is not higher, given that so many students possessed high school credentials at AO entry. However, state administrators noted that some programs (such as short welding programs) were not eligible for Pell grants, even for students with high school credentials. Further, some colleges offered scholarships to students so that they did not need to apply for financial aid during the AO pathway period. The average AO student worked for 3.6 of the 8 quarters before enrollment, with stronger employment histories for students in health pathways than in other occupational areas.

Important variations in the AO population are apparent in figure 3. The Kansas adult education population had the highest share of female students (77 percent) of any state or recruitment source. Louisiana also had a relatively large share of female students (64 percent). Kansas CTE and Kentucky developmental education students were less likely to be female than other states or recruitment sources, at 53 and 55 percent respectively. This is likely related to the distribution of enrollment among occupational areas.

The average age of AO students was fairly comparable across states, though AO students in Louisiana, with an average age of 26, were somewhat younger than students in other states. Kentucky students from both adult education and developmental education, at nearly 30 years old, were somewhat older.

The racial composition varied widely, largely reflecting variations in the racial and ethnic populations of the states. Although 84 percent of developmental education AO students in Kentucky were white, only 37 percent of AO students in Louisiana were white. Many more AO students in Illinois and Louisiana were black or African American than in other states. Illinois and Kansas had relatively larger shares of students who were Hispanic or Latino.

As would be expected, students recruited from adult education in each state were less likely to have a high school credential than those recruited from developmental education in Kentucky or CTE in Kansas. In Kentucky, all students recruited from developmental education had a high school credential by definition. Notably, a relatively large proportion of adult education students in Kansas had a high school credential, but that was mainly a result of students earning their credentials shortly before AO enrollment. In Kansas, a relatively large proportion of CTE students had a postsecondary credential before AO enrollment. That statistic is expected given that Kansas primarily recruited students from already-formed college classes.

The predicted probability of attending college applies only to students recruited from adult education. Students in Illinois had the highest predicted probability of attending college; students from Louisiana had the lowest. However, the predicted probabilities are difficult to compare across states because they are principally determined by the prevalence of college attendance among adult education students generally in a state. As a hypothetical example, an AO student with a low predicted probability of attending college in Louisiana may have a much higher predicted probability of attending college if they had the same characteristics but lived in Illinois.

Finally, the average number of quarters worked in the prior two years varies little across states. Students from Kansas have relatively more robust recent work histories than students from adult education. Students in Illinois had the least recent work history of any of the states or recruitment sources. Note that the differences are smaller in appearance in the graphic because of the scale; the maximum number of quarters a student could have been employed in the prior two years is 8, while the scale continues to 100.

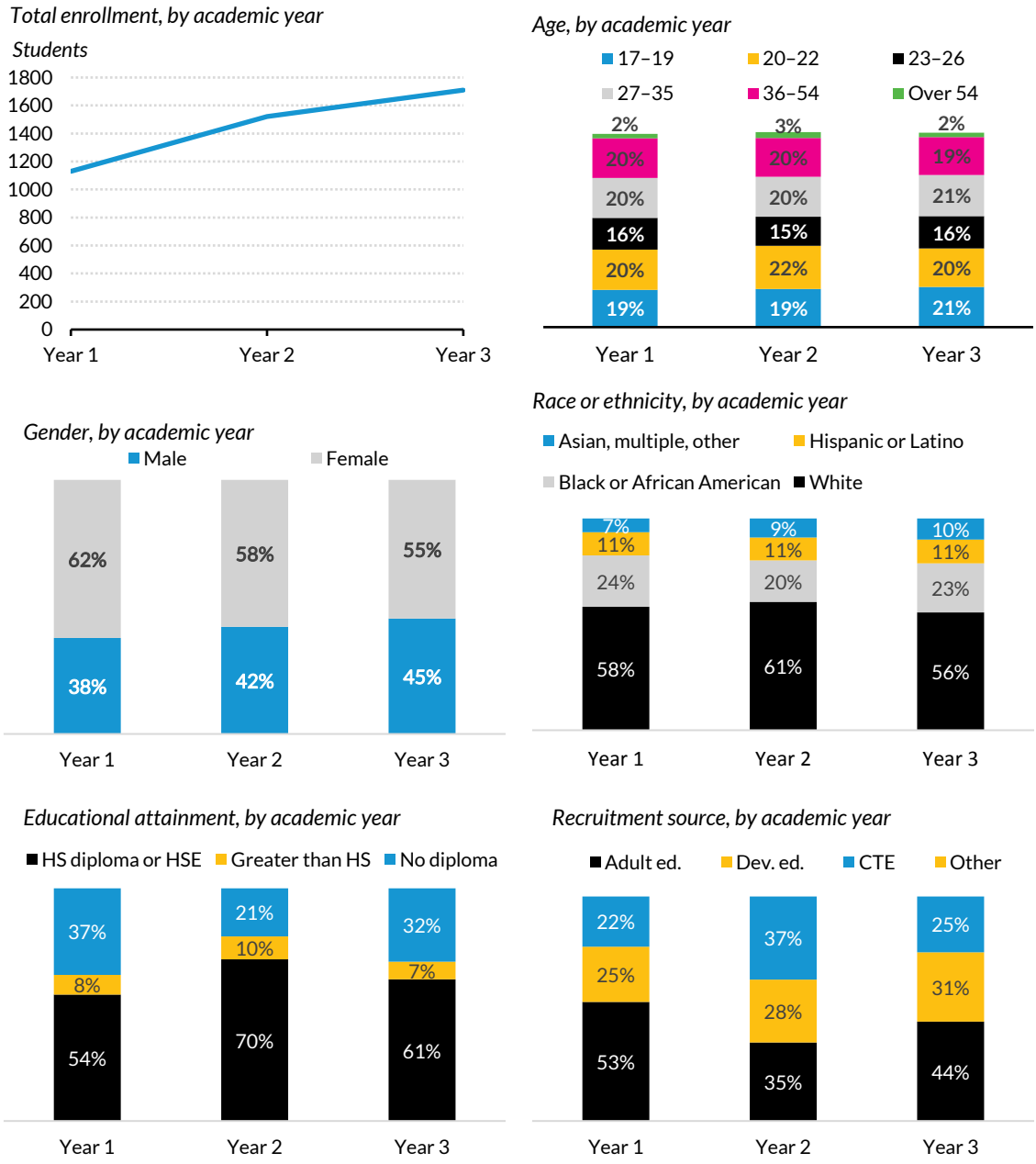
Changes in Characteristics over Time

Figure 4 show the changes in the characteristics of AO students across the states by program year. In Illinois, Kansas, and Kentucky, a program year corresponded to calendar years; in Louisiana a program year corresponded to an academic year because of a delay in starting the AO grant. Over the course of implementation, AO students were significantly more likely to be men, despite sustained majorities of women. Otherwise, the characteristics of students across the states displayed variability over time but no notable trends.

FIGURE 4

Total Enrollment by Academic Year, All States

Data for new enrollees from college records



Sources: Illinois Community College Board, Kansas Board of Regents, Kentucky Community and Technical College System, and Louisiana Community and Technical College System.

Notes: Percentages are computed for students for whom data are available; missing values are excluded. Years correspond to calendar years 2012-2014 in Illinois, Kansas, and Kentucky and to academic years 2012-2014 in Louisiana. CTE = career and technical education; HSE = high school equivalency; Dev. ed. = developmental education.

Basic-Skill-Level Variation

Basic skill levels are of interest because such levels were the primary method of determining student AO eligibility. The AO guidelines specified that the students should score on basic skill tests in the NRS functioning levels 4 through 6 (and English language NRS functioning levels 5 and 6, though those few students are excluded from the analysis). Students with those scores have high intermediate basic education to high adult secondary education skill levels.

The implementation research revealed that colleges applied cutoff criteria for AO in different ways. JFF and the state system offices did not require that colleges modify or amend existing assessment requirements for students. Some colleges admitted students into AO based on their composite scores; others admitted students to AO if one of their subscores in reading, writing, or math fell within the eligible range, even if the student's composite score was outside the eligible range. Some programs determined eligibility based on the subscore that staff determined was most relevant to the program area (such as math for manufacturing). Such variations in eligibility policies led to a wide range of basic skill levels among AO students. Skill level differences across states may lead to differences in AO impacts if AO affected relatively high-skill students differently than low-skill students. Similarly, differences in other student characteristics may lead to differences in impact if the AO intervention is more effective for certain types of students than others.

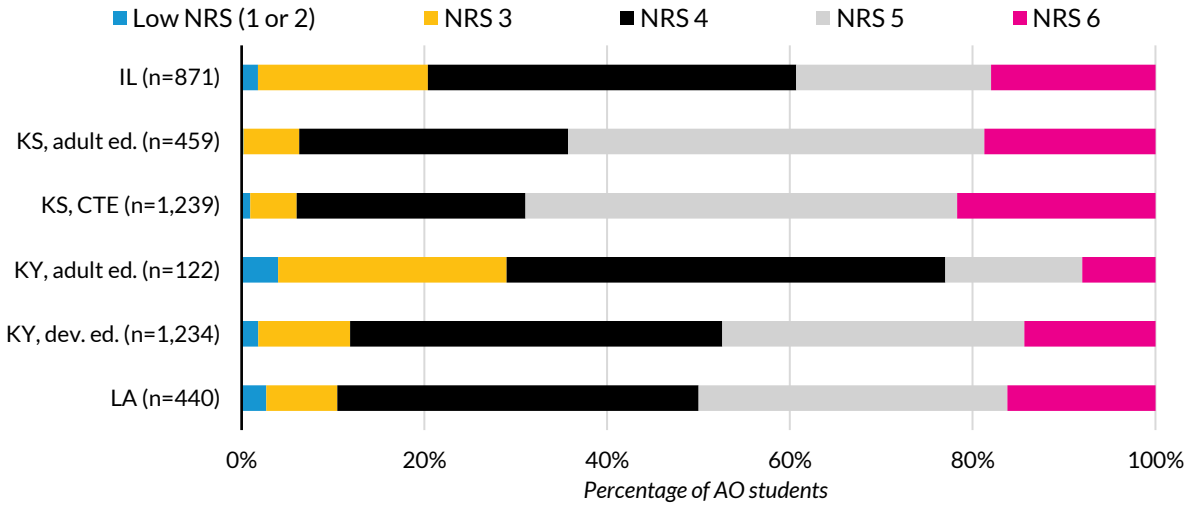
Figure 5 describes the composite NRS functioning levels for AO students by state and recruitment source.[38] The NRS functioning levels are based on the most recent scores before AO enrollment. Though basic skills test scores would typically only be available for participants in adult education, most AO students were assessed for their NRS functioning level regardless of recruitment source. Most scores were reported in the state's adult education data system, but some populations of AO students have high missing rates on NRS functioning levels. It is possible that these students were assessed but their scores were not uniformly recorded in the adult education data systems, preventing states from providing the scores to the research team. Alternatively, the colleges may have based eligibility decisions on a different test, such as an entrance examination used in many colleges (e.g., ACT or COMPASS). Such exams do not produce NRS functioning levels and often measure different competencies than adult basic skills exams.

Among the AO participants with NRS test data, the vast majority scored at NRS functioning levels 4–6, the levels targeted by the designers of AO. The most frequent NRS functioning level was 5, or a 9th to 10th grade functioning level. About 12 percent of participants tested below NRS functioning level 4. Illinois and Kentucky adult education had a larger share of students who tested below NRS functioning level 4 than the other states, at about 20 percent and 29 percent, respectively.[39] Although over 60 percent of AO participants had completed a high school credential (Kansas and Kentucky participants recruited from developmental education or CTE classes, in particular, were very likely to have a high school credential), a small number tested at the NRS functioning level 6 or above, equivalent at least an 11th grade functioning level. One state noted that the discrepancies between high school completion

and test scores may be partially explained by a substantial time gap between a student's high school experience and their basic skills testing for AO.

FIGURE 5

Basic Skill Levels for AO Students at Enrollment, by State and Recruitment Source



Note: NRS = National Reporting System educational functioning level. Data are for nonmissing values. The missing rates were as follows: IL: 17 percent, KS adult education: 0 percent, KS CTE: 0 percent, KY adult education: 18 percent, KY developmental education: 2 percent, LA: 33 percent.

Outcomes Achieved

Table 4 displays the credit and credential achievements of the full AO sample and the sample used in this evaluation. Data were available for students 2 to 11 semesters following AO enrollment, depending on cohort. Students in the AO impact sample enrolled in at least one college course, were not English-language learners, had a valid Social Security number, and were retained in the sample after propensity score matching. Table 4 presents descriptive statistics only and does not represent net impacts of AO; net impacts are presented in the next chapter. Table 4 is based on the administrative data provided by the states. The data in table 4 may therefore differ from the AO sample reported in the grantee surveys and in other grant reporting.

TABLE 4

AO Enrollment, Credits, and Credentials by Sample and State

	Full AO Sample					AO Impact Sample				
	Enrollees	Cred.	Crdn.	Cred. per Enrollee	Crdn. per enrollee	Enrollees	Cred.	Crdn.	Cred. per enrollee	Crdn. per enrollee
IL	952	10,094.5	423	10.6	0.4	867	9,300	385	10.7	0.4
KS	1,733	38,401	3,636	22.2	2.1	1,698	37,647.9	3,567	22.2	2.1
KY	1,372	25,596	2,247	18.7	1.6	1,356	25,499	2,242	18.8	1.7
LA	515	5,010.5	482	9.7	0.9	440	4,246.5	378	9.7	0.9
Total	**4,572**	**79,102**	**6,788**	**17.3**	**1.5**	**4,359**	**76,693.4**	**6,572**	**17.6**	**1.5**

Note: AO = Accelerating Opportunity initiative; cred. = credits; crdn. = credentials. Samples are students enrolled in the first three years of AO implementation.

In all, the states enrolled 4,572 students in AO, awarding 6,788 credentials and 79,102 credits through the end of 2014 in Illinois, Kansas, and Kentucky and summer 2015 in Louisiana. Kansas had the highest enrollment, at 1,733 students; Louisiana had the lowest enrollment at 515 students (mainly because about three-quarters of the 2,144 students flagged as AO in the Louisiana data did not enroll in credit courses, leading to their exclusion from the sample). Kansas also had the highest number of credits per enrollee and the highest number of credentials per enrollee.

Outcomes by Occupational Area

Because students may change their mind about their occupational area after enrolling in AO based on their experience in the program, the research team did not generate separate impact estimates by occupational area.[40] However, an examination of descriptive outcomes by occupational area is useful. Figure 6, figure 7, figure 8, and figure 9 describe the education and labor-market outcomes for AO students by occupational area. Unlike the impact estimates in the next chapter, which include people with no earnings, the earnings presented in figure 9 are only for students who were employed. Figure 9 is limited to students with earnings to represent the approximate amount of an employed person's quarterly "paycheck," while the impact estimates capture average earnings gains, both from entry into the labor market and for those already employed. The estimates in the following figures are only for the AO group and do **not** represent impacts of AO.

Occupational areas were determined as described earlier. AO students varied considerably across the occupational pathways. In some cases, variation in student characteristics is greater between two occupational pathways within a state than it is between two states.

In most of the states, the average number of earned credentials varied little across occupational areas.[41] However, state differences did emerge. For example, students in Kansas earned a larger number of credentials on average across all occupational areas than did students in the other three states. In states except Illinois, students in manufacturing earned more credentials on average than

students in other occupational areas; in Illinois, students in health and manufacturing earned approximately the same number of credentials on average. Students in "other" pathways in Illinois and in health pathways in Louisiana earned a particularly small number of credentials on average. The differences in credential attainment by occupational area have been caused by differences in the structure of pathways, differences in the persistence of students to earn additional credentials within the observed period, or a combination of both. Further, if many health credentialing programs are tracked in the noncredit system in Louisiana, that may explain the low number of average health credentials in that state because those data come only from the for-credit data system. Examples of credentials included college-awarded certificates for CNAs, CNC operators, welding technicians, and automotive technicians.

Credit attainment varied widely among states and occupational areas, but the patterns across occupational areas are not consistent among the states. In Kansas, students in health occupations earned on average just over half the number of credits as students in "other" occupational areas earned. In Kentucky, however, students in health pathways earned slightly more credits on average than students in manufacturing, who earned slightly more credits on average than students in other pathway areas. In Illinois and Louisiana, students in manufacturing earned the most credits, followed by health. Although Kansas students exhibited notably higher credit attainment than students in other states, the difference represents only about one more semester of courses. High credit attainment in Kansas across occupations may reflect the higher level of initial skills of its AO students, as indicated by school attainment and NRS functioning levels, or it may reflect differences in the structure of credits within the state. For example, the Kansas Board of Regents undertook a concerted effort to align all of their credit-bearing CTE programs across colleges and with the needs of employers beginning in 2010. As a result, Kansas offers more programs for-credit than many other states, but these credits are well aligned with labor market needs because of the state's efforts. This may affect credit accumulation as well as labor market outcomes in the state.

