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# A Look at Five Key Outcomes in Early Adulthood for Associate Degree Earners

**Jonathan M. Turk, Ph.D.**

*Associate Director, Center for Policy Research and Strategy,  
American Council on Education*

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# Summary

## A Look at Five Key Outcomes in Early Adulthood for Associate Degree Earners

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This research brief is the fourth in a series of four exploring early outcomes for recent high school graduates who enroll in community colleges. In this study, I used data from the Education Longitudinal Study of 2002 to test the relationships between attaining an associate degree and five outcomes in early adulthood: (1) employment status, (2) wages, (3) homeownership, (4) voting rates, and (5) volunteerism. These outcomes are representative of not only the individual economic returns expected from higher education, but also some of the benefits society enjoys by having a more highly educated citizenry.

### Key Findings

Compared to students with no postsecondary enrollment history after high school, students who earn an associate degree are more likely to:

- Be employed.
- Earn higher hourly wages.
- Be homeowners.
- Vote in federal, state, and local elections.

- Volunteer.

## Recommendations

In light of key findings, this study concludes with two recommendations for practitioners to consider:

1. Emphasize the economic benefits of associate degrees to students and their families, beginning in high school.
2. Implement new academic and student support models to increase completion rates at community colleges.

The recommendations presented in this brief can have a meaningful impact on the promotion and attainment of postsecondary credentials in the nation. More work is needed to communicate the value of sub-baccalaureate credentials to students and their families and to increase the number of students who complete associate degrees. Community colleges must continue to be at the forefront of ensuring students, especially those who have been most disadvantaged, can access the benefits of a college education. State and federal policymakers must ensure these institutions receive adequate financial support to fulfill their mission.



# The Research Study

## The Research Study

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Recent national polls have shown a growing skepticism about the role and value of higher education. According to one survey, 57 percent of Americans say that colleges and universities fail to provide students with good value for the money spent (Taylor et al. 2011). Even more troubling is a finding that 36 percent of adults say colleges and universities have a negative effect on the current direction of the country (Doherty, Kiley, and Johnson 2017). As college costs continue to rise, it is clear that more and more individuals are questioning whether higher education can still deliver on the promises of a better life for themselves and their families. Despite this skepticism, the importance and value of a college education has never been greater.

Research continues to show that college graduates earn more over their lifetimes, contribute more in taxes, are more engaged with their local communities, and live healthier lives than individuals without a college education (Ma, Pender, and Welch 2016). However, far too often the public discourse around the benefits of college is focused predominantly on bachelor's degree earners, overlooking the value that associate degrees can provide. As a result, students and their families may not be receiving enough information to adequately consider all of their college and career options.

To that end, in this fourth and final brief of the series, I explore the impact earning an associate degree has on five key outcomes in early adulthood: (1) employment status, (2) wages, (3) homeownership, (4) voting rates, and (5) volunteerism. These outcomes represent not only the individual economic returns expected from higher education, but also some of the benefits society enjoys by having a more educated

citizenry. The brief concludes with recommendations aimed at helping students and their families more fully consider the value of earning an associate degree and recommendations to improve associate degree completion rates.

## Previous Research

A number of previous studies have explored the relationships between higher education and a variety of early labor market and social outcomes. While the majority of these studies examine the individual economic and social returns tied to earning a bachelor's degree, a growing number have analyzed the returns of earning a certificate or associate degree from a community college. What follows here is a brief and by no means exhaustive review of some of the relevant literature.

Belfield and Bailey (2011) provide a thorough review of the literature examining the relationship between associate degree completion and earnings gains. Across almost all of the 18 studies reviewed by Belfield and Bailey, a significant gain in earnings was found for associate degree completers relative to those with a high school education but no college degree. More recently, Belfield and Bailey (2017) found that students who earn an associate degree can expect on average to earn anywhere between \$4,640 and \$7,160 per year more than students who leave college with no degree.

While it is clear that an increasing number of jobs are requiring education beyond the high school level, not all of these jobs require a bachelor's degree. In a 2017 study, Carnevale, Strohl, Cheah, and Ridley sought to address the increasingly popular notion that individuals can only secure "good jobs" with a bachelor's degree.<sup>1</sup> According to the authors, in 2015 there were approximately 66 million good jobs in the economy. Of those 66 million good jobs, 30 million or 45 percent were held by individuals without a bachelor's degree (Carnevale et al. 2017). Between 1991 and 2015, the number of good jobs held by individuals without a bachelor's degree increased from 27 million to 30 million—an increase of 11.1 percent.

However, for those in that group with an associate degree, the share of good jobs increased from 14.2 percent in 1991 to 23.6 percent in 2015—an increase of 66.2 percent. During this same period, the share of good jobs held by individuals with a high school diploma or less decreased by 17.7 percent. These data show that an associate degree is becoming increasingly important for individuals in pursuit

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<sup>1</sup> A "good job" was defined as one with an annual salary of at least \$35,000 for those under age 45 and at least \$45,000 for workers age 45 and older (Carnevale et al. 2017).

of jobs that pay a self-sufficient wage. While individual economic returns are important, the benefits of community college extend beyond just the individual employment rates and earnings.

