BENEFIT-COST ANALYSIS OF ACCELERATED STUDY IN ASSOCIATE PROGRAMS (ASAP) OF THE CITY UNIVERSITY OF NEW YORK (CUNY)

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ABSTRACT

This study evaluates CUNY's Accelerated Study in Associate Programs (ASAP) from a benefit-cost perspective. ASAP is designed to accelerate degree completion within three years at community colleges. This report builds on the CUNY evaluations of ASAP, which provide consistent evidence for the dramatic success of ASAP on increasing the timely completion of associate degrees. Although ASAP requires more resources per student than the traditional associate program, the cost per graduate was found to be lower because of its much higher effectiveness in producing graduates.

The benefit-cost analysis of ASAP enables us to calculate the monetary costs and benefits of this intervention with particular emphasis on the financial returns to the taxpayer. We estimate the benefits arising from higher tax revenues and lower costs of spending on public health, criminal justice, and public assistance and compare them with the required investment for ASAP. The estimates show that there are large financial returns on ASAP investment for the taxpayer and for the students in the program. In all cases, the benefits exceeded the costs. For each dollar of investment in ASAP by taxpayers, the return was between three and four dollars and around twelve dollars for each dollar invested by the individuals, suggesting that ASAP is a very productive public and private investment. When applied to the much higher ability of ASAP to produce high graduation rates, the overall returns to the taxpayer are impressive. A cohort of 1,000 students enrolled in ASAP would generate fiscal benefits for the taxpayer of more than $46 million beyond those of investing an approximately equal amount in the conventional degree program. This is a very substantial monetary return for this educational intervention.

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EXECUTIVE SUMMARY

In 2009 more than 7.5 million students were attending community colleges in the U.S. (Bureau of the Census, U.S. Department of Commerce 2012), however, only about 22 percent of students who enrolled in community colleges completed an associate degree within three years (Snider & Dillow 2011), and completion rates were even lower in urban institutions. A separate analysis of a national database by the CUNY Office of Institutional Research and Assessment (OIRA) has found that only 16 percent of students at urban community colleges graduate within three years.

In recognition of this challenge, the City University of New York (CUNY) established a comprehensive program to assist students to complete their associate degrees with support from the New York City Center for Economic Opportunity (CEO). This program, known as Accelerated Study in Associate Programs (ASAP), aims to graduate at least "…50 percent of students within three years through provision of comprehensive support services and financial resources that remove barriers to full-time study, build student resiliency, and support degree completion" (Linderman & Kolenovic 2012: 9).

The results have been immediate and impressive; ASAP has more than doubled the number of associate degrees in three-years compared with the results of a matched group of similar students who did not benefit from ASAP services. The program has been considerably more effective at graduating students than conventional community college experiences. But, given the fact that ASAP requires additional financial resources, two questions arise: 1) Is ASAP more cost effective than the conventional approach? and 2) Does the investment return greater benefits to the taxpayer than its costs?

In a previous cost-effectiveness study[1] we asked whether the larger number of graduates is sufficient to compensate for the additional resource costs (Levin & Garcia, 2012). In that study, we compared the institutional costs per associate degree completion of students in ASAP with that of a comparison group of similar students who did not participate in ASAP. This comparison revealed that the cost per three-year graduate with an associate degree was actually **lower** for ASAP than for the comparison group. Although the program costs per student were greater, the increase in the number of three-year graduates was so substantial that the cost per completed degree for ASAP students was about $6,500 less than for the comparison group.

The report that follows evaluates the returns on the investment in ASAP by comparing the value of monetary benefits to taxpayers and students relative to the monetary costs that each constituency pays. Benefit-cost analysis enables us to ascertain whether an investment in ASAP is "worth it" in terms of benefits exceeding costs. In the case of improving educational success, there are obvious benefits to the student in terms of better employment and job opportunities and improved options for further education, as well as better health, greater knowledge, and the

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[1] http://www.cuny.edu/academics/programs/notable/asap/about/evaluation/Levin-ASAP-Cost-Effectiveness-Report.pdf

ability to learn new things. There are also benefits to the taxpayers who pay much of the cost of investment in education. By increasing the numbers and quality of educated persons, society gains from higher economic productivity and income, as well as greater technological advance and inventive activity. Government and taxpayers also experience fiscal benefits in higher tax revenues and lower demand for and costs for spending on public health, criminal justice, and public assistance (Belfield & Levin 2007a). This report compares the benefits and costs of the additional associate degrees produced by ASAP to ascertain if the benefits exceed costs and to estimate the magnitude of those differences. That is, we focus specifically on whether taxpayer investments in producing additional associate degrees at CUNY community colleges through ASAP will produce taxpayer benefits that are equivalent or greater. The basic method draws upon traditional analysis of investment in human capital (Becker 1964), which was first applied to specific educational policies by Levin (1972) to calculate the benefits of specific educational interventions relative to their costs.

Benefits of Associate Degree Completion

We calculate the benefits of completing an associate degree for the student and the taxpayer by considering the benefits of higher earnings; income tax contributions, property taxes, sales taxes, local income taxes, and the reduced costs of public services for crime, public health, and public assistance.

Summary of Student Benefits

Table ES1 shows the present value[2] of lifetime earnings for high school and associate degree recipients by gender and race. The average for the overall group is based upon the overall composition of the New York City population, on the premise that CUNY community college enrollments should ultimately be ethnically similar to the city. The advantage in present value of lifetime earnings for the associate degree over high school completion is substantial, varying from about $310 thousand to about $362 thousand, depending upon the group. This is a substantial lifetime premium for an associate degree. Present value in this table can be thought of as the equivalent of a certificate of deposit (CD) that pays 3.5 percent a year in interest over a lifetime.

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[2] For specific details, see detailed information in the report (Levin & Garcia, 2013).

Table ES1: Lifetime Earnings by Educational Attainment. Breakdown by Gender, and Ethnicity (Present Value at Age 23 at 3.5 Percent Discount Rate), 2008-10

	HS	Associate	Associate minus HS
Total	**640,330**	**964,472**	**324,142**
Male	790,064	1,128,983	338,919
Female	485,903	848,132	362,229
White	792,455	1,128,714	336,260
Black	616,739	926,892	310,153
Hispanic	566,767	869,654	302,887
Other	532,962	857,746	324,784

Source: Authors' calculations based on American Community Survey (ACS) 2008-2010. Productivity increase per year: 1.5 percent. In constant 2010 dollars.

Summary of Taxpayer Benefits

Table ES2 provides a summary of the direct fiscal benefits to the taxpayer for producing an additional associate degree. Most of the benefits are generated from the additional tax revenues of associate degree recipients, amounting to a present value at age 23 of about $165,000 (or 80 percent). However, there are also substantial benefits from reduced costs of public health, public assistance and criminal justice, amounting to about $40,000 (or 20 percent). Overall, each additional associate degree provides fiscal benefits to the taxpayer of $205,000 in present value of lifetime benefits at age 23, the equivalent of giving a gift of a certificate of deposit to taxpayers of this amount. That is, the achievement of an associate degree by high school completers provides considerable relief to taxpayers in higher tax revenues and lower public spending over the lifetime of the associate degree recipient.

Table ES2: Generation of Total Fiscal Benefits to the Taxpayer per Degree (Present Value of Lifetime Benefits at Age 23)

	Per Additional Associate Degree
Total Public Benefits	**$205,514**
Tax revenues from income[a]	$145,567
Property and sales taxes	$19,833
Savings-health expenditures-public[b]	$5,026
Savings-Welfare and public assistance	$5,956
Savings-Criminal Justice	$29,132

Note: a: Includes Federal, State, FICA, and City Income taxes; b: Includes Medicare, Medicaid, VA, TRICARE, Other Federal, State, and Local Sources, and Other Public. For specific sources of information, see detailed information in the report (Levin & Garcia, 2013). In constant 2010 dollars.

Net Benefits of Associate Degree Completion

Net Benefits of ASAP for the Taxpayer

Although there are considerable benefits to the taxpayer from this investment, it is important to deduct the investment cost to produce an associate degree. There are two ways to express this comparison. The first is to subtract the cost of the taxpayer investment for increasing the number of associate degree holders from the taxpayer benefits produced by the additional associate recipients. Do the benefits exceed the costs, and by how much? A second way is to establish the ratio of benefits to costs to ascertain the dollar return in benefits for each dollar of costs. Table ES3 shows the net benefits to the taxpayer after costs are accounted for, as well as benefit-cost ratios.

Table ES3: Benefits to Cost Comparisons for the Taxpayer: Total Institutional Costs versus Direct Benefits

	Benefits per Additional Degree (Taxpayer)	Institutional Cost per Graduate (Taxpayer)	Benefits Minus Costs (Net Benefits) (Taxpayer)	Benefit/Cost Ratio (Taxpayer)
Fall 2006 Comparison Group	$205,514	$65,884	$139,630	3.1
Fall 2007 ASAP Cohort	$205,514	$59,302	$146,212	3.5

In constant 2010 dollars.

The impressive return to the public investment for each graduate, does not take account of the massive increase in graduate completion of ASAP. ASAP has a three-year graduation rate of almost 55 percent, in contrast to only about 24 percent for the traditional program. If 1,000 students enter the traditional program, about 241 would be expected to graduate in three years. If 1,000 students enter the ASAP program, we would expect more than twice as many, about 549, to graduate. As shown in table ES4, the total net benefits associated with the initial enrollment of 1,000 students in ASAP are about $46,000,000 higher than the net benefits associated with a similar initial enrollment for the comparison group.

Table ES4: Net Present Value of the Taxpayer Investment for 1,000 ASAP Enrollees versus 1,000 Traditional Students

	Enrollees	Graduates per 1,000 Enrollees	Net Benefits per Graduate	Total Net Benefits per 1,000 Enrollees
Comparison Group	1,000	241.2	$139,630	$33,678,756
ASAP Cohort	1,000	548.6	$146,212	$80,211,903
Difference (ASAP-Comparison)			*$6,582*	*$46,533,147*

In constant 2010 dollars.

Total net benefit associated with actual current 2012/13 CUNY ASAP enrollment (2,200 students), is estimated to be $102,000,000 over and above a similar comparison group enrollment. This is a sizable advantage in the impact in favor of ASAP, as well as providing considerably higher efficiency in assisting community college students to complete their studies, a winning strategy for students, taxpayers, and CUNY.

Net Benefits of ASAP for the Students

The total direct benefit to the associate graduate in terms of additional income beyond that of a high school graduate is shown in table ES5. These incremental income gains are calculated after the student pays income taxes on gross earnings differences. The income gains minus costs paid by the student, including lost earnings while studying, are about $138,000 for each additional graduate in the comparison group, and about $146,000 for each additional graduate in ASAP. The benefit to cost ratio for the associate recipient is 7.6 for each additional graduate in the comparison group and 12.2 for each additional ASAP graduate. Another way of stating the gains to the student beyond the costs paid (including foregone earnings for three years) is that the income advantage of an associate degree beyond high school completion is the equivalent of being given a certificate of deposit of about $140,000 net of taxes. This provides a powerful incentive for students to undertake an associate degree at CUNY.

Table ES5: Net Benefits for the Student: Total Student Costs versus Benefits

	After-tax Income Benefits per Degree (Student)	Total Cost per Degree (Student)	Benefits minus Costs (Net Benefits) (Student)	Benefit/Cost Ratio (Student)
Fall 2006 Comparison Group	$158,742	$20,996	$137,746	7.6
Fall 2007 ASAP Group	$158,742	$13,062	$145,680	12.2

In constant 2010 dollars.

A Highly Productive Investment

From the comparison of benefits over a lifetime we can conclude that, for both taxpayer and students, the benefits far exceed the investment costs. For each dollar of investment in ASAP by taxpayers, the return was between three and four dollars. For each dollar of investment by students, the return was much more, even when including student foregone earnings as the major component of student costs. Using available data on which public constituencies receive the benefits—federal, New York State, and New York City governments, we believe that all constituencies receive benefits that exceed their cost contributions to the investment.

From a policy perspective, the full magnitude of the returns to the taxpayer must take account of the superior effectiveness of ASAP in comparison with the conventional program. When converted into overall benefits generated by the 1,000 enrollees, the considerably higher productivity of ASAP in producing associate degrees would provide fiscal benefits to the taxpayers of $46 million dollars beyond those of investing an approximately equal amount in the conventional degree program.

Not only is ASAP less costly per additional graduate and twice as effective in the production of associate degrees, but from the perspective of both taxpayer and student, the benefits generated by ASAP represent a very productive public investment with a high monetary return. Needless to say, this powerful public investment is buttressed further by the other substantial educational contributions and success that cannot be assessed in monetary terms.

