RESEARCH REPORT

A Cost-Benefit Analysis of Accelerating Opportunity

Daniel Kuehn
THE URBAN INSTITUTE

Lauren Eyster
THE URBAN INSTITUTE

Theresa Anderson
THE URBAN INSTITUTE

Burt Barnow
THE GEORGE WASHINGTON
UNIVERSITY

Robert Lerman
THE URBAN INSTITUTE

Amanda Briggs
THE URBAN INSTITUTE

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Executive Summary

Accelerating Opportunity (AO) was an initiative to help adults with low basic skills earn industry-recognized credentials in high-growth occupations and succeed in the labor market. AO offered low-skill students, regardless of whether they had a high school credential, the opportunity to enroll in career and technical education (CTE) pathways at two-year colleges without the usual prerequisites. AO was based on Washington State's Integrated Basic Education and Skills Training model and lessons from the Breaking Through initiative. AO allowed students scoring in the 6th- through 12th-grade National Reporting System (NRS) educational functioning levels to enter CTE courses concurrently with high school equivalency (HSE) completion programs or other adult education 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. To help improve student success, AO provided supports for these students such as team teaching, career navigation, and the opportunity to coenroll in adult education to complete a high school credential. The Urban Institute and its partners at the Aspen Institute and the George Washington University 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 discusses the findings of the cost-benefit analysis (CBA) of AO in the four evaluation states: Illinois, Kansas, Kentucky, and Louisiana.[1] It compares the value of the benefits associated with AO—principally labor market benefits—with the value of the costs of the program. The benefits of AO are estimated using standard quasi-experimental methods that are nearly identical to the approach used in the AO impact report. The costs of the program were collected in a cost survey sent out to participating colleges that were running AO for all three program years and from grant reporting and follow-up discussions with state offices.

The report follows the standard CBA practice of focusing on the social (real resource) costs and social (real resource) benefits of AO and determining the dollar value of the "net benefits" of the program. "Net benefits" are calculated by subtracting the costs associated with AO from the benefits that it provides. Since most costs are not borne by AO participants, the net benefits of AO differ

depending on whether they are considered from the student or the social perspective. The report therefore answers two distinct research questions:

1. What is the dollar value of the net student benefit of AO?
2. What is the dollar value of the net social benefit of AO?

Summary of Key Results:

- Per-student net student benefits were positive for three of the four AO states: Illinois ($705), Kansas ($4,030), and Louisiana ($1,639). However, per-student net student benefits were negative for Kentucky (-$305). These net student benefits suggest that participants in Illinois, Kansas, and Louisiana are economically better off for participating in AO.

- Only Kansas achieved positive net social benefits from AO (meaning that the social returns outweighed the costs). The state incurred a relatively low cost per student of delivering AO of per student ($2,717), but a much higher per-student benefit of $4,129.

- None of the other three states generated positive net social benefits. While Louisiana's costs per student were somewhat lower than Kansas's, the benefits associated with AO in Louisiana were not large enough that the program produced a positive net gain. Illinois and Kentucky had the highest costs of delivering AO and the lowest benefits associated with the AO program.

How Do We Assess the Net Benefits of AO?

The CBA considers two different perspectives: (1) the "social perspective," which incorporates the costs and benefits experienced by all members of society; and (2) the "student perspective", which considers costs and benefits from the perspective of the student. Social costs include college resource expenditures on AO, supports provided by colleges to AO students, and state administrative and oversight costs. Social benefits consist of the earnings gains of AO participants relative to similar students who did not participate in AO. Student costs are their actual expenditures as well as any forgone earnings (i.e., reductions in earnings while they are in school). Student benefits are the earnings gains experienced by AO participants after taxes and reductions in social assistance. "Net benefits" are calculated by subtracting the costs associated with AO from the benefits that it provides. The net benefit is a key metric for understanding whether a program is a good social investment. A program is a good social investment if it has positive net benefits, which indicate that the benefits produced by the program exceed the costs of implementing and operating that program.

The evaluation team determined that a quasi-experimental evaluation approach was most feasible and appropriate. As such, the benefits of AO are estimated by comparing the earnings of participants after enrollment to the earnings of comparable students that did not participate in AO. This comparison group is identified by matching nonparticipants to AO students who are the most similar on their observed baseline characteristics. The comparison group provides the best estimate of what would have happened to AO participants in the absence of AO. The AO impact report discusses details of how the benefits of AO are estimated (Anderson et al. 2017). This report uses the same methods but examines a more restricted sample of colleges that participated in AO for all three program years and provided usable cost data. The colleges in this report represent 30 of the 54 colleges formally involved in AO at any time across the four states.

Finding positive net benefits from the student perspective would indicate that participating students benefit from AO after considering all the costs to them that are associated with the program. However, since other members of society besides participants bear many of the costs of AO, the value of AO depends on the net benefits from the perspective of society, including both students and all others. This social perspective captures all costs and all benefits and does so independently of which members of society bear the costs and which reap the benefits. From this perspective, positive net benefits would indicate that the AO program increased valued social resources by more than the value of resources used to undertake the initiative.

Several constraints on the analysis suggest caution in drawing conclusions about AO. First, this CBA only covers the first three AO program years, a period during which participating colleges were constructing their pathways. The cost effectiveness of AO may be different in more mature programs that do not incur the same start-up costs and have forged stronger connections with employers. Second, the evaluation team is only able to observe the initial labor market outcomes for AO participants. Tracing effects of more mature programs and long-term earnings gains could be remedied in future research. Still, this CBA provides a rigorous assessment of the initial costs and benefits of the early years of implementing the AO model.

What Are the Net Benefits of AO?

The CBA finds that AO was only a good social investment in its first three years of operation in one of the four evaluation states. In the other three states, the program's net social benefit was negative despite it demonstrating positive impacts on educational outcomes and mixed impacts on earnings

outcomes, as described in the impact report (Anderson et al. 2017). Although net benefits from the student perspective tended to be positive, net benefits from the social perspective were typically negative. Only the AO initiative in Kansas generated positive and significant net benefits for both students and society. Kentucky's AO initiative incurred negative net benefits from both perspectives. AO in Illinois and Louisiana generated positive net benefits for students but negative net benefits for society as a whole.

Variations across AO states provide important insights into the factors that contribute to the success of the AO model. For example, Kansas had a particularly strong labor markets for low-skill workers, which likely increased the benefits associated with AO. Some states (notably Louisiana) were engaged in several reform efforts in their community college system that reduced the added value of the AO program model relative to what typical adult education students received in the absence of AO.

The body of this CBA report presents a range of net benefit estimates. In table 1, we show more curated results. The range of the exact net benefit estimates is wide, even though all of these estimates tell the same basic story about the net benefits of AO in each state. **This indicates that the precise dollar figures in the report should be interpreted with caution.**

TABLE 1

Net Benefits Across All States, Preferred Specification

	Net social benefit	Net student benefit
Full net benefit		
Illinois	-$5,569,007	$543,993
Kansas	$1,900,882	$4,803,242
Kentucky	-$3,729,899	-$289,790
Louisiana	-$405,985	$648,939
Per-student net benefit		
Illinois	-$7,214	$705
Kansas	$1,595	$4,030
Kentucky	-$3,922	-$305
Louisiana	-$1,025	$1,639

Note: The preferred specification uses a 5 percent discount rate and projects program years separately before combining benefit estimates. These specifications are discussed in more detail in the How Benefits are Calculated section of the report.

Table 1 reports the per-student social and student net benefits based on the preferred most plausible assumptions of the evaluation team. Since states, localities, and other AO funders bear many of the costs of delivering the AO program, social benefits and costs are important to understanding the complete picture of AO. The first column displays these net social benefit estimates. Although net

student benefits were positive across most of the states, per-student net social benefits were positive only in Kansas ($1,595). Negative net social benefits in Illinois, Kentucky, and Louisiana indicate that any earnings gains caused by AO were not large enough to compensate for the state and college costs incurred.

The AO model, like the Integrated Basic Education and Skills Training model upon which it is adapted, is a somewhat high-cost approach to integrating basic skills education with technical training. It therefore requires at least equally large earnings gains to pass a cost-benefit test from the social perspective. The pattern of negative net social benefits summarized in table 1 are attributable to variations in both the costs and benefits of AO programs across the four states included in the CBA. Table 2 summarizes per-student AO costs and benefits in each state from the social perspective. The costs reported in table 2 are the additional costs of delivering AO above the normal costs of a community college education, just as the AO benefits are the additional earnings the program produces above the earnings of a comparable college student not participating in AO. More detailed cost categories are discussed in the body of this report.

TABLE 2

Costs and Benefits Across All States from the Social Perspective, Preferred Specification

	Per-student AO costs	Per-student AO benefits	Per-student net social benefits
Illinois	-$7,128	-$86	-$7,214
Kansas	-$2,717	$4,311	$1,595
Kentucky	-$4,527	$605	-$3,922
Louisiana	-$2,635	$1,610	-$1,025

Note: The preferred specification uses a 5 percent discount rate and projects program years separately before combining benefit estimates. These specifications are discussed in more detail in the How Benefits are Calculated section of the report.

The costs and benefits reported in table 2 highlight the importance of variations in the cost of delivering the AO program for estimates of cost effectiveness. Kansas, the only state with a positive net social benefit, had a relatively low cost of delivering AO of $2,717 per student but a much higher per-student benefit of $4,311. While Louisiana's costs were even somewhat lower than Kansas's costs on a per-student basis ($2,635 per student), the benefits associated with AO in Louisiana ($1,610 per student) were not large enough to make the program a good social investment. Illinois and Kentucky have the highest costs of delivering AO as well as the lowest benefits associated with the AO program. Per-student costs in Kentucky are comparable to the median per-participant cost for the Workforce Investment Act (WIA) of $4,500. Per-student AO costs in Illinois are higher than the WIA cost

benchmark, although costs in Kansas and Louisiana are lower (McConnell et al. 2016). This combination of somewhat high costs and low benefits leads to large, negative per-student net social benefits in these states.

Breaking out the component costs and benefits in each state is instructive. The large variation in per-student costs across states suggests that active efforts to control costs will be important for future applications of the AO model. However, cost control alone cannot guarantee positive net benefits. In Louisiana, the state with the lowest per-student cost of delivering AO and the second highest estimated benefits of AO, the incremental social benefits still did not outweigh the incremental costs. Given the high costs of delivering AO even in states like Kansas and Louisiana, higher earning benefits must materialize to ensure positive net benefits. As the implementation study suggests, stronger connections to employers may be one way to improve the labor market outcomes of career pathway students (Anderson et al. 2016).

The broadly but not entirely negative CBA results should not necessarily be interpreted as cause to abandon the AO model. These findings pertain to the early years of the AO program, and one state (Kansas) is operating an AO program with positive net social benefits. This CBA should instead be understood as an opportunity to realistically assess what worked well and what did not work well across the four states to improve future iterations of the AO model. The CBA results invite the question, "What explains the variation in the net benefits of AO across the four states?"

What Explains the Net Benefits of AO across the Four States?

One of the most notable features of both the final impact report and this CBA report is that Kansas's AO program performed much better than the other three states. Earnings impacts were higher in Kansas than in the other states, particularly for participants recruited from CTE courses, and net student and social benefits were both consistently positive for the state. Future applications of the AO model can benefit from understanding the differences between Kansas and the other states, and future research efforts should further explore these differences.

Illinois and Louisiana differed from Kansas (and Kentucky) in their AO recruitment patterns. Both states focused their efforts on adult education students who face substantial barriers and almost no prior attachment to college. In contrast, Kansas and Kentucky recruited a significant number of low-skill participants from college CTE and developmental education programs, respectively. Kansas and

Kentucky turned to these non-adult-education populations in part as a response to changes in federal Pell grant rules, which restricted the access of students without a high school credential to grants (known as the "Ability to Benefit" provision). The original AO model was intended to serve primarily students recruited from adult education.

Difficulties associated with educating AO participants recruited from adult education may be an important source of the differences in earnings gains and college costs between Kansas on the one hand and Illinois and Louisiana on the other. These difficulties might include additional costs in the form of personnel time and direct supports, challenges getting students to complete their high school equivalency credentials after beginning in college courses, and lower academic persistence and progression (as documented by Anderson et al. [2017]).

The principal difference between the net student benefit and the net social benefit calculations is that the latter include state and college costs. This suggests that although Illinois and Louisiana successfully served participants from adult education from the student's perspective, the society-wide costs of providing this service relative to the benefits were higher than those faced by Kansas to support a largely low-skill CTE student population. One complication to this explanation, however, is that the impact results for students in Kentucky recruited from adult education were large and positive (Anderson et al. 2017). This suggests that earnings impacts of AO are not necessarily smaller for adult education students than students who entered AO from college programs. (Because adult education students were a small minority of students served in Kentucky and the CBA included earnings impacts averaged across all students, the benefits were still modest.)

Another important source of variation across the states was the relative strength of each state's labor market for low-skill workers, which can be inferred from the earnings levels of the comparison group, reported in appendix D of the impact report (Anderson et al. 2017). The comparison group is the best estimate of what AO students would have earned had they not enrolled in AO. Quarterly earnings levels were highest in Kansas, indicating that Kansas AO participants entered a more robust low-skill labor market than participants in other states. Weak labor markets could be an important factor in the effectiveness of the AO model.

Louisiana differs from the other three AO states because it had several other pathway programs comparable to AO that were implemented in the state during this period. Large Trade Adjustment Assistance Community College and Career Training grants and Health Profession Opportunity Grants offered similar career pathways and support as AO. The state was also undertaking a systems-level reform called Train to Attain that emphasized many of the same elements as AO across the adult

education system. These interventions emphasized career pathways, stackable credentials, navigation and counseling, and support services for low-skill students. The wide availability of pathway programs as potential alternatives to AO would have the effect of reducing the added value contributed by the AO program.

The results also provide a cautionary tale about creating credentials and targeting them as a performance measure rather than the ultimate labor market outcomes that help participants to achieve self-sufficiency. Credentials are easily created and accumulated by colleges, but the labor market value of a credential varies considerably across fields of study and occupations. One opportunity for improving the AO model is to require greater employer involvement in the planning and operation of AO programs, to ensure that program activities are well-targeted to the labor markets that participants will be entering upon completion.

