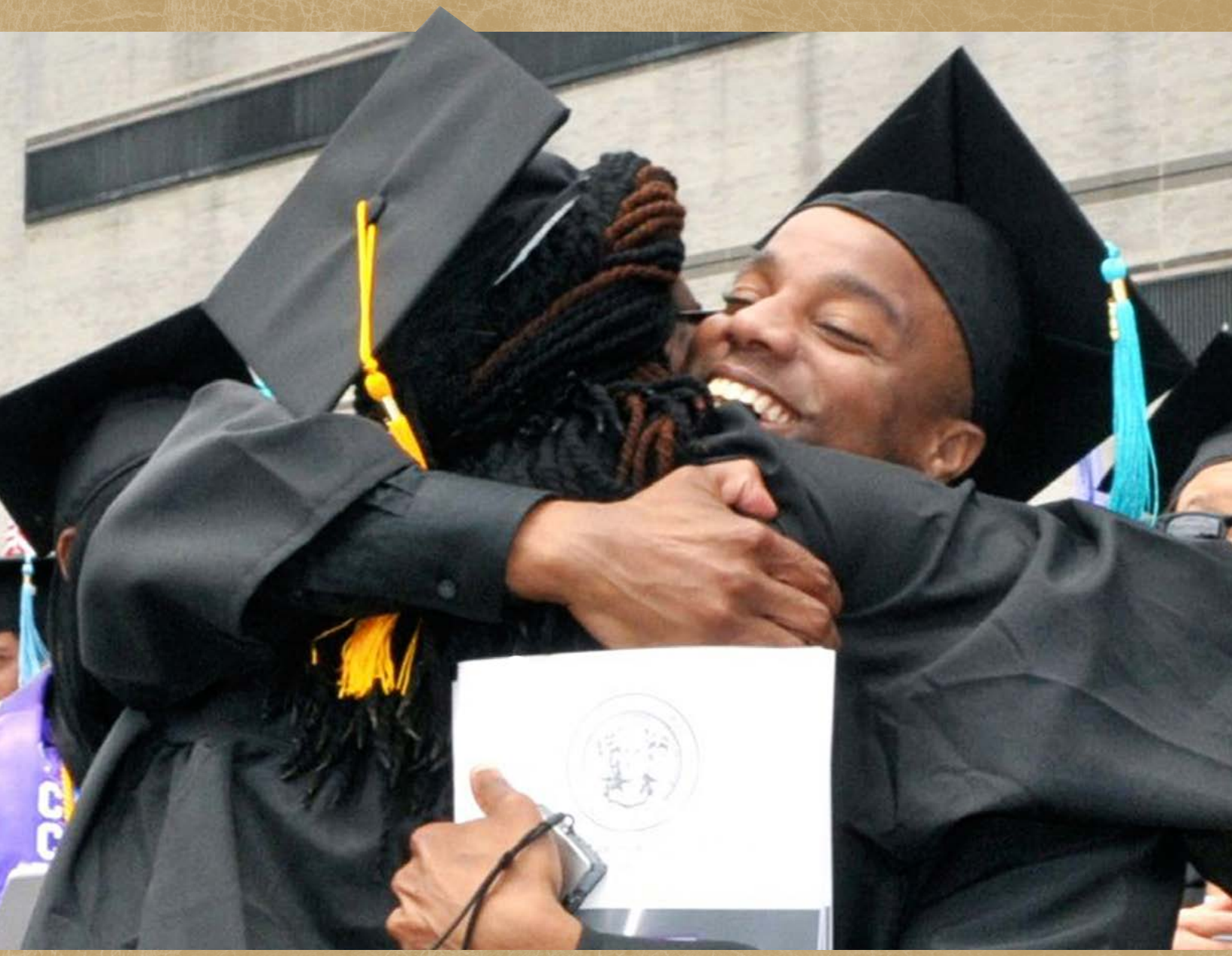
BEYOND HIGH SCHOOL

HIGHER EDUCATION AS A GROWTH AND FISCAL STRATEGY FOR NEW YORK CITY



NEW YORK CITY COMPTROLLER
JOHN C. LIU

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BEYOND HIGH SCHOOL:

Higher education as a growth and fiscal strategy for New York City

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About the New York City Comptroller's Office

The New York City Comptroller, an independently elected official, is the Chief Financial Officer of the City of New York. The mission of the office is to ensure the financial health of New York City by advising the Mayor, the City Council, and the public of the City's financial condition. The Comptroller also makes recommendations on City programs and operations, fiscal policies, and financial transactions. In addition, the Comptroller manages the assets of the five New York City Pension Funds, performs budgetary analysis, keeps the City's accounts, audits City agencies, manages the City's debt issuance, and registers proposed contracts. The office employs a workforce of more than 700 professional staff members. These employees include accountants, attorneys, computer analysts, economists, engineers, budget, financial, and investment analysts, claim specialists, and researchers, in addition to clerical and administrative support staff.