INTRODUCTION

In 2009 more than 7.5 million students were attending community colleges in the U.S. (Bureau of the Census, U.S. Department of Commerce 2012). These institutions provide opportunities for entry into higher education because of their geographic accessibility, adaptability to student and employer educational needs, transfer route to four-year institutions, and flexibility in scheduling and composition of courses. The reality, however, is that relatively few students complete the 60-credit course of study to obtain the associate degree. According to the U.S. Department of Education, only about 22 percent of students who enroll in community colleges complete an associate degree three years later (Snider & Dillow 2011) and completion rates are even lower in urban institutions.[3]

In recognition of this challenge, the City University of New York (CUNY) established a comprehensive program to assist students to complete their associate degrees with support from the New York City Center for Economic Opportunity (CEO). This program became known as Accelerated Study in Associate Programs (ASAP) and is designed to increase dramatically the number of students who complete an associate degree in a timely manner (Linderman & Kolenovic 2012).

The goal of ASAP is to graduate at least "…50 percent of students within three years through provision of comprehensive support services and financial resources that remove barriers to full-time study, build student resiliency, and support degree completion" (Linderman & Kolenovic 2012: 9). When ASAP began in 2007, the three-year CUNY community college graduation rate was 24 percent for fully skills proficient students, based on CUNY analysis of student-level data from the CUNY Institutional Research Database (IRDB),[4] and 13 percent for all first-time full-time community college students who entered in fall 2004 regardless of skills proficiency (CUNY Office of Institutional Research and Assessment, 2012).

ASAP was established at CUNY's six community colleges:[5] Borough of Manhattan Community College (BMCC), Bronx, Hostos, Kingsborough, LaGuardia, and Queensborough, and uses a common and comprehensive design to overcome the obstacles to timely degree completion. To counter these obstacles, the program enlists a variety of interconnected supports (Linderman & Kolenovic 2012:10-11).

1. <u>Financial Incentives</u>: Any gap between a student's financial aid award and tuition and fees is waived, and all students receive free monthly transit Metrocards and free use of textbooks.

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[3] CUNY Office of Institutional Research and Assessment (OIRA) analysis of data from Integrated Postsecondary Education Data System (IPEDS) reveals that nationally only 16 percent of urban community college students graduate within three years.
[4] The CUNY IRDB is the official source for all CUNY student-level data and is maintained by the Office of Institutional Research and Assessment (OIRA).
[5] CUNY opened a seventh community college, the New Community College (NCC) in fall 2012. NCC incorporates many elements of ASAP into its design.

2. <u>Consolidated Full-time Schedule</u>: Classes are clustered into a consolidated schedule (either morning or afternoon) to help balance school, work, and domestic responsibilities, and students are required to take at least 12 units each semester.

3. <u>Cohort Design and Faculty Support</u>: Students are grouped in cohorts with ASAP students by major; in their first year, they take several "blocked" classes with fellow ASAP students that are capped at 25 students.

4. <u>Regular Advisement</u>: ASAP students meet with advisors monthly for provision of academic, social, and interpersonal support. Students also participate in a weekly seminar for two semesters.

5. <u>Career Preparation</u>: ASAP career and employment specialists meet with students for career assessment, discussion of job skill requirements, career planning, and interview preparation. They also support students with any immediate job placement needs.

6. <u>Extra Academic Assistance</u>: Tutoring is provided for struggling students. These services are mandatory for students with outstanding developmental needs, those who have experienced course failure, or those identified as struggling by faculty members through referral to ASAP advisors.

Careful assessment of ASAP has provided evidence of its early promise with over half of its initial cohort of 1,132 students who started community college in the fall of 2007 having earned an associate degree three years later, in comparison with only about a quarter of a matched comparison group of students who did not benefit from inclusion in ASAP (Linderman & Kolenovic 2012). The second ASAP cohort admitted in 2009 also realized a three-year graduation rate of 55 percent vs. 23 percent for a comparison group of similar students (Linderman, 2012). These evaluations were accomplished by matching ASAP students with a statistically similar group in terms of demographic characteristics, academic major, and educational preparedness. Other evaluations are also underway using different methodologies—for example, an experimental study using random assignment to ASAP, being led by MDRC.[6]

ASAP has been shown to more than double the number of graduates in a three-year comparison with similar students who did not benefit from ASAP services. Although the program is more effective than the conventional community college pathways, the question arises as to whether it is more cost effective. Implementing ASAP requires additional costs to provide the extra services outlined above. In a previous cost-effectiveness study, we asked whether the larger number of graduates compensate for the additional resource costs (Levin & Garcia, 2012).

To undertake the cost-effectiveness analysis, we compared the institutional costs per associate degree completion of students in ASAP with that of a comparison group of similar students who did not participate in ASAP. This comparison revealed that the cost per three-year

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[6] A preliminary report from MDRC on the ASAP random assignment study can be found at:
http://www.mdrc.org/node/13229#featured_content

graduate with an associate degree was actually less for ASAP than for the comparison group. Although the program costs were greater, the increase in the number of three-year graduates was so substantial that the cost per completed degree for ASAP students was about $6,500 less than for the comparison group. This difference suggests that not only is ASAP more cost-effective than the conventional approach, but that CUNY could save about $6.5 million in producing another 1,000 graduates through ASAP.

Returns on Investment: A Benefit-Cost Analysis

Cost-effectiveness analyses address the relative costs among alternatives for achieving particular goals. In the case of increasing the numbers of three-year graduates in the community colleges of CUNY, this evaluation has shown that ASAP can double the number of graduates in a three-year period and do it at less cost per graduate than the conventional program without ASAP. Cost-effectiveness comparisons enable us to choose the most efficient approaches for achieving objectives, but they do not evaluate the returns to investing in a program like ASAP. They provide information that enables us to choose those approaches that accomplish a particular goal with the least resources.

In contrast, benefit-cost analyses enable us to ascertain whether a particular alternative is "worth it" by comparing the costs in monetary terms with the value of the benefits in monetary terms. In the case of improving educational success, there are obvious benefits to the student in terms of better employment and job opportunities and improved options for further education, as well as better health, greater knowledge, and the ability to learn new things. But there are also benefits to the taxpayers who pay much of the cost of investment in education. By increasing the numbers and quality of educated persons in society, the society gains from higher economic productivity and income, as well as greater technological advance and inventive activity. It also experiences fiscal benefits in higher tax revenues and lower demand for and costs for spending on public health, criminal justice, and public assistance (Belfield & Levin, 2007a).

This report compares the benefits and costs of additional associate degrees produced by ASAP to ascertain if the benefits exceed the costs and the magnitude of the differences. Although some reference will be made to the individual costs and benefits, the focus will be primarily on the fiscal costs and benefits to the taxpayer. That is, we will address whether taxpayer investments in producing additional associate degrees at CUNY community colleges through ASAP will produce taxpayer benefits that are equivalent or greater.

The basic method for making such benefit-cost calculations has been used in education since the early sixties when economists refined the method of analysis for investment in human capital (Becker 1964). Economists found that investments in education showed rates of return that were comparable or greater than those found for investments in physical capital-- that is, productive facilities and equipment, the traditional focus of investment. Although this literature referred largely to the "profitability" of individuals investing in further education, it extended to societal investments and the investment benefits to society of more education.

The first attempt to apply these methods to a benefit-cost analysis of taxpayer investment was conducted in 1972 with an analysis of the costs and benefits of reducing high school dropouts (Levin 1972). This study compared the costs of reducing dropouts with the benefits of increased income and tax revenues as well as reduced costs of public assistance, crime, and public health. The limited informational resources and statistical methods available forty years ago restricted the comprehensiveness and precision of benefit-cost estimates, but even with conservative assumptions it appeared that the benefits to the taxpayer of reducing high school dropouts exceeded the costs by at least two to one.

A more refined analysis was applied to an experimental study of a specific investment in early childhood education. Children at ages three and four from poor families were randomly assigned to an experimental group that received a quality, pre-school program or a control group that did not. At age 19 it was found that the pre-school recipients had greater educational success, lower crime rates, and greater employment prospects than the comparison group that had not been enrolled in the pre-school. A calculation of benefits to the taxpayer showed that for every dollar of investment cost, the benefits exceeded six dollars (Barnett 1985). The follow-up studies of the two groups at ages 27 and 40 confirmed even higher benefits (Belfield, Nores, Barnett & Schweinhart 2005).

Dramatic improvements in data sources and social science modeling of benefits have generated studies of benefits and costs of specific educational programs to reduce high school dropouts (Belfield & Levin 2007b). Five studies were selected from experimental and quasi-experimental evaluations that showed evidence of increasing graduation rates. The public costs of these programs were compared with the public benefits in terms of higher tax revenues and reductions in public costs of crime, health, and public assistance. All five programs showed benefits in excess of costs, with the median program among the five showing that fiscal benefits would exceed costs by $127,000 for each additional graduate over a lifetime when valued at age 20 (Levin, Belfield, Muennig, & Rouse 2007; Levin & Belfield 2007). Similar studies were carried out for states with similar results (e.g. Belfield & Levin 2007b).

Methods

The general approach used for measuring the benefits of education is first to identify the benefit categories and the evidence behind them. Then it is necessary to place values on benefits. In the case of completion of an associate degree the benefits are associated with greater adult success of the individual relative to what the individual would have experienced if he or she had terminated education at the end of high school. What we do know is that individuals with more education obtain higher earnings and pay greater taxes (Rouse 2007); experience better health and lower likelihood of drawing on government health services (Muennig 2007); are less likely to engage in crime and to enter the criminal justice system (Moretti 2007); and are less likely to require public assistance (Waldfogel, Garfinkel, & Kelly, 2007). All of these better outcomes provide benefits to society and the taxpayer by increasing public revenues and

reducing the costs of public services. It is this increase in public income and reduction in public costs that constitute many of the public benefits of additional educational attainment.

In the case of ASAP it would be expected that the additional associate degrees would produce benefits for the ASAP students as well as for the taxpayer. That is, more associate degrees translate into greater employment and higher income and tax revenues as well as lower costs for public health, crime, and public assistance. The value of these public benefits can be compared with the public costs to ascertain the return on taxpayer investment in ASAP.

Modeling Relationships

Of course, in each of these domains we want to estimate benefits independently of other possible influences that might be associated with more educated individuals. For example, it is well known that persons who undertake more education have family advantages and may have greater educational ability as well. This means that at least some of the additional income and other benefits of education might be due to associated advantages of the more educated, but are not uniquely education-induced. Economists have long been concerned with this potential upward bias in estimating the benefits of education, and have tested a range of methods to try to separate out the unique effects of education on adult benefits.

These methods have included statistical adjustments for family socioeconomic status and for an individual's test performance as well as the use of more sophisticated analytical models. The latter (see Rouse, 2007) include studies of identical twins with different amounts of education (but the same families and genes); studies of education and earnings of fraternal twins, siblings, and father-son pairings. They also use natural experiments to isolate the unique effects of education, where changes in laws impose more education on a group of students such as arbitrary increases in compulsory education. The findings from all of these methods suggest that the observed differences in earnings by educational level are not biased upwards because they are roughly offset by measurement errors in educational attainment that provide a downward bias (Rouse 2007). As much as possible we have tried to use estimates of effects based upon causal models from the academic literature rather than accepting mere correlation.

Data and Measurement

To a very high degree, CUNY's community college graduates remain in the New York metropolitan area and in New York City.[7] This creates an advantage to the City in capturing the benefits from more education, but a challenge for data collection by researchers. State and national studies on the consequences of additional education have access to considerable data on these larger entities. Both independent studies and government studies by the Department of Justice or the Department of Health and Human Services provide systematic information for the nation that link education to crime and to health respectively. But, systematic studies at local

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[7] This is discussed in the later section on community college graduates' mobility (see page 47).

levels are rare to non-existent. The exception is that of the relation between education and income and its yield of government tax revenues for which data are available from the U.S. Department of Commerce, and, particularly, the Bureau of the Census. In what follows, we will be drawing upon the best data sources available on each topic to predict the benefits to the taxpayer of CUNY ASAP's success in substantially increasing the timely completion of associate degrees.

Present Value

Present Values at Age 23

Both benefits and costs will be based upon comparing three-year associate degree recipients with those of high school completers who have not entered post-secondary education.[8] Data for partial completers of community college degrees are not available. Costs and benefits will be stated in terms of present values (PV) in 2010, which is the three-year graduation mark for students in the original ASAP cohort and the cohort that served as the basis of our study. It is important to explain PV and why it is used. If costs of additional education and its benefits were derived in a single year, they could be readily compared. But the costs and benefits of educational investment occur over different periods of time. For example, the three years of community college investment to obtain an associate degree necessitate a financial obligation prior to graduation and produce benefits following graduation. Benefits extend from completion of study over an entire lifetime. If the typical graduate is 23 years old[9], we are concerned with the cost of community college during the previous three years to age 23. Subsequently, the benefits of the additional education will typically be yielded between the ages of 23-65, a period of more than 40 years. All of the investment is concentrated early and "up-front," but the benefits are delayed and distributed over the next four decades after completion of the associate degree. We use PV because it allows us to account for a stream of benefits and costs in one simple figure.