Turning to employment, students in Kentucky had the lowest employment rates in all three occupational areas, Kansas had the highest employment rate in health and manufacturing, and Louisiana had the highest rate in other occupational areas. Similarly, Kansas had the highest level of earnings in health and manufacturing, while students in Louisiana had the highest earnings in "other" occupational areas, including information technology, early childhood education, business, and automotive pathways. Illinois had the lowest level of earnings in health and other professions, while Louisiana had the lowest earnings for manufacturing. Note that those data only represent earnings for those who were employed.

Although health professions generally had the highest rates of employment, students in manufacturing professions generally had the highest earnings (except in Louisiana). That may reflect the sector's characteristics and the workers' characteristics, because students in manufacturing pathways tend to be overwhelmingly men (12 percent across all states) while students in health pathways tend to be overwhelmingly women (88 percent across all states). The manufacturing profession's high earnings may also reflect the levels of positions targeted by AO pathways. Health

pathways generally targeted more entry-level, low-paid positions such as CNA, phlebotomists, and home health aides. Manufacturing pathways may have targeted mid-level, well-paid occupations, such as welders and computer-aided manufacturing technicians. Anderson and colleagues (2016) describe the pathways in more detail. The earnings data reported here may reflect patterns of interstate commuting. If people in certain occupations or state-occupation combinations are more likely to work across state lines, their employment and earnings would not be reflected in these data.

FIGURE 6

Number of Credentials Earned Per Student by AO Students, by State and Occupational Area

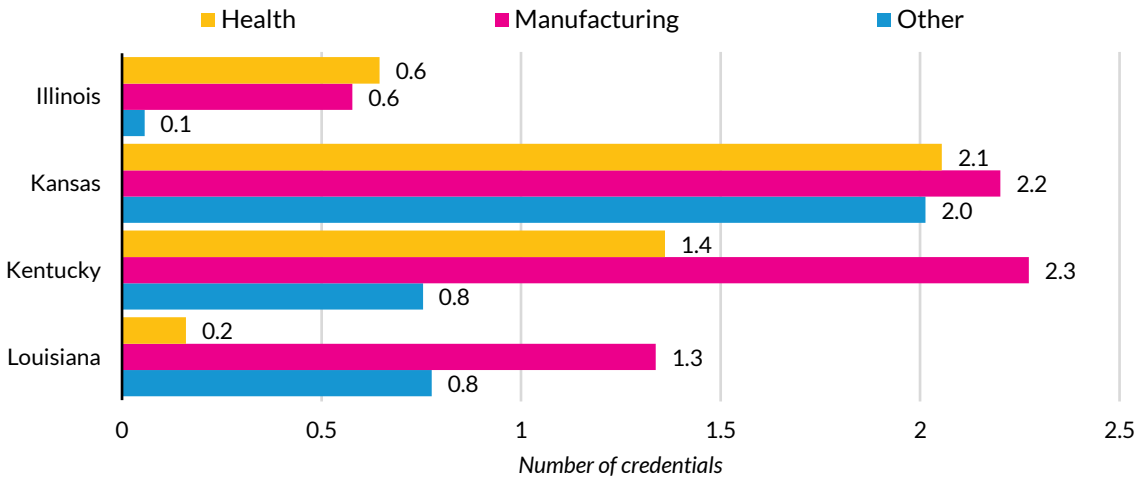


FIGURE 7

Number of Credits Earned per Student by AO Students, by State and Occupational Area

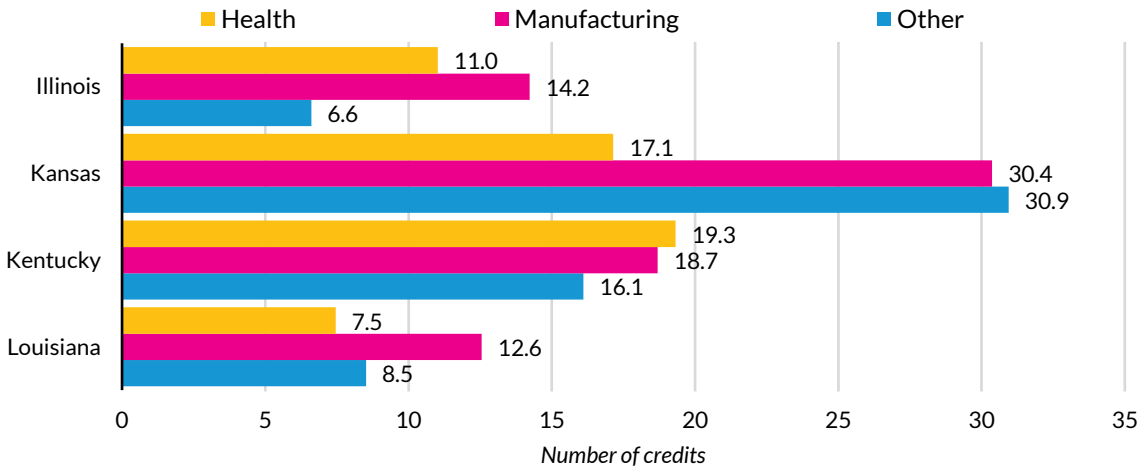


FIGURE 8

Percentage of AO Students Employed, Quarterly by State and Occupational Area

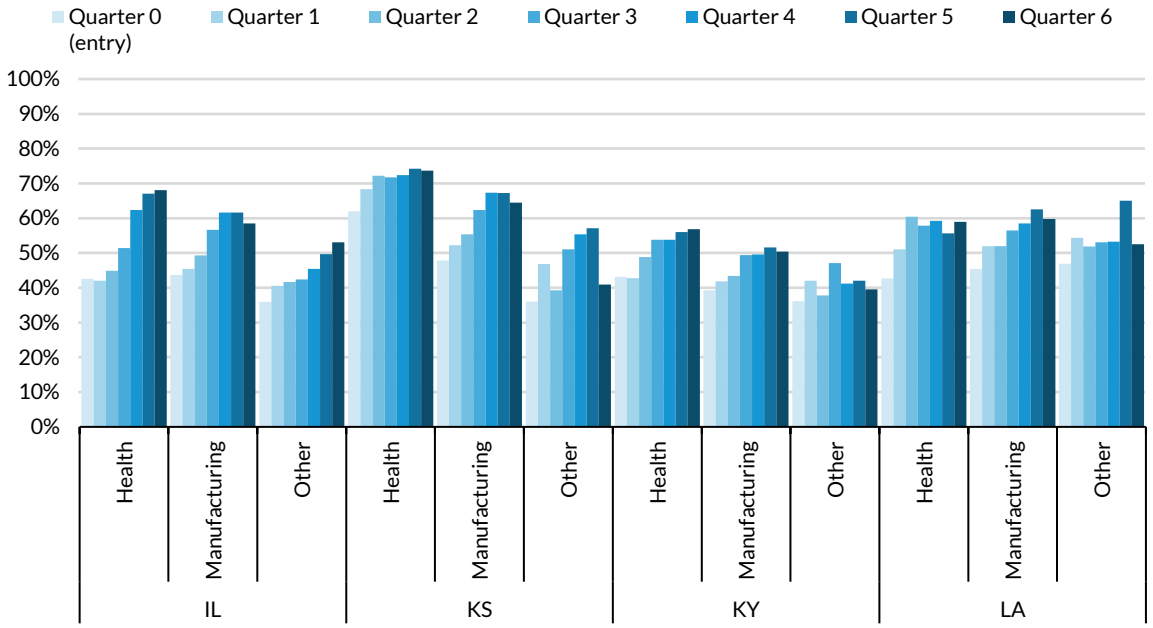
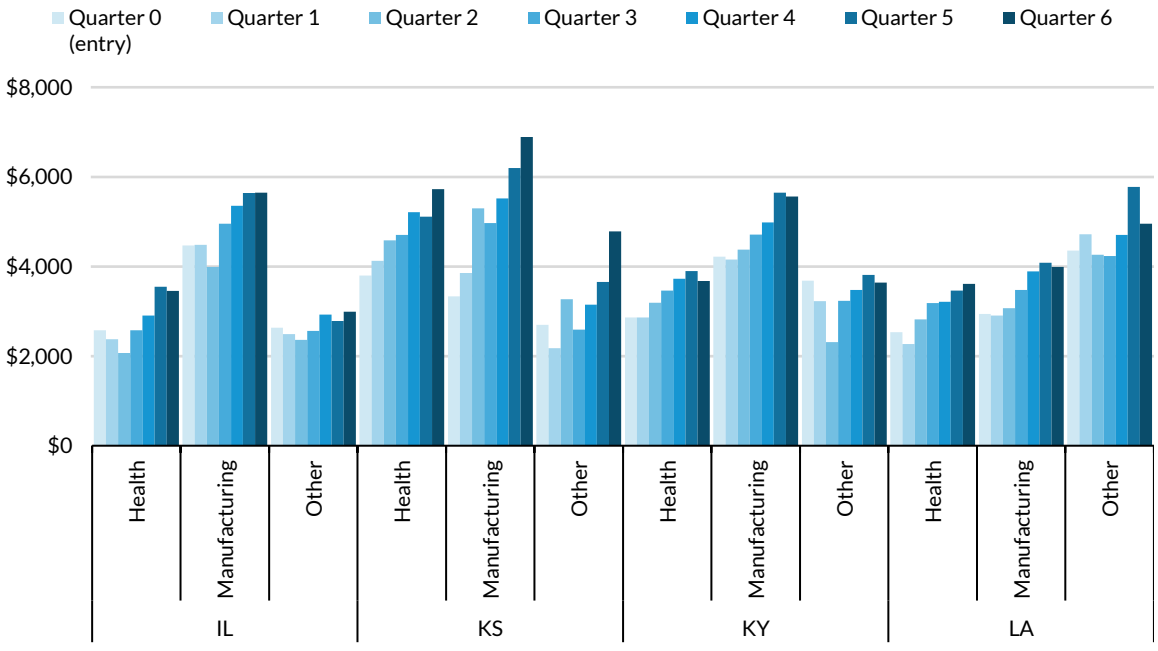


FIGURE 9

Quarterly Earnings for AO Students of Those with Any Earnings, Quarterly by State and Occupational Area



Note: Some values in Kentucky were redacted due to cell size restrictions.

Summary of AO Student Description

Information from the implementation study on state recruitment practices has been important in the design of the impact study because it revealed that two of the four states have drawn substantial portions of their AO population from non–adult education sources.

Overall, AO students are somewhat more likely to be women and older than traditional college students, and they more or less reflect the racial and ethnic demographics of each state. Test scores of adult education and CTE students in Kansas did not differ much, but both were higher than AO participants' test scores in other states. Differences in test scores for adult education and developmental education students in Kentucky were larger, with adult education students scoring substantially lower. Louisiana and Illinois AO students, who were all from adult education, had test scores similar to those of developmental education students in Kentucky. Student demographic characteristics did not change notably over time but did shift to include more men, probably reflecting changing pathway offerings at the colleges. Overall, more than 4,500 AO enrollees earned over 79,000 credits and nearly 6,800 credentials by spring 2015 in Illinois, Kansas, and Kentucky and by spring 2016 in Louisiana. Students in most states experienced growth in employment and earnings over time, though Kentucky had the lowest levels and growth of employment and Illinois had below-average earnings in health and other professions. Louisiana had the lowest earnings in manufacturing. In all states except Louisiana, manufacturing professions had the highest earnings of the three occupational categories examined.

Kansas appeared to have the most advantaged students as measured by educational attainment, prior employment, and NRS functioning level. Students in Kansas earned the largest number of credits and credentials and had the highest employment levels and earnings.

Additional state-specific descriptive statistics are available in appendix B. The variation in participant characteristics across states, recruitment sources, and occupational areas requires careful adjustments of the comparison group to ensure equivalence on baseline characteristics to produce an impact estimate. This variation also shows the importance of identifying impact estimates for each state and recruitment source separately. Impact estimates are presented in the next chapter.

Impact Estimates

This chapter presents state-specific results for the four states implementing AO. It includes impacts of AO on education outcomes and on employment and earnings. The AO model intended to increase the number of credits and credentials that students earned and to improve their employment and earnings outcomes. Appendix C contains tables with detailed earnings and employment impacts by state.

All students who are in the impact sample are represented in this analysis. The follow-up period is noted for each state, but it allows for 2 to 10 semesters of college enrollment and 3 to 12 quarters of follow-up depending on the student cohort and the state data. The Methodology chapter provides a detailed description of the analysis approach.

Expected and Summary Results

Before presenting the state-by-state summaries, this discussion previews overall patterns and summarizes the findings. AO generally had positive effects on the attainment of CTE credentials awarded by colleges but mixed effects on college persistence. It also had positive effects on postprogram employment and some limited positive effects on postprogram earnings that persisted over time for CTE students in Kansas and adult education students in Kentucky but faded in most other instances. The effects varied across states and student populations, suggesting that AO exerted different impacts on outcomes depending on the population served, local economic context, and implementation conditions.

One would expect that AO's net impacts on credentials earned would be positive given the program's focus on helping students obtain marketable occupational credentials. AO's emphasis on accelerated learning for those with low basic skills could help students obtain those credentials through more purposeful enrollment in courses and credits. The impact results in several states demonstrate that the number of credits earned by AO participants is lower than the comparison group even though the number of credentials is higher. That finding may be evidence of acceleration because AO students earned more credentials even though they took fewer courses and credits.

Persistence beyond 12 credits would suggest that students continued with college beyond the initial pathway. Some students may use their new credentials to become employed during or immediately following the pathway period, leaving school for some period of time, and then returning to school to seek additional education or career advancement. If such a pattern is common, persistence may not be observable within the relatively short follow-up period observed in this study. Other research has shown that low-income students (which many AO students are, even though AO eligibility

does not explicitly account for income) tend to take a break from college to work or tend to life needs, such as child care. Many students, however, do return eventually to college once they have started, even years later.[42]Overall, AO had mixed effects on persistence in the short term.

Many of the AO initial pathways lasted one to three quarters. With students still participating in AO classes and other services in the initial quarters, one would expect enrollment in AO to lead to short-term reductions in work effort. During this in-program period, participants have "forgone earnings" as they shift time from work to school. After this initial period of negative impacts, however, one would expect AO to increase employment rates and average earnings. Because earnings outcomes take more than a year or two to manifest, this report may not capture long-term gains that would emerge with a longer follow-up period. On the other hand, programs such as AO often experience fade-out effects, where the initial gains fade out as the earnings of the treatment group converge toward the earnings of the comparison group.[43]

Later cohorts of students are observed for fewer quarters after enrollment because of the timing of the evaluation. As a result, the composition of the sample shifts as the time from enrollment lengthens, possibly introducing cohort effects. Impacts might vary by cohort because of differences in their characteristics or in program experiences. Program experiences were likely different across cohorts because AO efforts were least developed for the earliest cohorts. Further, the characteristics of participants and comparison group members may differ across cohorts because those who entered college in early 2012 during the economic recovery may have weaker earnings trajectories than those who entered college in later years. Therefore, the longer-term effects of AO are only observed for students who experienced early program implementation; their experiences and the impacts of AO may differ from those of later cohorts. The section "Cohort Effects" below presents impact estimates by cohort for the students enrolled at colleges that are included in the cost-benefit analysis.

Tracking the Comparison Group

In any impact analysis, the characteristics and experiences of the comparison group matter a great deal. The experiences of a well-matched comparison group, as is used in this analysis, represents the best estimate of what AO students would have experienced in the absence of AO. If the comparison group experienced strong earnings growth, AO students would have likely experienced similar growth even if they were not in AO. Conversely, a comparison group with weak outcomes suggests that AO students would have had similarly weak outcomes without the intervention.

If there were alternative, similar programs or services available in the state that AO students would have received in place of AO, then the comparison group would have benefitted from these programs and there would be very small or no additional impacts associated with AO on top of the already available programs. The four states had similar initiatives, such as federal grant programs like the Trade Adjustment Assistance Community College and Career Training Grants (TAACCCT) and the Health Profession Opportunity Grants (HPOG), at the same time AO was being implemented. Moreover, the

state office in Louisiana implemented I-BEST-like career pathways with navigation support across all state adult education programming concurrent with AO implementation through their Train to Attain initiative. Though Louisiana's statewide supportive pathways were motivated by AO and related grant efforts, their broad availability during the AO evaluation period likely affected the outcomes of the comparison group, leading to AO's minimal and even negative impacts in the state.

Illinois Impact Estimates

Illinois Education Impacts

AO impact estimates on education and earnings in Illinois cover the cohorts of AO participants who enrolled from the beginning of the spring 2012 semester through the end of the fall 2014 semester. The data on educational activities for this report cover the period through the end of the spring 2015 semester, allowing for 2 to 10 semesters of follow-up. The Illinois AO impact results on education outcomes are presented in table 5. AO generally improved educational outcomes, particularly the number of college-awarded credentials earned and the share of participants earning at least 12 hours of credit. Specifics are as follows:

- **AO increased the number of credentials earned** for all participants by 0.1 credentials on average, a 25 percent increase over the number of credentials earned by the comparison group.
- **AO increased the probability that AO students earned any credential** by 11.0 percentage points, an increase of more than 35 percent over the probability of earning a credential in the comparison group.
- **AO reduced the average number of credits earned** by 0.9 credits. The reduction in the number of credits earned might reflect acceleration, as described earlier.
- **AO increased the probability that participants earned more than 12 credits** by 5.5 percentage points, a 19 percent increase over the comparison group.