A large body of literature has shown a strong and positive relationship between higher education and improved health (see Cutler and Lleras-Muney 2010; Groot and Maassen van den Brink 2007; Grossman 2006). In one study, Cutler and Lleras-Muney (2010) found each additional year of education to be associated with a reduced probability of smoking, drinking in excess, and obesity. Hummer and Lariscy (2011) found higher levels of college attainment to be associated with lower mortality rates, with individuals with some college or an associate degree having a 7 percent lower mortality rate than individuals with only a high school diploma. In addition to improved health outcomes, community colleges play an important role in preparing students to become active members of their communities.

As Kisker, Weintraub, and Newell (2016) point out, “In addition to providing transfer education and workforce preparation, community colleges do the work of democracy in a multitude of ways” (316). Community colleges work to foster greater levels of civic engagement among their students through service-learning, classroom discussion, voter registration drives, and a variety of other activities. Research has shown that attending community college increases students’ likelihood of volunteering within their community and voting, relative to not attending college (Lopez and Brown 2006; Newell 2014). In fact, Ma, Pender, and Welch (2016) found individuals with some college or an associate degree volunteer at rates nearly double that of high school graduates.

## The Study

The purpose of this study was to examine the impact of earning an associate degree on a series of outcomes in early adulthood. The outcomes, presented in Table 1, were measures of individual economic return—employment status, wages, and homeownership—and benefits to society—voting rates and volunteerism. Data for each outcome was collected in 2012–13, or roughly eight years after the students in the study left high school. While there are many other benefits to higher education, these outcomes represent just a few of the individual and societal benefits often tied to higher education.

Table 1. Outcome Variable Definitions

Employment Status
1 = Employed either full time or part time.
0 = Unemployed or out of the labor force.



<b>Wages</b>
A continuous variable which measured an individual's earnings at their current job, standardized to dollars per hour.
<b>Homeownership</b>
1 = Owned a home or was paying a mortgage towards a home.
0 = Did not own a home, was not paying a mortgage towards a home.
<b>Voting Rate</b>
1 = Voted in a local, state, or federal election between 2008 and 2011.
0 = Did not vote in a local, state, or federal election between 2008 and 2011.
<b>Volunteerism</b>
1 = Performed unpaid volunteer work during the last two years.
0 = Did not perform unpaid volunteer work during the last two years.

Data used in this study came from the U.S. Department of Education's Education Longitudinal Study of 2002 (ELS) and the corresponding Postsecondary Education Transcript Study (PETS). ELS is a nationally representative, longitudinal study of students who began 10th grade in 2002 and who were tracked over a 10-year period. The study collected extensive data on students' high school experiences, family demographic and background information, transcript-derived postsecondary enrollment and achievement information, and early labor market outcomes. To explore the impact of earning an associate degree on the outcomes of interest using ELS data, a sample of students was constructed in order to compare (1) individuals who earned an associate degree as their highest award against (2) individuals who had never enrolled in any postsecondary education after high school. This sample allowed for an examination of how the outcomes of interest varied between individuals who earned an associate degree and those who never attended college.

Two types of regression modeling were used. Probit regression analysis was used to estimate the impact of earning an associate degree on the models exploring dichotomous outcomes; employment status, homeownership, voting rates, and volunteerism. The results of these models were then converted into marginal effects for ease of interpretation. Marginal effects show how each independent variable in the model, holding all others constant, impacts the probability of achieving the outcome—being employed, owning a home or paying on a mortgage, having voted, and having volunteered.

Standard linear regression was used to estimate the relationship between earning an associate degree and wages. The wages variable was a continuous and standardized measurement of an individual's hourly wage at his or her current place of employment. To account for the skewness of the wage variable, I

transformed the variable using its natural log. Therefore, the coefficients or results of the models show the approximate percent change in hourly wages for a one-unit increase in an independent variable, holding all others constant.

It is important to note that the ELS data are not representative of all community college students, rather, just recent high school graduates who enrolled in community college. Furthermore, the findings presented in the next section suggest correlation between the outcomes and associate degree attainment and do not necessarily imply causation. More information about the ELS data, as well as a complete discussion of the sample construction strategy, regression modeling, and variables used in this study is presented in the appendix.

# III Study Findings

## Study Findings

Again, the purpose of this study was to explore how earning an associate degree, relative to not attending college, influences five different economic and social outcomes. Each model evaluates the relationship between earning an associate degree—relative to never enrolling in postsecondary education—and the outcomes, while controlling for a variety of other factors. Across each model, earning an associate degree resulted in a statistically significant and positive impact on the outcome of interest. Table 2 provides an overview of the key findings, that is, the size of the positive effect earning an associate degree had on each outcome of interest. For detailed variable definitions and descriptive statistics on the variables in each model, see Table A1 and Table A2 in the appendix. What follows next is a full presentation of each model, organized by outcome of interest.