The calculation of PV assumes that benefits received at present have more value than those that are received in the future. The normal way of valuing future benefits is to use a discount rate, reduce them by a rate of interest, to make them comparable to benefits received at present. For example, if you wanted to have $10,000 in 40 years in a lump sum, you would need to invest only about $2,500 today with a discount or interest rate of 3.5 percent. Another way of stating this is that $2,500 today is worth $10,000, 40 years from now. Present value simply takes account of the different time patterns of receipt and disbursement and puts them in comparable

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[8] We have made all comparisons of benefits and costs between high school graduates and associate degree graduates. We also attempted to undertake analyses comparing partial completers with associate degree recipients. Unfortunately, the data that exist for those with "some college" encompass a wide range of education from those who have taken a single course to those who have completed almost an entire bachelor's degree. Thus, they cannot be used to represent "partial completers" studying for the associate degree.

[9] The average age of a three year graduate would be 23 for ASAP based on a mean starting age of 20 (see Linderman and Kolenovic 2012 pg. 17).

terms so that they can be compared directly. By expressing benefits and costs in present values at age 23 in 2010, we will be able to use a comparable yardstick that adjusts for the very different time patterns in which the costs and benefits are incurred or received for an associate degree relative to high school completion. The present value of the costs can be subtracted from the present value of the benefits at a specific time to get "net present value," the net benefits that are produced by the investment.

Labor Markets

Since we will be estimating the income and tax revenue gains of associate graduates as one of the major benefits to degree recipients and the taxpayer, an obvious concern is the impact of more graduates on the labor market. If we add substantially to the supply of associate degrees, won't we reduce the returns to each one? This would certainly be a concern if the demand for associate degrees held constant while the supply increased significantly through the success of ASAP. In actuality, the overall trend in U.S. labor markets is in exactly the opposite direction, where the relative economic value of post-secondary education is rising in comparison with that of high school graduates. Empirical studies confirm that even with massive increases in community college graduates, the economic returns have not declined (Marcotte, Bailey, Borkowski, & Kienzl 2005). The general explanation is that changes in technology and work organization and the decline of manufacturing have increased the demand for post-secondary educational skills relative to lower levels of education. If anything, the use of existing data on earnings differences by education may understate the future benefits to the individual, taxpayer, and society of additional education.

COSTS OF THE CUNY ASSOCIATE DEGREE

As a first task, we establish the costs of producing a CUNY associate degree for both the comparison students representing the regular program and for the ASAP students to contrast costs with the later presentation of benefits that the degree produces for the individual, the taxpayer, and society. There are several ways that costs can be presented. As noted earlier, we could list the cost for each year incurred and the benefits for each year received, but this approach would compare amounts over very different time patterns which are not comparable. As described above, the standard approach is to state both costs and benefits as "present" values (PV) at a particular age or time, which enables a comparison that adjusts for the amount and time distribution of each. We will use age 23 as a typical age of completion of degree and estimate both the present value of the costs at that age and the value of benefits received when discounted to age 23.

Levin and Garcia (2012) estimated the costs of producing additional associate degrees within a three-year period for both the regular programs of CUNY and with the added support from ASAP. Although ASAP adds additional costs, it also increases the number of degree completions. The basic method of establishing costs was to first calculate for the ASAP group

the costs of their aggregate, full-time equivalent (FTE) enrollments over three years.[10] This was compared with the overall costs of full-time equivalent students (FTE) of the comparison group that had not received ASAP services. These costs were then divided by the respective numbers of associate degrees produced in each group over the three-year period to determine a cost per graduate. Even with the additional spending for ASAP services, the cost per graduate was less than for the comparison group because of the much higher yield of graduates, about 55 percent for ASAP and 25 percent for the comparison group.

Table 1 shows the total institutional cost per graduate expressed as present value (PV) in 2010 at age 23.[11] Although the cost per ASAP student is higher than for the traditional student because of the extra services, the institutional cost for each graduate is less for students in ASAP because of the considerably higher graduation rates for ASAP. How institutional costs are financed will be addressed in later sections, as well as student costs.

Table 1: Total Institutional Cost per Graduate

	Total Fall 2006 Comparison Group	Total Fall 2007 ASAP Group
Total Institutional Cost per Graduate	$65,884	$59,302

Notes: The total institutional cost per graduate is the capitalized average cost per graduate at age 23, in 2010 dollars (see Table 5, Levin & Garcia, 2012).

The overall institutional cost incurred by CUNY for each associate degree (expressed in terms of present value at age 23) is about $59,000 for the ASAP students and almost $66,000 for the comparison group. These amounts are slightly more than the totals in Levin and Garcia (2012) because an interest rate is used to calculate their present value to age 23, assuming that the typical graduate starts at about age 20 and finishes at age 23. These institutional costs do include some student costs in terms of tuition and fees. Students also may forego earnings during the period of study and pay for materials and other costs related to their education. We will focus the following section of analysis primarily on the cost and returns of the ASAP investment for the taxpayer. Essentially we will be comparing the institutional costs of conventional and ASAP students with the benefits generated for taxpayers. This is a conservative approach to the benefit-cost ratio since not all of the institutional costs are paid by the taxpayer, but a small portion is paid by the student. Thus, by assuming that all of the institutional costs are paid by the taxpayer, we will be understating the benefit-cost ratio because we will be assuming higher costs than the taxpayer actually pays.

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[10] Full-time equivalent students (FTE) are a commonly used measure for enrollments because instead of just counting students, they adjust for the number of credits of study undertaken by students so that part-time students are not given the same enrollment weights as full-time students.

[11] The present value represents the cumulative cost expressed in 2010 prices over the three years, presented as the present value of the investment at age 23. Present value cumulates the investment at an interest rate of 3.5 percent to get an overall value which can ultimately be compared with the discounted value of the benefits generated when the costs of the investment and the benefits are compared at age 23.

BENEFITS OF ASAP

It is important to note that although the costs differ between the two programs for producing an associate degree, the average benefits for a CUNY associate degree are assumed to be similar for the two groups since they have relatively similar educational requirements. The major difference educationally is that a far higher proportion of the non-ASAP students who start their programs reduce their participation sharply or drop-out, resulting in lower completion rates for the associate degree (also lower transfer to baccalaureate institutions (Linderman & Kolenovic 2012)). We will limit this analysis to the benefits of higher associate degree completion because we lack information on the eventual educational attainments of transfers.

From a cost perspective, the big advantage of ASAP is that even with added program costs per student, the cost per graduate is lower than the conventional program because the yield in terms of graduates is doubled. Thus, when we calculate the benefits of the associate degree to compare with the costs, we will assume that both ASAP and non-ASAP graduates generate the same benefits per degree, but the costs will be slightly different. We will also show that the higher yield of ASAP means that the aggregate benefits for any initial group of ASAP enrollees will exceed considerably the aggregate benefits for a similar number of enrollees who are not recipients of ASAP services.

As we noted earlier, there are many benefits of higher education that are identified in the literature, but not all can be measured and given monetary values. McMahon (2009) has provided one of the most comprehensive presentations and discussion of these benefits, but only a portion of these defy monetary quantification. The incomplete assessment of benefits gives a conservative estimate of the payoffs to the investment in ASAP because it includes only those that can be assessed monetarily, while costs are more readily defined and measured. Specific benefits of increased associate degree attainment that can be assessed sufficiently to determine their monetary values include:

1. The additional income reflecting higher productivity and trainability of an associate degree completer relative to a high school graduate, reflecting benefits to the student and to society.

2. The higher tax revenues derived from the additional income, reflecting fiscal benefits to the taxpayer.

3. The reduced costs of public services for crime, public health, and public assistance, reflecting fiscal benefits to the taxpayer.

4. Overall gains in productivity of other workers created by the presence of a more educated workforce.

In the following section we will focus on estimating the return on investment to the taxpayer in terms of higher taxes generated by the increase in associate degrees and the reduction in cost of public services associated with the additional education. These are the fiscal returns to

taxpayer investment through investment in ASAP. In the final section we will consider other benefits to both individuals and society.

Education, Income, and Tax Revenues

One of the most powerful and consistent findings in the economics of education is the measurable impact of additional education in producing additional economic opportunity for both the individual worker and society. Workers with more education are valued more highly in the workplace because they tend to be more proficient at jobs, benefit more from additional training, and make better and more productive decisions in the allocation of resources, including the use of their own time. Out of their higher income they pay greater taxes, which represent the source of the public share of investment in their education.

In this section we *compare* the income and tax contributions of individuals with an associate degree such as those who graduate within three years from ASAP with those who obtained high school completion or its equivalent.[12] We calculate the benefits for the individuals and the taxpayer along the following dimensions: earnings; income tax contributions, property taxes, sales taxes, and local income taxes. In the next section we will provide estimates of the reductions in public health expenditures, welfare support and public assistance, and criminal justice associated with associate degree completion. The procedure to compute the PV of the modeled relationships between educational attainment and these outcomes is explained in the earlier section on "Present Value."

Income Gains

The relationship between education and earnings has been largely documented in the empirical research (Angrist & Krueger, 1991 and 1999; Griliches, 1979; Ashenfelter & Rouse, 1998; Card, 1999; and Rouse, 2007). On average, individuals with higher educational levels have higher earnings. They are also more likely to be employed. Figure 1 and Table 2 show these associations between education and labor market outcomes for both males and females.

Figure 1 shows the average earnings[13] by years of schooling and gender for individuals in New York City, demonstrating the familiar finding that more years of education are associated

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[12] Educational attainment is defined, according to the American Community Survey (ACS) and Census information as:

      i)   High school graduate or GED; Regular high school diploma; GED or alternative credential (the acronym "HS" is used in tables and figures hereafter).

      ii)   Associate degree –type not specified, occupational program, academic program.

The classification is slightly different under MEPS-2008, utilized for the estimates of the health expenditures savings. A few data sources show income for those with "some college". Unfortunately the "some college" category is highly ambiguous and includes a wide range of educational attainments from a single post-secondary course to many years of study that did not culminate in a degree (the acronym "AA" is used in some figures hereafter).

[13] We will refer to earnings and income interchangeably. They are not identical. Earnings are derived from wages and salaries; income includes not only wages and salary, but also rents, dividends, and interest from property, etc. However, for high school and associate degree populations, the proportion of income from earnings is usually 95 percent or greater.

with higher average earnings. The relationship between education and income is particularly pronounced between 12 years of schooling and 14 years of schooling, the approximate difference between high school completers and associate degree recipients. Table 2 shows the labor market status of individuals by their educational attainment. The rates are shown separately by gender. At first glance it appears that employment and unemployment rates of high school completers and associate degree completers are about the same, but this comparison is misleading because it does not take account of the differences in labor force participation of the two groups. For associate degree holders in the 23-65 year old population, the associate degree recipients are 10 percentage points more likely to be in the labor force. This means that even with the same unemployment rates, a much higher proportion of the associate degree holders are employed, a partial explanation for their higher incomes.

Figure 1: Average Earnings and Years of Schooling, 2008-10

Years of Schooling (HS = 12; Associate= 14)
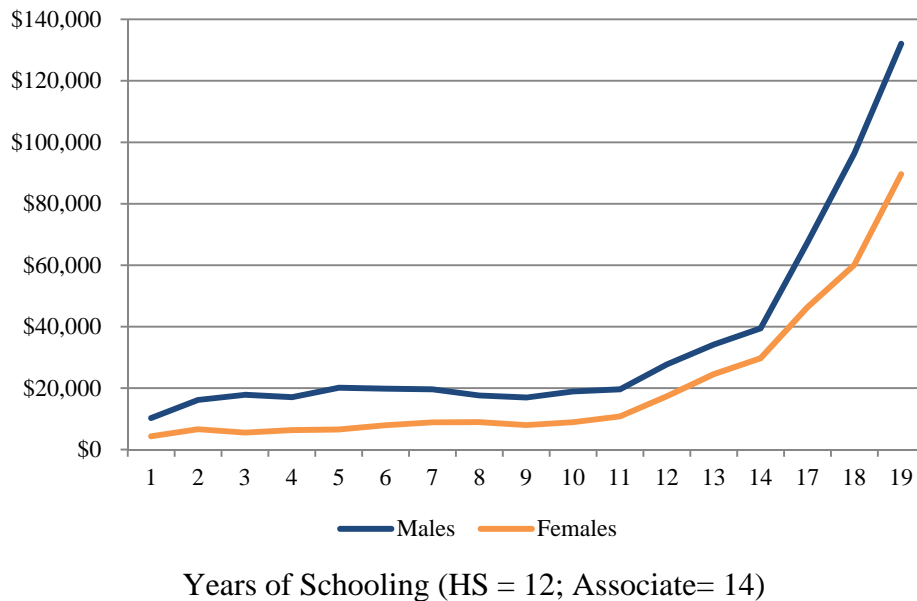
Note: American Community Survey, 2008-2010, Individuals in New York City, ages 23-65 (population weighted means). In constant 2010 dollars.