TABLE 5

Education Impact Results for Illinois

Outcome	Comparison group mean outcome	AO group mean outcome	AO impact	AO gain over comparison (%)
Number of credentials earned	0.3	0.4	0.1***	25%
Any credential earned	31.2%	40.6%	11.0 pp***	35%
Number of credits earned	11.2	10.7	-0.9***	-8%
Earned more than 12 credits	28.7%	36.9%	5.5 pp***	19%

Note: *N* = 4,996; pp = percentage points. Impacts may not equal the exact difference between the comparison and treatment means because of rounding and regression adjustment of the impact estimates.
*** p < 0.01, ** p < 0.05, * p < 0.10

Illinois Employment and Earnings Impacts

The Illinois AO impact results on employment and earnings cover AO entrants in spring 2012 through fall 2014 and follow them for 3 through 12 quarters (three years). The total sample sizes associated with each quarter after enrollment are reported in appendix C. **Readers should note that all dollar amount averages include students who earned $0 per quarter.** The purpose of including cases that had zero earnings is to ensure that individuals who move from zero earnings to positive earnings as a result of AO have these benefits counted in the impact estimates.

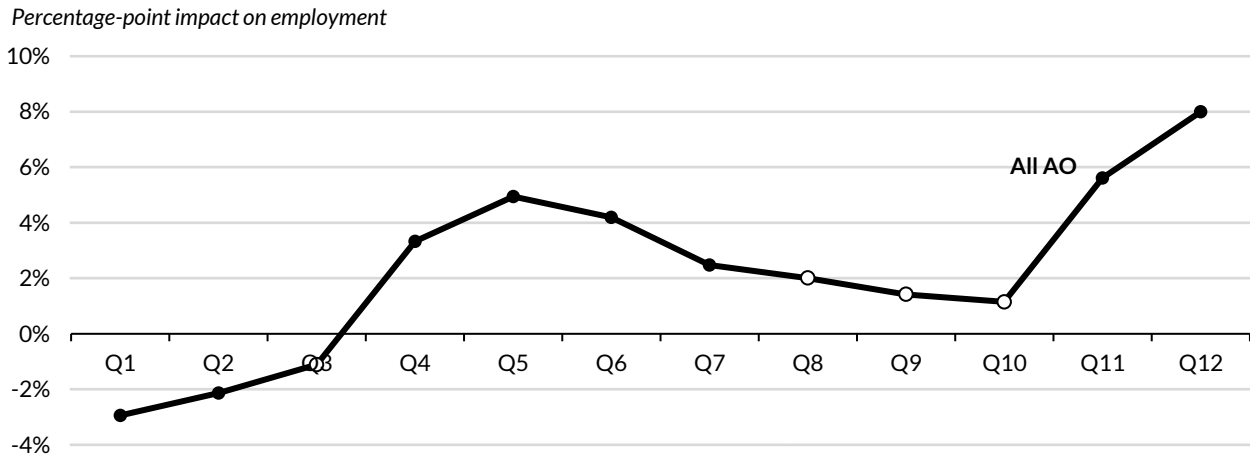
Overall, AO exerted positive impacts on employment for a substantial period after enrollment, but the gains in quarterly earnings are modest and diminish over time. Figure 10, figure 11, figure 12, and figure 13 below display the specific findings, which include the following:

- **AO** increased the probability of being employed following the second quarter of enrollment, but the size of the impact is inconsistent and not always statistically different from zero. Following an initial decrease in employment, as may be expected while students are still engaged in education programming, students experienced an increase in employment that peaked at 8.0 percentage points in the 12th quarter following enrollment. This represents as much as a 15 percent increase. Through the 10th quarter, the effects of AO on employment appear to be fading out before a marked increase in the 11th and 12th quarters, apparently partially because of lower comparison group employment in those quarters (as shown in figure 11). By the 12th quarter, however, the analysis only retained about 48 percent of the original sample because of time censoring, meaning that the results reflect the experience of an early subset of the AO population.
- **AO increased the average quarterly earnings for AO students somewhat in the medium term, but the effects disappear over time.** The earnings gains are significantly different from zero only in a few quarters. The largest gain is in the fifth quarter following enrollment, when AO

students experienced earnings $293 higher on average than the comparison group, a gain of 14 percent. Earnings then taper off and become not statistically different from zero. Even in the 11th and 12th quarters, when employment outcomes were relatively large and positive, there were no significant impacts on earnings, suggesting that the additional employment was in jobs with wages below the comparison group average. Though earnings impacts were not statistically different from zero, students in AO and the comparison group experienced growth in earnings over time (figure 13), meaning that the trajectory of growth was very similar for AO students and non-AO students.

FIGURE 10

Employment Impacts of AO by Quarter after Enrollment, Illinois

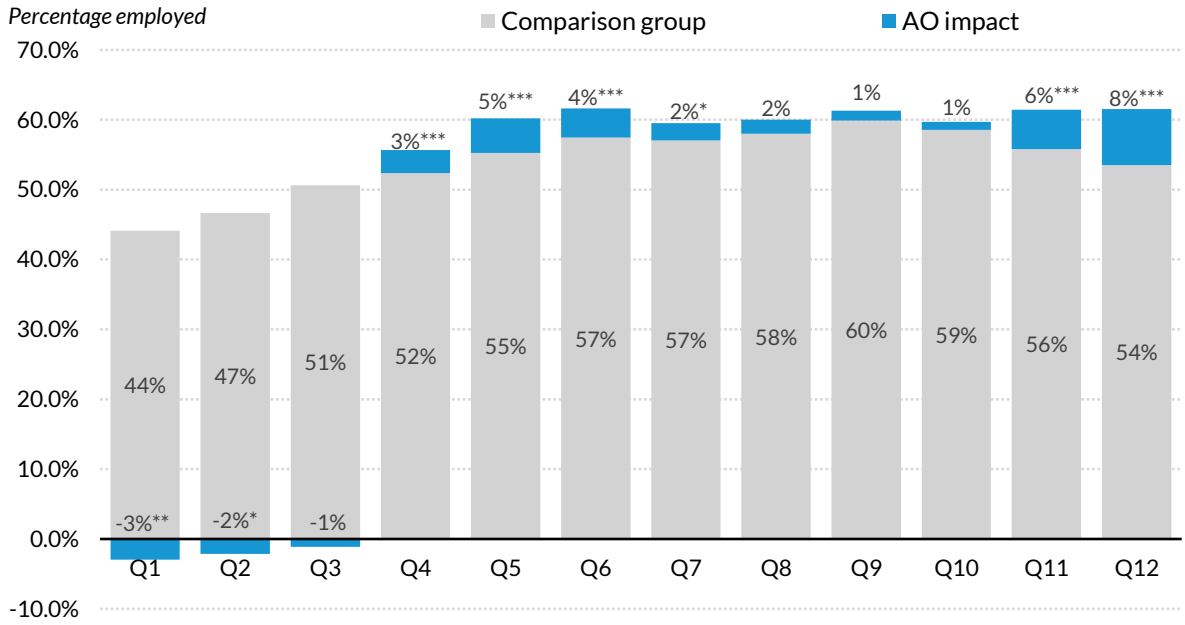


Note: Filled circles indicate significant impacts ($p < 0.10$); empty circles indicate impacts that are not statistically different from zero.

Figure 11 illustrates changes in the employment rate associated with AO relative to employment rates of the comparison group in each quarter. The AO employment net impacts rise in quarters 11 and 12 largely because the comparison group's employment rate declines while AO students retain consistent levels of employment at about 60 percent.

FIGURE 11

AO Impact on Employment Rates in Illinois

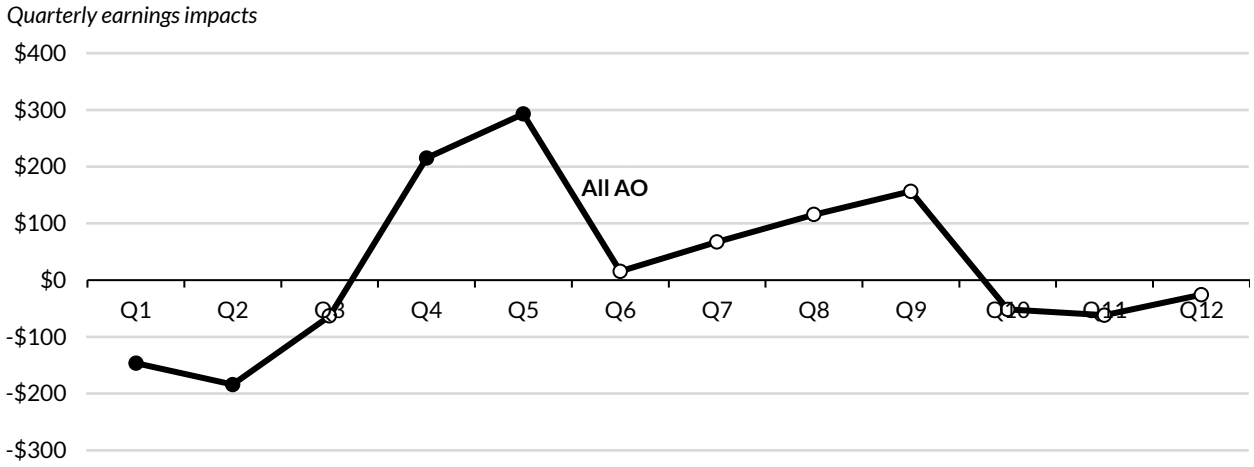


Note: *** p < 0.01, ** p < 0.05, * p < 0.10.

Figure 12 graphs the net earnings impacts and figure 13 shows the earnings gains relative to the earnings levels of the comparison group. The net earnings impacts are modestly positive in quarters 4 and 5, decline in quarter 6, are positive but not significantly different from zero in quarters 7 through 9, and then become negative but not significantly different from zero over quarters 10 through 12. The results indicate that the gains in credentials achieved by AO students did not materialize into robust increases in earnings.

FIGURE 12

Earnings Impacts of AO by Quarter after Enrollment, Illinois

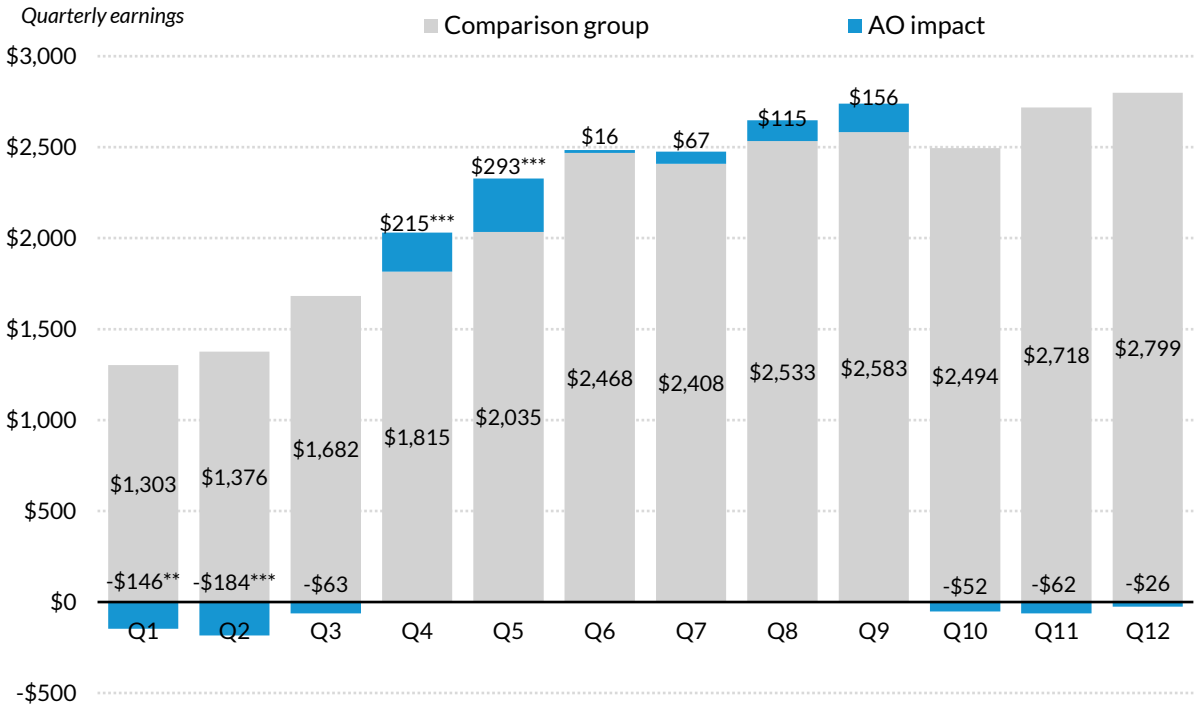


Note: Filled circles indicate significant impacts ($p < 0.10$); empty circles indicate impacts that are not statistically different from zero.

The results in figure 13 highlight the similarity of earnings trends for the AO and comparison groups. For both groups, earnings increased substantially over the 12 quarters, more than doubling from about $1,300 per quarter to about $2,800 in the last quarters. These data illustrate the importance of including a comparison group. The absolute gains experienced by the AO group are large, but so were the absolute gains of the comparison group. By the sixth quarter after enrollment, AO participants experienced no earnings advantage over the non-AO workforce.

FIGURE 13

AO Impact on Quarterly Earnings in Illinois



Note: Data include participants with zero earnings.
*** p < 0.01, ** p < 0.05, * p < 0.10

Kansas Impact Estimates

Kansas Education Impacts

The impact estimates for AO in Kansas cover the cohorts of AO participants enrolled from the beginning of the spring 2012 semester through the end of the fall 2014 semester. Data on educational activities for this report cover the period through the end of the spring 2015 semester, following students for 2 to 10 semesters after AO enrollment. The impact results for Kansas are presented in

table 6.

The results vary substantially by recruitment source. Specifically,

- **AO increased the number of credentials earned for all participants** by 0.6 credentials on average, a 40 percent increase over the number of credentials earned by the comparison group. The average effects on credentials were lower among adult education students (0.1 credentials and not significant) than among CTE students, who experienced an increase of 0.8 credentials, representing a 57-percent increase. The adult education comparison group had roughly the same credential attainment as the CTE comparison group (1.5 and 1.4 credentials on average, respectively), so the gain relative to the comparison group was also lower for the adult education population. Although the comparable performance of adult education and CTE students in the comparison group may appear surprising, note that the adult education students who enrolled in AO are not typical in their pursuit of college relative to other adult education students, who may never enroll in a college level course. The CTE students in this study are college students with unusually low basic skills scores. Therefore, each group is not necessarily representative of the larger populations of adult education students and CTE students within the state.
- **AO increased the probability that AO students earned any credential** by 12.8 percentage points for the full sample, about a 19 percent increase over the probability of earning a credential in the comparison group. Again, the impact on AO students recruited from CTE was larger and more positive than the impact on students recruited from adult education. AO actually reduced the probability that AO students recruited from adult education earned any credentials by 0.7 percentage points, although this reduction is less than a 1 percent decrease. AO increased the probability of earning any credential by 20.4 percentage points for students recruited from CTE, a 30 percent increase.
- **AO reduced the average number of credits earned** for the full sample by 3.5 credits. AO reduced the average number of credits earned by a substantial 10.2 credits for participants from adult education but only by 1.0 credit for participants that came from CTE. As in Illinois, the reduction in the number of credits earned might reflect acceleration, or students proceeding through courses more efficiently to achieve meaningful credentials. These data also align with an internal study of Kansas's AO program, which found that the AO group did better in credential attainment and technical credits earned but that they earned fewer nontechnical credits. The internal study explained the effects by pointing to more directed advising into the pathway, which led to less exploration and a more efficient use of resources.[44]
- **AO reduced the probability that participants earned more than 12 credits** by 11.5 percentage points for the full sample. The impact was a 30.3 percentage-point reduction for participants from adult education but only a 4.8 percentage-point reduction for participants from CTE.

TABLE 6

Education Impact Results for Kansas, by Recruitment Source

	Comparison group mean outcome	AO group mean outcome	AO impact	AO gain over comparison (%)
All (N = 14,293)				
Number of credentials earned	1.5	2.1	0.6***	40%
Any credential earned	68.6%	81.4%	12.8 pp***	19%
Number of credits earned	26.0	22.2	-3.5***	-13%
Earned more than 12 credits	65.6%	53.6%	-11.5 pp***	-18%
Recruited from adult education (N = 918)				
Number of credentials earned	1.5	1.6	0.1	7%
Any credential earned	71.5%	63.2%	-0.7 pp**	-1%
Number of credits earned	25.8	15.1	-10.2***	-40%
Earned more than 12 credits	64.9%	34.9%	-30.3 pp***	-47%
Recruited from CTE (N = 13,375)				
Number of credentials earned	1.4	2.3	0.8***	57%
Any credential earned	67.6%	88.2%	20.4 pp***	30%
Number of credits earned	26.1	24.8	-1.0***	-4%
Earned more than 12 credits	65.8%	60.5%	-4.8 pp***	-7%

Note: pp = percentage points. All sample sizes include both AO and non-AO groups. Impacts may not equal the exact difference between the comparison and treatment means because of rounding and regression adjustment of the impact estimates.
*** p < 0.01, ** p < 0.05, * p < 0.10

Kansas Employment and Earnings Impacts

The impact estimates for quarterly employment and earnings outcomes for AO in Kansas cover the cohorts of AO participants enrolled from the beginning of the spring 2012 semester through the end of the fall 2014 semester, similar to the educational impact estimates. Students' employment and earnings are tracked for up to eight quarters following AO enrollment (two years).[45] The impact results for employment and earnings for Kansas for each quarter are presented in and figure 14, figure 15, figure 16, and figure 17. Note that all dollar amount averages include students who earned $0 per quarter.