How Else Did AO Impact the States?

Although AO did not produce promising net social benefits except in Kansas, the program had a considerable impact on the operation of participating colleges. AO refocused colleges on the needs of low-skill students and provided an evidence-based model for serving those students. This included waiving course prerequisites for AO students, providing academic support services, and changing mindsets to consider students with demonstrably low skills as potentially successful college students (Anderson et al. 2016). Many of these systems changes are already incorporated into the CBA insofar as they affected the program costs and outcomes for participating AO students during the first three program years. However, if these systems changes are sustained at participating colleges, then the initial AO investments may provide benefits to future students that are not included in this analysis.

Anderson and colleagues (2015) divide the systems change affecting AO colleges into three broad categories: (1) curriculum alignment and changes, (2) new funding models, and (3) data improvement. Each state pursued these areas of systems change with varying levels of intensity. Each state introduced some type of curricular alignment or change, including the introduction of new professional development models for their faculty (Illinois and Louisiana). Others adjusted their entrance examination requirements to be more accommodating to students coming from adult education (Kansas, Kentucky, and Louisiana). Another strategy was to align technical programs at different colleges across the state (Kansas and Kentucky). All states experimented with new funding models to support AO, including incorporating performance based funding (Illinois), accessing grant funding

(Illinois, Kentucky, and Louisiana), and braiding public funding streams (Illinois, Kansas, and Louisiana). Finally, all states except Kansas engaged in some improvements in their data systems, including an expansion of current P-20 systems (Illinois, Kentucky, Louisiana), and the introduction of new data systems (Louisiana). These changes are for the most part not accounted for in the CBA, but they may introduce important social benefits.

CBA Limitations

Because of the complexity of community college systems and local labor markets, any CBA of a program such as AO will have limitations. Understanding these limitations can help interpret the results and future research requirements. One of the most prominent limitations of this CBA is that the labor market benefits of AO are only observed for a few years after students are enrolled. Lifetime earnings benefits from AO must therefore be projected. This CBA reasonably but conservatively assumes that the labor market benefits of AO gradually move toward zero in the period after earnings are observed. Some researchers find that education and training programs may not become cost effective until as much as ten years after the program (Elliot and Roder 2017; Eyster 2017; Minaya and Scott-Clayton 2017). Consider, for example, an AO certified nurse aide (CNA) pathway that includes advanced credentials in phlebotomy and echocardiogram technology. A graduate of this pathway may initially get an entry-level CNA job that is identical to the jobs obtained by non-AO students with basic CNA training. However, because of the additional training, the AO student may be able to move up the career ladder faster or be retained longer in their job than the non-AO student. These longer-term gains may not be apparent in the first few years after enrollment. On the other hand, early gains in earnings for participants could fade over time as the initial earnings advantage from participating in AO erodes. Assuming that these delayed benefits of training hold for the AO program would be speculative, but this research highlights the limitations of a limited follow-up period.

Another important limitation of the CBA is that the earnings gains associated with AO do not include the earnings effects associated with AO's impact on college attendance. Because of data limitations outlined by Anderson and colleagues (2017), the comparison group used to estimate the effect of AO on earnings is restricted to non-AO students who took at least one college course. Since the comparison group is composed entirely of college students, the benefits estimates assume that in the absence of AO, AO participants would have enrolled in college. Since some participants are likely to have gained access to college because of AO, this analysis decision overlooks the potential benefit of college access that AO participants enjoyed.

Background

Launched in 2011, the AO initiative aimed to transform how states and two-year colleges train and educate students with low basic skills. Past research had found that many students with low scores on academic tests sometimes spend considerable time in developmental education classes and often do not complete all the occupational courses that are required to attain a college 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 career and technical education (CTE) courses, the AO model moved students directly into community college CTE courses. AO incorporated comprehensive student support services, accelerated learning, and alignment between basic skills instruction and substantive technical concepts. The critical team teaching component involved adult education and occupational skills instructors working together in the same classroom to assist students with basic skills reinforcement in reading and math within the context of their CTE coursework.

This report presents findings from a cost-benefit analysis (CBA) of AO for 32 community and technical colleges in Illinois, Kansas, Kentucky, and Louisiana. The evaluation of AO in these four states began in 2012 and focused on AO programs in each state through the end of 2014. Because of wide state variations in the operational aspects of the programs, the study examines the costs and benefits of the initiative separately for each participating state.

The CBA is the third element of a mixed-methods evaluation of AO conducted by the Urban Institute and its partners at the Aspen Institute and the George Washington University. The CBA draws on the findings from the implementation study, which measured the resources used by colleges and financial support provided by the states to implement AO, informing the cost side of the CBA calculation (Anderson et al. 2016). It also uses quasi-experimental results from the impact study to estimate the effect of AO on earnings, which are AO benefits (Anderson et al. 2017).

The report follows the standard CBA practice of focusing on the social (real resource) costs and social (real resource) benefits of AO. It answers two questions:

1. What is the dollar value of the net student benefit of AO?
2. What is the dollar value of the net social benefit of AO?

The AO Model

The AO initiative was a state-led effort funded by grants from a consortium of foundations and administered by Jobs for the Future (JFF) with its partners, the National College Transition Network, the National Council for Workforce Education, and the State Board for Community and Technical Colleges in Washington State.[2] Grants were awarded to seven states, four of which were part of the AO evaluation.[3]

State-level teams guided and funded 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.[4]

AO pathways were designed to make participation and completion manageable for low-skill, low-income 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 took one academic year or less, although some programs were even longer. During this phase, students participated in CTE programs that offered credentials or sets of credentials valued by employers. A key goal is that the CTE credentials, along with subsequent steps on the pathway that yield additional credentials and degrees, would help participants qualify for mid- to high-skill occupations that pay good wages.

Other key components of AO integrated career pathways included integrated instruction, where both basic skills and CTE instructors taught in the same classroom (known as the "team teaching approach"); a focus on comprehensive student support services; accelerated learning; and labor-market connections. AO students could concurrently complete their high school equivalency (HSE) credentials or receive other support to build their basic skills while taking CTE courses.

JFF and its partners derived these approaches from Washington State's I-BEST model and from the Breaking Through initiative.[5] Although AO incorporates the key elements of these initiatives, it has a distinct design, with enhanced elements such as policy change, partnerships, and culture shift 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-skilled students to access, be accepted in, and succeed in postsecondary education. The states involved in the evaluation—Illinois, Kansas, Kentucky, and Louisiana—agreed to adhere to the AO model and the required program elements.

JFF's overall goal for the initiative was for each participating state to award at least 3,600 credentials within the grant period. During the first three years of implementation, the 4,572 students in AO pathway programs earned 79,102 credits and 6,788 credentials based on AO program and state postsecondary

records (Anderson et al. 2017), though this does not include third-party certifications and credentials. Participating colleges were required to target recruitment efforts toward students who are within NRS levels 4–6 (6th- to 12th-grade level) on math, reading, or writing. English language learners had a different threshold of NRS levels 5–6 (high intermediate to advanced) in English language skills. Eligible students may or may not have had high school diplomas or HSE credentials, though the initiative was originally designed to target adult education students without an HSE or with low English language skills. Shifts in the target population 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, 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 and an analysis of how well the states and colleges implemented the AO model.

- **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.

This report provides the final results of the CBA in Illinois, Kansas, Kentucky, and Louisiana. In addition, the report provides the context for examining costs and benefits.

Prior AO Research Relevant to the CBA

The Urban Institute and its partners have released five reports on AO to date: three that document and assess the AO implementation experience, one that presents the results of a student survey, and one on the quasi-experimental impacts of AO on students' education and employment outcomes. The implementation study describes the variety of ways states implemented the AO model over the three initial years of the

grant period. The study provides state-level profiles, capturing the key government agencies, colleges, and partners that contributed to the development and operation of AO's pathway programs. Of particular relevance to this study, the implementation study reports the resources community colleges used in implementing AO pathway programs beyond what they otherwise would have spent (the incremental costs). The incremental costs borne by government agencies and community colleges make up most of the costs of AO. The average level of resources used per college by the third year was $227,000. The resources include time for the personnel who supported program operations (including for team teaching and contextualization of the curriculum), student support services, and training equipment and materials.

The Impact Analysis and the CBA

The impact analysis of AO provides the basis for estimating the benefit component of this CBA as well as the costs associated with any forgone earnings of participants. "Forgone earnings" are reductions in earnings while a participant is pursuing education or training. Ideally, the benefit component represents returns on the investments that states and community colleges undertook to implement the AO model. Like other investments, including investments in human capital, the costs are realized upfront while the benefits materialize over time.

To estimate AO's impacts, the evaluation measured the education, employment, and earnings patterns of participants and matched comparison groups. The matched comparison group provided the best estimate of how participants would have performed in the absence of AO, so the difference between participants' and their matched comparison groups' outcomes provides an estimate of the impact of AO. In constructing comparison groups, the evaluation took account of potential differences among states and programs from which students were recruited (i.e., adult education, CTE classes, or developmental education). Illinois and Louisiana recruited entirely from adult education or similar populations (Anderson et al. 2016). Therefore, AO students were matched only to similar adult education students in each of those states. Kansas and Kentucky drew AO participants from adult education programs, but they also recruited many participants who were already enrolled in a community college developmental education or CTE course but who tested within eligible skill levels. For these states, the impact analysis matched AO students from each source with comparison group members from the same recruitment source within their state, partly to correct for differences between adult education and other college students that are not reflected in their measurable personal characteristics. Thus, the evaluation generated separate impact estimates for six groups (two each for Kansas and Kentucky, plus one each for Illinois and Louisiana). This approach still aggregates across colleges within each state. Thus, the estimates in the impact analysis represent weighted averages of the impacts of AO in each college by state and recruitment source.

The impact analyses yield estimates of both the predicted value of the intervention (the point estimate of the impact) and the standard error around the predicted value. These, in turn, capture the statistical significance of the predicted values or the probability that AO gains/losses are greater/less than zero. However, the conventional approach to applying these estimates to a CBA is to rely on the predicted values alone, largely ignoring the variability around the estimates. The justifications are that the predicted values are the best estimates of the expected impacts of the program and that sensitivity analysis can take account of the variability. Several sensitivity analyses appear at the end of this report.

The impact estimates cover up to 12 calendar quarters after participants enrolled in AO. Since most programs were designed to be one to two quarters, the estimates reveal potential gains for up to 2.5 years after students leave the program as well as potential forgone earnings in the immediate post-enrollment period. However, later cohorts are observed for substantially less time; the minimum follow-up period is three quarters in all states.

The main estimates highlighted in the impact report used the data on all participants and did not distinguish among cohorts by quarter or year of entry into AO. The impact report's main estimates of AO's earnings impacts reveal a wide range of patterns (table 3). These earnings gains are estimated for the entire AO impact sample rather than the more restricted CBA sample (discussed below), and they are estimated separately for each recruitment source.[6] In both respects, the impact report findings differ somewhat from the net earnings gains used in this report for the CBA benefits (see appendix B).

Two different recruitment sources across two states stand out as having experienced large positive program impacts as shown in the impact report: the Kansas CTE group and the Kentucky adult education group. The Kansas CTE group never experienced earnings losses, even during the enrollment period (that is, there were no forgone earnings for the group). By the seventh and eighth quarters after enrollment, the AO group achieved net earnings gains over the comparison group of $964 and $1,188, respectively. As noted in the impact report, these are net quarterly earnings gains for the AO group; the estimates include those with $0 earnings. Within the first eight quarters, the Kansas CTE group experienced a total benefit of well over $5,000 per participant. Moreover, the earnings gains for this group show no signs of eroding during the period over which the data are observed. The gains for Kentucky's adult education group are also substantial, though not nearly as large as for the Kansas CTE group. Still, by quarters 9–12, AO appears to have stimulated gains of about $750 per quarter for the Kentucky adult education group. While the gains for this group peak in quarters 9 and 10 and begin to decline in quarters 11 and 12, the estimates remain statistically significant and meaningful. Overall, the Kentucky adult education group experiences a total benefit of over $3,000 per participant in the 12 quarters observed.

Although the overall gains associated with AO across all four states are limited, both the comparison group and AO participants generally experience large increases in earnings over time in the quarters after

the enrollment date into AO. Especially striking are the gains for the Kansas adult education comparison group, which saw its earnings rise from about $2,400 in the first three quarters after participants entered AO to about $4,100 per quarter just over one year later (quarters 6–8). These increases may be associated with the college experiences of the comparison and AO groups or because earnings are especially low prior to and during the quarter AO participants enroll. The relatively high earnings levels for both recruitment sources in Kansas are indicative of a strong labor market in that state.

TABLE 3

Net Earnings Gains Over the Comparison Group Attributed to AO from the Impact Report, by Quarter after Enrollment, Site, and Recruitment Source

	Illinois (Adult ed.)	Kansas (Adult ed.)	Kansas (CTE)	Kentucky (Adult ed.)	Kentucky (Dev. Ed.)	Louisiana (Adult ed.)
Quarter after enrollment						
Quarter 1	-$146**	$46	$325***	-$722***	-$224***	$205***
Quarter 2	-$184*	$346*	$565***	-$922***	-$22	$166**
Quarter 3	-$63	$118	$676***	-$114	$79*	$193**
Quarter 4	$215***	-$20	$734***	$344***	-$47	$316***
Quarter 5	$293***	$63	$605***	$607***	-$50	$710***
Quarter 6	$16	-$284	$610***	$199*	-$86*	$500***
Quarter 7	$67	-$150	$964***	$500***	-$40	-$212**
Quarter 8	$115	$53	$1,188***	$426***	-$7	-$363***
Quarter 9	$156			$847***	-$97*	-$500***
Quarter 10	-$52			$871***	$13	-$610***
Quarter 11	-$62			$691***	$157**	-$491***
Quarter 12	-$26			$665***	$343***	-$633***

Notes: *p<0.1, **p<0.05, ***p<0.01. Impacts in Kansas were only observed for eight quarters following enrollment.