Table 2. *The Effects of Attaining an Associate Degree Relative to Not Enrolling in College*

Outcome	Effects
Employment Status	+9.3 percentage points
Wages	+13.4 percent
Homeownership	+11.6 percentage points
Voting Rate	+27.2 percentage points
Volunteerism	+9.8 percentage points

## Employment Status

The first model estimated the relationship between earning an associate degree and employment—either full time or part time—controlling for other factors (see Table 3). Students who had earned an associate degree were 9.3 percentage points more likely to be employed in 2012 than students who had no college enrollment history. Other control variables in the model were also significant. Women were nearly 20 percentage points less likely to be employed relative to men. Individuals who identified as African American were 9.6 percentage points less likely to be employed relative to white individuals—the comparison category. High school GPA, which was included as a control for academic effort and achievement, was found to be a significant predictor of employment. With each one-point increase in a student’s high school GPA, the probability that he or she would be employed increased nearly 5 percentage points. Finally, relative to individuals who were living in the Northeast—the comparison region—those who lived in the Western United States were 7.3 percentage points less likely to be employed. However, this finding was only marginally significant.

Table 3. Full Results of Model 1: Employment Status

	Marginal Probability Effect
Associate Degree	0.093***
	(0.026)
Sex	-0.197***
	(0.023)
African American	-0.096*
	(0.041)
Asian/Pacific Islander	-0.006
	(0.056)
Hispanic	-0.012
	(0.033)
Other/Multiple Races	-0.071
	(0.045)
Socioeconomic Status	0.029
	(0.023)
Parental Education	0.047
	(0.029)
HS GPA	0.046**
	(0.017)
Marital Status	0.021
	(0.023)
Children	-0.037
	(0.023)

Midwest	-0.005
	(0.038)
West	-0.073+
	(0.043)
South	0.012
	(0.035)
Pseudo R <sup>2</sup>	0.082
N =	2,050

+p < .10 \*p < .05 \*\*p < .01 \*\*\*p < .001

Standard errors in parentheses. Per the Institute of Education Sciences guidelines, all unweighted sample sizes were rounded to the nearest 10. F3QWT weight was used in analysis.

## Wages

The next model examined the relationship between associate degree attainment and hourly wages (see Table 4). Controlling for factors such as race, sex, socioeconomic background, region, employment sector, and time in job, attaining an associate degree increased an individual's hourly wages by 13.4 percent, relative to individuals with no postsecondary enrollment history. While no statistically significant relationship was found between race or socioeconomic background and hourly wages, women earned 13.5 percent less than men. Furthermore, each one-point increase in an individual's high school GPA was associated with a 5.7 percent increase in hourly wages. Relative to the Northeast, individuals in the Midwest and South had lower hourly wages. Furthermore, the sector in which individuals work had a highly significant impact on wages. Across all sectors, excluding art and design, working in healthcare was associated with higher hourly wages. Finally, individuals who had been in their current job longer earned more. With each additional month on the job, hourly wages increased by 0.1 percent or increased 1.2 percent with each year at that job.

Table 4. Full Results of Model 2: Wages

	B	exp(B)-1
Associate Degree	0.126***	0.134
	(0.033)	
Sex	-0.145***	-0.135
	(0.030)	
African American	-0.041	-0.040
	(0.037)	
Asian/Pacific Islander	0.062	0.064
	(0.051)	
Hispanic	0.009	0.009
	(0.035)	

Other/Multiple Races	-0.014	-0.014
	(0.047)	
Socioeconomic Status	0.042	0.043
	(0.030)	
Parental Education	0.007	0.007
	(0.033)	
HS GPA	0.055**	0.057
	(0.021)	
Marital Status	0.118***	0.125
	(0.026)	
Children	-0.001	-0.001
	(0.026)	
Midwest	-0.077*	-0.074
	(0.036)	
West	-0.019	-0.019
	(0.045)	
South	-0.142***	-0.132
	(0.036)	
Employment Sector: Business	-0.281***	-0.245
	(0.049)	
Employment Sector: Manufacturing/Construction	-0.193***	-0.176
	(0.049)	
Employment Sector: Office/Administration	-0.287***	-0.249
	(0.045)	
Employment Sector: Legal/Protective Services	-0.159*	-0.147
	(0.067)	
Employment Sector: Science/Social Science	-0.181+	-0.166
	(0.100)	
Employment Sector: Education/Community Services	-0.469***	-0.374
	(0.064)	
Employment Sector: Food Services	-0.695***	-0.501
	(0.058)	
Employment Sector: Personal Care	-0.445***	0.236
	(0.071)	
Employment Sector: Art/Design	-0.131	-0.123
	(0.140)	
Time in Job	0.001**	0.001
	(0.000)	
Constant	2.715***	--
	(0.073)	
R <sup>2</sup>	0.263	
n =	1,500	

+*p* < .10   \**p* < .05   \*\**p* < .01   \*\*\**p* < .001

Standard errors in parentheses. Per the Institute of Education Sciences guidelines, all unweighted sample sizes were rounded to the nearest 10. F3QWT weight was used in analysis.