Overall, AO in Kansas exerted positive impacts on both employment and earnings, but the results vary substantially by recruitment source:

- **AO increased the probability of being employed, but only for the CTE-recruited students.** The increase for CTE students ranged from 2.4 to 6.9 percentage points, depending on the quarter. This represents as much as an 11-percent increase. The impact on employment for CTE students wavered from quarter to quarter after enrollment, peaking in the seventh quarter. Notably, employment was not negatively affected in the short term (i.e., participants did not forgo any earnings) during the period of AO enrollment. For adult education students, AO is generally associated with negative employment effects, although these are not statistically

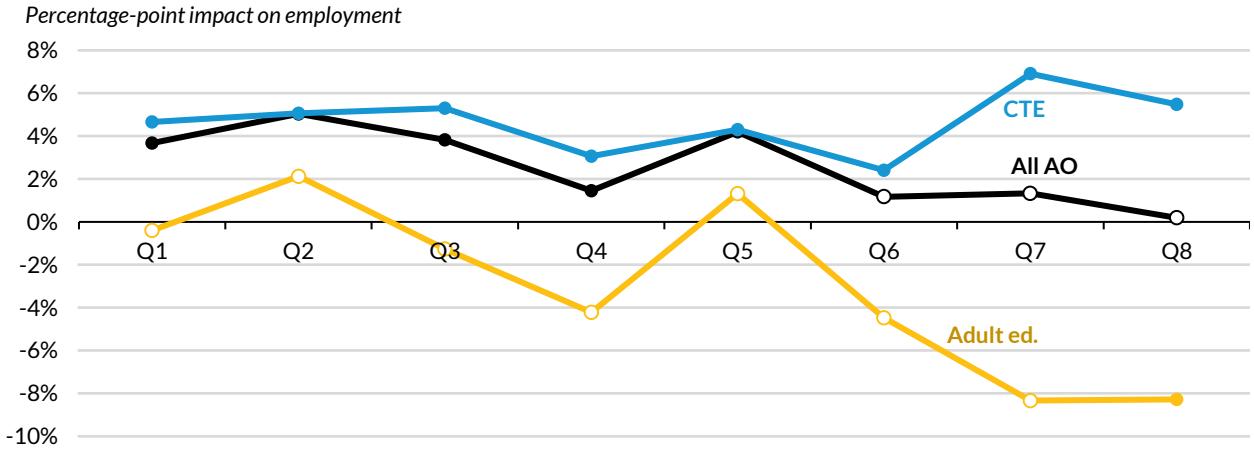
significant. For the full sample, AO increased the probability of being employed by between a less than one percentage-point increase and a 5.0 percentage-point increase, depending on the quarter.

- **AO increased the average quarterly earnings for AO students** but increased them more consistently for CTE students than for adult education students. The gain for CTE students ranged from $325 to $1,188 depending on the quarter. The earnings of the AO group recruited from CTE are almost 33 percent higher than those of the comparison group from CTE in the eighth quarter after enrollment, at their peak. The positive effect of AO on average quarterly earnings is only statistically significant in the second quarter after enrollment for adult education students. AO increased earnings by $346 in that quarter (a 15 percent increase). For the full sample, the impact on earnings was between $233 and $811, depending on the quarter.

Figure 14 graphs the absolute employment impacts while figure 15 displays these impacts alongside the employment levels of the comparison groups. Statistically insignificant impacts are indicated by empty circles in figure 14. The impacts for the CTE group remained positive through the entire postenrollment period, meaning that AO significantly increased CTE students' employment rates. By the sixth quarter after enrollment in AO, the full sample of AO students did not experience statistically significant employment effects.

FIGURE 14

Employment Impacts of AO by Quarter after Enrollment, Kansas



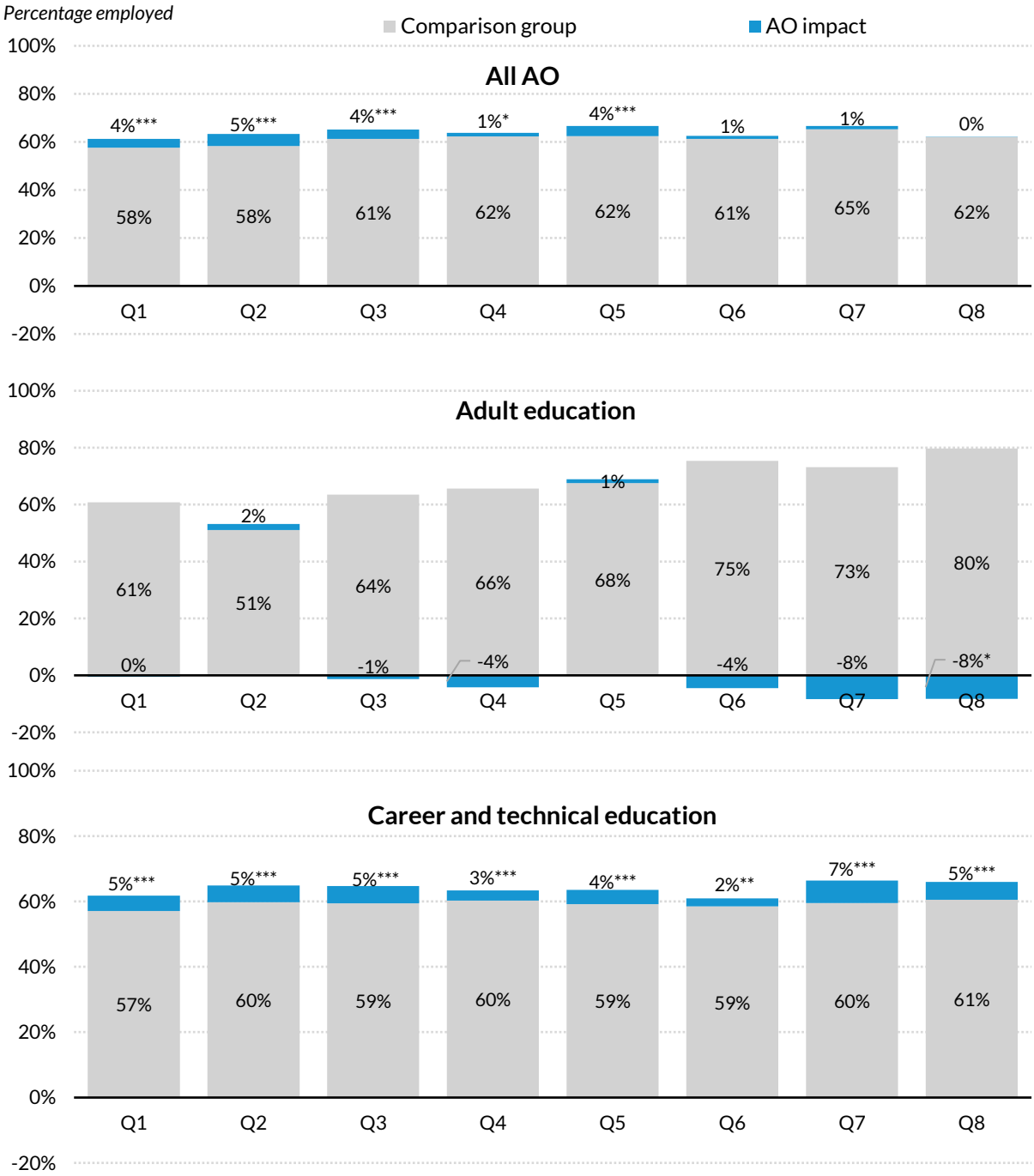
Note: Filled circles indicate significant impacts ($p < 0.10$); empty circles indicate impacts that are not statistically different from zero.

Figure 15 shows the employment rate of the comparison group in each quarter and impacts experienced by AO students overall and from each recruitment source. The comparison group's employment rates grew over time, but so did the impact of AO on employment. The adult education comparison group had a particularly high employment rate, except in the eighth quarter (the only

quarter in which positive and significant AO impacts appeared), when the comparison group's employment rate was somewhat lower. The research team and state administrators do not have a firm explanation of the strong labor-market showing of the adult education comparison group. One possibility is that Kansas had a relatively strong economy during this period. The comparison group in Kansas was a particularly motivated and low-barrier subset of the adult education population that apparently did well in the local labor-market conditions.

FIGURE 15

AO Impact on Employment Rates for Kansas



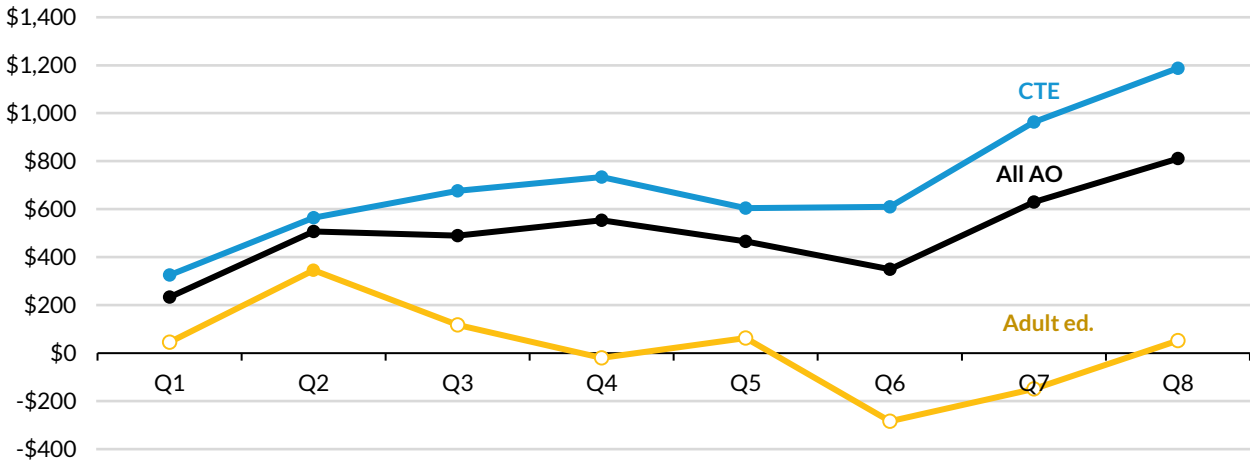
Note: *** p < 0.01, ** p < 0.05, * p < 0.10.

Figure 16 graphs the net earnings impacts while figure 17 shows the impacts alongside the trends in earnings levels for the comparison group. As with employment, earnings impacts for AO students

recruited from CTE are consistently higher than for the full sample of AO students. Also like the employment impacts, earnings impacts for AO students recruited from CTE continued to increase, reaching a 33 percent gain in the 8th quarter after enrollment. These represent net impacts in that AO increased CTE student earnings relative to the comparison group, which provides the best estimate of what AO participant earnings would have been had AO students not participated in AO. Although the research team did not estimate impacts separately by pathway because pathway selection occurs after program enrollment, a higher share of AO students recruited from CTE were enrolled in manufacturing pathways compared with AO students recruited from adult education. That may suggest an increased effectiveness of AO in manufacturing pathways.

FIGURE 16

Earnings Impacts of AO by Quarter after Enrollment, Kansas

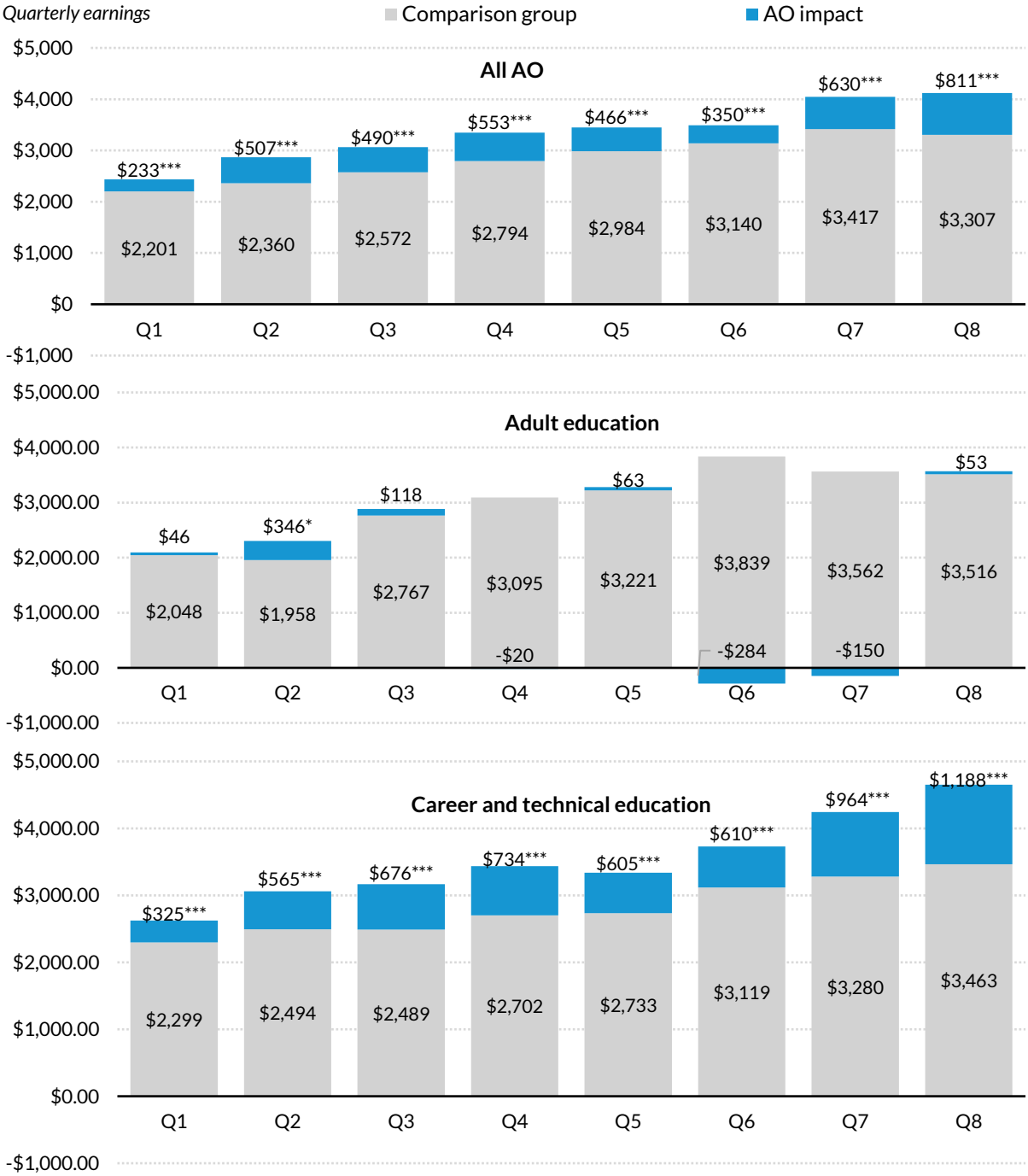


Note: Filled circles indicate significant impacts ($p < 0.10$); empty circles indicate impacts that are not statistically different from zero.

Although AO students from CTE experienced significantly higher earnings than their comparison group, adult education students' earnings generally did not exceed their comparison group's earnings. Notably, both the CTE comparison group's earnings and the adult education comparison group increased substantially over time. With AO, the CTE group achieved a 77 percent earnings gain from the first quarter after enrollment to the last quarter, higher than the 51 percent increase achieved by the comparison group over the same period.

FIGURE 17

AO Impact on Quarterly Earnings in Kansas



Note: Data include participants with zero earnings.
*** p < 0.01, ** p < 0.05, * p < 0.10.

Overall, CTE students in Kansas's AO program experienced positive gains in credential attainment even while taking fewer credits overall. The CTE group experienced positive employment outcomes and earnings gains because of AO. Although AO's adult education group did not significantly increase credential attainment, over 70 percent of both the AO group and comparison group earned at least one credential. Credential attainment effects were quite large for CTE participants, with 88 percent of the AO group earning at least one credential compared with 68 percent of the CTE comparison group. The impact on credits earned was negative for both the adult education and CTE groups. Although the CTE treatment and comparison groups began at similar levels, the gains over time were significantly higher among AO participants than among members of the CTE comparison group. By the sixth through eighth quarters following enrollment, AO students drawn from CTE programs were averaging $920 more in earnings per quarter than their comparison group counterparts. This represents a very large gain, perhaps partially explained by the strong alignment between Kansas CTE programs and labor market demand, which was coordinated beginning in 2010 by the Kansas Board of Regents.