Table 2: Employment and Unemployment Rates, and Economically Active Population (% in the Labor Force) by Educational Attainment, 2010

	Males			Females			Total		
	Employ. Rate	Unemploy. Rate	Economically Active Pop (% in labor force)	Employ. Rate	Unemploy. Rate	Economically Active Pop (% in labor force)	Employ. Rate	Unemploy. Rate	Economically Active Pop (% in labor force)
High School	88.2%	11.8%	80.0%	90.1%	9.9%	62.6%	89.0%	11.0%	71.2%
Associate Degree	89.3%	10.7%	83.9%	90.1%	9.9%	78.9%	89.7%	10.3%	81.0%

Note: American Community Survey, 2010, Individuals in New York City, ages 23-65 (population weighted means).

In order to calculate the average earnings differentials between individuals with high school completion versus an associate degree in New York City, we exploit the American Community Survey (ACS, hereafter), between 2008 and 2010. We use population weighted means for the inflation-adjusted wages and salaries of individuals in New York City, between 23 and 65 years old, and assume that productivity grows at a constant rate of 1.5 percent per year (see Rouse, 2007, page 114). The values are expressed in constant dollars by adjusting all values to the 2010 price level. Figure 2 shows the age-earnings relationships for the subgroup populations in New York City. We note that average earnings are higher for individuals with an associate degree than for those who have limited their education to high school completion. The earnings-gap widens shortly after age 23, and continues over the years.

Figure 2: Age-Earnings Profiles by Educational Attainment, 2008-10
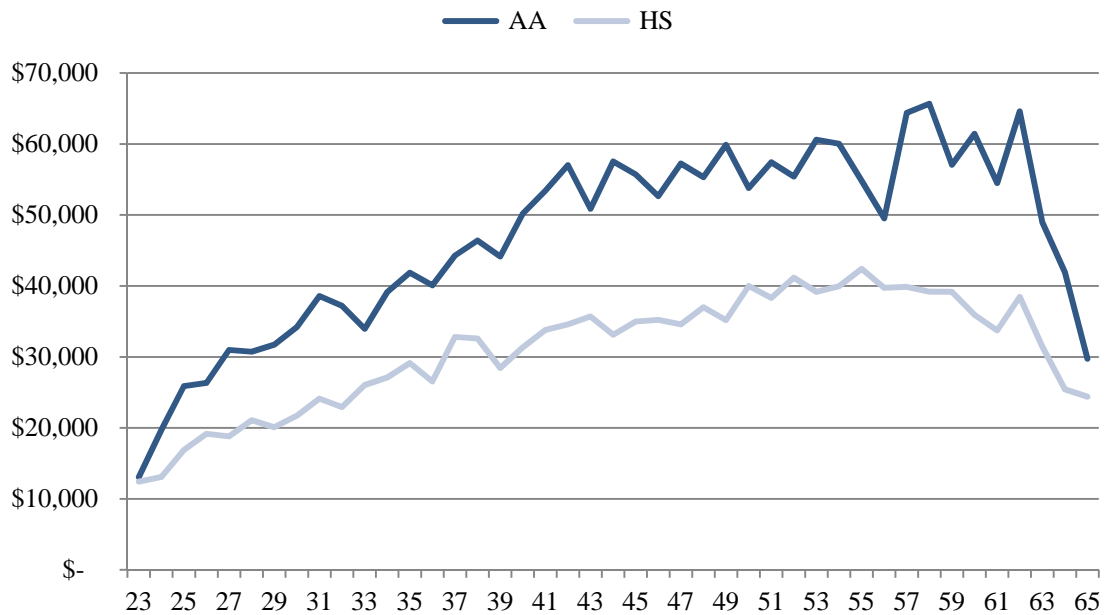
Source: ACS, 2008-2010
Note: Individuals in New York City, ages 23-65, population weighted means, constant 2010 dollars, all individuals in the labor force (i.e., individuals with zero and positive earnings, employed, unemployed, out of the labor force/inactive). Productivity increases yearly by 1.5%.

In order to compare the private income benefits for the student, we wish to compare the present value of income from age 23 to age 65 for those with the associate degree and those with a high school diploma or equivalency degree. We assume that productivity growth equals 1.5 percent increase per year. The discount rate is 3.5 percent (Moore, Boardman, Vining, Weimer & Greenberg, 2004).

Table 3: Lifetime Earnings by Educational Attainment. Breakdown by Gender, and Ethnicity (Present Value at Age 23 at 3.5 Percent Discount Rate), 2008-10

	High School	Associate	Associate minus HS
Total[1]	**640,330**	**964,472**	**324,142**
Male	790,064	1,128,983	338,919
Female	485,903	848,132	362,229
White	792,455	1,128,714	336,260
Black	616,739	926,892	310,153
Hispanic	566,767	869,654	302,887
Other	532,962	857,746	324,784

Source: Authors' calculations based on ACS 2008-2010. Productivity increase per year: 1.5 percent. In constant 2010 dollars.

[1]Total represents an average of graduates representing the gender and ethnic distribution of New York City.

Table 3 shows the present value of lifetime earnings for high school credential and associate degree recipients overall as well as by gender and race. The total or average for the overall group at the top of the table is an average based upon the overall composition of the New York City population. We assign this outcome to CUNY graduates, on the premise that CUNY community college enrollments are demographically representative of the population in New York City. The advantage in present value of lifetime earnings for the associate recipients varies from about $310 thousand to about $362 thousand, depending upon the group. This is a substantial lifetime premium for an associate degree. As a reminder, the present value calculation may be thought of as the value of a certificate of deposit (CD) with a 3.5 percent interest rate that is given to the student on completion of their associate degree. Since degree requirements are similar for both ASAP and non-ASAP graduates, we assume that the income benefits will be similar too.

Additional Tax Revenues from State and Federal Income Tax

The higher income[14] for individuals with an associate degree is an important source of additional fiscal gains for the taxpayers (Rouse 2007). In order to estimate the expected state and federal taxes for social security and Medicare (FICA) taxes paid by individuals with earnings, we use the NBER-Taxsim, version 9.0[15] that was designed for this purpose. To provide information that is representative of the potential benefits of the CUNY ASAP graduates, who are likely to remain in the New York Metropolitan area, we use estimates based upon residents of New York State who are single,[16] only have earnings from income, and have no itemized deductions. We use the fiscal structure existing in 2010, and the consumer price index (CPI) adjusted to constant

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[14] Tax contributions are calculated on earnings, as a proxy for an individual's total income. For the groups studied in the report, earnings constitute more than 90 percent of income.

[15] Available http://users.nber.org/~taxsim/taxsim-calc9

[16] Rouse 2007 and Levin, Belfield, Muenning & Rouse (2007) used the same method. As a check, we estimated the tax contributions from earnings for married people. The results for married people are shown in the Appendix. Total taxes for married people were, on average, 15% lower than for single people.

2010 dollars. The tax base is also adjusted for a productivity increase in earnings of 1.5 percent per year.

Figure 3 shows the average annual taxes on income by associate or high school educational attainment. As with the lifetime patterns of income, the lifetime tax contributions widen until near retirement. It is the difference between these two profiles that represents benefit recovery to the taxpayer from additional tax revenues for each additional associate degree recipient relative to the high school graduate.

Figure 3: Federal, State, and FICA Age-Income Tax Profiles by Educational Attainment, 2008-10

Age
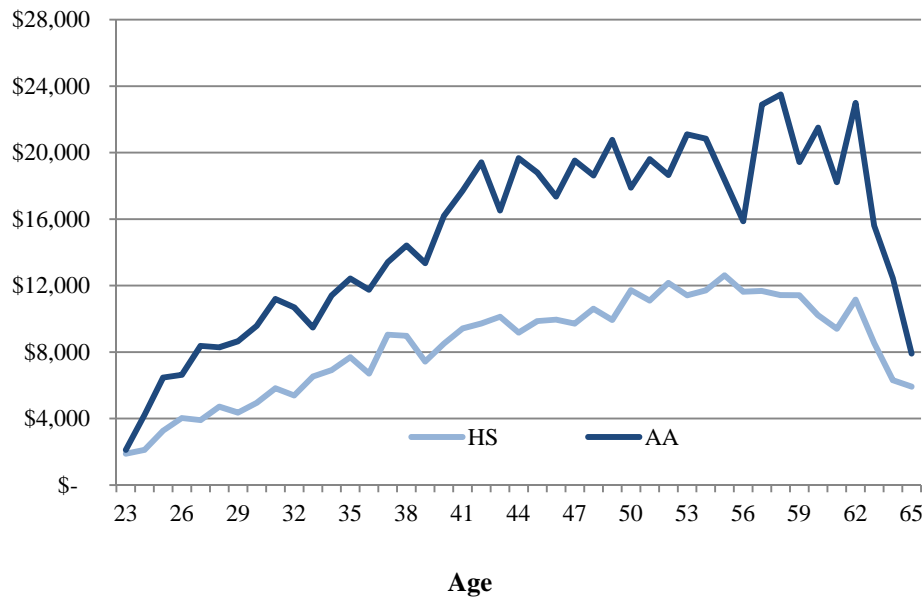
Source: Calculations based on ACS 2008-2010 incomes and NBER-Taxsim, version 9.0, in constant 2010 dollars.

Table 4 summarizes the estimates of taxes paid by high school completers and associate degree recipients. Present values at age 23 are calculated using a discount rate of 3.5 percent. All amounts are expressed in 2010 constant dollars. Table 4 also provides the calculations by gender and ethnicity.

The first three columns show the amount of federal, State and FICA taxes paid by the individuals. On average, individuals with an associate degree are expected to contribute $106,000 in federal taxes, $45,000 in state taxes, and about $148,000 in FICA taxes over their life time (see bottom panel, columns 1, 2, and 3). In contrast, individuals who completed high school pay about $46,000 in federal taxes, $24,000 in state taxes, and almost $98,000 in FICA tax contributions over their life time (top panel, columns 1, 2, and 3).

Table 4: Lifetime Earnings, City, Property and Sales Taxes by Educational Attainment. Breakdown by Gender and Ethnicity (Present Value at Age 23 at 3.5 Percent Discount Rate)

	By Type of Tax							*Total*
	High School Completers							
	Federal Income Tax Liability after all Credits	**State Income Tax Liability after all Credits**	**FICA (OADSI & HI, Employee & Employer)**	**City Income Tax (Net)**	**Property Tax**	**NYC Sales Tax**	**NY State Sales Tax**	**Total High School Completers**
Total	45,749	23,614	97,970	26,788	7,522	15,977	15,682	233,303
Male	70,413	33,627	120,880	33,052	9,281	19,712	19,349	306,313
Female	23,339	13,995	74,343	20,327	5,708	12,124	11,900	161,736
White	71,071	33,860	121,246	33,152	9,310	19,772	19,408	307,819
Black	42,506	22,149	94,361	25,801	7,245	15,388	15,104	222,554
Hispanic	34,734	18,670	86,715	23,710	6,658	14,141	13,880	198,509
Other	30,353	16,934	81,543	22,296	6,261	13,298	13,053	183,738

	Associate Degree Recipients							
	Federal Income Tax Liability after all Credits	**State Income Tax Liability after all Credits**	**FICA (OADSI & HI, Employee & Employer)**	**City Income Tax (Net)**	**Property Tax**	**NYC Sales Tax**	**NY State Sales Tax**	**Total Associate Degree**
Total	106,319	45,457	147,564	40,348	11,330	24,064	23,620	398,703
Male	143,330	56,775	172,734	47,230	13,263	28,169	27,649	489,150
Female	83,449	37,471	129,764	35,481	9,964	21,161	20,771	338,061
White	141,502	56,613	172,693	47,219	13,260	28,162	27,643	487,093
Black	99,773	42,877	141,815	38,776	10,889	23,126	22,700	379,955
Hispanic	86,956	39,053	133,057	36,381	10,216	21,698	21,298	348,659
Other	89,391	38,570	129,562	35,883	10,077	21,401	21,007	345,891

Source: earnings' taxes calculated based on ACS 2008-2010 and NBER-Taxsim, version 9.0, in constant 2010 dollars. Productivity increase of income (the tax base) is 1.5 percent per year. City income, property, NYC Sales and NY State taxes are calculated based on ACS 2005-2010[17] and City and State sources (see Table A1 in the Appendix for details). Columns may not sum to total due to rounding.

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[17] In order to utilize the maximum amount of information about property and sales tax rates, available since 2005, we utilize ACS between 2005 and 2010.