About Beyond High School NYC

Beyond High School NYC is a major initiative launched by Comptroller John C. Liu to increase the proportion of New Yorkers with higher education to 60 percent by the year 2025 through strategic investments in public education.

Cover photo: Courtesy of The City College of New York, Commencement, June 2012

Introduction

This report argues that the most promising strategy for achieving long-term fiscal balance, economic prosperity, and a high quality of urban life in New York City is one that focuses on elevating the educational attainment of its population or, in economists' language, by investing in human capital.

Investment in education offers unique opportunities. Unlike other budget-balancing strategies, it promises to enhance City revenues and, at the same time, lower its spending, thus attacking the budget problem from both sides of the fiscal equation. Education raises revenues primarily by increasing individuals' earnings, and hence the City's income, sales, real estate and other tax collections. On the spending side, well-educated residents tend to require fewer public services, both because many services are "privatized" as income goes up (such as recreation and transportation) and because well-educated residents have fewer needs (resulting, for example, from better health).

In addition to the beneficial fiscal effects, raising the City's aggregate level of education will be a potent economic development strategy. In fact, urban economists have identified a city's level of human capital as one of the most reliable indicators of future economic growth,[1] and some have advocated metropolitan development strategies aimed at retaining or attracting highly-educated people.[2] Consequently, increased investment in the education of individuals benefits all residents of the City, not just those who avail themselves of the enhanced educational opportunities. By encouraging more innovation and higher productivity directly and through "knowledge spillovers," additional education for some promotes faster economic growth and more economic opportunities for all.

"Raising the City's aggregate level of education will be a potent economic development strategy."

Investment in human capital has the added advantage of improving the individual lives of residents as well as improving the collective life of the City. Well-educated individuals have higher earnings, less frequent unemployment, more job satisfaction, and better health. They are less likely to be single parents and less likely to ever be incarcerated. They are able to retire in greater financial comfort and live longer. But perhaps most importantly, they are better equipped to fulfill their aspirations whatever they may be, and to enjoy the fruits of their accomplishments with a broader and deeper understanding of the world around them.[3]

The purpose of this study is to gauge where New York City ranks among major U.S. cities in terms of the educational attainment of its population, to identify the weak links in the chain of human capital development, and to survey some of the private and public benefits that would be expected to result from a meaningful elevation of educational attainment. Of course, improving educational attainment is easier said than done, but clarifying goals is always a sound first step in developing policies. In coming months, the Comptroller will issue additional research identifying areas in which the City's educational efforts could be enhanced or re-targeted to achieve specific and measurable educational goals. The emphasis will be on raising the rates of college degree completion among New York City residents, an end goal that is often obscured by the formidable challenges of K-12 education in the City.

[1] Curtis Simon (1998), "Human Capital and Metropolitan Employment Growth," *Journal of Urban Economics* 43; Edward Glaeser, Jose Scheinkman and Andrew Shleifer (1995), "Economic Growth in a Cross-Section of Cities," *Journal of Monetary Economics* 36; Edward Glaeser and Albert Saiz (2004), "The Rise of the Skilled City," *Brookings-Wharton Papers on Economic Affairs* 2004; Rob Roy McGregor and Gaines Liner (2002): "Municipal Economic Growth, 1960-1990," *Quarterly Journal of Business and Economics* 41; Jesse Shapiro (2006): "Smart Cities: Quality of Life, Productivity, and the Growth Effects of Human Capital," *Review of Economics and Statistics* 88.
[2] Richard Florida (2004): *The Rise of the Creative Class*. Basic Books.
[3] For a discussion of the non-monetary benefits of education and a review of the literature, see Philip Oreopoulos and Kjell Salvanes (2011), "Priceless: The Nonpecuniary Benefits of Schooling," *Journal of Economic Perspectives* 25.