Because the colleges experienced challenges during the start-up phase (Anderson et al. 2016), it is possible that the impacts on earnings vary by when participants entered the program. If so, the estimates for all participants may not be an accurate guide to the expected impacts of an ongoing program. For this reason, we provide separate estimates of earnings gains for those entering the first, second, and third years of AO. This approach captures cohort differences in impacts, but the follow-up periods for the second and third year cohorts are one to two years shorter than for the first-year cohort. The benefit section of this study discusses the issue in detail.

There are several reasons why the benefit numbers used in this CBA will differ from the results in table 3 and in Anderson et al. (2017). First, the population of students included in the impact study differs somewhat from the population included in the CBA. The CBA includes only students at colleges that both participated in AO for all three years of the grant and provided complete and verified information on their

AO costs (30 of the 33 colleges that were involved in AO for all three years). The impact study included all students flagged as AO in the state's education records, who may have been enrolled at any of the 55 colleges that took part in the AO initiative at some point across the four states. Second, the CBA counts benefits by state instead of separating the analysis by recruitment source. Therefore, even though there were particularly large gains in the Kansas CTE AO group and the Kentucky adult education AO group, the state-level benefits represent the weighted average between both recruitment sources in each state. Finally, the CBA projects benefits into the future with the assumption that impacts fade over time These are all discussed in more detail later in the report.

Assumptions for the AO CBA

Cost-benefit analyses can help policymakers and practitioners understand whether an investment, such as education and job training, yields a net benefit, both from the perspective of the participants and for society as a whole. Boardman et al. (2011) define CBA as "a policy assessment method that quantifies in monetary terms the value of all consequences of a policy to all members of society" (2). CBA builds on many principles of economic analysis. A key principle is identifying costs and benefits in terms of resources; costs are resources used up in the operation of the program, while benefits are the additional resources the program generates. In the case of education and training programs, the additional resources come mostly from a rise in the productivity of participants. Assuming more productive workers are paid higher wages, changes in wages are typically used to estimate productivity gains.

All costs and benefits in this report are measured in or converted to dollar terms. In the case of AO, the primary benefit is increased earnings. The impact analysis assessed how AO affected college credits, credentials awarded by the college, and the share of AO participants achieving more than 12 college credits. The benefits of educational outcomes in dollars are observed through increased earnings, since people with more valuable educational credentials should earn higher wages. AO's impact on educational outcomes may also generate intangible or unmeasured benefits such as increased enjoyment of learning or reduced crime. Since these benefits are unmeasured, they are not included in this report.[7]

One resource cost that is closely related to the earnings impact of AO is the opportunity costs of the time spent in the AO program above the costs of the education they would have pursued otherwise. Students who enroll in AO may give up more of the opportunity to work during the time they are in class and doing homework than students in the comparison group if AO is a more intensive program. The forgone earnings for such students are a real resource cost borne by the students. It is possible to estimate these forgone earnings from the earnings records obtained for the AO and comparison groups by observing short-term earnings losses experienced by AO students.

A large portion of the costs borne by colleges related to the value of personnel time. This cost represents both the time and cost of new staff hired for AO and—for existing staff—the effort devoted to AO instead of other activities they could have been supporting (their next-best use of time). The sensitivity analysis at the end of this report explores alternative ways to count personnel time.

Social costs and benefits are separated from participant costs and benefits because the costs are borne by different people. For example, students bear only the net costs of tuition (total tuition minus scholarships and discounts). Society at large—including private entities and taxpayers—bear the costs of running the courses and other aspects of the program because they fund the grants and the other resource contributed by the states and colleges. On the benefit side, society benefits from the entire productivity gains by participants represented by gross earnings (before taxes), while participants benefit only from net earnings (after taxes and reductions in social assistance benefits).

A major challenge in estimating AO's benefits is that the follow-up periods for the cohorts of participants and comparison groups at most extend up to three years and, in some cases, are observed for less than a year. Certainly, the goal of an education and training program such as AO is to raise the long-term productivity and wage rates of participants for a number of years, perhaps even over the participant's entire career. Thus, counting only the initial earnings gains could understate AO's benefits. Projections of future benefits is also potentially subject to error. While a number of studies have found long lasting earnings gains associated with a four-year degree (over holding only a high school degree), evaluations of shorter term training programs tend to show that income gains fade within a few years.[8] EMSI (2012) projects earnings gains while acknowledging the tendency of benefits to fade by applying a decay rate to the projected gains. This approach is discussed in more depth in the detailed benefits discussion.

Like other educational investments, programs like AO are characterized by costs that are primarily incurred while students are enrolled in the program and benefits that take place in future years. Because costs and benefits materialize in different years, valuing an investment requires a technique that makes dollars in the future comparable to dollars today. One technique is to calculate the value today—the "net present value"—of all the costs and benefits in various years. This technique "discounts" future costs or benefits based on the notion that a dollar in say, 10 years, is worth less than a dollar today; the investor requires much less than one dollar today to yield a dollar in 10 years. Because it is an important point that can have a large effect on the estimates, the issue of discount rates is discussed in detail in the section "Discount Rates, Risk, and Uncertainty." The preferred discount rate in this report is 5 percent, representing a midpoint between Boardman et al.'s (2011) preference for a 3.5-percent discount rate and the Office of Management and Budget's (OMB's) recommendation of a 7-percent discount rate. The results of the CBA are generally not sensitive to the choice of discount rate, including even more discount rates than 3.5 percent or 7 percent, meaning that they do not change substantially when this assumption is altered.

Level of Analysis

Cost-benefit analysis can be conducted from different perspectives. In the literature, the issue of whose costs and benefits are considered is referred to as "standing." For social programs, including education and training programs, it is common to compute the benefits and costs from the perspective of society as a whole and from the perspective of the participants. This CBA is divided into two sub-analyses with different levels of standing. The first level is society, including participants, colleges, and the state and federal government. Social costs and benefits represent real resource costs, including opportunity costs that extend beyond what appears in an institution's budget. Social benefits consist of the earnings gains of AO participants. The second level deals with the costs and benefits from the standpoint of students. Student costs are their actual expenditures as well as any forgone earnings. Student benefits are the earnings gains experienced by AO participants after taxes and reductions in social assistance.

Both types of calculations are useful, though they serve different purposes. Net social benefits tell us whether the present value of resources used for a program are less than the present value of the additional resources generated by the program. If the present value of all the benefits exceeds the present value of all costs, then society as a whole is better off undertaking the project. The cost-benefit analysis from the perspective of program participants yields estimates of whether the students themselves should invest in the program. In the case of both the social and the participant perspectives, the method of projecting earnings gains over future years could play a critical role in determining the value of the investment. These projection methods are discussed in more detail below.

AO Cost and Benefit Categories

Figure 1 summarizes the costs and benefit components at the society level with expected directions. This figure shows the costs and benefits that accrue to AO participants, community colleges, and states. The costs and benefits are divided into three stages: the period when participants are enrolled in an AO pathway, the short-term post-AO period, and the long-term post-AO period. These time frames generally align as 1–3 quarters after enrollment (AO pathway), 4–8 quarters after enrollment (short-term post-AO), and 9 or more quarters after enrollment (long-term post-AO). The short-term costs to AO participants include forgone earnings, if participants reduce work effort while they take part in the program; these costs are expected based on the additional time dedicated to course work; analyses of similar interventions often find these results. Earnings gains are expected after the program period, though the precise timing of the gains is uncertain.

FIGURE 1

Net Social Costs and Benefits (excluding transfers)

Society		Period 1: AO Pathway	Period 2: Post-AO, Short-Term	Period 3: Post-AO, Long-Term
AO Participants	*Costs*	Forgone earnings		
	Benefits		Net earnings gains	Net earnings gains
Community Colleges	*Costs*	Resources for AO courses, excluding tuition waivers		
	Benefits			
States	*Costs*	Administration and oversight of AO		
	Benefits			
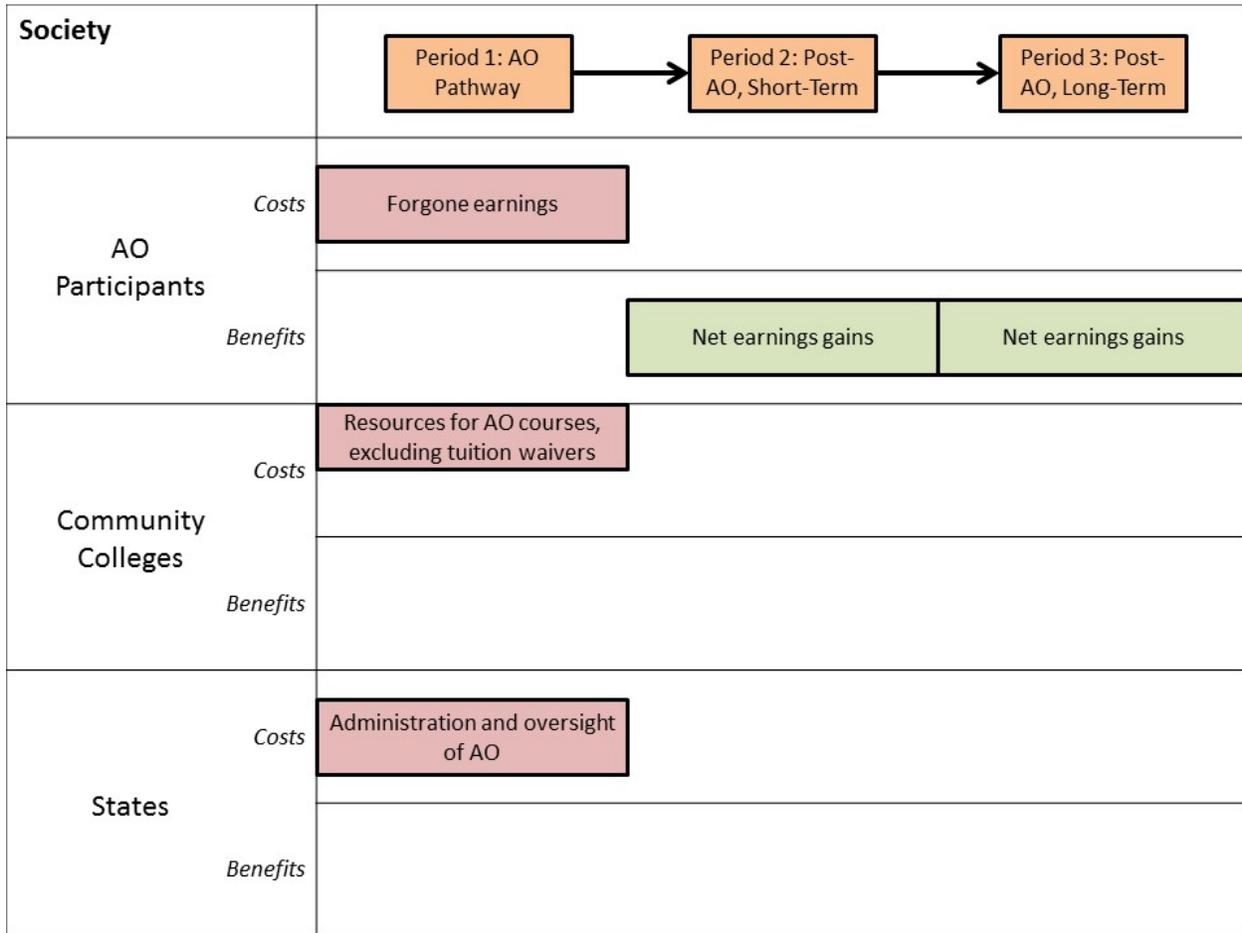
The model excludes all transfers, such as tuition waivers from the college to the student or tuition from the student to the college. Transfers are excluded from CBAs at the social level because the benefit to one party and the costs to another cancel each other out, so there is no net change in social benefits. Excluding transfers does not imply that transfers do not have real costs and benefits; it simply recognizes that from society's perspective, the costs and benefits balance each other out. The model includes expenditures that have opportunity costs, such as expenditures on administration and oversight of the initiative at the state level, as those resources could have gone to other administrative purposes. Some costs that are relevant from the student's perspective, such as tuition or taxes that are paid on the marginal earnings increase are transfers from the social perspective. For example, participants may see income reductions as they pay higher taxes that are offset by reduced tax burdens on others in society. The benefits of participants' pre-tax earnings gains represent the total productivity gains that accrue to society.

Figure 2 demonstrates the expected directionality of the costs and benefits that accrue to students. Some items that were not included in the society-level model appear in this model because transfers to the student are benefits and transfers from the student are costs. For example, tuition waivers offset the cost of tuition and figure into the "net tuition" calculation. Social transfers and taxes are also estimated to calculate the students' net earnings gains.

Student Costs and Benefits

| Student			
	Period 1: AO Pathway	Period 2: Post-AO, Short-Term	Period 3: Post-AO, Long-Term
AO Participants — *Costs*	Forgone earnings		
	Net tuition		
AO Participants — *Benefits*	Value of non-tuition supports	Net earnings gains (subtracting lost transfers, adding EIC)	Net earnings gains (subtracting lost transfers, adding EIC)
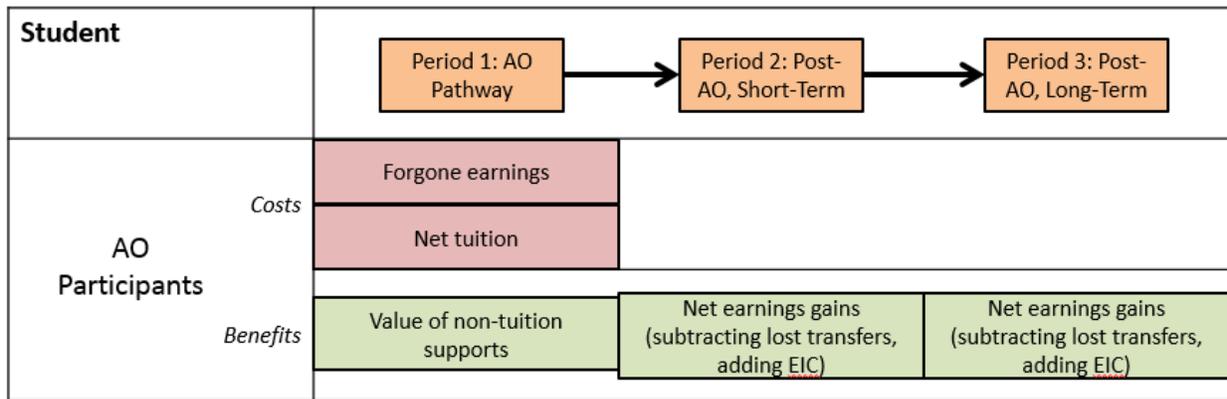
Table 4 summarizes the data sources for each item in the cost-benefit calculations. Two key items are derived from the AO impact study: AO student differential earnings and AO student differential course-taking relative to the comparison group. The costs attributed to state administration and oversight of AO comes from a series of questions and phone conversations conducted with the state offices that administered AO. The remaining items come from the annual survey of AO college administrators, which achieved a 100-percent overall response rate, and a response rate of 91 percent on the detailed cost section among the 33 colleges that participated in AO for all three years of the initiative. Only the 30 colleges that responded to the survey are included in this cost-benefit analysis.