## Homeownership

Moving beyond employment status and earnings, Table 5 presents findings on homeownership rates. Again, homeownership was defined as any individual who either owned his or her current residence outright or who was paying a mortgage. When compared to students who had never enrolled in college, associate degree earners were nearly 12 percentage points more likely to be homeowners. Race was also a significant predictor of homeownership. Both Hispanics and African Americans, relative to white individuals, were significantly less likely to be homeowners. Hispanics were close to 8 percentage points less likely than whites to be homeowners, while African Americans were closer to 11 percentage points. Being employed, married, or having children were also both associated with a significantly higher probability of being a homeowner. Finally, living in the Midwest was associated with a nearly 10 percentage point increase in the probability of owning a home, while living in the South was associated with an increase of 8 percentage points, both relative to living in the Northeast.

Table 5. Full Results of Model 3: Homeownership

	Marginal Probability Effect
Associate Degree	0.116***
	(0.026)
Sex	-0.016
	(0.019)
African American	-0.106***
	(0.023)
Asian/Pacific Islander	-0.081*
	(0.036)
Hispanic	-0.078***
	(0.022)
Other/Multiple Races	-0.004
	(0.033)
Socioeconomic Status	-0.009
	(0.020)
Parental Education	0.034
	(0.024)
Employed	0.108***
	(0.019)
Marital Status	0.322***
	(0.026)
Children	0.041+
	(0.021)
Midwest	0.102**

	(0.036)
West	0.028
	(0.037)
South	0.080**
	(0.030)
Pseudo R <sup>2</sup>	0.209
n =	2,250

+p < .10 \*p < .05 \*\*p < .01 \*\*\*p < .001

Standard errors in parentheses. Per the Institute of Education Sciences guidelines, all unweighted sample sizes were rounded to the nearest 10. F3QWT weight was used in analysis.

## Voting Rates

Higher education is often thought about in terms of its ability to increase individuals' economic returns. However, an educated citizenry is vital to the health of any democracy. Table 6 presents the results exploring how an associate degree impacts the likelihood of voting. Compared to individuals who never attended college, those who earned an associate degree as their highest degree were 27.2 percentage points more likely to have voted in either the 2008 presidential election or any other state, local, or federal election in 2008, 2009, or 2011. Additional controls in model were also significant. Women were 6.1 percentage points more likely to vote than men. Individuals who came from higher socioeconomic backgrounds, along with those who were homeowners, or from the Midwest were also more likely to vote. Race was also a significant factor. Relative to white individuals, African Americans were significantly more likely to have voted.

Table 6. Full Results of Model 4: Voting Rate

	Marginal Probability Effect
Associate Degree	0.272***
	(0.028)
Sex	0.061*
	(0.027)
African American	0.265***
	(0.036)
Asian/Pacific Islander	-0.077
	(0.061)
Hispanic	-0.054
	(-0.037)
Other/Multiple Races	0.039
	(0.049)
Socioeconomic Status	0.120***



	(0.027)
Parental Education	0.053
	(0.033)
Employed	0.009
	(0.031)
Own Home	0.064+
	(0.033)
Marital Status	0.033
	(0.031)
Children	-0.021
	(0.028)
Midwest	0.075+
	(0.041)
West	0.013
	(0.045)
South	0.009
	(0.039)
Pseudo R <sup>2</sup>	0.101
n =	2,230

+p < .10 \*p < .05 \*\*p < .01 \*\*\*p < .001  
Standard errors in parentheses. Per the Institute of Education Sciences guidelines, all unweighted sample sizes were rounded to the nearest 10.  
F3QWT weight was used in analysis.

## Volunteerism

In addition to voting, volunteerism is another important indicator of civic engagement. Table 7 provides the results of the model exploring the relationship between associate degree attainment and volunteerism. Associate degree earners were 9.8 percentage points more likely to report volunteering than individuals who never attended college. Again, additional controls in the model were significant. Women were 5.9 percentage points more likely than men to volunteer, and married individuals were 14 percentage points more likely than those who were single to report volunteering. Being employed was also a positive predictor of volunteerism, though this finding was only marginally significant. Finally, relative to individuals living in the Northeast, individuals in the South and West regions were more likely to report volunteering.

Table 7. Full Results of Model 5: Volunteerism

	Marginal Probability Effect
Associate Degree	0.098*** (0.027)
Sex	0.059** (0.022)
African American	0.041 (0.035)
Asian/Pacific Islander	-0.022 (0.047)
Hispanic	-0.024 (0.030)
Other/Multiple Races	0.039 (0.043)
Socioeconomic Status	0.027 (0.022)
Parental Education	-0.014 (0.027)
Employed	0.041+ (0.025)
Own Home	-0.030 (0.027)
Marital Status	0.140*** (0.028)
Children	-0.015 (0.023)
Midwest	0.036 (0.036)
West	0.066+ (0.040)
South	0.090** (0.033)
Pseudo R <sup>2</sup>	0.044
n =	2,240

+ $p < .10$  \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

Standard errors in parentheses. Per the Institute of Education Sciences guidelines, all unweighted sample sizes were rounded to the nearest 10. F3QWT weight was used in analysis.