Additional Tax Revenues from City Income, Property and Sales Taxes

Based upon other studies, an amount of 5 percent of total income could be added to cover property and sales taxes (see Levin, Belfield, Muennig & Rouse, 2007, p.24). This amount is thought to be a conservative approximation,[18] given the characteristics of the taxes in the City and State of New York. Using the information listed in Table A1 (in the Appendix), we calculate the sales, property and other local taxes for individuals who reside in New York City. On average, an associate degree recipient pays almost $100,000 in these taxes ($40,000 in City income tax, $11,000 in property tax, and about $40,000 in sales taxes; bottom panel, columns 4 to 7), compared to almost $66,000 paid by the average person who graduated from high school (the breakdown for this person is $27,000 in City income tax, $7,500 in property tax, and about $32,000 in sales taxes top panel, columns 4 to 7). We should keep in mind that this is the present discounted value of the higher taxes paid by associate degree recipients relative to high school completers.

Overall Tax Burden

As shown in Table 4, individuals with an associate degree contribute, on average, almost $398,700 in lifetime taxes (overall tax contributions from earnings, property and sales) over their lifetime, present value at age 23. Individuals with a high school diploma or GED pay, on average, about $233,000 in total tax contributions over their lifetimes. In viewing the benefits to the taxpayer of an additional associate degree, we can compare the additional tax revenue contributed by an associate degree recipient with that of a high school completer. Table 5 shows the difference in the present value of lifetime aggregate taxes between the recipients of these degrees, by gender and ethnicity. On average, a person with an associate degree contributes $165,000 more in tax revenues than a person who completed high school. Although we will address this issue later, note that the value of additional tax revenues alone from an associate degree is about twice as large as the public investment required to fund the degree (that ratio is even larger if we take into account that student tuition is part of the institutional cost). An additional 1,000 associate graduates would generate about $165 million dollars of additional tax revenue, measured in present value at age 23.

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[18] We assume total income equals earnings. This is a second conservative assumption, since other income than earnings may also pay taxes of a different type.

Table 5: Lifetime Earnings, City, Property and Sales Taxes: Comparison by Educational Attainment. Breakdown by Gender and Ethnicity (Present Value at Age 23 at 3.5 Percent Discount Rate)

	High School	Associate	Associate versus High School
Total	233,303	398,703	165,400
Male	306,313	489,150	182,837
Female	161,736	338,061	176,325
White	307,819	487,093	179,274
Black	222,554	379,955	157,401
Hispanic	198,509	348,659	150,150
Other	183,738	345,891	162,152

In constant 2010 dollars. Columns may not sum to total due to rounding.

Reduced Costs of Public Services to Taxpayer

Benefits of additional education to taxpayers comprise not only higher tax revenues from those with greater levels of educational attainment, but also reductions in the taxpayer cost of public services. More specifically, if high school graduates are able to obtain associate degrees, there is strong evidence that they will place fewer cost burdens on public services for health, public assistance, and criminal justice. In this section, we review the evidence on these benefits.

Health

Considerable empirical literature has summarized the relations between education and health (e.g. Lleras-Muney, 2005; and Cutler & Lleras-Muney, 2010). Almost all measures of health status are positively related to educational attainment. Education may improve health through such mechanisms as healthier lifestyles in terms of nutrition, exercise, and reductions in substance abuse; better health decisions because of better knowledge and more scientific ways of addressing health needs; and the obvious possibility that more education may be associated with other social advantages that correlate with better health. In an attempt to causally account for the statistical relation between education and health, Cutler and Lleras-Muney (2010) find that a substantial portion of the education advantage is due to knowledge and cognitive ability. To estimate the public cost savings on health from receipt of associate degrees, we use public data sources on public medical expenditures by educational level.

More specifically, we estimate the relationship by drawing on the Medical Expenditures Panel Survey-2008 (MEPS), which is a nationally representative dataset, but we limit our analysis to data for individuals residing in the Northeast region, within a metropolitan statistical area (MSA). Importantly, the measurement of the educational variables in MEPS is recorded at the time the individual joined the study. This means that if the individual earned any educational credential afterwards, his educational attainment would be under-reported. In addition to that, the potential classification of education varies slightly from the one ACS employs. In this case, the survey reports years of education of the individuals rather than degree received. Since the degree

is not reported in these data, we converted 12 years of education to a high school equivalent and 14 years of education to an associate degree, providing an approximation for purposes of computing public health costs.

   Table 6 documents the association between educational attainment and some health indicators in terms of enrollment and coverage by public health services. The two principal public sources of spending on health costs are Medicaid and Medicare. Medicare is a federal program that covers those 65 years and over, as well as those with chronic disabilities (without age restriction). For populations under 65 in this analysis, the payments are limited to chronic disabilities without respect to income. Medicaid is a program for low-income recipients, funded by both federal and State taxpayers. Table 6 shows that the percentage of the general population covered by each program is greater for high school completers than for associate degree graduates.   We remind the reader that these educational distinctions are approximate and based upon the years of educational attainment because the data source does not specify the degrees attained.

Table 6: Health Coverage Indicators by Educational Attainment

	12 Years of Education (High School)	2 Years of College (Associate)
Percentage ever covered by Medicaid	21.4%	15.5%
Percentage ever covered by Medicare	6.2%	4.4%
Percentage with positive expenditures paid by Medicaid	19.6%	13.8%
Percentage with positive expenditures paid by Medicare	8.4%	5.4%

Source: MEPS-2008; unweighted means, individuals in the Northeast region, within a MSA, ages 23-65.

   Similar relationships are documented using ACS 2008-2010, for individuals based in New York City (Table 7), which allows us to provide a breakdown by gender and race. Differences in coverage by public sources are greater for women than for men. The higher percentage of Medicare recipients among the high school graduates than the associate group is due to a higher proportion of Medicare eligible persons with chronic disabilities.

Table 7: Health Coverage Indicators by Educational Attainment. Breakdown by Gender and Race

	Percentage Covered by Public Funding		Percentage Covered by Medicaid		Percentage Covered by Medicare	
	High School	Associate	High School	Associate	High School	Associate
Total	**27.8%**	**19.5%**	**24.4%**	**17.2%**	**5.2%**	**3.0%**
Men	23.1%	17.2%	19.6%	14.3%	4.7%	3.3%
Women	32.5%	21.3%	29.2%	19.3%	5.6%	2.8%
White	22.4%	14.2%	17.0%	11.1%	6.6%	4.2%
Black	28.5%	20.8%	25.3%	18.3%	5.3%	3.0%
Hispanic	30.5%	24.5%	28.0%	23.0%	4.6%	2.2%
Other	31.9%	19.6%	30.3%	17.7%	3.0%	2.1%

Source: ACS 2008-2010, weighted means, individuals 23-65 in New York City.

Table 8 shows the present value at age 23 of total health expenditures by educational attainment. These lifetime medical expenditures are calculated using MEPS-2008, for individuals living within a MSA. We consider all individuals, with positive or zero health expenditures (unweighted), ages 23-65. All amounts are expressed in 2010 constant dollars. The table shows the breakdown by source of payment. Total public health expenditures of individuals with an associate degree are, on average, about $15,000 in present value at age 23. Total public health expenditures for individuals who completed high school (or with 12 years of education) are about $20,000, about one-third higher than for those with the associate degree. Coverage of Medicare for those under 65 is limited to chronic disease and is not restricted by income. It is similar for both groups, although associate degree recipients may be better informed about this coverage. On average, a person with an associate degree costs $5,000 less in public health expenses than a person who completed high school, with most of the difference found in Medicaid coverage. If an additional 1,000 new associate degrees can be gained by expanding ASAP, the savings to the tax payer from subsidized health care alone would be over $5 million.

Table 8: Lifetime Public Health Expenditures, by Educational Attainment (Present Value at Age 23 at 3.5 Percent Discount Rate)

	12 Years of Education (High School)	2 Years of College (Associate)
Total Public Expenditures	20,111	15,085
By source of payment:		
Medicare	6,878	6,431
Medicaid	10,222	5,257
VA	1,270	1,309
TRICARE	468	689
Other Federal Sources	55	34
Other State and Local Sources	735	549
Other Public	483	816

Source: Author's calculations using MEPS-2008; weighted means, individuals living in a MSA (all regions), ages 23-65, in 2010 constant dollars.

Public Assistance

In 1996 the Federal Government passed welfare or public assistance reform, reducing dramatically the numbers who were eligible for traditional welfare payments and requiring work assignment and training as well as limiting the length of time that payments could be received. The following years also witnessed economic growth that further reduced welfare dependency. As a result, the overall participation in and cost of welfare declined considerably for both New York City (Chernick & Reimers 2004) and the rest of the nation. As a result, only a small proportion of the population receives such benefits. Table 9 shows the relationship between education and receipt of welfare income for individuals in New York City. Table 9 shows the

proportion of individuals in New York City who receive welfare income[19] and supplemental security income,[20] for individuals aged 23-65 and by educational attainment.[21] The proportion of individuals receiving public housing, broken down by education, is only available for the year 2002, for individuals in metropolitan areas in New York State. The proportion of people receiving any type of welfare income is lower among individuals whose highest educational attainment is an associate degree.

Table 9: Welfare Assistance by Educational Attainment

	High School	**Associate**
Welfare Income[a]	2.9%	2.0%
Supplemental Security Income[a]	3.3%	1.8%
Public Housing[b]	12.7%	9.7%

Sources: (a) ACS 2005-2010, weighted means, individuals 23-65 in New York City. (b) ACS-2002, weighted means, individuals 23-65, in New York State, in a metropolitan area.

Table 10 shows the present discounted value at age 23 of the lifetime stream of income received through welfare assistance, for those with positive welfare income. Values are expressed in constant dollars for 2010. Total public assistance and welfare income is, on average, about $11,000 for individuals with an associate degree compared to about $17,000 in present value for lifetime receipt of public assistance for high school graduates. Readers should keep in mind that the average payment per member of any education group will be very low if few members of that group receive benefits. That is, these figures are not for each welfare recipient, but are averages determined by dividing payments over all members of the educational group whether receiving public assistance or not. An additional 1,000 associate graduates would reduce the taxpayer burden for public assistance by about $6 million.

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[19] According to the definition of variables on IPUMS (Integrated Public Use Microdata Series census microdata for social and economic research), this variable reports how much pre-tax income (if any) the respondent received during the previous year from various public assistance programs commonly referred to as "welfare" (identified as INCWELFR). Assistance from private charities was not included, but the following were included: federal/state Supplemental Security Income (SSI) payments to elderly (age 65+), blind, or disabled persons with low incomes; Aid to Families with Dependent Children (AFDC); and General Assistance (GA). (This does not include separate payments for hospital or other medical care.)

[20] How much pre-tax income (if any) the respondent received from Supplemental Security Income (SSI) during the previous year.

[21] ACS provides information about an additional source of income (INCOTHER), which, according to the questionnaire, measures: "Any such other sources of income received regularly such as Veterans' (VA) payments, unemployment compensation, child support or alimony". However, in ACS the variable is constructed as a residual variable, reporting how much of each respondent's total money income (or losses), as recorded in the total personal income, came from sources not included in the other IPUMS person-record income variables, such as INCWAGE (wage and salary income), INCBUSFM (business and farm income), INBUS (Non-farm business income), INCBUS00 (business and farm income, 2000), INCFARM (farm income), INCSS (Social Security income), INCSUPP (Supplementary Security Income), INCWELFR (Welfare (public assistance) income), INCINVST (interest, dividend, and rental income), and INCRETIR (retirement income). Since this information does not allow us to distinguish which portion of the income would be coming from public assistance sources, we disregard it for the purposes of the current analysis. ACS collected information on such income during the past 12 months.

Table 10: Lifetime Welfare Income, by Educational Attainment (Present Value at Age 23 at 3.5 Percent Discount Rate)

	High School	Associate
Welfare Income[a]	$ 2,221	$ 1,441
Supplemental Security Income[a]	$ 4,698	$ 3,013
Housing Subsidy[b]	$ 236	$ 134
Food Stamps[b]	$ 6,030	$ 2,779
Unemployment Compensation[b]	$ 3,884	$ 3,746
Total	**$ 17,069**	**$ 11,113**

Notes and source: (a) ACS 2005-2010, weighted means, individuals 23-65 in NYC; (b) Trostel (2010), in 2010 constant dollars.

Crime

The relation between education and crime has been studied extensively and summarized by Lochner (2011). Higher incomes of the more educated raise the risk or opportunity cost of committing a crime. Education also induces individuals to become more patient, reducing impulsive behavior (as suggested by Becker & Mulligan, 1997) and reduces the tendency to take risks. By increasing the expected future punishment in terms of income foregone, education discourages crime commission. Lochner and Moretti (2004) use a causal modeling approach to estimate the impact of education on commission of different crimes, using the US population census and the crime reports from the Federal Bureau of Investigation (FBI).