Several important but difficult-to-measure costs or benefits to society and students are not included in this model. On the benefit side, these include all elements that are not direct student earnings gains. These might include changes in participants' social inclusion, changes in participants' health status, and changes in college and state culture and practices toward low-skilled students. AO staff highlighted one important, not readily measured, benefit that may accrue to future students: AO demonstrated that low-skilled students can be integrated into college career-focused classes without first having to complete adult education or developmental education classes.

TABLE 4

Sources of Data on Costs and Benefits for AO CBA

Measure	Expected Direction	Data Source(s)
Society-Level Perspective		
Student earnings gains and losses	Cost from forgone earnings during AO pathway; benefit from earnings gains	State Unemployment Insurance administrative records (impact analysis)
College resource expenditures on AO courses	Cost during AO pathway	Annual survey of AO program administrators
College supports provided to AO students	Cost during AO pathway	Annual survey of AO program administrators
State administration and oversight of AO	Cost during AO pathway	State offices administering AO
Student-Level Perspective		
Student forgone earnings and net earnings gains (subtracting lost transfer payments and public assistance due to increased earnings and adding the Earned Income Credit [EIC])	Cost during AO pathway; benefit short-term and long-term post-AO	State Unemployment Insurance administrative records (impact analysis); transfer and tax changes estimated based on Hollenbeck (2016)
Students' net tuition	Cost during AO pathway	Tuition amount net of waivers from annual survey of AO program administrators; differential in course-taking from state education records (impact analysis)

Discount Rates, Risk, and Uncertainty

The AO CBA uses two discount rates for sensitivity analysis around the preferred discount rate of 5 percent: the real discount rates of 3.5 percent suggested by Boardman et al. (2011) and of 7 percent used by OMB (OMB 1992). The high levels of variability and uncertainty in the payoffs from AO imply that AO is a risky investment from the standpoint of taxpayers trying to increase the earnings of low-skill workers. As such, there is a strong argument for focusing on a higher discount rate, if alternative discount rates provide dramatically different results (which they do not in this case).

Although all researchers agree on the practice of discounting future benefits and costs in any calculation of the present value of an investment, determining the appropriate rate of discount is controversial, especially for government investments (Boardman et al. 2011). Nearly all investments carry risks and are subject to uncertainty. Investments in projects subject to high variability and uncertainty typically require a high rate of return to compensate for the risk.

Prominent authors in the field differ, and some have even changed their own views of appropriate discount rates.[9] Even within the federal government, agencies differ on the appropriate discount rate.

Boardman et al. (2011) note that the OMB uses a real discount rate of 7 percent, although OMB also indicates that a rate of 3 percent is sometimes acceptable.[10] Boardman et al. (2011) state that the Congressional Budget Office (CBO) uses a real discount rate of 2 percent, plus or minus 2 percent, and the Government Accountability Office (GAO) uses a rate based on the nominal yield on U.S. Treasury securities that mature between one year and the life of the project minus the projected rate of inflation. However, after reviewing and analyzing highly cited research, Lucas and Phaup (2010) suggest that government investments should indeed use discount rates that reflect market risks.[11]

For a project with a relatively short period of benefits, the choice of discount rates has only a modest impact on the net present value. But for a project such as AO, where benefits might last for 40 years, the choice of the discount rate can exert a large impact on the present value. Consider a project that produces a benefit of $1,000 five years out. With a discount rate of 3.5 percent, the present value of that benefit is $842 and with a discount rate of 7 percent, the present value is $713. But for a project yielding $1,000 after 30 years, the present value using a discount rate of 3.5 percent is $356 and the present value using a discount rate of 7 percent is $131. Nonetheless, in practice, the choice of discount rate has only a modest effect on the AO CBA analysis results.

The CBA Sample

While each state adhered to and implemented the broader AO model, the states and colleges implemented their model to fit their state and local context. They drew their AO participants from different recruitment sources (such as adult education, CTE programs where students tested into eligible skill levels, and developmental education) and provided different training opportunities for both the treatment and comparison groups. One of the most important motivations for recruiting outside of adult education was the loss of access to federal Pell grants for students without high school credentials, known as the "Ability to Benefit" provision. Federal lawmakers eliminated Ability to Benefit in July, 2012, just as the initiative's implementation phase began. The elimination of Ability to Benefit made it impossible for students without a high school diploma or equivalent to access federal financial aid to pay for college courses included in this initiative. The loss of Ability to Benefit made it more difficult to recruit adult education students, who might have to pay for college tuition themselves. Kansas and Kentucky were acutely affected by the policy change, and ultimately decided to recruit more heavily from the pool of current college students who still met the eligibility criteria of having low skills, but had high school credentials. As noted above, the experiences of participants also differed by cohort even within states, especially those entering in the first program year when the colleges were just beginning to implement AO. For these reasons, the CBA developed separate estimates for the four states and estimated earnings gains separately by cohort. However, the CBA

combined recruitment sources within each state because cost information was not available by recruitment source.

As noted previously, colleges included in the cost-benefit analysis participated in AO for all three years of the grant period and provided information on institutional costs every year through the annual AO survey. The restriction to colleges that participated for three years allows for more consistent experiences with start-up across colleges, as well as consistency across state-level factors (such as the economy and guidance from the AO leadership team) and consistency in the amount of follow-up time to track benefits. A small number of colleges that could not provide reliable and accurate cost information in one or more years were excluded from this analysis (3 of 33 colleges). The main barriers to complete information were missing personnel pay rates or staff turnover that resulted in unreliable reporting.

Table 5 compares the number of CBA colleges with the number of colleges that participated in the AO grant for all three years. The three colleges that were excluded had small- to mid-size AO programs and do not appear to differ in consistent ways from colleges that did provide cost data.

TABLE 5

CBA Colleges by State

	CBA colleges	**Colleges with three grant years**
Illinois	8	8
Kansas	6	8
Kentucky	7	8
Louisiana	9	9
Total	**30**	**33**

Source: AO College Survey.

How Costs Are Calculated

States and colleges invested substantial resources, leveraged with the AO grants, to make career pathway programs with integrated instruction and supports available to students with low basic skills. AO allows students to enter and complete for-credit career-oriented education more quickly and with fewer hurdles from adult education and developmental education coursework. Ideally, the programs should result in accelerated progress towards learning the skills and earning the credentials AO students need to find middle–skill or high-skill jobs. The cost side of the CBA is the value of incremental resources used by the states and colleges to implement AO—that is, the extra resources used beyond what the states and colleges would have invested if AO did not exist.

College Costs

The resources colleges used for AO include the time allocated to AO by administrators, instructors, counselors, and other personnel; supplies; space; advertising; and supports. The resource measures compare the actual costs with what they would have been under "business as usual." In many cases, business as usual for this student population would be adult education programming, although in Kansas or Kentucky, it may be CTE or developmental education programs. The costs represented here are those that went toward AO programming and would not have been incurred in the absence of AO or would have been redirected to other uses.

The economic costs, or real resources used, do not necessarily represent money directly spent. Most colleges did not write a check for the entire amount of the resources used; colleges redirected some portion of the resources captured in this analysis from other potential uses. The analysis accounts for redirected resources because they were "used up" by AO when they could have gone toward other activities that were of value to the college, their "second-best use." The resources counted are net, so savings associated with college costs (e.g., savings on classes not offered because of AO) are treated as benefits.

Most college outlays in all states and years went toward personnel. Personnel resources included the cost of providing an additional teacher to implement team-teaching approaches, as well as the cost of providing student supports, since most AO colleges hired coaches and navigators for the program. Colleges were asked to report time spent on AO that either offset time that would have been spent on non-AO activities or was additional (i.e., new staff or an increase of effort among current staff). These estimates are imprecise, so the personnel costs are only an approximation of actual labor invested in the AO effort. The

total college costs were the summation of personnel costs, consultants, course costs, non-personnel support services, advertising, and other costs.

Personnel costs were computed as an estimated proportion of full-time equivalents (FTEs) multiplied by the total cost per FTE, including benefits. The categories of personnel were as follows:

- Deans/administrators

- Regular (non-adjunct) career and technical faculty members/ instructors

- Adjunct career and technical faculty members/ instructors

- Adult education instructors

- Counselors/Coaches/Navigators/Advisors

- Marketing/Outreach/Recruiting staff

- Administrative support staff (e.g., clerical staff)

- Data staff

- Physical plant/Maintenance staff

- Other staff

Course costs were collected per semester and by pathway, and then multiplied by the number of semesters that the pathway was offered. The questionnaire asked for average total costs and the portion of those costs that could be attributed to the instructor, supplies, space, and other. The instructor costs were then subtracted from new and enhanced course sections because those personnel costs would otherwise be double-counted. In many cases, this resulted in no additional "course" costs because all countable costs were attributable to the instructor—a "personnel" cost. In addition, supply costs were only counted once per year (as opposed to every semester the course was offered) because conversations with the college administrative staff revealed that these costs were often only incurred annually – such as a set of textbooks that were then re-used by the next cohort of students. Course costs were computed as:

- The total non-instructor costs of courses added for AO (class sections that were added for AO);

- The marginal non-instructor costs of courses enhanced by AO (class sections that already existed before AO, but to which AO students were added); and

- The total savings of courses not offered due to AO (class sections that were not offered because of AO but would have normally been offered)

In the society-level analysis, the value of direct student supports and course supplies are counted as transfers to students. This is because they offset expenditures that students would have otherwise incurred, such as transportation costs, books, and uniforms. In the student-level analysis, the value of direct student supports and course supplies are counted as benefits.

Personnel costs were by far the largest college expenditure category. The sensitivity analysis at the end of this report explores the effect of reducing personnel costs on the CBA bottom line.

Appendix A displays the survey questions pertaining to cost from the college survey for Louisiana in the third program year. Cost surveys for other colleges and program years largely mirrored the design for Louisiana.

State Costs

State AO administrators estimated the costs for the following categories over the original three-year grant period:

- State staff/personnel

- AO sub-grants to colleges

- Travel and convening costs

- Other direct costs (including professional development)

In addition, state AO administrators estimated the portion of these costs allocated to the colleges that participated in AO for all three years and the portion allocated to the scale-up colleges. This assumption allowed the research team to scale the total reported costs and allocate an appropriate portion toward the colleges included in the CBA.

Costs at both the college and the state level were reported with the entire population of AO students in mind. Since the CBA is limited to a narrower set of colleges, these costs had to be deflated to reflect the fact that fewer AO students were included in the CBA. Each state and college's cost data were reduced proportionally to reflect the percent of students in the full sample of AO students that are included in the CBA. For example, if 70 percent of students flagged as AO in a state were included in the CBA analysis, the analysis counted only 70 percent of the total college and state costs.

Information on costs from the AO states was collected from grant reporting documents. These materials were supplemented by email communication and phone conversations.

How Benefits Are Calculated

Benefits in a CBA represent the return on a program investment. At the social level for an education or training program, these returns are often in the form of increased productivity, which result in wage gains for workers. At the participant level, the primary benefit is increased earnings, which should capture the market value of the increase in knowledge and credentials earned through the education or training program. There are other potential benefits beyond wages that participants or society might realize from a social program, but they are excluded for reasons discussed in this section.

Although the AO impact report tracked several non-wage benefits such as accumulated credits and credentials, the CBA conceives of benefits only in terms of earnings gains. The reasons for this decision are twofold. First, many of the benefits associated with education and training, particularly occupational training, come in the form of increased earnings. In this case, counting credits or credentials separately risks double-counting benefits. Second, even to the extent that there are intrinsic or other non-wage benefits (such as reduced crime or increased family cohesion), these are difficult to measure or value. The exclusion of these intrinsic benefits associated with education suggests that the benefits in this CBA may undercount benefits associated with AO (Wolfe and Haveman 2013). Nevertheless, this is the standard approach in CBAs of job training programs (Schochet, Burghardt, and McConnell 2006).

The estimates of net earnings impacts draw on a propensity score matching approach that follows the steps outlined in the AO impact report (Anderson et al. 2017). Propensity score matching generates an impact estimate in two stages. In the first stage, the predicted probability of receiving AO is estimated for each treatment and comparison group member using a set of individual demographic, educational, and labor market characteristics. These predicted probabilities are used to reweight the comparison group so that it is similar to the group of AO participants on all observable characteristics. These weights are then used in the second stage regression analysis for each quarter of earnings to estimate the impact of AO on post-enrollment earnings. Additional details on this method and the rich set of variables used for the propensity score matching analysis are available in Anderson and colleagues (2017), the impact report.

Although conceptually it is possible to distinguish between earlier forgone earnings and later earnings gains, there is no guarantee that participants will experience a reduction in initial earnings as a result of AO, or for that matter an increase in future earnings. Distinctions between "early" forgone earnings and "later" earnings gains are also subject to fairly arbitrary divisions of time. In practice, the evaluation combines all earnings impacts—both costs associated with forgone earnings and benefits associated with increased productivity—into a single net present value of earnings that discounts the stream of future earnings

impacts. In other words, both short-run "forgone earnings" and long-run earnings gains (where they exist) are added together into a single net present value of the earnings effects of AO.