Kentucky Impact Estimates

Kentucky Education Impacts

The impact estimates for AO in Kentucky cover the cohorts of AO participants enrolled from the beginning of the spring 2012 semester through the end of the fall 2014 semester. The analysis follows these cohorts through the end of the spring 2015 semester, allowing 2 to 10 semesters to track outcomes. The impact results for Kentucky appear in table 7 and are similar across recruitment sources. The key findings on educational outcomes for AO in Kentucky are as follows:

- **AO increased the number of credentials earned for all participants** by 0.7 credentials on average, representing a 78-percent increase over the number of credentials earned by the comparison group (which were quite low). The impact levels were the nearly same for the adult education and developmental-education groups, but the magnitudes of the impacts relative to the comparison group varied, with a much larger relative impact for the adult education AO group.
- **AO increased the probability that AO students earned any credential** by 19.0 percentage points for the full sample, representing a 133-percent increase over the likelihood of earning any credential among the comparison group. The impact on AO students recruited from adult education (19.8 percentage points) was again similar to the impact on students recruited from developmental education (19.5 percentage points) in absolute size. However, adult education AO students' gain was substantially larger in relative terms at 566 percent compared with a 127 percent increase for the developmental education AO group; that disparity was caused by differences in the comparison group values. Note that the impact of AO on earning any

credential is lower for the analysis of all AO students than it is for either the adult education or the developmental-education analyses. Those results are accurate and reflect differences in the regression adjustment between the subsamples and the total samples, known to statisticians as Simpson's paradox.

- **AO increased the average number of credits earned** for the full sample by 4.3 credits, a 30 percent increase. AO increased the number of credits earned by 6.3 credits on average for participants that came from adult education, a 73-percent increase, and by 4.4 credits on average for participants that came from developmental education, a 29-percent increase.
- **AO increased the probability that participants earned more than 12 credits** by 14.9 percentage points for the full sample (a 38 percent increase), 21.8 percentage points for participants from adult education (a 114-percent increase), and 14.9 percentage points for participants from developmental education (a 36 percent increase). Those are quite large impacts, particularly for the adult education population.

TABLE 7

Education Impact Results for Kentucky, by Recruitment Source

	Comparison group mean outcome	AO group mean outcome	AO impact	AO gain over comparison (%)
All (N = 20,150)				
Number of credentials earned	0.9	1.7	0.7***	78%
Any credential earned	14.3%	33.6%	19.0 pp***	133%
Number of credits earned	14.4	18.8	4.3***	30%
Earned more than 12 credits	39.3%	54.7%	14.9 pp***	38%
Recruited from Adult Education (N = 2,814)				
Number of credentials earned	0.3	1.0	0.7***	233%
Any credential earned	3.5%	22.1%	19.8 pp***	566%
Number of credits earned	8.6	14.1	6.3***	73%
Earned more than 12 credits	19.1%	39.3%	21.8 pp***	114%
Recruited from Developmental Education (N = 17,336)				
Number of credentials earned	1.0	1.7	0.8***	80%
Any credential earned	15.4%	34.7%	19.5 pp***	127%
Number of credits earned	15.0	19.3	4.4***	29%
Earned more than 12 credits	41.3%	56.2%	14.9 pp***	36%

Note: pp = percentage points. All sample sizes include both AO and non-AO groups. Impacts may not equal the exact difference between the comparison and treatment means because of rounding and regression adjustment of the impact estimates.
*** p < 0.01, ** p < 0.05, * p < 0.10

Kentucky Employment and Earnings Impacts

The impact estimates for quarterly employment and earnings in Kentucky cover the cohorts of AO participants enrolled from the beginning of the spring 2012 semester through the end of the fall 2014 semester. The data follow students' labor-market outcomes for up to 12 quarters (three years) after enrollment.

The impact results for employment and earnings for Kentucky for each quarter are presented in figure 18, figure 19, figure 20, and figure 21. Note that all dollar amount averages include students who earned $0 per quarter.

The impacts of AO on employment rates were positive for both groups, though earnings effects varied. Unlike in Kansas, the AO adult education group in Kentucky experienced significant earnings gains, while no significant gains emerged for the group who was recruited from a college source. Specifics are as follows:

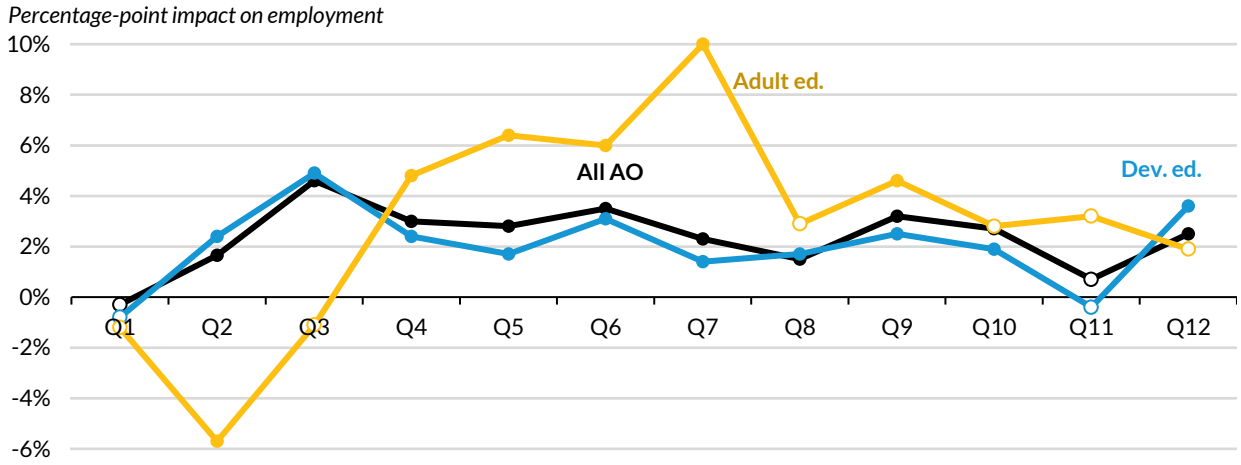
- **AO increased the probability of being employed for all AO participants.** The increase for developmental education AO students ranged from zero to 4.9 percentage points, with a consistent 2 to 4 percentage-point impact in most quarters except for a dip in the eleventh quarter and slight upticks in the third observed quarter and the final observed quarter. Unlike developmental education students, AO students recruited from adult education experienced reduced employment levels and thus forgone earnings (negative impacts) in the initial quarters after starting the program. In subsequent quarters, AO's positive effects on employment for adult education students reached 10.0 percentage points in the seventh quarter following enrollment, became statistically insignificant in the eighth quarter, and then were significant and positive in the ninth quarter before becoming statistically insignificant again. The pattern of impacts for the full sample looked very similar to the developmental education students.
- **AO increased the average quarterly earnings consistently for AO students from adult education** after an initial reduction in earnings in the first three quarters. The gain for adult education students reached $855 in the ninth quarter after enrollment, a 43 percent gain. The earnings of the AO group recruited from adult education peaked in the ninth quarter, when they were 43 percent higher than the comparison group. After the 10th quarter, the size of the impact declined somewhat but remained positive and statistically significant (ending with a 31 percent increase relative to the comparison group in the last quarter). For AO participants recruited from developmental education, the impact on earnings was negative or zero through the 10th quarter and generally statistically significant; the final quarter indicated a positive and significant increase of $249, an 8 percent increase relative to the comparison group. The impacts for the full AO sample closely mirrored the impacts for the developmental education AO students.

Figure 18 shows the net employment impacts and figure 19 shows the impacts in the context of the employment rates of the comparison group. Statistically insignificant impacts are indicated by an empty

circle in figure 18. AO students from adult education experienced negative employment and earnings impacts in the initial quarters after enrollment. By the fourth quarter after enrollment, however, AO students from both adult education and developmental education had achieved positive employment impacts as a result of AO, though only the adult education group experienced consistently positive impacts on earnings after the initial dip. Overall, the impacts for the adult education group were more consistent and positive than the impacts for the developmental education group.

FIGURE 18

Employment Impacts of AO by Quarter after Enrollment, Kentucky

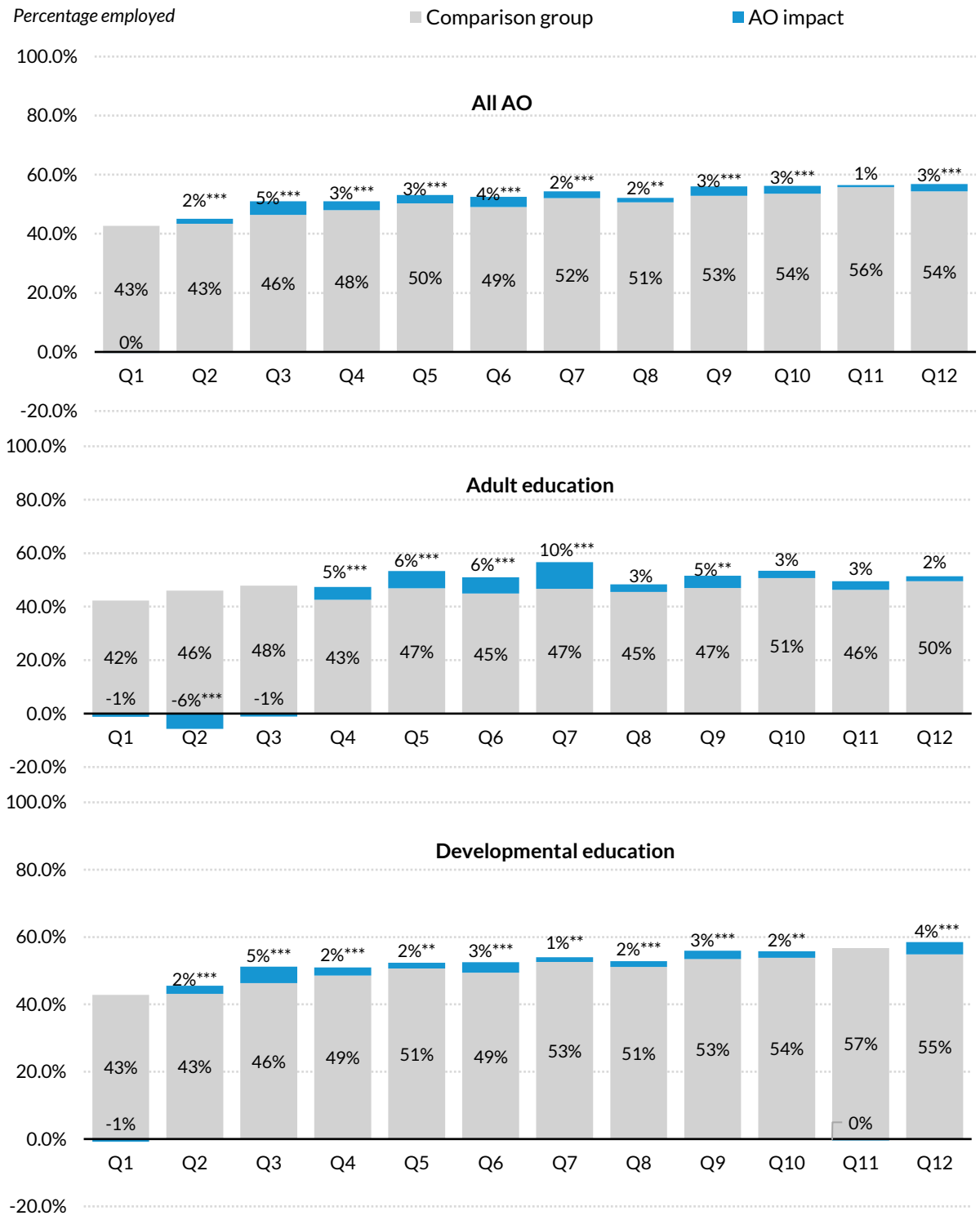


Note: Filled circles indicate significant impacts ($p < 0.10$); empty circles indicate impacts that are not statistically different from zero.

Figure 19 shows the employment rate of the comparison group in each quarter and the impact of AO on students overall and from each recruitment source. The developmental education comparison group's employment rates grew over time. AO students from developmental education experienced employment rates slightly higher than the comparison group rate for most of the observed period. Employment rates among the adult education comparison group grew only slightly. AO students from adult education initially saw some positive and significant impacts, but then employment rates moved closer to the comparison group rate.

FIGURE 19

AO Impact on Employment Rates for Kentucky

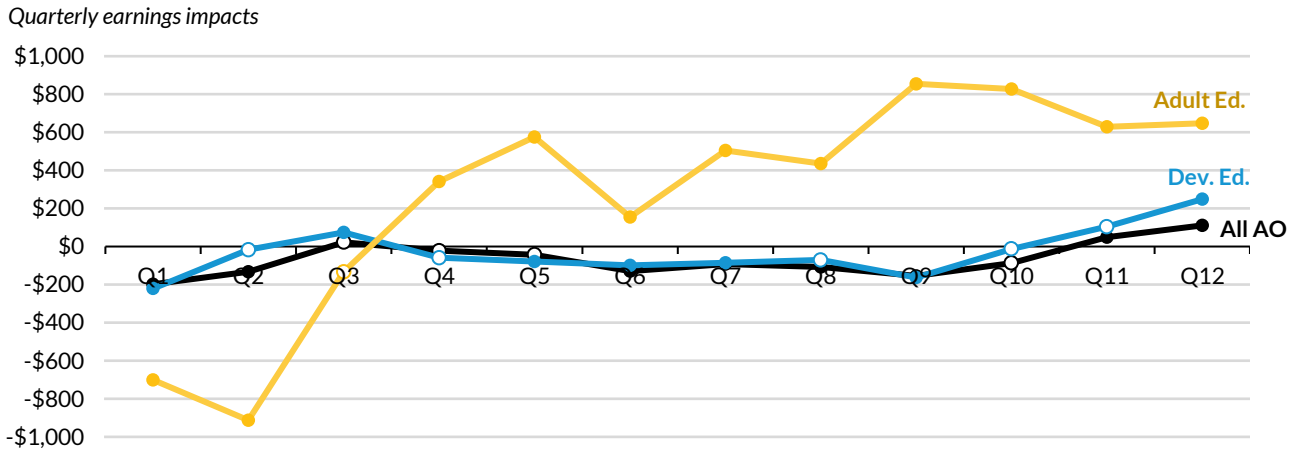


Note: Statistical significance is indicated as asterisks where *** p < 0.01, ** p < 0.05, * p < 0.10.

Figure 20 shows the net earnings impacts while figure 21 presents AO earnings alongside the earnings of the respective comparison groups. The impact of AO on earnings was consistently positive and statistically significant for students from adult education. In Kansas, in contrast, adult education students did not experience positive earnings impacts. Among developmental education students, no significant positive impacts emerged until the final quarter.

FIGURE 20

Earnings Impacts of AO by Quarter after Enrollment, Kentucky

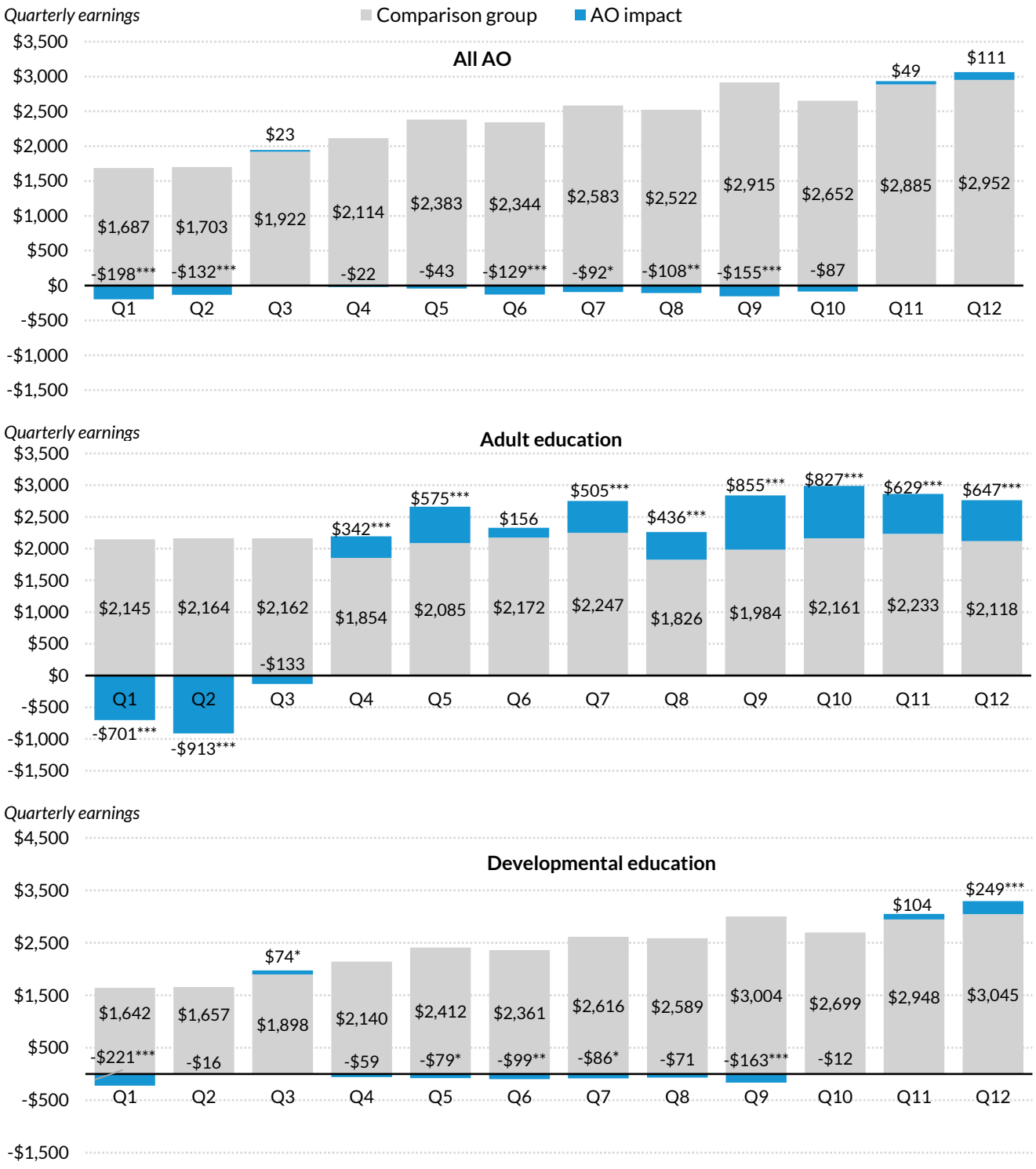


Note: Filled circles indicate significant impacts ($p < 0.10$); empty circles indicate impacts that are not statistically different from zero.