Table 11 shows the relationship between education and crime (nationally, for the first row, and for individuals within a MSA in the Northeast region). The first row is based on Trostel (2010), who reports the percentage of individuals who are incarcerated by educational attainment. The rate of incarceration for individuals with a high school diploma or equivalency is considerably higher than the proportion of individuals with an associate degree who are incarcerated, even though overall rates at any time for both groups are low. Despite the fact that these percentages are calculated using nationally representative information, they are similar to the ones calculated using ACS for individuals who are incarcerated from New York City. The table also shows the relationship between other crime-related activities and education, using information from the National Longitudinal Survey of Youth, 1997 (1997-2009), for individuals 23-29, in the Northeast region, in a metropolitan area. Individuals with a high school credential are more likely to have been arrested since the last interview, have used marijuana, and have been in prison, than individuals with an associate degree.[22] The consumption of cocaine or other drugs (other than marijuana, since last interview) is constant across the two educational groups.

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[22] Educational categories with NLSY97 are constructed in the following way: HS: GED or high school graduates; AA: Not enrolled-Some college/two-year college; enrolled in a two-year college.

Table 11: Proportion of Incarceration and Participation in Other Crime-Related Activities

	High School	Associate
Proportion Incarcerated[a]	**1.19%**	**0.32%**
Proportion arrested since last interview [b]	6.0%	3.1%
Proportion used marijuana since last interview [b]	30.2%	24.4%
Proportion used cocaine or other drugs since last interview [b]	3.1%	3.1%
Proportion current dwelling: "in prison"[b,c]	1.2%	0.4%

Sources: (a) Trostel (2010), based on Harlow (2003). (b) NLSY97 (pooled 1997-2009) weighted means, individuals in the Northeast region, within a MSA, ages 23-29 (c) In Jail/Prison/Detention/Work Release.

Following Belfield, Levin, & Rosen (2012), in order to calculate the total burden associated with crime we need to take into account public costs associated with correction, police protection and the other costs of the criminal justice system. Trostel (2010) calculates the estimated lifetime corrections cost for individuals with high school credentials and associate degrees. The correction costs, as explained by Trostel (2010), are calculated "using all correction costs, including probation" (p. 237, footnote 24). In 2010 dollars, the present discounted value of these costs is about $11,400 for an individual who graduated from high school (Table 12). These costs contrast with a cost that is less than $3,500 for a person with an associate degree. The present value of the difference in lifetime costs of crime for an average individual from the two educational groups is about $7,900. Regarding the other crime-related categories, Belfield, Levin & Rosen (2012) report that correction costs account only for about 20 percent of annual government expenditures on crime nationally (see Appendix Table, p. 39).[23] Police protection costs account for 54 percent of government expenditures on crime (we assume that half of the amount spent on police protection is devoted to crime prevention or crime apprehension, which is the relevant portion for our study), while judicial and legal costs are 26 percent of total costs. We use these proportions to provide some estimates of additional crime costs associated with police protection costs and the costs of the criminal justice system expenditures. Judicial and legal costs over a lifetime are about $15,000 for a person who completed high school. These costs are about $4,500 for a person with an associate degree. The present value of the difference in lifetime judicial and legal costs for an average individual from the two educational groups is about $10,400. Finally, police protection costs incurred over a lifetime are about $15,600 for a person who completed high school. These costs are less than $4,800 for a person with an associate degree. The present value of the difference in lifetime costs of police protection costs for an average individual from the two educational groups is about $10,800.

When each of these cost-savings components is added, the expected public savings from lower criminal involvement of associate degree recipients relative to high school graduates is about $30,000 per additional associate degree.   This means that the taxpayer savings in costs of the criminal justice system for another 1,000 associate graduates would be about $29 million, a very substantial amount.

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[23] In the absence of specific data on this statistic for New York City, we use the national figure.

Table 12: Lifetime Crime Costs, by Educational Attainment (Present Value at Age 23 at 3.5 Percent Discount Rate)

	High School	Associate
Total	$41,857	$12,725
Correction	$11,391	$3,463
Judicial and Legal	$14,908	$4,532
Police Protection[a]	$15,558	$4,730

Source: Trostel (2003) and Belfield, Levin and Rosen (2012).
Note: (a) This value corresponds to half of the amount that would be estimated using Belfield et al's (2012) calculation. We assume that half of the total amount spent on prevention activities is devoted to crime prevention and crime apprehension. In constant 2010 dollars.

Summary of Taxpayer Benefits

Table 13 provides a summary of the direct fiscal benefits to the taxpayer for producing an additional associate degree. Most of the benefits are generated from the additional tax revenues of associate degree recipients, amounting to about $165,000 (or 80 percent). However, there are substantial benefits from reduced costs of public health, public assistance and criminal justice, amounting to about $40,000 (or 20 percent). Overall, each additional associate degree provides fiscal benefits to the taxpayer of $205,000 in present value of lifetime benefits at age 23. That is, the achievement of an associate degree by high school completers provides considerable relief for the taxpayer by making the investment in additional associate degrees.

Table 13: Generation of Total Fiscal Benefits to the Taxpayer per Degree (Present Value of Lifetime Benefits at Age 23)

	Per Additional Associate Degree
Total Public Benefits	**$205,514**
Tax Revenues From Income[a]	$145,567
Property and Sales Taxes	$19,833
Savings-Health Expenditures-Public[b]	$5,026
Savings-Welfare and Public Assistance	$5,956
Savings-Criminal Justice	$29,132

Note: (a) Includes Federal, State, FICA, and City Income taxes; (b) Includes Medicare, Medicaid, VA, TRICARE, Other Federal, State, and Local Sources, and Other Public. In constant 2010 dollars.

NET BENEFITS OF ASAP FOR THE TAXPAYER

Although there are considerable benefits to the taxpayer from this investment, it is important to take account of the investment cost to produce an associate degree. There are two ways to express this comparison. The first is to subtract the cost of the taxpayer investment for increasing the number of associate degree holders from the taxpayer benefits produced by the additional associate recipients. Do the benefits exceed the costs, and by how much? A second way is to provide a contrast of the ratio of benefits to costs to ascertain the dollar return in

benefits for each dollar of costs. Table 14 provides estimates for both types of comparisons of benefits and costs.

Total institutional cost per graduate in Table 14 is taken from Table 1 and is about $66,000 for the comparison group and about $59,000 for ASAP. We have assumed for simplicity that the public institutional cost per graduate is charged to the taxpayer. As mentioned earlier, this is an overestimate of the public cost because some of this cost will be paid by the student. By overstating the public costs, we will be imparting a very conservative estimate of the difference between benefits and costs because of the inclusion of the student fees in the taxpayer burden. However, we will subsequently look more specifically at the costs and benefits for students.

Table 14 also shows that the total fiscal benefits received by the taxpayer per additional degree are $205,514 (from Table 13). The net benefits received by the taxpayer, however, require deduction of the investment required to obtain the fiscal benefits. By subtracting the cost of the taxpayer outlay, we obtain the net investment return to the taxpayer. After accounting for the cost of the investment, there is a net return in the present value of benefits to the taxpayer of about $140,000 for each additional graduate in the comparison group, and about $146,000 for each additional ASAP graduate. The benefit to cost ratio for the taxpayer is 3.1 for each additional graduate in the comparison group and 3.5 for each additional ASAP graduate. This means that each additional associate degree graduate provides between three to four dollars in return to the taxpayer for every dollar of taxpayer investment. Expressed in terms of the equivalent of a certificate of deposit (CD) type of investment returned to the taxpayer, each additional associate graduate from ASAP provides to the taxpayer the equivalent of a CD worth $146,000, a very sizable amount.

Table 14: Benefits to Cost Comparisons for the Taxpayer: Total Institutional Costs versus Direct Benefits

	Benefits per Additional Degree (Taxpayer)	Institutional Cost per Graduate (Taxpayer)	Benefits Minus Costs (Net Benefits) (Taxpayer)	Benefit/Cost Ratio (Taxpayer)
Fall 2006 Comparison Group	$205,514	$65,884	$139,630	3.1
Fall 2007 ASAP Cohort	$205,514	$59,302	$146,212	3.5

In constant 2010 dollars.

Although this is a very impressive return on public investment for each graduate, it does not take account of the massive increase in numbers of additional graduates attributed to ASAP. Recall that ASAP has a three-year graduation rate of almost 55 percent, in contrast to less than 25 percent for the traditional program. If 1,000 students enter the traditional program, about 240

would be expected to graduate in three years. If 1,000 students enter the ASAP program, we would expect more than twice as many, about 549, to graduate. Using the cost and net benefit per graduate and the number of graduates in each group (see Table 14 and Levin & Garcia, 2012), the fiscal return on investment shows much larger returns to the public investment in ASAP than in the traditional program. **As shown in Table 15 for this comparison, the total net benefits associated with the enrollment of 1,000 students in ASAP are about $46,000,000 higher than the net benefits associated with a similar initial enrollment for the comparison group.** Total net benefit associated with actual current 2012/13 CUNY ASAP enrollment (2,200 students), is estimated to be $102,000,000 over and above a similar comparison group enrollment. This is a sizable difference in impact in the use of tax resources in favor of ASAP, as well as providing considerably higher efficiency in assisting community college students to complete their studies, a winning strategy for students, taxpayers, and CUNY.

Table 15: Net Present Value of the Taxpayer Investment for 1,000 ASAP Enrollees versus 1,000 Traditional Students

	Enrollees	Graduates per 1,000 Enrollees	Net Benefits per Graduate	Total Net Benefits per 1,000 Enrollees
Comparison Group	1,000	241.2	$139,630	$33,678,756
ASAP Cohort	1,000	548.6	$146,212	$80,211,903
Difference (ASAP-Comparison)			*$6,582*	*$46,533,147*

In constant 2010 dollars.

NET BENEFITS OF ASAP FOR STUDENTS

A portion of the cost of acquiring an associate degree, whether in the conventional program or in ASAP, is incurred by students. Given this cost, it is important to determine the return to students from this investment. Costs to the student include three components: student tuition, educational materials, and transportation, and the loss of earnings (or opportunity cost). Table 16 shows that the total costs paid by the student are $21,000 for the comparison group and about $13,000 for the ASAP group. Students in ASAP are subsidized for fees or tuition after application of need-based financial aid awards (ie: federal Pell and New York State Tuition Assistance Plan (TAP)) as well as transportation and textbooks, but they typically must forego some earnings while they are studying. Students in the conventional group must incur all of these costs. We use the information on average tuition as reported on CUNY's website (see http://www.cuny.edu/admissions/tuition-fees.html), and on financial aid based on CUNY ASAP's analysis of student financial aid data from the CUNY Institutional Research Database (IRDB). Net tuition is the difference of total tuition and financial aid award for students in the comparison group. For students in ASAP, the gap between tuition and fees and financial aid award is waived. We use census data from the ACS to compute the forgone earnings. Foregone

earnings are calculated as the difference between the average earnings of a full-time worker with high school degree, and the average earnings of an enrollee in a public institution (ages 20 to 22), both expressed as present value at age 23 and in 2010 dollars. Finally, we add the estimated costs of the textbooks and transportation per student in the comparison group by basing it on the regular costs on this category for CUNY students (http://www.cuny.edu/admissions/tuition-fees.html). For ASAP students the costs of textbooks and transportation are covered by the program.

Table 16: Total Costs Per Graduate, Comparison Group and ASAP Group: Breakdown per Constituent (Student), for Three Years

	Total Fall 2006 Comparison Group	Total Fall 2007 ASAP Group
Total Cost for the Student	**$20,996**	**$13,062**
Institutional Cost per Graduate-Student	$1,569	$0
Average Tuition	*$9,403*	*$11,112*
Average Financial Aid	*($7,834)*	*($8,384)*
Other Financial Assistance (only ASAP)	*($0)*	*($2,728)*
Net Forgone Earnings	$13,062	$13,062
Earnings HS graduates Working Full Time	*$28,515*	*$28,515*
Earnings HS graduates Enrolled in Public Institutions	*($15,453)*	*($15,453)*
Textbooks and Transportation	$6,365	$0

Notes:
Institutional Cost per Graduate: for comparison group, equals the difference between average tuition (60 credits) and financial aid. Sources: http://www.cuny.edu/admissions/tuition-fees.html and CUNY ASAP's analysis of student financial aid data from CUNY Office of Institutional Research and Assessment's Institutional Research Database (OIRA, IRDB), for the first cohort. For the ASAP group, any remaining difference between total average tuition (3 years, full-time enrollment) and financial aid award is waived (Linderman & Kolenovic, 2012).
Net Forgone Earnings correspond to the present value at age 23 of the average earnings of a person who completed high school, at ages 20, 21 and 22, minus the present value at age 23 of the average earnings of a person who completed high school and is attending a public school, at ages 20, 21 and 22. The average earnings are calculated as the weighted mean earnings of individuals with such educational attainment in New York City, using ACS (2008-2010). The forgone earnings per graduate are assumed to be equal to these average earnings, regardless of being in the comparison or ASAP groups.
Average Textbook and Transportation Costs per Student are obtained from CUNY's tuition and fees website (see http://www.cuny.edu/admissions/tuition-fees.html). Total costs in this category equal the cost in FY2012 multiplied by 3 years. In constant 2010 dollars.
The discount rate used to calculate the present value at age 23 is 3.5 percent.