Estimation and Projection of Earnings Impacts

The evaluation team tried two different approaches for estimating the earnings impacts associated with AO, although only the first, preferred approach is reported:

1. Estimating impacts for each program year separately, projecting those impacts into the future, and then weighting the impacts by the number of AO participants in each year, and
2. Estimating impacts for all program years together, and then projecting the combined impacts into the future.

Each approach has advantages and disadvantages. Since AO participants enroll at different points over the course of several years, post-enrollment earnings outcomes are available for different participants for varying lengths of time. For example, a participant that enrolls in later AO cohorts in 2014 may only have three quarters of post-enrollment earnings records. In contrast, a participant that enrolls in 2012 would have at least 12 quarters of post-enrollment earnings records (8 quarters in Kansas). These varying levels of data availability across cohorts matter because different cohorts of AO participants may experience the program differently as it matures or changes over time. To account for these "cohort effects" on the net earnings impacts, the first approach estimates separate net earnings impacts for each program year and then projects them into the future, beyond the point where earnings outcomes are actually observed. After estimating and projecting net earnings impacts for each cohort, the estimates are combined to determine the net earnings impact of the AO program as a whole.

The second approach estimates earnings impacts for all program years combined and then projects future earnings for all cohorts together. Combining all cohorts has advantages and disadvantages relative to estimating impacts separately by cohort. The advantage of combining all program year cohorts is that this method relies less on projections, because fewer quarters are unobserved. The major disadvantages are that estimating all program year cohorts together does not control for cohort effects and weights earlier cohorts more heavily than later cohorts. It should be noted that the impact report takes this second approach of combining cohorts, though it does not project gains into the future (Anderson et al. 2017).

There is no reason to believe *a priori* that one approach or the other provides a systematic over- or under-estimate of the true earnings impacts. However, if different program years exhibit substantially different earnings impact patterns, this would be a reason to prefer the first approach, which estimates the impact of AO separately for each program year before projecting impacts and taking the weighted average.

Since there is evidence of large variations in earnings impacts across program years, the first approach is reported here. The evaluation team also estimated the net benefits of AO using the second approach, which combines all program years to estimate earnings impacts before projecting those impacts into the future. These results did not differ qualitatively from the results reported here, although the net benefits associated with this approach were highly volatile, differing from the reported results by hundreds of thousands or even millions of dollars. These differences indicate that the precise net benefit levels are highly sensitive to the assumptions applied in the CBA. The broader narrative of negative net social benefits in every state except for Kansas is consistent across alternative assumptions, even though the precise net benefit dollar amounts are sensitive to those assumptions. The direction of results for student benefits are also consistent in every state utilizing the less-preferred second approach, except for Louisiana, where the second approach causes student benefits to become negative. The sensitivity analysis at the end of this report provides more information about these alternative assumptions.

Projection of Earnings Benefits

After a certain number of quarters (typically 12, although it varies by state), net earnings impacts cannot be estimated for any cohort because earnings are no longer observed. However, there is no reason to believe that the effect of AO ends abruptly in the last quarter that earnings data are available. This analysis projects the earnings benefits of AO into the future using a decay rate, which predicts that benefits to move toward zero over time. This pattern has been observed in other analyses of training programs that have followed participants for longer than they were followed for AO. The approach used in this CBA is similar to that used by EMSI (2012). The decay rate approach assumes that the impact of a program decays at rate *k* over time until it reaches zero. Under the decay rate approach, future net earnings impacts are estimated, as shown in **Error! Reference source not found.**.

$$w_t = w_0 e^{kt} \tag{1}$$

Where w_t is the quarterly net earnings impact to be estimated, w_0 is a base period wage (in this case the average of the last two quarterly net earnings impacts), and *k* is the decay rate, which is constrained to be less than or equal to zero. If *k* is set equal to zero than there is no decay and impacts persist forever. More negative values for *k* make the net earnings impacts decay at a faster rate. EMSI (2012) uses *k* = -2.0 percent as the decay rate for trainees. That decay rate is adopted here as the preferred value of *k*. Less intensive interventions are expected to decay at a faster rate.

For the preferred method of projecting impacts separately by program year, the decay rate is used to project impacts forward for that cohort starting in the quarter after the earnings are observed.

Adjustment for Taxes

From the social perspective, taxes can usually be treated as transfers that net out of the final net social benefit calculation. When AO participants pay taxes, those taxes are experienced by other members of society as a benefit, either through direct transfer of the tax dollars or a reduction in tax burden. However, from the student's perspective, taxes have to be removed from the earnings benefits of AO because income paid towards taxes is not available to the participant.

Identifying the exact impact of AO on earnings net of taxes is complex because the marginal tax rate facing participants can vary considerably with filing status, state and locality, family circumstances, annual individual income, and family income. The marginal tax rate will also vary over time, as earnings are projected into the future. The data necessary for simulating AO participant tax liabilities are largely unavailable. Instead, this analysis follows the lead of Hollenbeck and Huang (2016), who applies a rough tax adjustment factor to the earnings impact estimates. All participants are assumed to pay 7.65 percent in federal payroll taxes, the standard Federal Insurance Contributions Act (FICA) rate plus Medicare taxes.[12] Federal income taxes are more complicated for these participants, since most will qualify for the Earned Income Tax Credit (EITC). The phase-in, plateau, and subsequent phase-out of the EITC results in large swings in the effective marginal tax rates facing AO participants, with very low effective rates during the phase-in period and high rates in the phase-out period as individuals lose benefits. This analysis uses Hollenbeck and Huang's (2016) calculation of an average effective marginal tax rate for relatively low-income trainees of 4.6 percent. Finally, the analysis includes the average marginal tax rate for each state, which varies from 2.75 percent in Louisiana to 4.88 percent in Kentucky.[13] State individual income tax rates come from Kaeding (2016).

Net Benefit Estimates by State

This section presents estimates of net social benefits and net student benefits for each state. All net benefits are reported in real (2015) dollars. Overall, net social benefits are negative in all states except Kansas. Net student benefits are positive in all states except Kentucky. The interpretation of this is that, based on the available information and with recognized data limitations, AO is not a worthwhile social investment in three of the four states, but it is worthwhile from the perspective of students in three of the four states.

Due to uncertainty around the appropriate discount rate, this section includes several alternative estimates of the net benefits of AO. In addition to accounting for the uncertainty surrounding the ideal approach to modeling net benefits, these alternative estimates also demonstrate the sensitivity of the results to alternative assumptions. Net benefits estimates that are less sensitive to alternative assumptions (i.e., that do not change substantially across alternative assumptions) should be more reliable than those that are more sensitive. Overall, the results are not very sensitive to variations in assumptions about the discount rate.

The first panel of each net benefits table reports total net benefits, while the second panel reports per-student net benefits, for easier comparison across states. The per-student versions of the student net benefits can be compared across states and are interpreted as the net benefits experienced by the typical AO participant in that state. A higher per-student net benefit suggests that the AO program generates more value for participants. The per-student social net benefits can be interpreted as the social "footprint" of AO for each additional AO participant. The components of the final net benefits in each state are discussed after presenting net benefits by state. States are reported in alphabetical order.

Illinois

Table 6 presents net benefit estimates associated with AO in Illinois. The table provides the net social benefits and the net student benefits in the same table for easy comparison. Each row of the table presents an alternative discount rate assumption.

Net social benefits in Illinois are large and negative, with social losses of over $5.5 million dollars under all assumptions presented. Variations in the discount rate do not substantially change the net social benefits. These results suggest that the AO program in Illinois was, on net, a cost to society. Per-student net social benefit losses in Illinois were very tightly clustered, ranging from $7,210 to $7,218. The poor performance of Illinois may reflect a weak local labor market for low-skill workers. The best estimates of

local labor market conditions for people like AO participants are the quarterly earnings of the matched comparison group. The average quarterly earnings of the Illinois matched comparison group, as reported in the impact report, range between $1,300 and $2,800 (including those with $0 earnings), which represents a lower range of earnings than every other matched comparison group included in the analysis from other states except for adult education students in Kentucky. Illinois also had relatively high fidelity to the AO model compared to Kansas and Kentucky, at least insofar as it served a predominantly adult education population. If the adult education population is more difficult to serve or if it takes longer for benefits to appear for adult education students, this may explain some of the relatively low impacts. In addition, the impacts ranged widely by cohort year. While the first-year cohort experienced large negative impacts, the second-year cohort experienced strong positive impacts, and the third-year cohort fell in the middle, based on available data (see appendix B). It is unknown what the pattern would be for additional cohorts of students.

TABLE 6

Net Benefits of AO in Illinois

Social- and student-level net benefits, by discount rate and earnings impact benefit assumptions

	Net social benefits	Net student benefits
Discount rate		
Full net benefit		
3.5%	-$5,566,341	$546,233
5.0%	-$5,569,007	$543,993
7.0%	-$5,572,542	$541,024
Per-student net benefit		
3.5%	-$7,210	$708
5.0%	-$7,214	$705
7.0%	-$7,218	$701

The net social benefits in Illinois stand in contrast with the net student benefits of AO in that state. The net student benefits were generally positive, just over $540,000. Per-student net benefits ranged between $701 and $708, depending on the discount rate. Since these are lifetime net benefits, AO had only a modest payoff for participants in Illinois.

Kansas

Net benefits for AO participants in Kanas are presented in table 7. In Kansas, net benefits associated with AO are positive from both the social perspective and the student perspective. This suggests that AO was a desirable investment for both society and students. Changes in the discount rate have a greater effect on

the results in Kansas than they did in Illinois, because Kansas's benefits from AO are sustained farther into the future. Net benefit ranges are large. For example, net social benefits range from $1.6 million to $2.1 million, depending on the discount rate assumptions. Net student benefit estimates range from $4.6 million to $5.0 million.

At least three factors could explain the positive results in Kansas. First, the Kansas AO program recruited heavily from currently enrolled college students in CTE classes with NRS score levels between 4 and 6. The success of the Kansas AO program could plausibly be due to lower barriers to academic success that CTE students face relative to adult education students. Second, the state of Kansas underwent an effort to systematically standardize CTE programs in the state shortly before launching AO. Decisions about the structure of approved CTE programs were based on prior performance as well as graduates' prospects in the labor market. This additional review could have resulted in higher-quality AO programs than in other states. Finally, the quarterly earnings of the matched comparison group in Kansas were high, indicating a relatively strong local labor market for low-skill workers. The total Kansas matched comparison sample experienced post-enrollment quarterly earnings ranging from approximately $2,200 to $3,300 (including those with $0 earnings).

TABLE 7

Net Benefits of AO in Kansas

Social- and student-level net benefits, by discount rate and earnings impact benefit assumptions

	Net social benefits	Net student benefits
Discount rate		
Full net benefit		
3.5%	$2,076,429	$4,951,711
5.0%	$1,900,882	$4,803,242
7.0%	$1,683,542	$4,619,426
Per-student net benefit		
3.5%	$1,742	$4,154
5.0%	$1,595	$4,030
7.0%	$1,412	$3,875

Per-student net social benefits ranged from just over $1,400 to over $1,700. The per-student net student benefits were much higher, ranging from nearly $3,900 to over $4,100.

Kentucky

As shown in table 8, net benefits associated with AO in Kentucky are uniformly negative, regardless of whether they are estimated from the student or social perspective or which discount rate is used. Since

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earnings impacts are so low in Kentucky, it is the only state where net student benefits are negative. Net social benefit losses ranged between $3.6 and $3.8 million, while net student benefit losses range from just under $250,000 to over $340,000. Per-student net social losses ranged from $3,868 to over $3,987, and per-student net student losses ranged from $260 to $359.

TABLE 8

Net Benefits of AO in Kentucky

Social- and student-level net benefits, by discount rate and earnings impact benefit assumptions

	Net social benefits	Net student benefits
Discount rate		
Full net benefit		
3.5%	-$3,678,526	-$247,217
5.0%	-$3,729,899	-$289,790
7.0%	-$3,791,986	-$341,241
Per-student net benefit		
3.5%	-$3,868	-$260
5.0%	-$3,922	-$305
7.0%	-$3,987	-$359

In Kentucky, AO students recruited from adult education experienced particularly strong, positive impacts in the impact analysis (Anderson et al. 2017). However, the much larger group of AO students recruited from developmental education experienced close to zero impacts. If the patterns of impacts between adult education and developmental education students remained consistent, the Kentucky results would be much more positive if there were a larger share of AO students recruited from adult education; however, it is not possible to know if a different student population would change the impact estimates. Another interesting note is that the impact results across cohorts are very inconsistent in Kentucky (see appendix B). The first-year cohort saw positive impacts emerge late, while the second-year cohort saw early positive impacts that faded quickly and the third-year cohort saw strong negative impacts that almost mirrored the second-year cohort. All this is to say that the effects of AO were very inconsistent over time. Another possible explanation for the poor performance of the Kentucky AO program is the strong focus of the program on certified nurse aide (CNA) training, which was identified as a growing field in the state. Despite the job opportunities for CNAs in Kentucky, the occupation is still relatively low paying in the longer-term if there are few opportunities for promotion up a defined career pathway. CNAs would need to pursue more education to advance, which could also delay their earnings impacts.

Louisiana

As in Illinois, the story in Louisiana is mixed. Table 9 shows that net social benefits were consistently negative, ranging from a loss of $405,000 to $407,000, while net student benefits were consistently positive and tightly distributed between $648,000 and $649,000. This means that AO is not a good social investment, based on the available data, but that it is a good investment for students.

TABLE 9

Net Benefits of AO in Louisiana

Social- and student-level net benefits, by discount rate and earnings impact benefit assumptions

	Net social benefits	Net student benefits
Discount rate		
Full net benefit		
3.5%	-$406,112	$648,830
5.0%	-$405,985	$648,939
7.0%	-$406,627	$648,393
Per-student net benefit		
3.5%	-$1,026	$1,638
5.0%	-$1,025	$1,639
7.0%	-$1,027	$1,637

Per-student net social losses were very consistent at about -$1,026 across discount rates. This insensitivity of the net per student social benefit to the discount rate is attributable to the fact that most of the estimated benefits of AO in Louisiana came within the first few quarters of enrollment. Per-student net student benefits were also tightly distributed at just about $1,638.