Figure 21 shows that AO students from adult education experienced a significant increase in earnings over the comparison group in most quarters. The adult education comparison group's earnings did not increase over time (actually decreasing slightly between the first and last observed quarter), while earnings for the AO students increased about 92 percent. Absent AO, these adult education students would have experienced no earnings growth, but with AO, they experienced substantial growth. The earnings of the developmental education AO group grew at approximately the same rate as the comparison group, pulling ahead slightly in the final two quarters.

FIGURE 21

AO Impact on Quarterly Earnings in Kentucky (Includes Zero Earnings)



Note: Statistical significance is indicated as asterisks where *** p < 0.01, ** p < 0.05, * p < 0.10.

Overall, adult education and developmental-education students in Kentucky's AO program experienced positive gains in credential attainment and credit taking. That means AO promoted retention and college attachment, but the evidence does not suggest acceleration as seen in Illinois and Kansas. Acceleration may still be occurring, but acceleration cannot be disentangled from increased persistence given the limitations of the data.

Although the labor-market impacts of AO in Kentucky were not positive and significant for the entire pool of AO participants, the employment and earnings gains among the adult education group were positive, significant, and substantively large. This pattern diverged from the results in Kansas, where AO exerted positive earnings impacts on CTE students but not on adult education students. Those results suggest that AO improved employment prospects and wages, particularly for the smaller group of students from adult education.

Louisiana Impact Estimates

Louisiana Education Impacts

The estimates for Louisiana capture AO impacts on adult education students only, because AO students were drawn from only one recruitment source. The impact estimates for AO in Louisiana cover the cohorts of AO participants enrolled from the beginning of the fall 2012 semester through the end of the summer 2015 semester. The data on educational activities for this report cover the period through the end of the spring 2016 semester, tracking students for 3 to 11 semesters after enrollment. The education impact results for Louisiana appear in table 8. Overall, AO substantially increased the number of credentials but reduced the number of academic credits and persistence beyond 12 credits. Specifics are as follows:

- **AO increased the number of credentials earned for all participants** by 0.8 credentials on average, a large increase over the number of credentials earned by the comparison group, which was essentially zero.
- **AO increased the probability that AO students earned any credential** by 19.9 percentage points, an over six-fold increase in the likelihood of earning a credential in the comparison group, which was very low.
- **AO reduced the average number of credits earned** for the full sample by 3.6 credits. As in Illinois and Kansas, the reduction in the number of credits earned might reflect accelerated pathways toward credentials.

- **AO reduced the probability that participants earned more than 12 credits** by 12.2 percentage points. That may be the result of students leaving college for employment after obtaining marketable credentials.

TABLE 8

Education Impact Results for Louisiana

Outcome	Comparison group mean outcome	AO group mean outcome	AO impact	AO gain over comparison (%)
Number of credentials earned	0.0	0.9	0.8***	NA
Any credential earned	3.2%	23.4%	19.9 pp***	622%
Number of credits earned	14.4	9.7	-3.6***	-25%
Earned more than 12 credits	40.8%	4.5%	-12.2 pp***	-30%

Note: *N* = 3,455; NA = not available because estimate would require dividing by zero. The impact may not equal the exact difference between the comparison and treatment means because of rounding and regression adjustment of the impact estimates.
*** p < 0.01, ** p < 0.05, * p < 0.10

Employment and Earnings Impacts

The AO impact estimates for quarterly employment and earnings outcomes in Louisiana cover the cohorts of AO participants who enrolled at any time from the beginning of the fall 2012 semester to the end of the summer 2015 semester. As in the other states, employment and earnings data are available for more quarters for the earlier cohorts (up to 12 quarters, or three years) than for the later cohorts. The latest cohorts had at least three quarters of follow-up. Thus, the long-term estimates include fewer observations than the short-term estimates.

The impact results for employment and earnings for Louisiana for each quarter appear in figure 22, figure 23, figure 24, and figure 25. Note that all dollar amount averages include students who earned $0 per quarter.

Overall, AO exerted some positive impacts on employment and earnings through the sixth quarter after enrollment but did not lead to higher employment and earnings for AO participants after that point. Specifics are as follows:

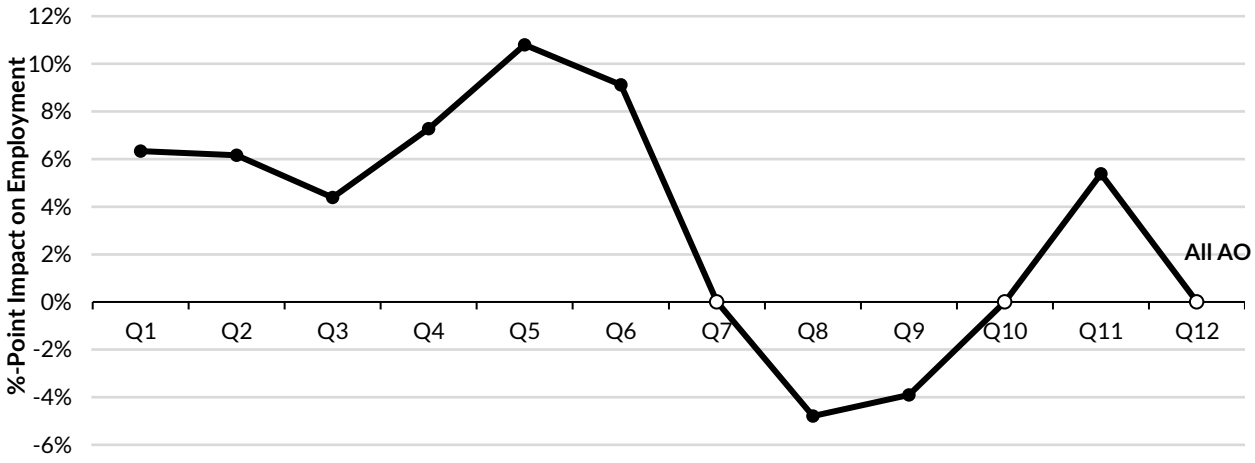
- **AO increased the probability of being employed in the short term**, but the gains eroded after the sixth quarter after enrollment. The gains peaked at 10.8 percentage points in the fifth quarter following enrollment, a 22 percent gain over the comparison group. By the seventh quarter after enrollment, AO appears to have exerted a negative effect on employment of 1.8 percentage points. Unlike in other states, AO in Louisiana exerted no negative effect on employment in the first few quarters after enrollment.

- **AO also increased the average quarterly earnings for AO students in the short term**, but the earnings gains eroded beginning in the seventh quarter after enrollment, leading to negative quarterly earnings impacts. During the first five quarters after enrollment, AO participants consistently earned more than the comparison group (or what they would have earned without AO). In the 6th through the 12th quarter after enrollment, however, earnings impacts on AO participants turned consistently negative. That is, AO participants earned less than they would have earned in the absence of AO. The reduction in quarterly earnings reached $633 in the 12th quarter following enrollment.

As shown in figure 22, the employment impacts for AO students in Louisiana grew steadily over the course of the first year after enrollment but subsequently collapsed, producing no long-term employment gains in the observed period.

FIGURE 22

Employment Impacts of AO by Quarter after Enrollment, Louisiana

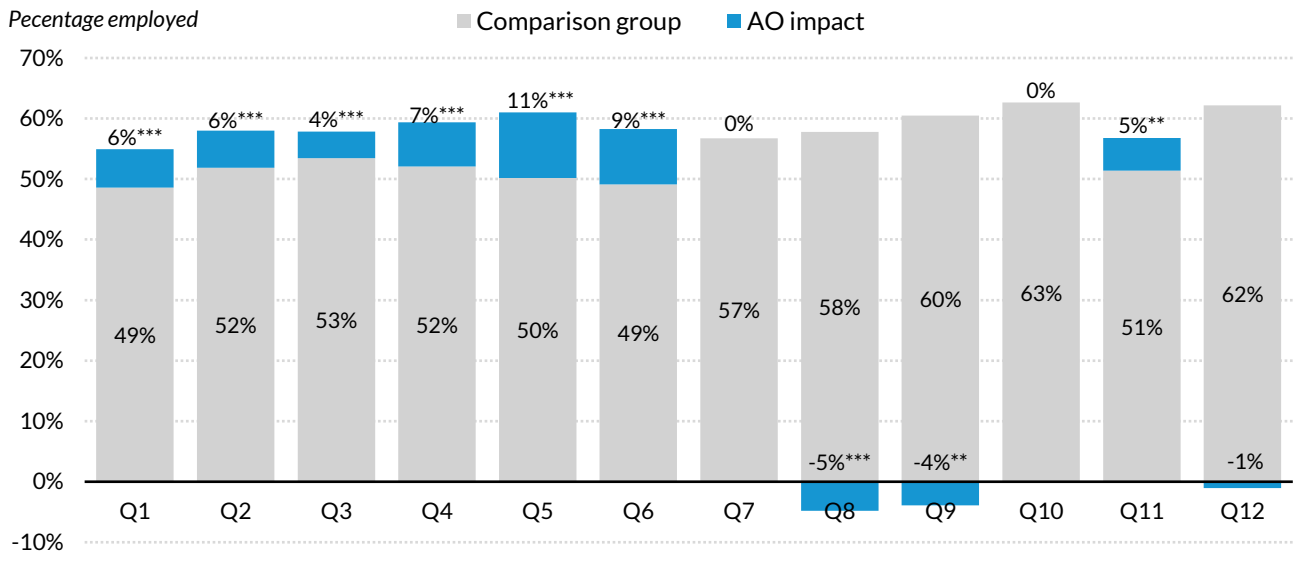


Note: Filed circles indicate significant impacts ($p < 0.10$); empty circles indicate impacts that are not statistically different from zero.

Figure 23 shows the employment rate of the comparison group in each quarter and impact of AO on students. State administrators pointed out that the declines for each cohort of AO participants relative to the comparison groups (see the "Cohort Effects" section below) roughly align with the rollout of the statewide Train to Attain model (an initiative inspired by AO) in 2014 as well as related initiatives that provided I-BEST-like services to adult education students across the state. The comparison group may have benefitted from a concurrent treatment similar to AO.

FIGURE 23

AO Impact on Employment Rates in Louisiana

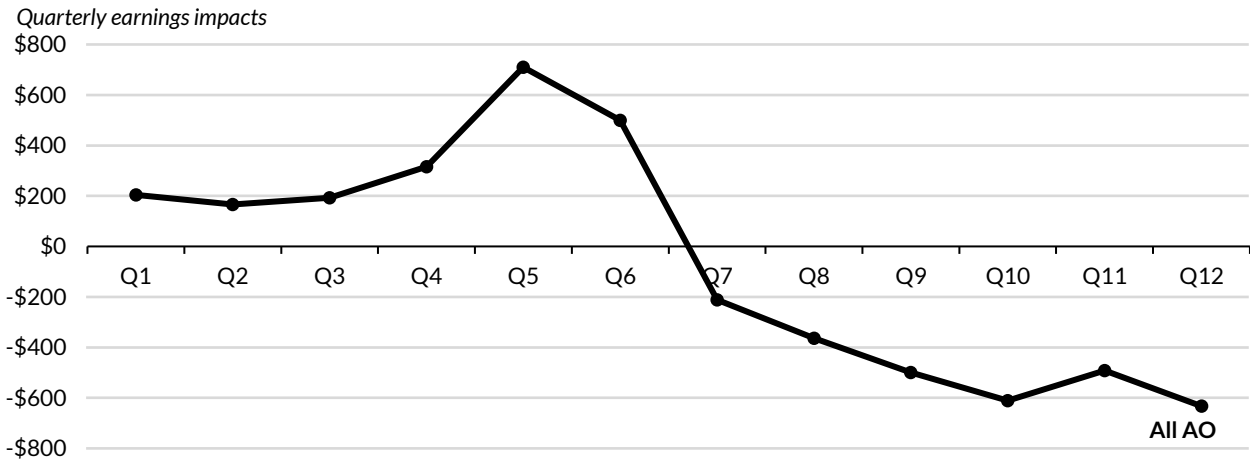


Note: *** p < 0.01, ** p < 0.05, * p < 0.10.

Figure 24 graphs the earnings impacts. As with employment, earnings impacts are positive for an initial period after enrollment before turning negative. But unlike employment, for which the impacts returned to zero by the end of the observed period, the earnings impacts remained negative through the end of the 12 quarters.

FIGURE 24

Earnings Impacts of AO by Quarter after Enrollment, Louisiana

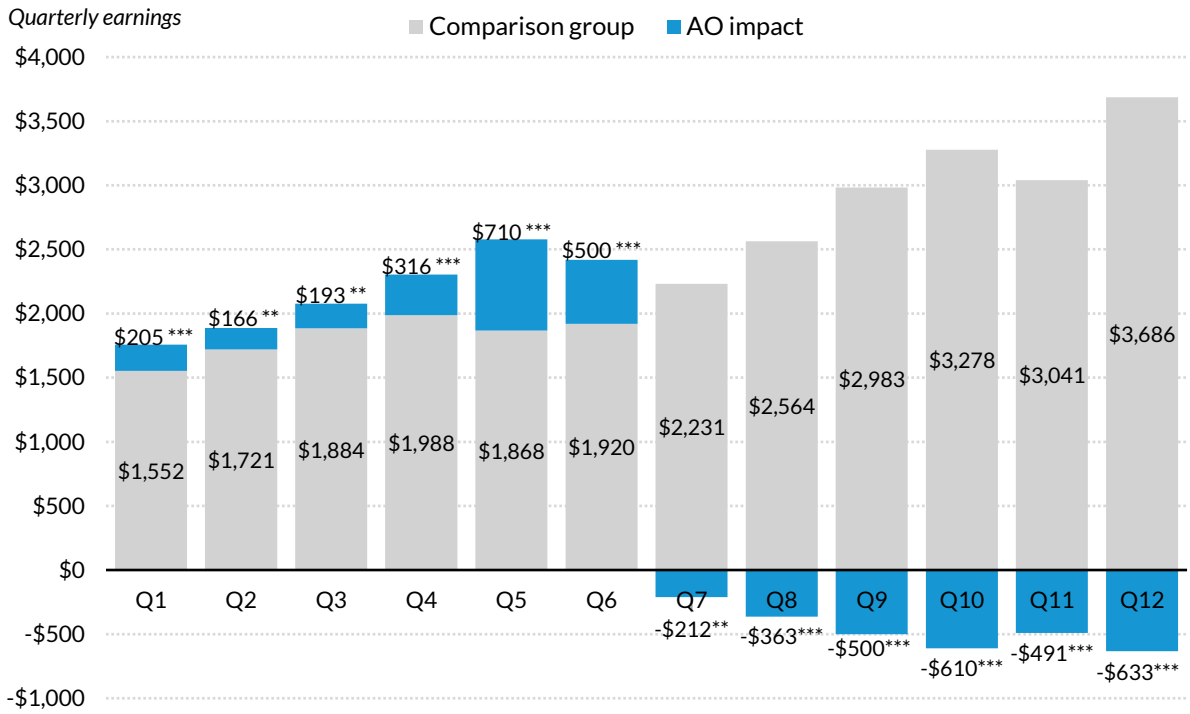


Note: Filled circles indicate significant impacts (p < 0.10); empty circles indicate impacts that are not statistically different from zero.