# Recommendations

## Recommendations

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Compared to individuals with no higher education enrollement history, associate degree earners are (1) significantly more likely to be employed, (2) when they are employed earn higher wages, (3) own a home, (4) volunteer, and (5) vote. This study, along with previous research, has shown that individuals, their families, and their communities benefit when students complete an associate degree. Informed by this fact, I offer two recommendations for practitioners to consider in order to encourage and increase associate degree completion rates.

1

**Emphasize the economic benefits of associate degrees to students and their families, beginning in high school.**

Financially strained school budgets have limited the amount of career counseling in schools around the country. In 2014–15, the national student-to-counselor ratio was 482 to one, almost double the recommended ratio by the American School Counselor Association (NACAC and ASCA 2018). With such large caseloads, high

school counselors are often unable to provide all of their students with thorough college and career counseling. While increased funding for school counseling is necessary, given the current economic climate, this may be unlikely to occur. As a result, K–12 institutions, with the support of postsecondary institutions, should consider ways to bolster career education in high school by expanding college and career exploration opportunities in the classroom.

One such way is to provide instruction to both pre-service and in-service teachers on how to incorporate college and career exploration opportunities into existing course content. Furthermore, teachers should be offered more professional development opportunities that focus on how to best support their students (and families) through the college search and career exploration process (Brand, Valent, and Browning 2013). College and university faculty and staff can play an important role in providing these professional development opportunities for teachers.

Effective college and career counseling also requires students and their families to have access to meaningful and interpretable data about postsecondary education and the labor market. Students and their families need access to comprehensive job outlook and salary data, information on how specific majors and degrees prepare individuals for certain careers, the associated educational costs of specific programs, and available financial aid. Much of these data already exist—across multiple sources—but can be difficult for students and families both to locate and to interpret.

A promising initiative out of the University of Texas (UT) System—SeekUT—provides students and their families with a comprehensive and free online tool that allows students to explore salary and student debt information of UT system graduates by program of study. SeekUT connects data from the Census Bureau, Texas Higher Education Coordinating Board, Texas Workforce Commission, Bureau of Labor Statistics, and National Student Clearinghouse to provide data on over 300,000 UT system graduates across 300 degree majors at the bachelor’s, master’s, doctoral, and professional levels. As a part of the launch of SeekUT, the UT system has provided resources, including training to high school counselors on how to help students and their families use the tool and make meaning from the data it contains. These kinds of institutionally driven partnerships are vital. More state systems of higher education should consider building tools like SeekUT and should expand them to include outcomes for associate degree completers. These kinds of tools can play a significant role in helping students and their families fully consider their education and career options. For more information on SeekUT, see Huie (2018).

Finally, community colleges and universities can help promote education and career exploration by providing opportunities for high school students to visit local campuses, engage with advising staff and faculty, and learn more about specific academic programs prior to enrollment. These kinds of short-term pre-enrollment programs can help students begin identifying potential careers and programs of study well before high school graduation. Furthermore, dual enrollment programs and early college programs—those that allow high school students to earn college credits and/or graduate with both their diploma and an associate degree—are examples of excellent community college/high school partnerships that can help promote both high school and associate degree completion. For more information on dual enrollment and early college programs see Zinth (2016) and Zinth and Barnett (2018).



## Implement new academic and student support models to increase completion rates at community colleges.

In order for students to maximize the benefits of higher education, they need to complete their programs of study. However, currently too few students who begin higher education in a community college go on to earn any degree. In order to increase completion rates, community colleges throughout the country are reviewing their practices and implementing new interventions. These interventions include establishing better defined and more structured pathways toward majors and degrees, incentivizing full-time enrollment, reforming developmental education, and implementing comprehensive academic and career advising practices that rely on real-time student data. Two promising examples of impactful interventions—those that more community colleges should consider adopting—are presented below.

The Guided Pathways model is a comprehensive framework that encourages community colleges to adjust their policies, practices, and overall organizational structures in order to help students more quickly select a program of study and more clearly understand the steps required in meeting their educational goals. As Jenkins, Lahr, Fink, and Ganga (2018) of the Community College Research Center put it, “At their core, Guided Pathways reforms involve clearly mapping programs

to specify course sequences, progress milestones, and program learning outcomes so that students know what they need to do to prepare for a career and further education and training in their field of interest” (1). Reports from institutions that have implemented Guided Pathways have shown students are completing more credits earlier in their enrollment and are graduating at higher rates (Bailey et al. 2015; Jenkins et al. 2018).