In Louisiana, the comparison group likely received education and training enhancements similar to that of the treatment group because the state educational system adopted a number of structural reforms over the same period, including a focus on career pathways and navigation (the "Train to Attain" model) and participated grant efforts that supported similar types of training. If an AO participant would have received comparable education and training in the absence of AO, the additional benefit of participation in AO will be reduced. In addition, there were some issues with data access in Louisiana so that the large proportion of students who were enrolled in non-credit AO programs (which were technically not aligned with the program model) were excluded from the analysis.

Component Costs and Benefits

Table 10 presents the broad component costs and benefits of the net social benefits calculations, by state, for the OMB's preferred discount rate of 5.0 percent. The first panel of the table provides total costs and benefits, while the second panel provides per-student costs and benefits. The earnings effects reflect

estimates where impacts for program year cohorts are estimated separately before being projected into the future and added together.

TABLE 10

Component Costs and Benefits of Net Social Benefits, by State

Discount rate, 0.05; Decay rate, -0.02, program year cohort earnings effects estimated separately

	College expenditures	State expenditures	Earnings impact (pre-tax)	Net benefit
Total costs and benefits				
Illinois	-$5,224,478	-$278,027	-$66,502	**-$5,569,007**
Kansas	-$3,138,284	-$100,092	$5,139,258	**$1,900,882**
Kentucky	-$4,026,527	-$278,856	$575,484	**-$3,729,899**
Louisiana	-$988,794	-$54,614	$637,423	**-$405,985**
Per-student costs and benefits				
Illinois	-$6,767	-$360	-$86	**-$7,214**
Kansas	-$2,633	-$84	$4,311	**$1,595**
Kentucky	-$4,234	-$293	$605	**-$3,922**
Louisiana	-$2,497	-$138	$1,610	**-$1,025**

These costs and benefits reveal the categories of costs and benefits that are added together to produce the final net benefit in each state. The per-student numbers are more informative, given the differences in enrollment numbers across states. The per-student college and state expenditures were similar in Kansas and Louisiana, somewhat higher in Kentucky, and substantially higher in Illinois. The per-student earnings impacts varied even more widely across states, with negative per-student earnings impacts on average in Illinois and quite large, positive impacts in Kansas. Though Kansas and Louisiana had similar per-student costs, the differences in the total per-student earnings impact results in a substantially different net benefit. Of all the states, only in Kansas did the total earnings impacts outweigh the college and state expenditures.

Costs and benefits from the student perspective are reported in table 11, with total costs and benefits in the first panel of the table and per-student costs and benefits in the second panel. Instead of the college and state expenditures, which are the major cost of AO from the social perspective, the broad cost category for students is net tuition and fees. These "costs" are positive in almost all cases, reflecting the fact that AO's acceleration effect reduced the number of credits earned by participants, thereby reducing the tuition and fees students have to pay.[14] As in the case of the net social benefits, most of the net benefit variation from the student's perspective comes from variations in the earnings impacts, with earnings impacts in Kansas coming in much higher than any other state. AO students in Kentucky also paid substantially higher tuition and fee costs than students in other states, making Kentucky's net student benefit associated with AO negative. Kentucky's higher tuition and fees reflects findings from the implementation study that Kentucky struggled to find alternative sources to finance student tuition after the termination of the Pell grant Ability to Benefit, which prevented students without high school credentials from accessing federal financial aid.

TABLE 11

Component Costs and Benefits of Net Student Benefits, by State

Discount rate, 0.05; Decay rate, -0.02, program year cohort earnings effects estimated separately

	Net tuition and fees	Non-tuition supports	Earnings impact (after tax)	Net benefit
Total costs and benefits				
Illinois	$314,371	$285,484	-$55,861	**$543,993**
Kansas	$405,228	$51,486	$4,346,528	**$4,803,242**
Kentucky	-$851,325	$84,631	$476,904	**-$289,790**
Louisiana	$93,290	$13,839	$541,809	**$648,939**
Per-student costs and benefits				
Illinois	$407	$370	-$72	**$705**
Kansas	$340	$43	$3,646	**$4,030**
Kentucky	-$895	$89	$501	**-$305**
Louisiana	$236	$35	$1,368	**$1,639**

Sensitivity to Alternative Assumptions

Net benefit estimates in this report show little sensitivity to changes in the discount rate because few costs and benefits of AO persist far into the future. The evaluation team applied two additional sensitivity tests:

1. An alternative assumption discounting personnel costs, and

2. An alternative approach to calculating earnings benefits.

Adjusting personnel costs to account for the possibility that college personnel would serve AO students even in the absence of the program only qualitatively changes the net social benefit results if implausibly large adjustments to personnel costs are made. Similarly, the alternative approach to calculating earnings benefits does not substantively change the net social benefit results.

Although these alternative assumptions do not change the basic finding of this report, they do generate large differences in the value of the net social benefit estimates. **This indicates that the precise dollar figures in the report should be interpreted with caution.** Although they represent best estimates of the net benefits of AO, the exact value of the net benefit is sensitive to various analytic choices. The broad story is both clear and robust to alternative assumptions: the AO program has negative net social benefits in all states except for Kansas. It has positive net student benefits in all states except for Kentucky (though the alternative approach to calculating benefits makes the net student benefits negative in Louisiana).

Alternative Personnel Cost Assumptions

The selection of the comparison group is likely to have strong implications for the estimates of program impacts. For this analysis, the selected comparison groups are students from adult education, developmental education, or CTE programs who had enrolled in college.[15] Restricting the adult education comparison group to those who enrolled in college is appropriate because a large portion of adult education students may not have an intention of or interest in going to college or are prevented from going to college by disconnected adult education and postsecondary education systems. Comparing AO students to adult education students who enroll in college ensures that both groups have interests in and intent to attend college and have successfully overcome many of the barriers to attending college. However, comparing AO students only to other college students means that any success AO has in drawing participants into college would not be reflected in the impact estimate.

The restriction of the AO comparison group to those who attended college has potential implications for the CBA. Since the choice of comparison group is grounded in the assumption that AO students would be

enrolled in college in the absence of AO, any college costs that would have been spent on those students in the absence of AO should not be included in the cost-benefit analysis. For example, *typically* if an administrator was diverted from other college activities to contribute to the AO program, that effort would be counted as a cost of AO. The loss of the administrator's efforts on valued activities is a cost the college must pay to operate the AO program. However, if that same administrator would have spent her time in the absence of AO serving the same college students that would have enrolled in AO, the administrator's efforts should not be counted as a cost in the CBA. The difference is that if the administrator would have served the same exact students even in the absence of the AO program, no extra personnel costs are incurred by running the AO program.

Nonetheless, it is unlikely that personnel costs would have been spent on the same students at the same level of intensity in the absence of AO. College personnel would have served a mix of AO and non-AO participants in the absence of AO, making the share of their additional costs spent on AO students uncertain even if it is assumed that all AO students would have attended college in the absence of AO. In addition, the implementation study demonstrated that administrators expended a large amount of effort on program development, which was a direct result of AO. Other staff, such as navigators, were working with much smaller caseloads under AO, so even if the same students would have enrolled in the college in the absence of AO, they would have received a much smaller portion of that navigator's time and attention. **The baseline case with no discounting is reported in the main results section of this report because the study team believes the appropriate discount factor should be quite small.** This sensitivity analysis simply shows the robustness of the directionality of the results to the measurement of personnel costs in almost all cases.

To determine the sensitivity of the results to these uncertainties around counting personnel costs, table 12 presents a net social benefit sensitivity analysis that discounts college personnel costs by 25 percent and 50 percent. The baseline case (which also appears in the net social benefit results presented in Tables 3 through 6) is for net social benefits with a discount rate of 5 percent and a decay rate of -2.0 percent. These discount factors are used to test the sensitivity of the results to extreme values, *not* because the evaluation team believes they are plausible.

TABLE 12

Net Social Benefit Sensitivity to Discounted College Personnel Costs

Discount rate, 5 percent; Decay rate, -0.02, program year cohort earnings effects estimated separately then added

	Illinois	Kansas	Kentucky	Louisiana
Baseline	-$5,569,007	$1,900,882	-$3,729,899	-$405,985
College personnel costs discounted 25%	-$4,324,973	$2,646,415	-$2,741,806	-$161,955
College personnel costs discounted 50%	-$3,080,938	$3,391,949	-$1,753,712	$82,074

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By definition, net social benefits increase in all four states as personnel costs are reduced. Since college personnel costs are the largest cost from the social perspective, the net social benefit changes from the baseline to a discounting of college personnel costs are dramatic, although negative net social benefits only become positive in one state (Louisiana) and only at implausibly large discounts to the personnel costs. Nevertheless, these results *only* serve to highlight the enormous importance of personnel costs for AO, and even given the importance of personnel costs, the directionality of the results is consistent in three of four states with deep discounting.

Alternative Earnings Benefit Calculations

The "How Benefits Are Calculated" section of the report describes two alternative methods for calculating the earnings benefits used in the net student and social benefits. The first method, which is strongly preferred by the evaluation team and reported in the body of the report, estimates earnings impacts separately by program year and projects each program year into the future before adding the program years together. An alternative method is to estimate the earnings impacts for all program years together before projecting those impacts into the future. This alternative method is less preferable because it places greater weight on the impact of AO on the first program year, which has more data available than any other program year. If the first program year is not representative of the second and third program year, this alternative approach could misrepresent the results across multiple cohorts.

The alternative approach to calculating earnings benefits is presented in Table 11, below, for the preferred discount rate of 5 percent and the decay rate of 2 percent.

TABLE 13

Per-Student Net Social Benefits of AO, Sensitivity to Alternative Benefit Calculations

	Preferred method	Alternative method
Illinois	-$7,214	-$6,708
Kansas	$1,595	$7,873
Kentucky	-$3,922	-$4,408
Louisiana	-$1,025	-$5,529

Note: The preferred method calculates impacts separately by program year, projects into the future, then adds impacts across years. The alternative method calculates impacts for all program years, then projects into the future.

Changing the approach to calculating earnings benefits has the largest effect in states where the earnings benefit was a large component of net benefits (Kansas and Louisiana). In states where the total earnings effects were relatively small (Illinois and Kentucky), the alternative approach has much less of an effect on net benefits. In Kansas, the alternative approach to calculating earnings benefits produces per-student net

social benefits that are over $6,000 higher than the preferred estimates. Per-student net social benefits retained the same sign in all four states, regardless of the method for calculating earnings benefits.

Appendix A. College Cost Survey Questionnaire

This is the questionnaire as administered to Louisiana in 2015. In the other three states, the survey referenced calendar years, while in Louisiana it referenced academic years due to Louisiana's later start date.

1. *Approximately how much, in dollars, did your institution spend on advertising/outreach for AO recruitment during the third year of AO implementation (the fall 2014, spring 2015, and summer 2015 semesters)?

   a. $_____

Section H.   Resources

In this section, we want to capture the costs of the AO program during the third year of AO implementation (the fall 2014, spring 2015, and summer 2015 semesters) relative to what your institution would have spent in the absence of AO.

This section is very important. Please try to answer every question as completely and accurately as possible. Where exact figures are not available, an informed estimate is fine.

Please give an answer to every question. If you have questions, you can contact AOCollegeSurvey@urban.org or call (202) 261-5847.

2. *In preparing for and operating AO during the third year of AO implementation (the fall 2014, spring 2015, and summer 2015 semesters), how many additional employees and how much additional time by current employees have been devoted to activities specifically related to AO?

   Please indicate the number of full-time equivalent employees (FTEs) in each of the following categories, combining new employee FTEs and FTEs of existing employees. An FTE is the equivalent of a full-time person.

   This is relative to whatever your college would be offering in the absence of AO. Please also include time spent on planning and professional development.

   For example, if two people in the same category (say, both deans/administrators) spent one third of their time on AO, then this would be 0.33 FTE for person 1 + 0.33 FTE for person 2, which equals 0.66 FTE in all. You would then enter 0.66 into the "dean/administrator" box. If there were a third administrator who increased their hours from half-time to full-time because of AO, then you would add the additional

0.5 FTEs of person 3 to the 0.66 that you calculated by adding together person 1 and 2. In that case, you would enter 1.16 (0.66+0.5).

To calculate FTEs, use the following method:

<u>*New staff hired (time allocated to AO) + Time transferred to AO by existing staff + Increase in hours worked by existing part-time staff for AO*</u>

Category	FTEs
Deans/ Administrators	
Regular (non-adjunct) career and technical faculty members/ instructors	
Adjunct career and technical faculty members/ instructors	
Adult education instructors	
Counselors/ Coaches/ Navigators/ Advisors	
Marketing/ Outreach/ Recruiting staff	
Administrative support staff (e.g., clerical staff)	
Data staff	
Physical plant/ Maintenance staff	
Other staff (specify _____)	

3.   *Please indicate the annual cost for one FTE in each category (including the dollar value of fringe benefits) for each category of employees that have greater than zero FTEs devoted to AO. Please provide the resource costs of one full-time person; do not multiply by the number of FTEs indicated in the previous question.

This is the average total salary plus benefits for employees in each category. This information might be available in your institution's budget.

Category [List only categories where FTEs were greater than zero in 2]	Annual Cost for one FTE (including value of fringe benefits)
Deans/ Administrators	
Regular (non-adjunct) career and technical faculty members/ instructors	
Adjunct career and technical faculty members/ instructors	
Adult education instructors	
Counselors/ Coaches/ Navigators/ Advisors	
Marketing/ Outreach/ Recruiting staff	
Administrative support staff (e.g., clerical staff)	
Data staff	
Physical plant/ Maintenance staff	
Other staff (specify _____)	

4. *Did your college employ consultants or contract out for AO in the third year of AO implementation (the fall 2014, spring 2015, and summer 2015 semesters) (not counting adjunct faculty or instructors)?

    a. __ Yes
    b. __ No

[If "Yes" is selected for 4, go to 5; else skip to 6]

5. *What were the costs of these consultants or contractors specifically allocated to AO activities, in dollars?