Figure 25 shows the comparison group's average earnings (including those with zero earnings) and the incremental impact on earnings experienced by AO students. The comparison group's earnings grew over this period, and the AO group's earnings did not keep pace. Such a pattern of earnings impacts is the opposite of what would be expected from human capital development programs. In the early periods around enrollment, participants may experience forgone earnings, but those early shortfalls are offset by long-term gains. It is hard to understand why the earnings of AO participants fell consistently short of those of the comparison group. Even if the comparison group was able to take advantage of a competing program, such an intervention would be expected to equalize earnings between AO and control groups, not place the AO participants at a disadvantage.

FIGURE 25

AO Impact on Quarterly Earnings in Louisiana (Includes Zero Earnings)



Note: *** p < 0.01, ** p < 0.05, * p < 0.10.

AO students in Louisiana experienced positive gains in credential attainment but completed fewer academic credits. AO seemed to exert short-run benefits for participants in Louisiana, peaking in the fifth quarter at $710 (a 38 percent increase over the comparison group). However, the fade-out of employment and earnings gains and the losses in earnings suggest that AO students were not consistently better off than other adult education students who enrolled in for-credit college courses. That may be partially because of the changes in the state's adult education system over the period; many of those changes were structural and rendered the adult education system very similar to AO, with a focus on career pathways and strong navigation through the Train to Attain model. Further, the

state sponsored several grant initiatives, including a statewide TAACCCT grant from the US Department of Labor and an HPOG grant at several colleges. Therefore, AO may not have been very different from the standard services that students in the comparison group received, and AO appears to have benefitted AO students in the labor market less than those standard services benefitted the comparison group members. Finally, macroeconomic changes caused by falling oil prices may have had some effect.

Cohort Effects

Because the grant period covers three program years, not all participants are observed for the same number of follow-up quarters after enrollment for the labor-market analyses. If the impact of AO is consistent across program years, this data limitation will have not biased the results, though earlier postenrollment quarters will have larger sample sizes than later post-employment quarters, allowing for more precise detection of statistical significance. But if AO exerts different impacts across program years (for example, if program content improves as AO matures), then the impact estimates reported in the previous sections are unlikely to represent the gains of late-entering cohorts. As a result, identifying the patterns of AO impacts by cohort is important for providing context to the overall results.

Figure 26, figure 27, figure 28, and figure 29 present the results of separate analyses of the impact of AO on annual cohorts in Illinois, Kansas, Kentucky, and Louisiana for a subset of AO colleges that are included in the cost-benefit analysis. The cost-benefit analysis colleges were running AO programs for all three years of the grant period, making them the most appropriate subset of colleges for an analysis of cohort effects. Including other colleges that only operated the AO program in the second and third years of the grant could conflate variations in the impact of AO across cohorts with variations in the impact of AO across colleges. By focusing only on colleges operating in all three years, the cohort analyses hold variations across colleges constant.

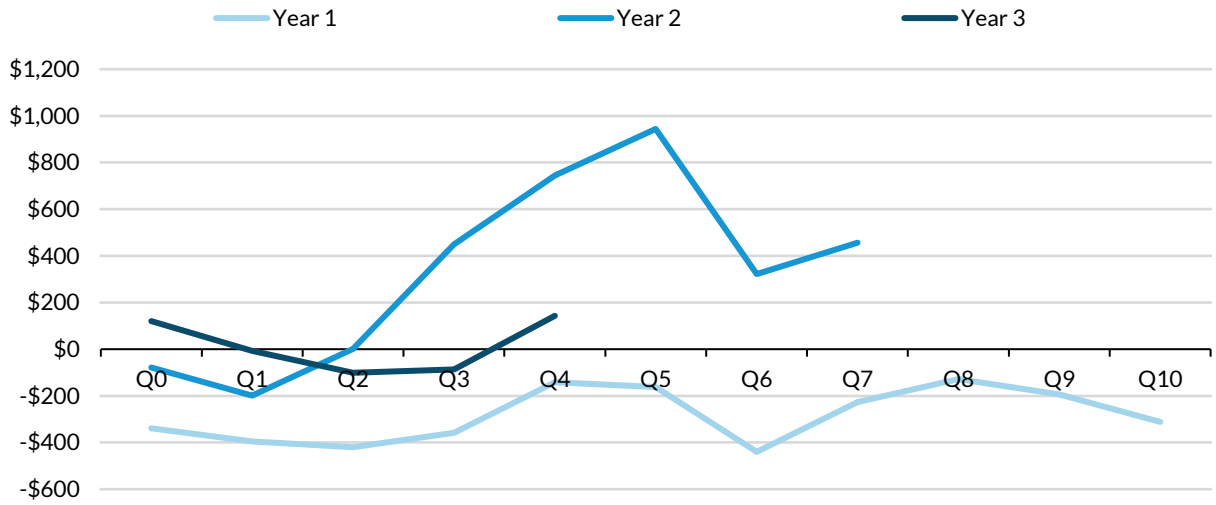
The cohort-specific impact estimates for Illinois and Louisiana demonstrate the importance of understanding the differences in impact estimates across cohorts. In both cases, the earnings effects of AO for participants enrolling in the first program year are generally low or even negative (a notable exception is the impact on the sixth quarter of earnings in Louisiana, which is relatively high, with a gain of over $600). In contrast, the impact of AO for participants enrolling during the second program year is much higher than the impact for those enrolling during the first program year in both Illinois and Louisiana. Those estimates suggest that some maturation of the AO program may have occurred between the first and second year, leading to higher earnings impacts in the second year.

In Kansas, the initial impact estimates for participants enrolling in the first year and the second year are relatively high. This is not surprising in light of the strong impact estimates for the total sample in Kansas. There is no evidence of program maturation in Kansas based on the cohort-specific impact estimates. AO participants in Kansas enrolling in the second program year saw reductions in earnings

caused by AO in quarter six. It is not clear whether those negative earnings persist for this cohort in Kansas, because no employment or earnings data are available for them after the sixth quarter.

FIGURE 26

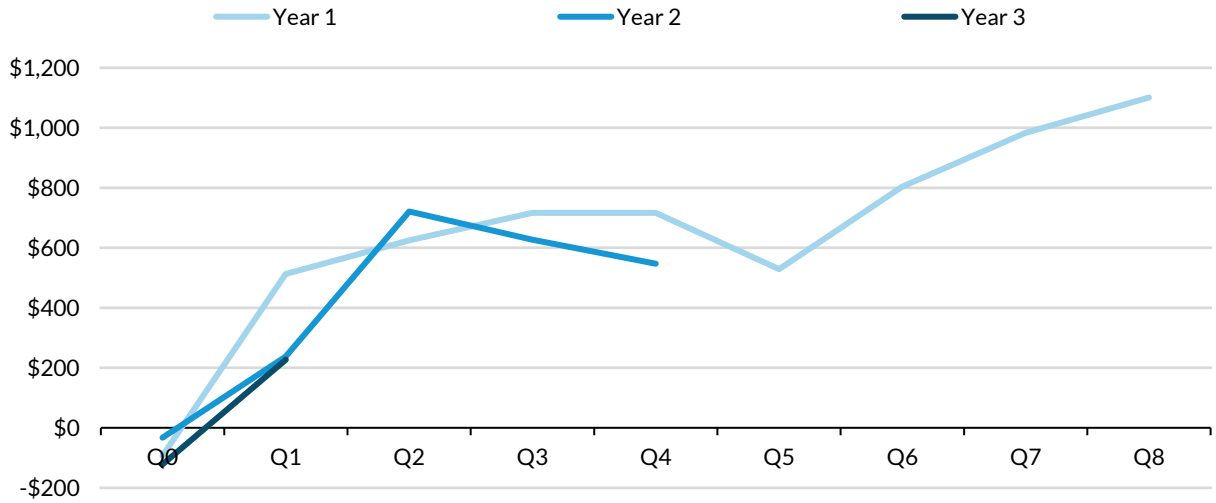
Cohort-Specific Earnings Impacts of AO, by Quarter after Enrollment for CBA Colleges in Illinois



Notes: Year 1 represents cohorts that enrolled in 2012, year 2 represents cohorts that enrolled in 2013, and year 3 represents cohorts that enrolled in 2014. CBA = cost-benefit analysis.

FIGURE 27

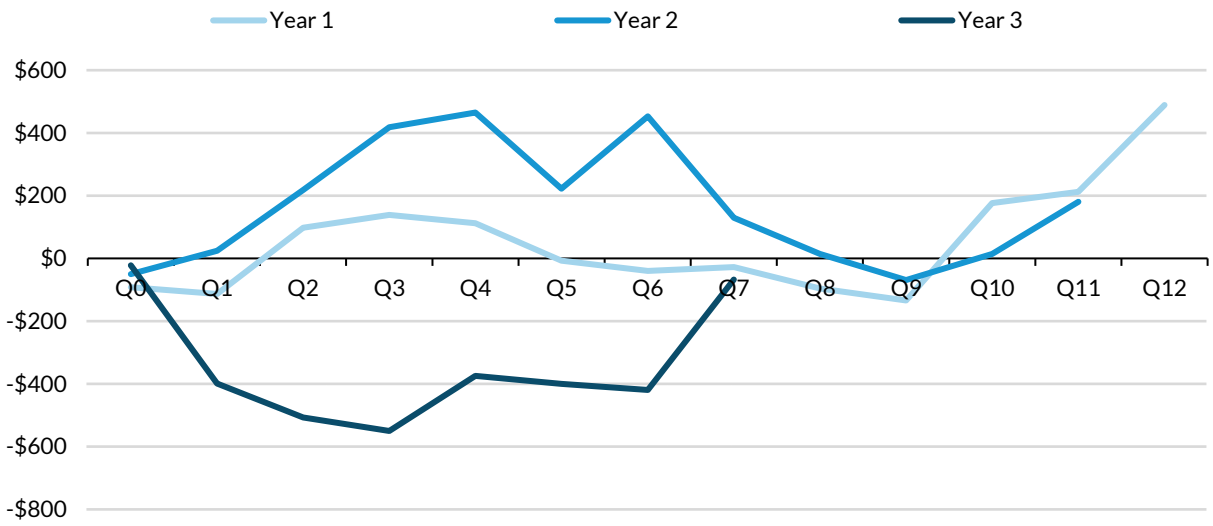
Cohort-Specific Earnings Impacts of AO, by Quarter after Enrollment for CBA Colleges in Kansas



Notes: Year 1 represents cohorts that enrolled in 2012, year 2 represents cohorts that enrolled in 2013, and year 3 represents cohorts that enrolled in 2014. CBA = cost-benefit analysis.

FIGURE 28

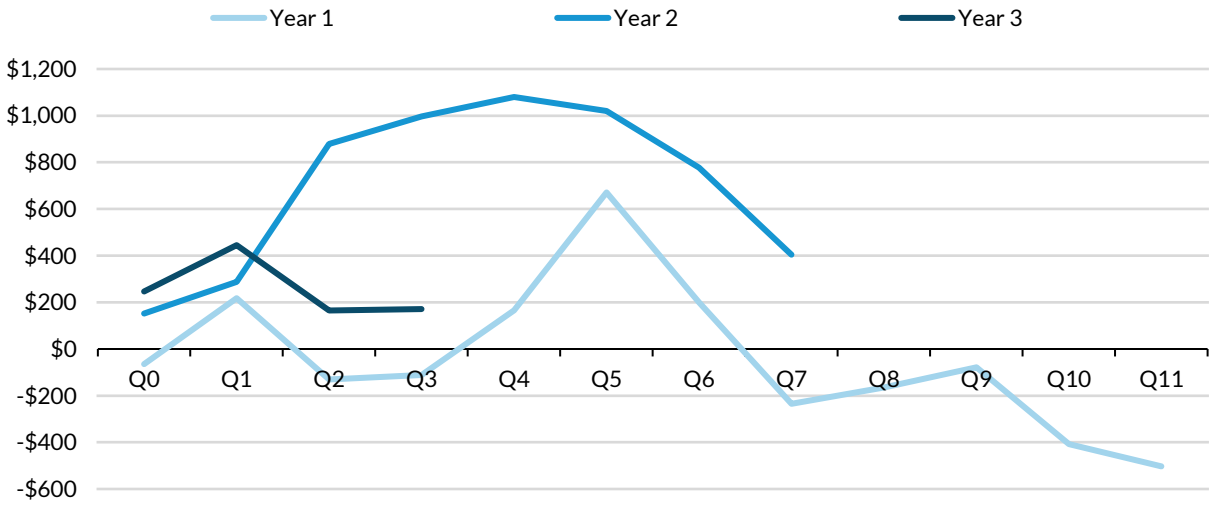
Cohort-Specific Earnings Impacts of AO, by Quarter after Enrollment for CBA Colleges in Kentucky



Notes: Year 1 represents cohorts that enrolled in 2012, year 2 represents cohorts that enrolled in 2013, and year 3 represents cohorts that enrolled in 2014. CBA = cost-benefit analysis.

FIGURE 29

Cohort-Specific Earnings Impacts of AO, by Quarter after Enrollment for CBA Colleges in Louisiana



Notes: Year 1 represents cohorts that enrolled from fall 2012 through summer 2013, year 2 represents cohorts that enrolled from fall 2013 through summer 2014, and year 3 represents cohorts that enrolled in fall 2014 through summer 2015. CBA = cost-benefit analysis.

Discussion

AO's purpose was to raise the education, skills, and employment success for adults with low basic skills. It also aimed to change the view of underprepared adult learners within state and college systems. Many policymakers, administrators, and staff were very skeptical initially that adults with low skills, especially those without high school credentials, could be successful in college programs. These results show that underprepared adult learners can be successful in college, earning more college-awarded credentials in fewer credits than their counterparts.

The labor-market outcomes of these additional credentials are mixed in the time frame studied here, but low-skilled CTE students in Kansas and adult education students in Kentucky show signs of meaningful and lasting gains. In integrated career pathways that offer multiple points at which students can enter and exit with credentials, students may be more likely to "stop out" of college to enter the labor market more than they would if they did not have a structured pathway. Thus, earnings gains may take longer to manifest, possibly explaining results where students experienced positive employment impacts but no or negative earnings impacts, such as among AO students in Illinois and the developmental education population in Kentucky. Following students' outcomes for more quarters would reveal a clearer picture of their academic and professional trajectories to draw stronger conclusions about long-term outcomes. Nonetheless, the appearance of any labor-market gains is of interest because research on the flagship I-BEST program in Washington State did not detect labor-market impacts, even though students had very positive education impacts (Zeidenberg, Cho, and Jenkins 2010).

As Anderson and colleagues (2016) found in the implementation research, connections to employers and workforce systems were initially weak in many states and colleges but developed over time. Kansas seems to have had the most direct alignment between their CTE programs and labor force needs resulting from a statewide program alignment effort from 2010 through 2015. Across all states, placement of students into work-based learning grew from 28 percent in the first year to 42 percent in the third year, suggesting growing employer connections over the implementation period. In addition, other aspects of the program, such as team teaching, matured as the initiative continued. The longer-term impacts in this report represent the experiences of the earliest cohorts, who did not experience the most developed version of AO programming. These early cohorts, who enrolled in 2012, also faced particular economic circumstances during the early years of the recovery from the 2007 to 2009 recession that may have affected their trajectories. Rising oil prices, shifts in manufacturing jobs, and other economic developments in these states and localities created conditions that may have affected cohorts of students differently. Following more cohorts for more time would make it easier to disentangle the effects.

Overall, the AO population is a subset of students that may not represent the broader adult education, CTE, and developmental-education populations in their states. For example, the Kansas adult education group appears to be particularly advantaged as measured by educational attainment, prior employment, NRS functioning levels, and the earnings of the comparison group. The unique characteristics of AO students may limit the generalizability of the findings across larger groups.

Further, students in particular state and local contexts experienced an array of complementary and competing services and programs that may have changed the added value of AO to students in those contexts. For example, during the demonstration period, the state of Louisiana was increasingly focused on career pathways and career navigation in its community colleges through their Train to Attain initiative. Large federal TAACCCT and HPOG grants in multiple states (particularly Louisiana) would have also improved the opportunity of many comparison group members to participate in programs similar to AO. Even if AO provided real benefits to participants in Louisiana, if those benefits are not large relative to the performance of comparison students enrolled in similar programs, then the estimated added benefits of AO will be minimal. Still, it is difficult to explain the significant negative earnings effects in Louisiana in the 6th through 12th quarters after enrollment.

AO shows fairly consistent evidence of success on students' education outcomes, with evidence of acceleration, or more credentials in fewer credits. One would expect college-awarded credentials to lead to lasting labor-market gains, but the evidence here is inconsistent. In Illinois, for example, it appears that AO students start out ahead in the labor market but then the comparison group is able to catch up. One possible explanation is that acceleration allows AO students to make gains earlier, but it does not result in lasting improved outcomes, at least for the population served in Illinois. Overall, more observation time is likely necessary to draw confident conclusions about the effectiveness of AO on improving employment outcomes. However, the CTE population in Kansas and adult education population in Kentucky suggest some promising longer-term labor-market gains.