The Accelerated Study in Associate Programs (ASAP) at the City University of New York (CUNY) provides students with a wide range of financial, academic, and personal support services to aid in their persistence and completion. A hallmark of ASAP is the requirement for students to maintain continuous full-time enrollment and regularly engage in comprehensive and personalized academic and career advising systems. ASAP also provides tuition waivers to students whose financial aid did not fully cover their needs. The program also provides textbook vouchers, transit cards, and opportunities to take classes with other ASAP students in blocks of time that accommodate work schedules. Early evaluations of CUNY’s ASAP have shown it to be very successful in increasing completion rates, particularly those of low-income students with developmental education needs. Scrivener et al. (2015) found students in the program completed their associate degree at nearly twice the rate of students in the control group—40 percent and 22 percent, respectively.

## Conclusion

Completing an associate degree brings substantial individual and public benefits. Highlighting these benefits is a key to encouraging students of all backgrounds to attain associate or other postsecondary degrees. Approximately 9 million, or 40 percent, of all undergraduates are enrolled in community colleges across the United States (Ginder, Kelly-Reid, and Mann 2017). During the 2016–17 academic year alone, these institutions awarded more than 833,000 associate degrees and nearly 534,000 certificates (AACC 2018). Community colleges must continue to be at the forefront of ensuring students, especially those who have been most disadvantaged, can access the benefits of a college education. State and federal policymakers must ensure these institutions receive adequate financial support to fulfill their mission.

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## Appendix: Methods

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Data for this study came from the Education Longitudinal Study of 2002 (ELS), a nationally representative study of 10th grade students in 2002. The sample was generated by randomly selecting 10th grade students from more than 700 randomly selected high schools across the United States, generating an initial sample of approximately 16,200 students. In addition to the original baseline data collected in 2002, data were collected in 2004, 2006, 2012, and postsecondary transcript data were collected in 2014. While it is important to note that this data is not a representative sample of all community college students, ELS provides the most recent and complete data for researchers interested in exploring the connections between high school and other pre-college factors and postsecondary persistence and degree completion.

The purpose of this study was to compare the economic and social outcomes of students who attain an associate degree compared to individuals who had no postsecondary enrollment history after high school. To form the initial sample, I first identified all individuals who had responded to ELS's third and final follow-up (n = 13,250). The third follow-up interviews were conducted between 2012 and 2013 and collected final information on outcomes, including those of interest in this study, eight years after the modal year of high school graduation. I then further restricted the sample to include only individuals who either 1) earned an associate degree as their highest award by the date of their third follow-up interview (postsecondary transcripts were used to verify associate degree attainment) or 2) had no record of postsecondary enrollment. This resulted in a sample of 2,680 (n =

2,680) where 830 individuals had earned an associate degree and 1,850 individuals had no record of postsecondary enrollment.

To address the outcomes of interest—employment status, wages, homeownership, voting rates, and volunteerism—five dependent variables were constructed using students' self-reported answers to the third follow-up interview. Employment status measured whether the individual was employed full time or part time compared to being unemployed or out of the labor force. Wages measured an employed individual's standardized hourly wage across all current jobs. Homeownership measured whether an individual owned a home outright or was paying down a home mortgage loan compared to individuals who were renting or had other living arrangements. Voting behavior measured whether an individual cast a ballot in a local, state, and or federal election between 2008 and 2011 compared to individuals who reported having not voted in any of those elections. Finally, volunteerism measured whether an individual had reported volunteering some amount of their time in the two years previous to their third follow-up interview.

Two statistical techniques were used to test the relationship between the independent variables and the outcomes of interest. For the models exploring employment status, homeownership, voting rates, and volunteerism, probit regression analysis was used. Probit regression analysis was used to explore the relationships between the independent variables and the dichotomous outcome variables. Probit analysis relies on the probit link—the inverse of the cumulative distribution function of the standard normal distribution—to transform probabilities to the standard normal variable.

Conceptually, the probit regression equation is represented by:

$$\Phi^{-1}(\pi_i) = \beta_0 + x_i \beta_i + \varepsilon_i$$

Where is the probit link function, represented by:

$$\Phi(z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}t^2} dt.$$

Because of the probit link function, estimation results are interpreted as a one unit change in  $x_i$  results in a  $\beta_i$  change in the z-score of the outcome  $\Phi^{-1}(\pi_i)$  or the probability of the outcome occurring (i.e., being employed vs. not, owning a home vs. not, voting vs. not, and volunteering vs. not). However, changes in z-score are hardly accessible effects to interpret. Rather, the results of probit regression are often presented in terms of marginal effects. Marginal effects are the change in probability as a function of a change in an explanatory variable, holding other

explanatory variables constant. The results presented in the brief were converted to marginal effects.