    Please exclude costs that were already accounted for in the total for advertising/outreach estimated earlier.

    a. $_____

Please fill in the following tables for each AO pathway in the third year of implementation. These tables refer to class sections that <u>were added for AO</u> (as opposed to sections in which AO students joined non-AO students in existing sections).

Please use an average per semester that the AO pathway was offered. That is, if there were two sections offered each semester that the pathway was active, please enter 2.

Please include both career and technical courses and adult education courses.

6.   *Number of class sections added for AO (not offered in the absence of AO) per semester

Pathway	Sections
[List pathways]	

[If any pathways in 6 are greater than zero, go to 7; else, skip to 11]

7.   *Average enrollment capacity per class section added for AO per semester (not offered in the absence of AO)

Include AO and non-AO students

Pathway	Students
[List pathways if greater than zero in 6]	

8.   *Average number of students enrolled per class section added for AO per semester

Include AO and non-AO students.

Pathway	Students
[List pathways if greater than zero in 6]	

9. *Average cost per section per semester

This can be an estimate based on multiplying FTEs by cost per FTE, then adding overhead.

Pathway	Dollars ($)
[List pathways if greater than zero in 6]	

10. *For each pathway, what percentage of the costs for class sections added for AO can be attributed to each of the following components?

The percentages for each row should sum to 100.

Pathway	Instructor costs Percent (%)	Supply costs Percent (%)	Space costs Percent (%)	Other Percent (%)
[List pathways if greater than zero in 9]				

Please fill in the following tables for each AO pathway in the third year of implementation. These tables refer to class sections that already existed before AO, but to which AO students were added.

Please use an average per semester that the AO pathway was offered. That is, if there were two sections offered each semester that the pathway was active, please enter 2.

Please include both career and technical courses and adult education courses.

11. *Number of class sections offered in the absence of AO but enhanced by AO resources per semester

Examples of AO resources include extra materials or supports, team teaching, or alternative curricular programming.

Pathway	Sections
[List pathways]	

12. *Average enrollment capacity per class section enhanced by AO per semester

Include AO and non-AO students.

Pathway	Students
[List pathways if greater than zero in 11]	

13. *Average number of students enrolled per class section enhanced by AO per semester

Include AO and non-AO students.

Pathway	Students
[List pathways if greater than zero in 11]	

14. *Average <u>incremental</u> cost per class section enhanced by AO per semester

These are costs added by introducing AO to existing class sections.

Pathway	Dollars ($)
[List pathways if greater than zero in 11]	

15. *For each pathway, what percentage of the incremental costs for class sections enhanced by AO can be attributed to each of the following components?

The percentages for each row should sum to 100.

Pathway	Instructor costs Percent (%)	Supply costs Percent (%)	Space costs Percent (%)	Other Percent (%)
[List pathways if greater than zero in 14]				

Please fill in the following tables for each AO pathway in the third year of implementation. These tables refer to class sections that were not offered because of AO but would have normally been offered (for example, adult basic education, English language education, or developmental education courses).

Please use an average per semester that the AO pathway was offered. That is, if there were two sections that you did not have to offer each semester that the pathway was active but that your institution would have offered otherwise, please enter 2.

Please include both career and technical courses and adult education courses.

16. *Number of class sections per semester not offered because of AO (but normally would have been offered otherwise)

Pathway	Sections
[List pathways]	

[If any pathways in 16 are greater than zero, go to 17; else, skip to 19]

17. *Average enrollment capacity per class section last time the class was offered.

Pathway	Students
[List pathways if greater than zero in 16]	

18. *Average cost per section last time the class was offered.

This can be an estimate based on multiplying FTEs by cost per FTE, then adding overhead.

Pathway	Dollars ($)
[List pathways if greater than zero in 16]	

19.   *During the third year of AO implementation (the fall 2014, spring 2015, and summer 2015 semesters), were any extra costs incurred by the college for support services for AO students besides the cost of the salary of the coach/navigator?

Examples of these support services include transportation vouchers, emergency financial assistance, and child care assistance. This does not include tuition waiver/scholarships.

These are costs for services that would not have been provided to students in the absence of AO.

a.   __ Yes
b.   __ No

[If "Yes" is selected for 19, go to 20; else, skip to 21]

20.   *What were the total extra costs incurred for college support services for AO students besides the cost of the salary of the coach/navigator in the third year of AO implementation (the fall 2014, spring 2015, and summer 2015 semesters), in dollars?

Examples of these support services include transportation vouchers, emergency financial assistance, and child care assistance. This does not include tuition waivers/scholarships.

a. $ _____

21.   *Were tuition waivers/scholarships provided to AO students that would not have been provided in the absence of AO?

a.   __ Yes
b.   __ No

[If "Yes" is selected for 21, go to 22; else, skip to 23]

22.   *What was the total value of tuition waivers/scholarships granted to AO students that would not have been granted in the absence of AO, in dollars?

If you do not know, please make your best estimate.

a. $ _____

23. If there are any other costs that your institution incurred as a result of AO that we did not ask you about, please enter them here.

	Dollars ($)
(Describe cost)	
(Describe cost)	
(Describe cost)	

24. *How much does the typical AO student pay out-of-pocket for tuition and other costs <u>per credit, per semester</u> as of the end of the third year of AO implementation (the fall 2014, spring 2015, and summer 2015 semesters) for each pathway?

   This <u>includes</u> cash and credit card expenditures and loans that will need to be repaid by the student, employer, or other entity. It <u>does not include</u> costs covered by college-provided scholarships or tuition waivers.

   To determine costs per credit, please divide total costs for the students by the number of credits taken.

   If unknown, please estimate.

Pathway	Per-credit tuition costs	Per-credit other out-of-pocket costs (books, lab fees, etc.)
[List pathways]		

Appendix B. Detailed Earnings Impact Estimates

This appendix presents the discounted AO earnings impact estimates using the preferred 5 percent discount rate, with projections described in the "Net Benefits Estimates by State" section in the body of the report. Different program year cohorts could have experienced different AO impacts because of program maturation, varying macroeconomic conditions, and compositional changes in the AO student population. To account for this possibility, the analysis includes separate impact estimates for each program year and earnings impact projections into the future using a decay rate adjustment. The projected decay is apparent in the form of the smooth decline in benefits towards zero after about the 12th quarter post-enrollment

As shown in figure 3, Earnings benefits experienced by AO participants in Illinois vary depending on the program year, with the most substantial gains occurring for students enrolling during the second program year. Lower or even negative earnings impacts occur in the first and third program years. Benefits peak around the sixth quarter after enrollment for the second and third program years. In the second program year, benefits peak at over $800 earned per quarter. The results for Illinois show some evidence of costs associated with forgone earnings in the quarters immediately following enrollment across all three program years.

FIGURE 3

**Illinois Estimated and Projected Earnings Impacts by Quarter**
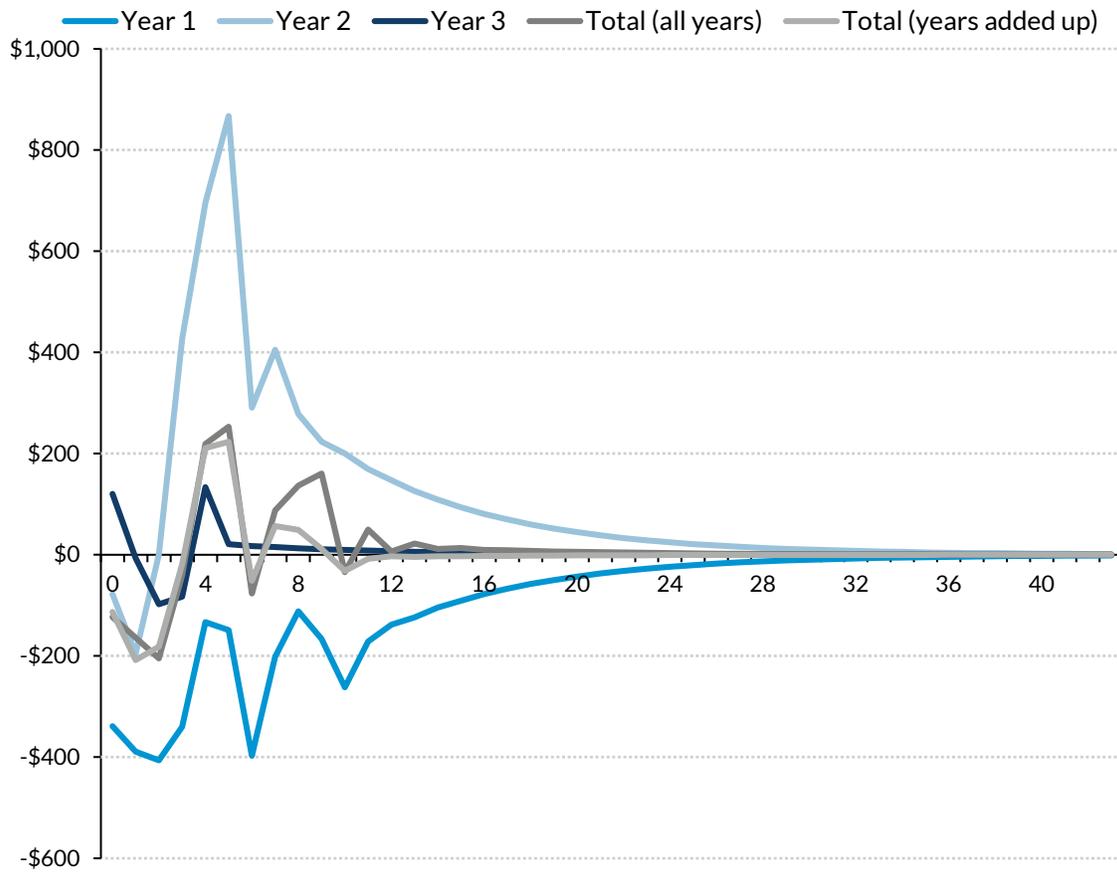
Note: Decay rate is -2.0 percent; discount rate is 5.0 percent.

Since earnings gains in the second program year are balanced out by earnings losses in the first program year, with little impact of AO in the third program year, the total earnings impact of AO is close to zero regardless of whether all years are estimated together or individual program years are estimated separately and then added together. The total effect of AO across all program years only exceeds $200 in the sixth quarter.

Figure 4 shows the earnings impacts by cohort for Kansas. As reported in the impact report, Kansas experienced the strongest projected earnings impacts associated with AO, particularly in the first program year, but also in the second program year. Earnings impacts for the first program year almost reach $1,000 per quarter by the eighth quarter after enrollment. In the third program quarter, the impact of AO turns negative. This is an unusual result, since the program should be implemented and fully matured in the colleges by that point.

FIGURE 4

**Kansas Estimated and Projected Earnings Impacts by Quarter**
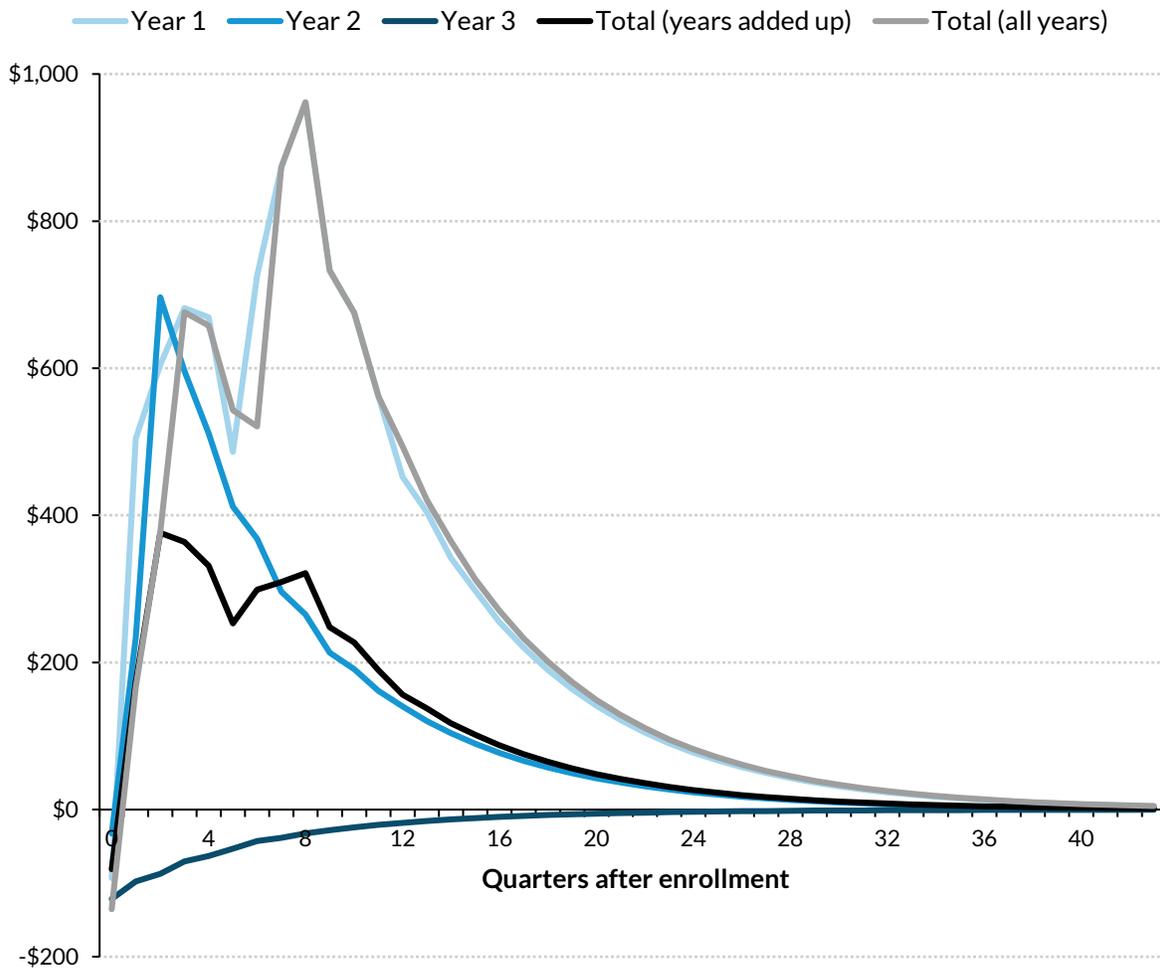
Note: Decay rate is -2.0 percent; discount rate is 5.0 percent.