The total direct benefits to the associate graduate in additional income beyond that of a high school graduate is shown in Table 17. These incremental income gains are calculated after the student pays income taxes on gross earnings differences. The income gains minus costs paid by the student are about $138,000 for each additional graduate in the comparison group, and about $146,000 for each additional graduate in ASAP. The benefit to cost ratio for the associate recipient is 7.6 for each additional graduate in the comparison group and 12.2 for each additional ASAP graduate. Another way of stating the gains to the student beyond the costs paid (including foregone earnings for three years) is that the income advantage of an associate degree beyond

high school completion is the equivalent of being given a certificate of deposit (CD) of about $140,000 net of taxes. This provides a powerful incentive for students to undertake an associate degree at CUNY.

Table 17: Net Benefits for the Student: Total Student Costs versus Benefits

	After-tax Income Benefits per Degree (Student)	Total Cost per Degree (Student)	Benefits minus Costs (Net Benefits) (Student)	Benefit/Cost Ratio (Student)
Fall 2006 Comparison Group	$158,742	$20,996	$137,746	7.6
Fall 2007 ASAP Group	$158,742	$13,062	$145,680	12.2

In constant 2010 dollars.

SENSITIVITY ANALYSIS

All estimates of benefits and costs require assumptions and data on which the calculations are based. It is important to challenge key assumptions to ascertain their validity and to estimate consequences for the results if other plausible assumptions were used. Three potential sources of concern that can affect the estimates are: (1) insufficient recognition of comprehensiveness of benefits; (2) external effects of the investment; and (3) mobility of graduates.

Comprehensiveness of Benefits

As McMahon (2009) has enumerated and explained in detail, there are many benefits of educational investments for both the individual and for the society. Because many of these cannot be readily measured or lack good data, we have not included them in this study. For students we include only the higher incomes represented by their greater employment and higher productivity. We do not include the value of the benefits to the educated person of better adult health, greater life expectancy, improved educational development and health status of offspring, or better consumer decisions, all of which have been linked by McMahon (2009) and others (e.g. Haveman & Wolfe 1984) to education. This is also true for such social benefits emanating from a more educated population such as a better functioning democracy, scientific and cultural progress, and greater equity and social opportunities for those from lower income backgrounds. Our lack of ability to measure and obtain data on a full range of benefits means that the full benefits are even greater, **perhaps much greater**, than those that we have captured. Thus, our estimates of net benefits are highly conservative ones.[24]

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[24] Another excluded benefit would be associated with the higher likelihood of students in ASAP of enrolling in four-year institutions and pursuing more education. Based on Linderman and Kolenovic (2012), CUNY ASAP estimates

Externalities

Benefits to New York City and its taxpayers are not limited just to those who have received the associate degree. The economics literature has demonstrated that as the educational level of a city rises, there are also benefits to workers with other levels of education. These externalities or spillover benefits result because a higher average level of education in the labor force also improves the productivity of other workers, even those with lower levels of education. The production of goods and services becomes more efficient with benefits that extend beyond just those who have been able to increase their own education.

For example, manufacturing plants located in cities where the fraction of college graduates grew faster experienced larger increases in productivity than similar plants in cities when the fraction of college graduates grew more slowly (Moretti 2004b: 683). A one-percentage point increase in college graduates was associated with a 0.5-0.7 percent increase in productivity and with a 1.1 percentage points in higher wages (Moretti 2004b: 683-4 and footnote 45). Research also shows that as the share of college educated persons rise in a city, the wages of groups with other levels of education also benefit (Abel and Dietz 2012, Moretti 2004a). McMahon (2006) estimated that the contribution of the aggregate education of the labor force to the earnings of workers of any given level of education was substantial.

Mobility

A further concern for sensitivity analysis is the issue of whether the benefits of taxpayer investment remain in the City and State whose taxpayers have made the investment. If many individuals move to other jurisdictions, the benefits will go to taxpayers in those places rather than New York City or New York State. In order to assess the return on the City's and State's investment in promoting the graduation of CUNY's associate degree students, we examine the mobility of the graduates from CUNY. We use the information from the Office of Policy Research, which surveyed a random sample of CUNY graduates (holding AA, BA, MA, JD and PhD degrees) who graduated between 1981 and 2008. The survey (conducted in September 2008) examined the cohorts graduating every three years, a sample composed of nearly 13,000 graduates.

Figure 4 shows the proportion of associate graduates from 1981 to 2008 (by graduation and year) currently residing in New York City or New York State. Among associate graduates, the proportions residing in the City or State were as high as 97 percent for recent graduates and 89 percent even for graduates as long ago as 1981. Thus, we can conclude that an overwhelming portion of the total benefits estimated above is provided to New York City taxpayers.

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that transfer rates of ASAP students who received the associate degree to a four-year institution are higher than those of associate degree recipients in the comparison group. Specifically, 72.4 percent of ASAP associate degree recipients versus 62.2 percent of associate degree recipients in the comparison group transferred to a baccalaureate institution.

New York State taxpayers also get a substantial share of benefits from both the presence of New York City resident graduates and those in other parts of the State. Even if we assume that only 80 percent of the associate graduates stay in New York City after completing their degrees, the taxpayer benefits would still be several times the taxpayer costs.

Figure 4: Proportion of CUNY's Associate Graduates Currently Residing in New York State and New York City by Graduation Year, 1981-2008 (in Percentages)
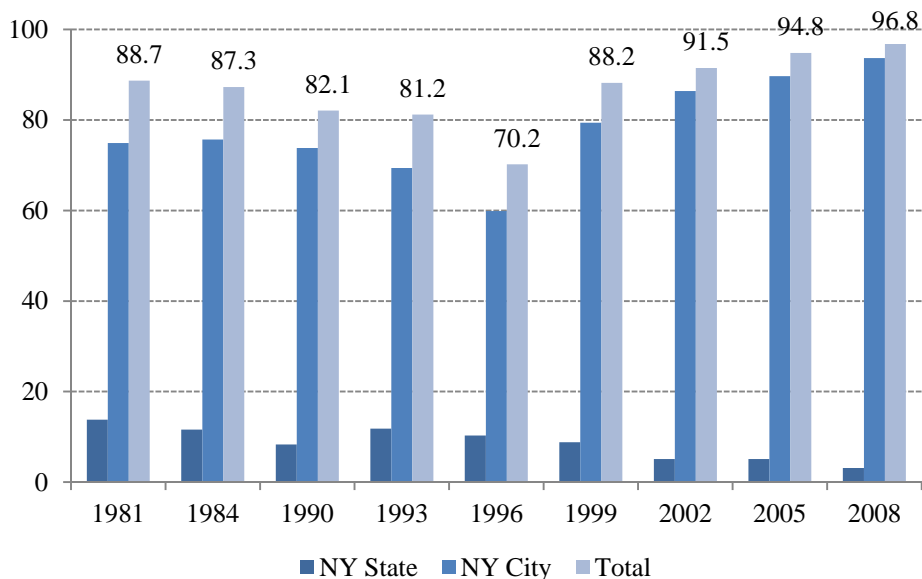
Source: CUNY, Office of Policy Research. Policy Research Brief: "Do CUNY Graduates Stay in New York?"

A HIGHLY PRODUCTIVE INVESTMENT

This study has undertaken an economic analysis of both the public investment of the taxpayer and the private investment of the student to compare the benefits and costs for each constituency of investing in ASAP. An earlier study established that although ASAP underwrites the cost of additional services relative to those allotted to the conventional associate degree program, the greater success of ASAP enrollees in completing the associate degree within three years more than compensates for the extra costs (Levin & Garcia 2012). In fact, the cost for each ASAP degree is less than that of the conventional program because of its higher success rate of completion.

In contrast, this study asked if there was a positive financial return on the ASAP investment for the taxpayer and for the students in the program. Two types of analysis were undertaken. First, the benefits to the taxpayer were compared with the taxpayer cost per three-year associate degree under ASAP and the traditional program. The returns to the taxpayer were comprised of the additional tax revenues from the higher income of associate graduates as well as the reduced cost of public services associated with the associate recipients relative to high school completers. In order to make comparisons over a lifetime for the gains in tax revenues

and reduction of public costs, this study drew upon official data sources for New York City and New York State. Lifetime benefits were converted to their present value at age 23 and compared with the taxpayer and student investment cost valued at age 23. In both cases, the benefits far exceeded costs. For each dollar of investment in ASAP by taxpayers, the return was between three and four dollars. For each dollar of investment by students, the return was much more, even when including foregone earnings by students as the major component of student costs. Using available data on which public constituencies receive the benefits—federal, New York State, and New York City governments, we believe that all constituencies receive benefits that exceed their cost contributions to the investment (see Appendix Table A5).

From a policy perspective, the full magnitude of the returns to the taxpayer must take account of the highly superior effectiveness of ASAP in comparison with the conventional program. About 55 percent of ASAP students were able to complete the associate degree in three years compared with about 24 percent of the students in the conventional program. For every 1,000 enrollees in ASAP, about 549 would be expected to complete the associate requirement in three years compared with only about 241 in the conventional program. When converted into overall benefits generated by the 1,000 enrollees, the considerably higher productivity of ASAP in producing associate degrees would provide fiscal benefits to the taxpayers of $46 million dollars beyond those of investing an approximately equal amount in the conventional degree program.

Not only is ASAP less costly per additional graduate and twice as effective in the production of associate degrees, but from the perspective of both taxpayer and student, the benefits generated by ASAP represent a very productive public investment with a high monetary return. Needless to say, this powerful public investment is buttressed further by the other substantial educational contributions and success that cannot be assessed in monetary terms.

References

Abel, J. R., & Deitz, R. (2012). "Do colleges and universities increase their region's human capital?" *Journal of Economic Geography*, 12(3), 667-691.

Angrist, J. D. and A. B. Krueger (1991). "Does Compulsory School Attendance Affect Schooling and Earnings?" *The Quarterly Journal of Economics* 106(4): 973-1014.

Angrist, J. D. and A. B. Krueger (1999). "Empirical strategies in labor economics". *Handbook of labor economics* 3: 1277-1366.

Ashenfelter, O. and C. Rouse (1998). "Income, schooling, and ability: Evidence from a new sample of identical twins." *The Quarterly Journal of Economics* 113(1): 253-284.

Barnett, W. S. (1985). "Benefit-cost analysis of the Perry Preschool Program and its policy implications". *Educational Evaluation and Policy Analysis* 7(4): 333-342.

Belfield, C. & Levin, H. (2007a). The Price We Pay: *The Economic and Social Costs of Inadequate Education* (Washington, DC: Brookings Institution Press).

Belfield, C. & Levin, H. (2007b). *The Economic Losses from High School Dropouts in California*, CDRP Report #1 (Santa Barbara: California Dropout Recovery Project, University of California, Santa Barbara). http://cdrp.ucsb.edu/researchreport1.pdf.

Belfield, C., Nores, M., Barnett, S., & Schweinhart, L. (2005). "Updating the Economic Impacts of the High/Scope Perry Preschool Program." *Educational Evaluation and Policy Analysis* 27(3): 245-261.

Belfield, C. R., Levin, H. M., & Rosen, R. (2012). "The Economic Value of Opportunity Youth". Civic Enterprises.
www.civicenterprises.net/MediaLibrary/Docs/econ_value_opportunity_youth.pdf

Becker, G. S. (1964). *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education* (3rd edition ed.): New York: National Bureau of Economic Research.

Becker, G. S., & Mulligan, C. B. (1997). "The Endogenous Determination of Time Preference". *The Quarterly Journal of Economics*, 112(3), 729-758.

Bureau of the Census, U. S. Department of Commerce (2012). The National Data Book (Washington, DC: U.S Government Printing Office), Table 278. http://www.census.gov/compendia/statab/2012/tables/12s0278.pdf

Card, D. (1999). "The causal effect of education on earnings". *Handbook of labor economics* 3: 1801-1863.

Chernick, H. & Reimers, C. (2004) "The decline in welfare receipt in New York City: Push or pull?", *Eastern Economic Journal*, 30(1), 3-29.