Standard linear regression was used for the model exploring wages. Linear regression is used to measure the relationship between a series of independent or control variables and a continuous outcome. Because the wage variable was highly skewed, I transformed the variable by calculating its natural logarithm. The linear regression model estimated in this research is called a log-linear model and takes the following form:

$$\ln(Y_i) = \beta_0 + \beta_1 X_{1-j} + \beta_2 X_{2-j} + \dots + \beta_j X_{j-j} + \epsilon_i$$

Where  $\ln(Y_i)$  is the predicted value on the dependent variable (i.e., the natural logarithm of wages),  $\beta_0$  is the intercept,  $X_{1-j}$  represent the independent variables (e.g., education level, sex, race, employment sector, etc.),  $\beta_{1-j}$  represent coefficients assigned to the independent variables during regression, and  $\epsilon_i$  represents the error term. The coefficients ( $\beta_{1-j}$ ) in this log-linear model explain the approximate percent change in outcome variable  $\ln(Y_i)$  given a one-unit change in an independent variable ( $X_{1-j}$ ), holding all other independent variables constant. However, as the absolute value of the coefficients  $\beta_{1-j}$  increase, the precision of the approximate percent change in the outcome variable ( $Y_i$ ) decreases. To ensure more precise results, I transformed the coefficients presented in Table 4 using the following equation:

$$\% \text{ effect} = \exp(\beta_{1-j}) - 1$$

Finally, it is important to note that the results of the models suggest correlation between outcomes and associate degree attainment and do not necessarily imply causation. Additional research will be needed to isolate the causal effects associate degree completion has on economic and social outcomes. Appendix Table A1 contains definitions for all variables used in this study. Descriptive statistics are presented in Table A2.

Table A1. Variable Definitions

Employment Status	1 = Employed either full time or part time.
	0 = Unemployed or out of the labor force.
Hourly Wages	A continuous variable which measured an individual's earnings at their current job, standardized to dollars per hour.
Homeownership	1 = Owned a home or was paying a mortgage towards a home.
	0 = Did not own a home, was not paying a mortgage towards a home.
Voting Rate	1 = Voted in a local, state, or federal election between 2008 and 2011.
	0 = Did not vote in a local, state, or federal election between 2008 and 2011.
Volunteerism	1 = Performed unpaid volunteer work during the last two years.
	0 = Did not perform unpaid volunteer work during the last two years.
Associate Degree	1 = Earned an associate degree as highest award by the date of third follow-up interview (postsecondary transcripts where used to verify associate degree attainment).
	0 = No record of postsecondary enrollment.
Sex	1 = Female
	0 = Male
African American	1 = African American
	0 = Not African American
Asian/Pacific Islander	1 = Asian/Pacific Islander
	0 = Not Asian/Pacific Islander
Hispanic	1 = Hispanic
	0 = Not Hispanic
Other/Multiple Races	1 = Other/Multiple Races (Including American Indian)
	0 = Not Other/Multiple Races
White	1 = White
	0 = Not White
Socioeconomic Status	A standardized composite measure of a respondent's families' socioeconomic status. This composite metric is based on five equally weighted components: father's education, mother's education, family income, father's occupation, and mother's occupation.
Parental Education	1 = Neither parent had attained a college degree.
	0 = At least one parent had earned an associate degree or higher.
HS GPA	Cumulative grade point average earned for all courses in grades 9-12 on a four-point scale.
Employment Sector: Business	1 = Respondent's current job was classified as a management, business and financial operations, or sales occupation using Occupational Information Network codes.
	0 = Respondent's current job was classified as another occupation.

Employment Sector: Manufacturing/Construction	1 = Respondent's current job was classified as a construction, installation, maintenance, and repair, production, transportation and material moving, building and grounds cleaning and maintenance, or farming, fishing, and forestry occupation using Occupational Information Network codes.
	0 = Respondent's current job was classified as another occupation.
Employment Sector: Office/Administration	1 = Respondent's current job was classified as an office and administrative support occupation using Occupational Information Network codes.
	0 = Respondent's current job was classified as another occupation.
Employment Sector: Legal/Protective Services	1 = Respondent's current job was classified as legal, protective service, or military specific occupation using Occupational Information Network codes.
	0 = Respondent's current job was classified as another occupation.
Employment Sector: Science/Social Science	1 = Respondent's current job was classified as a computer and mathematical, life, physical, and social science, or architecture and engineering occupation using Occupational Information Network codes.
	0 = Respondent's current job was classified as another occupation.
Employment Sector: Education/Community Services	1 = Respondent's current job was classified as an education, training, and library or community and social services occupation using Occupational Information Network codes.
	0 = Respondent's current job was classified as another occupation.
Employment Sector: Food Services	1 = Respondent's current job was classified as food preparation and serving related occupation using Occupational Information Network codes.
	0 = Respondent's current job was classified as another occupation.
Employment Sector: Personal Care	1 = Respondent's current job was classified as a personal care and service occupation using Occupational Information Network codes.
	0 = Respondent's current job was classified as another occupation.
Employment Sector: Art/Design	1 = Respondent's current job was classified as an arts, design, entertainment, sports, and media occupation using Occupational Information Network codes.
	0 = Respondent's current job was classified as another occupation.
Employment Sector: Healthcare	1 = Respondent's current job was classified as a healthcare practitioner or technical or healthcare support occupation using Occupational Information Network codes.
	0 = Respondent's current job was classified as another occupation.
Marital Status	1 = Respondent was married at the time of the third follow-up interview.
	0 = Respondent was not married at the time of the third follow-up interview.
Children	1 = Respondent had at least one biological or adopted child at the time of the third follow-up interview.
	0 = Respondent had no children at the time of the third follow-up interview.