The total impact of AO is large and positive in Kansas regardless of whether it is calculated by adding separately estimated program years together or by combining program years. However, benefits are much greater when all program years are combined and the decay rate is only used to project earnings impacts after the entire sample is no longer observed. These results show greater benefits because by the eighth quarter after enrollment, the sample is entirely composed of participants from the first program year who have much higher earnings impact than participants from other years. When each program year is estimated separately, projected into the future, and then averaged together, the estimated total effect is lower though still large and positive.

Figure 5 shows that Kentucky exhibited the greatest degree of variation in earnings impacts across program years. Participants who enrolled in the first program year enjoyed modest benefits until after the second-year post enrollment, at which point they enjoyed earnings benefits as high as $400. AO participants from the second program year, in contrast, enjoyed quarterly earnings impacts over $400 during the first two years after enrollment. As with Kansas, the third program year in Kentucky experienced negative earnings impacts, particularly in the initial post-enrollment quarters.

Kentucky Estimated and Projected Earnings Impacts by Quarter
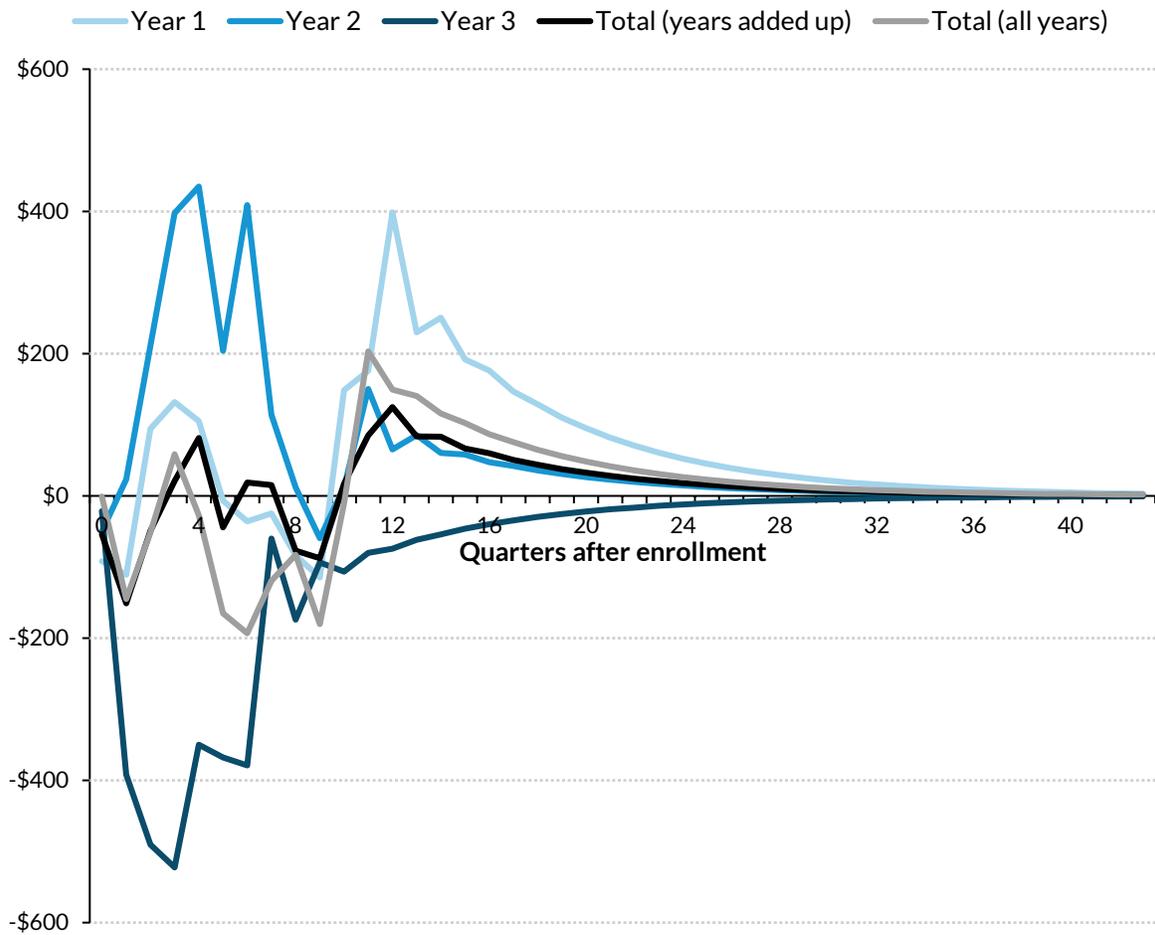
Note: Decay rate is -2.0 percent; discount rate is 5.0 percent.

The total impact of AO in Kentucky is negative for much of the initial two year after enrollment, and then becomes positive. Both methods for calculating the total impact of AO on earnings generate essentially the same patterns.

As shown in figure 6, Louisiana's estimated earnings impacts follow a pattern that is similar to that of Illinois. The first program year enjoys relatively low earnings impacts, but these participants are followed by participants in the second program year who enjoy large earnings benefits, peaking at about $1,000 by the fourth quarter after enrollment.

FIGURE 6

Louisiana Estimated and Projected Earnings Impacts by
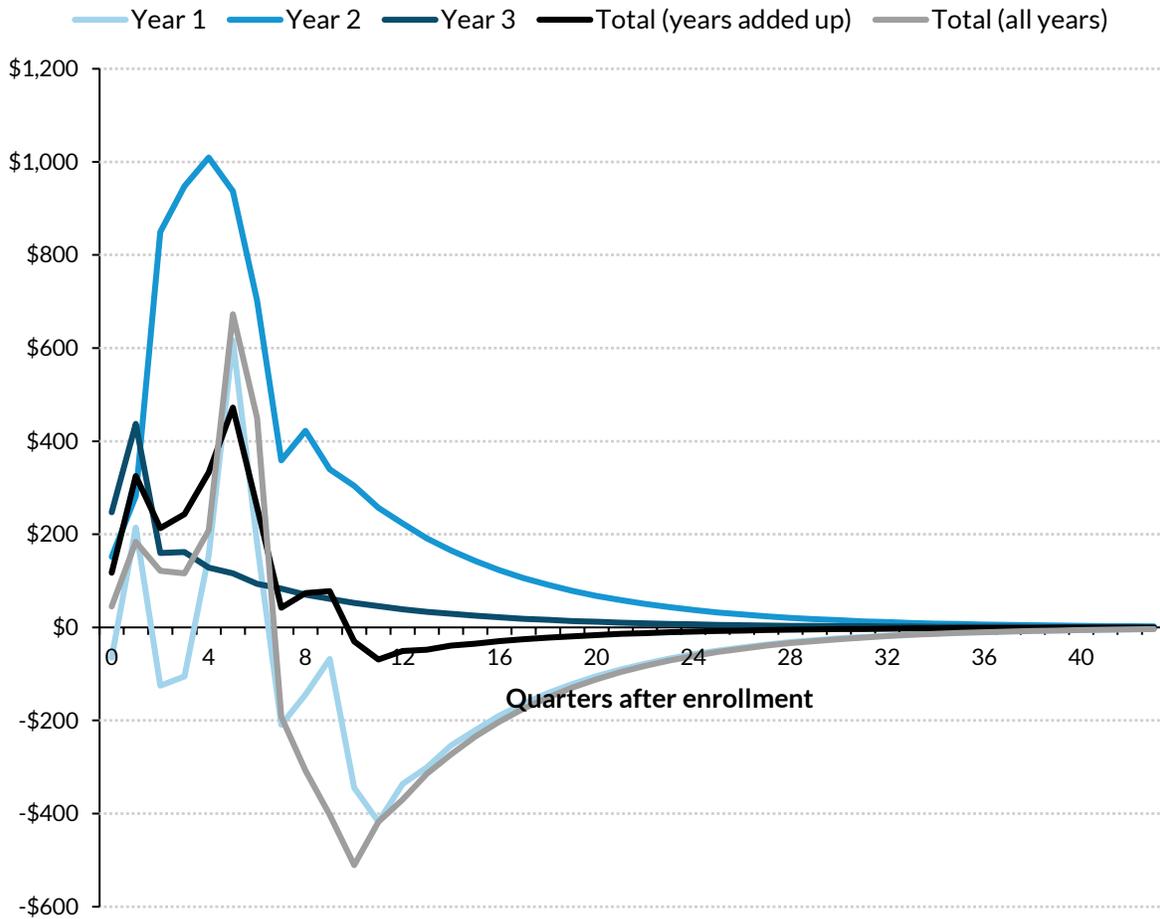
Note: Decay rate is -2.0 percent; discount rate is 5.0 percent.

Notes

1. The evaluation states were Illinois, Kansas, Kentucky, and Louisiana. The affiliate states were Arkansas, Georgia, and Mississippi.

2. Funders included the Bill & Melinda Gates Foundation, the Joyce Foundation, the W. K. Kellogg Foundation, the Kresge Foundation, the Open Society Foundations, the Arthur Blank Foundation, the Woodruff Foundation, the Annie E. Casey Foundation, and the University of Phoenix Foundation.

3. Arkansas, Mississippi, Georgia were AO affiliate states and were not part of the Urban Institute's evaluation.

4. See Clagett and Uhalde (2012); Fein (2012); and CLASP (2013).

5. For more detail, see Anderson et al. (2014); JFF's Breaking through website, (http://www.jff.org/initiatives/breaking-through); and the Washington State Board of Community and Technical College's I-BEST website (https://www.sbctc.edu/colleges-staff/programs-services/i-best/).

6. We cannot estimate net benefits separately by recruitment source, because the cost data, which is likely to differ across these groups, was not collected separately by recruitment source.

7. Other non-monetary benefits to increases in education are documented in Wolfe and Haveman (2003) and Oreopoulos and Salvanes (2011).

8. For analyses of the phase out of earnings impacts, see Schochet, Burghardt, and McConnell (2006) and . Michael Greenstone and Adam Looney, "Regardless of the Cost, College Still Matters," *Brookings on Job Numbers* (blog), October 5, 2012, https://www.brookings.edu/blog/jobs/2012/10/05/regardless-of-the-cost-college-still-matters/.

9. For example, in their 1994 cost-benefit analysis text, Zerbe and Dively claim the appropriate real (inflation-adjusted) discount rate should be between 2.5 percent and 5.5 percent, but in a 2013 article Burgess and Zerbe call for a rate of 7 percent. Boardman et al. have also changed their views over time, suggesting, under most circumstances, a real rate of 2.0 percent if consumption is displaced and 8.0 percent if investment is displaced in 2001, but 3.5 percent in their 2011 edition.

10. In Circular A-94 (OMB 1992), OMB calls for a discount rate of 7 percent, but in Circular A-4 (OMB 2003), which deals with regulatory analysis, the 3 percent rate is mentioned as sometimes being acceptable.

11. As Diamond pointed out in 1967, if markets are complete enough for stock prices to reflect the social cost of risk, then the private cost of risk is the right measure for evaluating government investments. While some argue that the government's ability to pool investments allows for risk reduction and thus a lower discount rate, others point out private market rates already reflect the pooling by mutual funds that capture the risk reduction of diversification. As Lucas and Phaup (2010) demonstrate, the mere fact that the government can borrow at a low rate does not imply it should discount risky investments at that same low rate. This is because if an investment turns out badly, taxpayers are on the hook for the increased resources needed to offset the loss. The risky investments are not really financed by Treasury debt but rather by the taxpaying public.

12. We follow this standard convention, although one can argue that 6.2 of the 7.65 in added taxes represent contributions that will yield added retirement, survivors, or disability benefits to individuals.

13. The average marginal tax rate is calculated as an average from $0 to $20,000 in income, reflecting the quarterly wages reported for non-zero wage earners among AO participants from Anderson et al. (2017). This is oversimplified because of course AO participants are not uniformly distributed across the range of incomes from $0 to $20,000 and some may earn more than $20,000.

14. Tuition and fee waivers are benefits from the student perspective because they are direct savings to the students relative to what they would have had to pay. In the society-level analysis, tuition and fee waivers are social transfers from the institution to the student and therefore do not count as social costs or benefits.

15. Developmental education students in Kentucky and CTE students in Kansas are enrolled in college by definition. Adult education students typically do not enroll in college, so the restriction of the comparison group to college enrollees had its principal impact on adult education students.

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About the Authors

Daniel Kuehn is a research associate in the Urban Institute's Income and Benefits Policy Center. Dr. Kuehn has eleven 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.

Theresa Anderson is a research associate in the Income and Benefits Policy Center at the Urban Institute, where she works primarily on completing evaluations of workforce development programs. She has worked on evaluations of programs such as the Health Profession Opportunity Grants, Accelerating Opportunity, Family-Centered Community Change, and the Alaska Native Science and Engineering Program. She has expertise on a wide range of social assistance programs and is skilled in mixed-methods research.

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 B.S. degree in economics from the

Massachusetts Institute of Technology and M.S. and Ph.D. degrees in economics from the University of Wisconsin at Madison.

Robert Lerman is an Institute fellow in the Center on Labor, Human Services, and Population at the Urban Institute as well as professor of economics at American University and a research fellow at IZA in Bonn, Germany. A leading expert on apprenticeship, he recently established the American Institute for Innovative Apprenticeship. His current research focus is on skills, employer training, apprenticeship programs in the United States and abroad, and housing policies.

Amanda Briggs is a research associate in the Income and Benefits Policy Center, where she contributes to the center's research and evaluation projects related to education and workforce development. She is the Project Manager of the Mississippi Integrated Basic Education and Skills Training (MIBEST) evaluation and the Adaptive Learning in Statistics project, a mixed-method math assessment evaluation. Briggs holds a master's degree from the Lyndon B. Johnson School of Public Affairs at the University of Texas at Austin.

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2100 M Street NW
Washington, DC 20037

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