CUNY, Office of Policy Research. Policy Research Brief: "Do CUNY Graduates Stay in New York?". 2011.
http://www.cuny.edu/about/administration/offices/ira/opr/briefs/NY_Residency_Research_brief_v11_rev20121005.pdf

CUNY Office of Institutional Research. (2012) "System Retention and Graduation Rates of Full-time First-time Freshmen in Associate Programs by Year of Entry: Community Colleges".
http://owl.cuny.edu:7778/RTGS_0015_FT_FTFR_ASSOC_CC_TOT_UNIV.rpt.pdf

Cutler, D. M. & Lleras-Muney, A. (2010). "Understanding Differences in Health Behaviors by Education," *Journal of Health Economics*, 29(1), 1-28.

Griliches, Z. (1979). "Sibling models and data in economics: Beginnings of a survey." *The Journal of Political Economy*: 37-64.

Haveman, R. & Wolfe, B. (1984) "Schooling and Economic Well-being: The Role of Non-Market Effects," *The Journal of Human Resources*, 19(3), 377-407.

Levin, H. M. (1972). "The costs to the nation of inadequate education (Report to the Select Committee on Equal Educational Opportunity, US Senate, 92d Cong.)" Washington, DC: US Government Printing Office.

Levin, H. M. (2011). "The Economics of Education," *Albany Government Law Review*, 4(2), pp. 394-426.

Levin, H. M. & McEwan, P. (2001). *Cost-Effectiveness Analysis: Methods and Applications* (Thousand Oaks, CA: Sage Publications).

Levin, H. M. and C. R. Belfield (2007). "Educational interventions to raise high school graduation rates". *The price we pay: Economic and social consequences for inadequate education*. Washington, DC: The Brookings Institution: 177-199.

Levin, H. M., Belfield, C., Muennig, P., & Rouse, C. (2007). "The costs and benefits of an excellent education for all of America's children". New York: Center for Benefit-Cost Studies in Education, CBCSE, Teachers College, Columbia University.

Levin, H. M. & Garcia, E. with the assistance of Morgan, J. (2012). "Cost-Effectiveness of the Accelerated Study in Associate Programs (ASAP) of the City University of New York". New York: Center for Benefit-Cost Studies in Education, CBCSE, Teachers College, Columbia University.

Linderman, D. (2012). "Significant Increases in Associate Degree Graduation Rates: Accelerated Study in Associate Programs (ASAP)". New York: City University of New York. http://cuny.edu/academics/programs/notable/asap/about/evaluation/ASAP-Key-Eval-Prog-Overview-0901712.pdf

Linderman, D. and Kolenovic, Z. (2012). "Results Thus Far and the Road Ahead: A Follow-up Report on CUNY Accelerated Study in Associate Programs (ASAP)". New York: City University of New York.
http://www.cuny.edu/academics/programs/notable/asap/ASAP_Followup_Report_020112.pdf.

Lleras-Muney, A. (2005). "The Relationship between Education and Adult Mortality in the United States". *The Review of Economic Studies*, 72(1), 189-221.

Lochner, L. (2011). "Non-production benefits of education: Crime, health, and good citizenship". NBER Working Paper No. 16722. National Bureau of Economic Research.

Lochner, L., & Moretti, E. (2004). "The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports". *The American Economic Review*, 94(1), 155-189.

Marcotte, D., Bailey, T., Borkowski, C. & Kienzl, G. (2005). "The Returns of a Community College Education: Evidence from the National Education Longitudinal Survey". Educational Evaluation and Policy Analysis, 27(2), pp.157-175.

McMahon, W. (2009) "*Higher Learning and the Greater Good: The Private and Social Benefits of Higher Education*". Baltimore: Johns Hopkins University Press.

McMahon, W. W. (2006). "Education finance policy: Financing the non-market and social benefits". Journal of Education Finance, 32(2), 264-284.

Moore, M. A., A. E. Boardman, et al. (2004). "Just give me a number!" Practical values for the social discount rate". *Journal of Policy Analysis and Management* 23(4): 789-812.

Moretti, E. (2004a). "Estimating the social return to higher education: evidence from longitudinal and repeated cross-sectional data". *Journal of Econometrics*, 121, 175-212.

Moretti, E. (2004b). "Workers' education, spillovers, and productivity: evidence from plant-level production functions". *American Economic Review*, 656-690.

Moretti, E. (2007). "Crime and the Costs of Criminal Justice". *The price we pay: Economic and social consequences for inadequate education*. Washington, DC: The Brookings Institution: 142-160.

Muennig, P. (2007). "Consequences in Health Status and Costs". *The price we pay: Economic and social consequences for inadequate education*. Washington, DC: The Brookings Institution: 125-141.

Rouse, C. (2007). "Consequences for the Labor Market". *The price we pay: Economic and social consequences for inadequate education. Washington*, DC: The Brookings Institution: 99-124.

Snider, T. A. & Dillow, S. A. (2011). Digest of Education Statistics, 2010, NCES 2011-

015 (Washington, DC: National Center for Education Statistics, U.S. Department of Education), Table 341. http://nces.ed.gov/programs/digest/d10/tables/dt10_341.asp.

Trostel, P. (2010). "The fiscal impacts of college attainment". *Research in Higher Education*, 51, 220-247.

Waldfogel, J., Garfinkel, I., & Kelly, B. (2007). "Welfare and the Costs of Public Assistance". *The price we pay: Economic and social consequences for inadequate education*. Washington, DC: The Brookings Institution 162-174.

Appendix

Table A1: Summary of Sources of Information

	New York City	New York State	National Source	Others
Personal Income	ACS 08-10			
Income Tax	ACS 08-10			NBER Taxsim
Sales Tax	ACS 05-10; Aggregate general sales tax revenues in NYC are available on: http://www.ibo.nyc.ny.us/; Fiscal history; Revenue and Spending since 1980; Tax revenues.	NYC sales tax bases (between 2005 and 2010) are available on http://www.tax.ny.gov/pdf/stats /stat_excise/taxable_sales_and_ purchases_march2009_february 2010.pdf.		Levin, H., C. Belfield, P. Muennig and C. Rouse (2007)
Property Tax	ACS 05-10; City of New York-Department of Finance, Office of Tax Policy			Levin, H., C. Belfield, P. Muennig and C. Rouse (2007)
Other City Taxes	(Personal income tax) ACS 05-10; Aggregate Personal Income- net- tax revenues in NYC are available on: http://www.ibo.nyc.ny.us/; Fiscal history; Revenue and Spending since 1980; Tax revenues			
Public Health	ACS 08-10		MEPS-2008	
Public Assistance	ACS 08-10 (welfare income) ACS 2002 (public housing)			Trostel (2010)
Crime		Uniform Crime Reporting Statistics UCR Data Online http://www.ucrdatatool.gov/ Estimated crime in New York	-NLSY-97 (% ever arrested; consumption of drugs, marijuana; % in prison) -Bureau of Justice Statistics (http://www.bjs.gov/index.cfm?ty=p bdetail&iid=4333) -Justice system expenditure by character, state and type of government, fiscal year 2008 Supplemental data for 49 large city governments	Trostel (2010) Belfield, Levin, Rosen (2012)

Table A2: Tax Revenue Gains for Married People

	By Type of Tax							*Total*
	High School Completers							
	Federal Income Tax Liability after all Credits	State Income Tax Liability after all Credits	FICA (OADSI & HI, Employee & Employer)	City Income Tax (Net)	Property Tax	NYC Sales Tax	NY State Sales Tax	Total HS
Total	4,304	11,479	97,970	26,788	7,522	15,977	15,682	179,723
Male	23,082	19,030	120,880	33,052	9,281	19,712	19,349	244,386
Female	-10,573	4,704	74,343	20,327	5,708	12,124	11,900	118,533
White	23,543	19,206	121,246	33,152	9,310	19,772	19,408	245,637
Black	2,332	10,562	94,361	25,801	7,245	15,388	15,104	170,793
Hispanic	-3,788	7,937	86,715	23,710	6,658	14,141	13,880	149,253
Other	-5,420	6,931	81,543	22,296	6,261	13,298	13,053	137,963
	Associate Degree Recipients							
	Federal Income Tax Liability after all Credits	State Income Tax Liability after all Credits	FICA (OADSI & HI, Employee & Employer)	City Income Tax (Net)	Property Tax	NYC Sales Tax	NY State Sales Tax	Total AA
Total	46,827	28,725	147,564	40,348	11,330	24,064	23,620	322,478
Male	70,633	38,903	172,734	47,230	13,263	28,169	27,649	398,581
Female	31,116	22,288	129,764	35,481	9,964	21,161	20,771	270,545
White	69,914	38,568	172,693	47,219	13,260	28,162	27,643	397,460
Black	42,485	26,879	141,815	38,776	10,889	23,126	22,700	306,670
Hispanic	33,805	23,495	133,057	36,381	10,216	21,698	21,298	279,949
Other	36,353	24,111	129,562	35,883	10,077	21,401	21,007	278,394

Source: earnings' taxes calculated based on ACS 2008-2010 and NBER-Taxsim, version 9.0, in constant dollars of 2010. Productivity increase of income (the tax base) is 1.5 percent per year. City income, property, NYC Sales and NY State taxes are calculated based on ACS 2005-2010 and City and State sources (see Table A1 in the Appendix for details).

Table A3: Lifetime Earnings, City, Property and Sales Taxes by Educational Attainment (for Married People)

Married	HS	Associate	Associate minus HS
Total	179,723	322,478	142,755
Male	244,386	398,581	154,195
Female	118,533	270,545	152,011
White	245,637	397,460	151,822
Black	170,793	306,670	135,877
Hispanic	149,253	279,949	130,696
Other	137,963	278,394	140,431

In constant 2010 dollars.

Table A4: Lifetime Earnings, City, Property and Sales Taxes by Educational Attainment: Single Minus Married

	HS	Associate	Associate minus HS
Total	53,580	76,224	22,645
Male	61,927	90,569	28,642
Female	43,202	67,517	24,314
White	62,182	89,633	27,451
Black	51,761	73,285	21,525
Hispanic	49,256	68,710	19,454
Other	45,776	67,497	21,721

In constant 2010 dollars.

Table A5: Approximate Distribution of the Benefits by Government Level

	Total Fiscal Benefits per AA Degree	Amount			%			Allocation		
		City	State	Federal	City	State	Federal	City	State	Federal
Total Public Benefits	**$205,514**	**$37,444**	**$47,970**	**$120,100**	**18.2%**	**23.4%**	**58.4%**			
Tax Revenues from Income	$145,567	$13,560	$21,843	$110,164	9.3%	15.0%	75.7%	City income tax	State income tax liability after all credits	Federal income tax liability after all credits; FICA
Property and Sales Taxes	$19,833	$11,895	$7,938		60.0%	40.0%		Property tax, NYC sales tax	NY sales tax	
Savings-Health Expenditures-Public	$5,026	($18)	$2,465	$2,580	-0.4%	49.0%	51.3%	Other State and Local Sources (50%); Other public (33%)	Medicaid (50%[a]); Other State and Local Sources (50%); Other public (33%)	Medicare; Medicaid (50%); VA; TRICARE; Other Federal sources; Other public (33%)
Savings-Welfare and Public Assistance	$5,956	$882	$69	$5,005	14.8%	1.2%	84.0%	Welfare income; Housing subsidy	Unemployment compensation (50%)	SSI; Food stamps; Unemployment compensation (50%)
Savings-Criminal Justice	$29,132	$11,125	$15,655	$2,351	38.2%	53.7%	8.1%	Correction and Judicial and Legal: Proportion of prisoners in local jail facilities[b]; Police protection: %NYCPD budget[c]/(NYCPD budget+8.2/19.5[e])*Annual budget State Police[d])	Correction and Judicial and Legal: Proportion of prisoners in State prisons[b]; Police protection: %8.2/19.5*Annual budget State Police/(NYCPD budget+8.2/19.5*Annual budget State Police)	Correction and Judicial and Legal: Proportion of prisoners in Federal prisons[b]

Source: (a) Federal Medical Assistance Percentages for NY State, http://aspe.hhs.gov/health/fmap10.htm; (b) *Prisoners in 2011,* U.S. Department of Justice, Bureau of Justice Statistics; (c) http://www.nyc.gov/html/omb/html/publications/projections.shtml?65 , FY 2010 Actual, Total, Agency Budget (d) http://www.budget.ny.gov/pubs/archive/fy1112archive/eBudget1112/fy1112littlebook/BriefingBook.pdf, p.65 (2010-2011); (e) U.S. Census Bureau.

Notes: For the allocation of the police protection costs, we assume the State police department's budget is allocated in per capita terms. Out of the 19.5 million people in New York State, 8.2 live in New York City (42 percent). Total police protection budget in NYC equals the NYCPD budget plus 42 percent of New York State police, and it is allocated according to the weight of each budget on the total budget. In constant 2010 dollars.