Midwest	1 = Respondent resided in the Midwest at the time of the third follow-up. Midwestern states were IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, and WI.
	0 = Respondent resided outside the Midwest at the time of the third follow-up.
West	1 = Respondent resided in the West at the time of the third follow-up. Western states were AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, and WY.
	0 = Respondent resided outside the West at the time of the third follow-up.
South	1 = Respondent resided in the South at the time of the third follow-up. Southern states were AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, and WV.
	0 = Respondent resided outside the South at the time of the third follow-up.
Northeast	1 = Respondent resided in the Northeast at the time of the third follow-up. Northeastern states were CT, MA, ME, NH, NJ, NY, PA, RI, and VT.
	0 = Respondent resided outside the Northeast at the time of the third follow-up.
Time in Job	The amount of time (in months) the respondent was employed at their current job measured from the date of employment to the time of their third follow-up interview.

Table A2. Descriptive Statistics

	Employment Status	Wages	Home Ownership	Voting Rates	Volunteerism
	Mean	Mean	Mean	Mean	Mean
	(SD)	(SD)	(SD)	(SD)	(SD)
Employment Status	0.768	---		0.765	0.764
	(0.011)	---		(0.010)	(0.010)
Log Hourly Wages	---	2.572	---	---	---
	---	(0.014)	---	---	---
Homeownership	---	---	0.213	0.213	0.214
	---	---	(0.010)	(0.010)	(0.010)
Voting Rate	---	---	---	0.505	---
	---	---	---	(0.012)	---
Volunteerism	---	---	---	---	0.255
	---	---	---	---	(0.010)
Associate Degree	0.33	0.364	0.315	0.316	0.315
	(0.012)	(0.014)	(0.011)	(0.011)	(0.011)
Sex	0.453	0.404	0.444	0.446	0.445
	(0.013)	(0.014)	(0.012)	(0.012)	(0.012)
African American	0.137	0.124	0.144	0.144	0.144
	(0.009)	(0.010)	(0.009)	(0.009)	(0.009)
Asian/Pacific Islander	0.024	0.025	0.024	0.024	0.023
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Other/Multiple Races	0.073	0.065	0.071	0.071	0.071
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)
Hispanic	0.19	0.181	0.194	0.193	0.194
	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)
White	0.575	0.604	0.568	0.569	0.568
	(0.012)	(0.014)	(0.012)	(0.012)	(0.012)
Socioeconomic Status	-0.303	-0.269	-0.309	-0.308	-0.310
	(0.015)	(0.018)	(0.015)	(0.015)	(0.015)
Parental Education	0.660	0.650	0.662	0.661	0.662
	(0.012)	(0.014)	(0.011)	(0.012)	(0.011)
HS GPA	2.314	2.364	---	---	---
	(0.019)	(0.022)	---	---	---
Employment Sector: Business	---	0.190	---	---	---
	---	(0.012)	---	---	---
Employment Sector: Manufacturing/ Construction	---	0.341	---	---	---
	---	(0.014)	---	---	---
Employment Sector: Office/ Administration	---	0.137	---	---	---
	---	(0.010)	---	---	---
Employment Sector: Legal/Protective Services	---	0.041	---	---	---
	---	(0.006)	---	---	---



Employment Sector: Science/Social Science	---	0.026	---	---	---
	---	(0.005)	---	---	---
Employment Sector: Education/Community Services	---	0.032	---	---	---
	---	(0.005)	---	---	---
Employment Sector: Food Services	---	0.086	---	---	---
	---	(0.009)	---	---	---
Employment Sector: Personal Care	---	0.036	---	---	---
	---	(0.006)	---	---	---
Employment Sector: Art/Design	---	0.014	---	---	---
	---	(0.003)	---	---	---
Employment Sector: Healthcare	---	0.097	---	---	---
	---	(0.008)	---	---	---
Marital Status	0.306	0.316	---	0.298	0.298
	(0.011)	(0.014)	---	(0.011)	(0.011)
Children	0.479	0.452	0.481	0.482	0.482
	(0.013)	(0.015)	(0.012)	(0.012)	(0.012)
Midwest	0.222	0.229	0.215	0.215	0.215
	(0.101)	(0.012)	(0.010)	(0.010)	(0.010)
West	0.248	0.231	0.237	0.237	0.237
	(0.012)	(0.013)	(0.011)	(0.011)	(0.011)
South	0.382	0.384	0.388	0.388	0.388
	(0.012)	(0.014)	(0.012)	(0.012)	(0.012)
Northeast	0.148	0.157	0.160	0.160	0.160
	(0.009)	(0.011)	(0.009)	(0.009)	(0.009)
Time in Job	---	37.352	---	---	---
	---	(0.979)	---	---	---
n =	2,050	1,500	2,250	2,230	2,240

*Per the Institute of Education Sciences guidelines, all unweighted sample sizes were rounded to the nearest 10.*



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