Notes

1. Bureau of Labor Statistics, "Usual Weekly Earnings of Wage and Salary Workers First Quarter 2017," news release, April 18, 2017, https://www.bls.gov/news.release/pdf/wkyeng.pdf.
2. For more detail, see Anderson et al. (2014); JFF's Breaking Through website, "Breaking Through," accessed May 23, 2017, http://www.jff.org/initiatives/breaking-through; and the Washington State Board of Community and Technical College's I-BEST website, "I-BEST," accessed May 23, 2017, https://www.sbctc.edu/colleges-staff/programs-services/i-best/.
3. The foundations that supported AO included the Bill & Melinda Gates Foundation, the Joyce Foundation, the W. K. Kellogg Foundation, the Kresge Foundation, the Open Society Foundations, the Arthur M. Blank Family Foundation, the Robert W. Woodruff Foundation, the Annie E. Casey Foundation, and the University of Phoenix Foundation. The national technical assistance providers included the National College Transition Network, the National Council for Workforce Education, and the State Board for Community and Technical Colleges in Washington State. The evaluation states were Illinois, Kansas, Kentucky, and Louisiana. The affiliate states were Arkansas, Georgia, and Mississippi.
4. Because the analysis depends on matching techniques and not randomized controlled trials, the results are subject to possible errors or biases. However, the extensive data available for the matching methods give confidence that the estimates in the analysis are unlikely to be subject to serious bias.
5. Authors' tabulations using the Bureau of Labor statistics data, based on data from the Current Population Survey. See "Databases, Tables & Calculators by Subject," Bureau of Labor Statistics, accessed May 23, 2017, www.bls.gov/data.
6. Bureau of Labor Statistics, "Usual Weekly Earnings of Wage and Salary Workers First Quarter 2017," news release, April 18, 2017, https://www.bls.gov/news.release/pdf/wkyeng.pdf.
7. Author tabulations using the Bureau of Labor Statistics data, based on data from the Current Population Survey (See "Databases, Tables & Calculators by Subject," Bureau of Labor Statistics, accessed May 23, 2017, www.bls.gov/data). Of the 50 occupational areas projected to grow the fastest between 2014 and 2024, 74 percent will require at least some postsecondary education, whereas 44 percent of the remaining 819 occupational areas will require at least some postsecondary education.
8. AO was managed by JFF in partnership with the National College Transition Network, the National Council for Workforce Education, and the State Board for Community and Technical Colleges in Washington State. JFF contracted with the Urban Institute and its partners, the Aspen Institute and the George Washington University, to independently evaluate the initiative.
9. Some colleges received exceptions from JFF to offer 10- or 11-credit-hour pathways; others offered much longer pathways. For consistency, this analysis utilizes the "tipping point" of 12 credits as one indicator of persistence. Data limitations prevented the use of another measure of persistence, continued enrollment beyond the student's pathway. The most substantial constraint faced in identifying completion of a pathway as an outcome variable was that student pathways were not identified in the data for three of the four states.
10. For more detail, see Anderson et al. (2014); JFF's Breaking Through website, "Breaking Through," accessed May 23, 2017, http://www.jff.org/initiatives/breaking-through; and the Washington State Board of Community and Technical College's I-BEST website, "I-BEST," accessed May 23, 2017, https://www.sbctc.edu/colleges-staff/programs-services/i-best/.
11. The report on the first year of AO implementation (Anderson et al. 2014) summarizes the AO model in depth. Anderson et al. (2016) provides information and lessons on AO implementation throughout the initiative.

12. Zeidenberg, Cho, and Jenkins (2010) used propensity score matching to evaluate I-BEST. Kansas's independent evaluation of AO (Ginther and Oslund 2016) also used this analysis method.

13. For more detail on the implementation findings, see Anderson et al. (2014), Anderson et al. (2015), and Anderson et al. (2016).

14. North Carolina initially participated in AO but later left the initiative to focus on state-sponsored efforts to accelerate low-skilled students in their Basic Skills Plus program. Louisiana joined the initiative around the time of North Carolina's departure.

15. The numbers did grow in later years of implementation; the size of the entering cohort across all four states grew from 2,370 students in 2012 to 3,043 students in 2014 according to college survey results (though these numbers differ somewhat from what is reported in the administrative data, as described below).

16. There are different ways to match treatment and comparison cases using the propensity score. One is called "nearest neighbor," where each treatment group member is matched to the comparison group member with the closest propensity score. Nearest neighbor can also be modified so that instead of matching one-to-one, the matches are one-to-five or one-to-ten, where each treatment group member is matched to multiple members of the comparison group. Another matching method is called "kernel density weighting." Instead of directly matching one-to-one or one-to-many, kernel weighting weights the members of the comparison group by the distance of their propensity score from each treatment case. Kernel weighting uses every member of the comparison group within a certain propensity score distance of each treatment case, but gives higher weight to the comparison cases that are closer to the treatment case and a lower weight to the cases that are farther away. The distance of allowable propensity scores is called the "caliper" and the relative weight placed on more distant cases is determined by the "bandwidth." This approach makes use of the most information available from the comparison group rather than only using information from one or a few neighbors. The estimates presented in this report are from kernel weighting at a bandwidth of 0.8. Sensitivity analyses using a bandwidth of 0.2 did not produce substantively different results. Nearest neighbor results were also not substantively different in most cases.

17. The main drawback of propensity score matching is that it does not match people on unobservable characteristics such as motivation or intrinsic ability (though the inclusion of test scores may capture some aspects of ability). Therefore, it can only be used to draw unbiased causal inferences when all characteristics of the treatment and comparison groups that determine program participation are observed in the dataset and there are no unobserved determinants of program enrollment. This assumption cannot be directly tested, but it is typically justified by careful selection of the comparison group and a well-specified matching strategy. It does not provide the standard of evidence of an experiment, which is designed to hold both observable and unobservable characteristics constant across treatment and comparison groups.

18. This approach builds on the analysis used in the I-BEST evaluation study (Jenkins et al. 2009) but enhances the I-BEST approach by including additional data. In particular, the expanded model used in this study controls for additional student characteristics in order to improve the match between AO and non-AO individuals and thus provide more reliable evidence of AO impacts on educational outcomes. Critically, the expanded model includes test scores, which were an important determinant of selection into AO and were not included in the I-BEST evaluation (Jenkins et al. 2009). The expanded model also includes information on local unemployment rates, program of study, and earning and employment history. For brevity, only the expanded model results appear in the body of this report. Results from a statistical model aligned with the I-BEST specification from Jenkins et al. (2009) are available from this report's authors upon request.

19. The Bureau of Labor Statistics Handbook reports that in 1997, 92.5 percent of the wage and salary component of national income is accounted for in the unemployment insurance records (see Bureau of Labor Statistics [1997]). This has increased over time, particularly following changes to federal regulations in 2014 that caused unemployment insurance to cover a wider range of earnings.

20. Earnings were adjusted for inflation in all states except Kentucky, where it was impractical to do so given the structure of the data analysis. In Kentucky, the state could not release deidentified earnings records to

nonstate entities, so the research team wrote analysis code for the state to run on their data. It was exceedingly complex to write inflation adjustment code without having access to the structure of the underlying earnings records. However, inflation was relatively low, at less than 2 percent in 2010–16, and would not substantively change the Kentucky results.

21. Personally identifiable information includes name, address, Social Security number, college ID, and date of birth.

22. Limiting the population studied to students who took a for-credit college course also excludes from the comparison group adult education and developmental-education students who did not enroll in a for-credit college course. Jenkins et al. (2009) used this approach by comparing I-BEST students recruited from the adult education population with adult education students who were not in I-BEST but who enrolled in at least one college workforce course. In addition, the research team made the judgment that college course takers are most comparable to the AO participants. Broadening the comparison group to any adult education student, regardless of college enrollment, would likely produce an overestimate of the impact of AO, because AO participants are generally different from the broader adult education population in their higher (but unobserved) interest in and cultivation of occupational skills.

    At the same time, if many AO students who came from adult education would not have enrolled in college if not for AO, then comparing them to adult education students who accessed college without AO might end up comparing AO students to a set of non-AO students who are particularly motivated and had relatively low barriers to college access. Such an approach may lead to underestimates of the impacts of AO. The section "Adjustment for Comparison Group's College Enrollment" describes one way that the research team attempted to reconcile this selection effect.

23. The research team made the decision to look only at the first four courses because it roughly aligns with the 12-credit AO pathway, assuming each course is three credits on average. The decision to designate courses as AO if they had at least four AO students in them was a somewhat arbitrary but seemingly reasonable cut-off to determine which courses were "AO courses."

24. States had the following ELL AO cases removed after all other sample cuts: 64 in Illinois, 6 in Kansas, 10 in Kentucky, and 3 in Louisiana.

25. See, for example, Wilson (2014), which discusses how English-language learners generally have very different characteristics and motivations than low-skilled English-proficient students.

26. Because Illinois has a very large adult education population, matching all potential comparison group members to state earnings records was not cost effective. To remain within the state's budget, the research team conducted a preliminary propensity score match to narrow down the pool for which the state would pull UI earnings records. The preliminary match included all variables except for those available through the earnings records. The research team conducted a nearest neighbor match (20 neighbors, with replacement) to identify cases in the comparison group that were the most similar to the AO treatment group. All treatment cases were retained for the earnings match. The state matched this smaller comparison pool as well as all of the treatment cases with state earnings records, and the research team put the resulting sample through the full propensity score match utilizing a kernel density approach that included preprogram employment and earnings variables.

27. The reason for limiting the sample to those with valid Social Security numbers was that valid Social Security numbers are required for linking individuals to state earnings records. The earnings records provide critical information that are used here for matching the AO and comparison groups and used in later analyses to estimate impacts on employment and earnings. Because the research team did not have access to students' Social Security numbers, the states flagged those students who did not have a valid Social Security number so they could be dropped from the analysis.

28. For example, according to state administrators, about 40 percent of adult education students in Kansas who complete their HSE transition to postsecondary education, but that is only about 6–7 percent of the overall adult education population.

29. See more detail about recruitment strategies by state in the chapter "Description of AO Students" and in Anderson et al. (2015).

30. The credentials included in this report are only credentials awarded by the college, not credentials awarded by third parties. College credentials are often certificates of completion. These credentials are awarded and recorded by the college and are often occupationally related per the career pathways created by the colleges. However, the nature of the credentials varies widely across pathways, and there is no measure of the "value" of these credentials in the workplace (see Anderson et al. 2015). In addition, because the data come from the college system, they do not include third-party credentials such as state licenses and professional/occupational certifications. Jobs for the Future required the colleges and states to collect student information on third-party credential attainment for AO students later in 2012. Collecting these data is challenging as the data are self-reported by students and the quality and completeness may be suspect. In addition, states do not collect these data for the comparison group so they cannot be included in the impact analysis.

    As a result of these limitations, estimates of the impact of AO on the number of credentials could understate the impact of AO on all credentials. Note however that the inability to observe non-college credentials does not necessarily mean that the impact estimate is an underestimate. If comparison group members earned more noncollege credentials than AO students, then the impact estimates presented here could overstate the impact on the number of credentials earned. The impact on noncollege credentials cannot be identified without data on noncollege credentials.

    Credentials offered in AO pathways were not always the same as those offered in non-AO programs. States and colleges faced clear incentives to increase the number of credentials offered in a pathway to meet the ambitious expectation from JFF that states award 3,600 credentials by the end of the three-year grant period. For this reason, the analysis measures both "any credential earned" and "number of credentials earned." AO's implicit incentive to increase credentials offered differs from I-BEST, because Washington State required that I-BEST programs have the same structure as similar non-I-BEST programs.

31. The Louisiana data did not include noncredit academic activity.

    In fiscal year 2012 (though June 30, 2012), the Illinois adult education database, which was used in this analysis, only captured data on "gateway" courses to liberal arts programs. These are courses such as prerequisite math and writing courses. Although this gap should not bias the results because it applies to both the AO group and the comparison group, it may deflate the total number of courses taken. Data for all courses taken in Illinois were available after July 1, 2013.

32. In all states, the treatment and comparison groups were rematched for each quarter of postprogram outcomes.

33. The students profiled are in the sample of AO students included in the impact estimates before matching. This means that students who were excluded from the analysis because they did not take a credit-bearing course, did not have a valid Social Security number, or were English-language learners were also excluded from the profile. For simplicity, this chapter refers to this population as "AO students," is the students discussed in this chapter are a subset of all students served.

34. These are the percentages for the matched treatment population. Of the overall Kansas AO population, 30 percent were from adult education and 70 percent were from CTE, according to the administrative records.

35. Students who tested above the AO eligibility threshold and were in classes with AO students are not included in the analysis and are excluded from the comparison group.

    A small portion of students categorized as CTE came from developmental education programs or came to the college from external sources. Students were categorized as adult education or CTE per the following decision rule described in the text. Information from the implementation reports and unpublished analyses provided by the state roughly match the share of students categorized as CTE for the purposes of the analysis.

36. The research team flagged a Kentucky student as a developmental education student if they earned a traditional high school diploma before or in the year of AO entry (allowing for a traditional high-school-to-college trajectory) or if they earned an HSE at least two semesters before AO enrollment. Students who earned an HSE in the semester before AO entry were considered recruited from adult education because adult education students were often encouraged to complete their HSE immediately before or very shortly after AO enrollment in order to qualify for federal financial aid.

37. Identifying AO students and their pathways for the impact study differed from the how they were identified for the implementation study. For the implementation study, enrollment counts in AO overall and by pathway identifications were provided by AO college staff who completed the annual AO college surveys. For the impact study, enrollment in AO was determined by an AO flag in the data, and the assignment of pathways was determined empirically by examining the Classification of Instructional Programs (CIP) codes of the first four courses of enrollment after AO entry and any credentials earned in the first two semesters after enrollment. Therefore, enrollment numbers, particularly by pathway, may differ in this report relative to the earlier AO implementation reports (Anderson et al. 2014, Anderson et al. 2015, and Anderson et al. 2016). Sometimes it was not possible to discern a pathway because a student only took for-credit basic skills courses or courses in other areas that made it difficult to determine their substantive occupational area.

38. Basic skill levels for students in specific pathways are not provided here, but they generally followed the same pattern of NRS functioning levels of the state as a whole.

39. State administrators noted that they focused attention on students with intermediate NRS functioning levels because those students have historically been hardest to serve

40. This type of separation may be possible if there existed an indicator of a student's occupational interests at baseline (that is, before enrollment). However, because the research team determined occupational area based on actual course-taking and credentialing activity, the measure of occupation is endogenous to participation in AO and therefore not a useful covariate to segment the sample for impact estimation.

41. Note that not all credentials are equal. A credential can be anything from a short-term certificate resulting from one or two courses through a degree. AO's performance measures treated credentials more or less equally (for example, setting a goal of 3,600 credentials per state) and this analysis continues this approach. In future research, it may be valuable to distinguish types of credentials earned, but that level of analysis was beyond the purview of this effort.

42. See, for example, Attewell et al. (2007).

43. See, for example, Hotz, Imbens, and Klerman (2006); and Schochet, Burghardt, and McConnell, 2008. The results of the cost-benefit analysis will be strongly influenced by the trajectory of impacts (whether they continue to decline or level off).

44. See Ginther and Oslund (2016).

45. Because of the timing of data delivery, Kansas was only able to track students for 8 quarters while other states followed them for up to 12 quarters.

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Daniel Kuehn is a research associate in the Urban Institute's Income and Benefits Policy Center. Dr. Kuehn has ten years of experience conducting and managing research on employment, education and training, apprenticeship the science and engineering workforce, racial disparities, and the transition from school to work. He primarily conducts quantitative empirical work, with an emphasis on non-experimental evaluation methods. Dr. Kuehn also has experience doing qualitative research and much of his quantitative research experience has been on mixed-methods projects.

Lauren Eyster is a senior research associate in the Income and Benefits Policy Center at the Urban Institute, where her research focuses on innovative workforce development programs and how to best evaluate and learn from them. Most recently, Eyster has examined industry-focused job training and career pathway initiatives implemented through the workforce investment system and at community colleges. She studies how these programs can best provide education and training to different groups such as laid-off workers, youths, low-income individuals, and older workers. She also researches how systems and various stakeholders can collaborate to help these individuals find and retain jobs.

Burt Barnow is the Amsterdam Professor of Public Service and Economics at the Trachtenberg School of Public policy and Public Administration at George Washington University. Dr. Barnow has over 40 years of experience as an economist and manager of research projects in the fields of workforce investment, program evaluation, performance analysis, labor economics, welfare, poverty, child support, and fatherhood. Prior to coming to George Washington University, Dr. Barnow was Associate Director for Research at Johns Hopkins University's Institute for Policy Studies, where he worked for 18 years. Prior to that, he worked for 8 years at the Lewin Group and nearly 9 years at the U.S. Department of Labor, including 4 years as Director of the Office of Research and Evaluation in the Employment and Training Administration. Prior to those positions, Dr. Barnow was an assistant professor of economics at the University of Pittsburgh. He has a BS degree in economics from the

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