Where New York City Stands in Educational Attainment

New York City prides itself on being the intellectual capital of the U.S., and possibly in terms of books published or dramas staged, it is. But it is far from being the national leader in educational attainment; among the 15 largest metropolitan areas in the United States, the New York area ranks only in the middle of the pack. Table 1 shows the educational attainment of residents aged 25-64 for the fifteen largest U.S. metropolitan areas and their corresponding central cities.

TABLE 1

Percent of Working-Age Population with College Degree, 2010
Largest Metropolitan Areas and Corresponding Central Cities

Location	Metro Area		Central City	
	AD+	*BA+*	*AD+*	*BA+*
% with college education				
Washington	54.6%	48.7%	56.4%	52.9%
Boston	55.4%	48.2%	52.3%	48.4%
San Francisco-Oakland	50.6%	43.1%	61.3%	55.8%
Seattle	51.5%	42.2%	64.7%	57.0%
Minneapolis-St Paul	51.3%	41.0%	52.5%	44.6%
New York	45.7%	38.7%	42.2%	35.7%
Chicago	43.9%	36.9%	41.9%	36.3%
Philadelphia	42.8%	36.1%	29.0%	24.3%
Atlanta	43.5%	35.9%	NA	NA
Dallas-Ft Worth	39.2%	32.4%	NA	NA
Houston	35.2%	29.3%	NA	NA
Detroit	38.5%	29.7%	19.6%	12.8%
Phoenix	38.1%	29.2%	NA	NA
Los Angeles-Riverside	36.3%	29.0%	36.7%	30.8%
Miami	37.1%	27.6%	NA	NA

Source: NYC Comptroller's Office from ACS microdata

Table 1 shows that five of the other fourteen largest metropolitan areas rank ahead of the New York metropolitan area in the percentage of the working-age population (measured as ages 25 to 64) who have a college degree (measured as having received an associate's degree or higher or a bachelor's degree or higher). As can be seen, in the Washington D.C. metropolitan area 48.7 percent of the working-age population has a bachelor's degree or more—fully 10 percentage points higher than in the New York metropolitan area. The other four which rank higher are those centered around Boston, San Francisco, Seattle, and Minneapolis. It is important to note that all of those which rank higher are significant competitors with New York in key industries such as finance, professional and business services, and information and technology.

The largest metropolitan areas are used in Table 1 because, by comparing them rather than cities, a better sense of where New York ranks relative to its principal competitors can be obtained. If the chart showed the largest "cities," defined according to political boundaries, smaller central cities including

Washington D.C., Seattle, Boston, Minneapolis, and Miami would drop off the list. Moreover, the ranking would be distorted because the educational levels could be influenced by the size of the central city relative to its overall metropolitan area, and by how many members of its educated labor pool lived within and without the political boundaries of the city.

When we look at the educational attainment of the residents of each central city, New York ranks even lower. Among the cities around which the 15 largest metropolitan areas are centered, New York ranks no higher than seventh in the percentage of residents with BA or higher degrees. In the city rankings, Chicago also ranks ahead of New York City, in addition to the five previously noted. Moreover, the educational attainment gap between New York City and the top-ranked cities is even wider than it is in the metropolitan area rankings; for example, only 35.7 percent of working-age New York City residents have a BA degree or higher, compared to 57 percent in Seattle and 56 percent in San Francisco. In fact, of the 10 metropolitan areas that can be compared the central city has an equal or higher share of college-educated residents than its suburbs. Only New York, Chicago, Philadelphia, and Detroit have a lower share of college-educated residents than do their suburbs in six of them.

TABLE 2

Origins of Resident Population Holding a College Degree [1] New York City and Most-Educated Cities [2]

Top 5 Cities			New York City		
Origin	*Number*	*Percent*	*Origin*	*Number*	*Percent*
Total Population[3]	1,797,836	100.0	Total Population	4,552,670	100.0
College Educated	1,009,158	56.1	College Educated	1,921,918	42.2
College educated born in:			*College educated born in:*		
Same state	308,298	17.1	Same state	706,252	15.5
Neighboring state	41,589	2.3	Neighboring state	73,123	1.6
Rest of U.S.	423,012	23.5	Rest of U.S.	369,761	8.1
Abroad	236,259	13.1	Abroad	772,782	17.0

[1] Associates degree or higher degree [2] Washington D.C., Boston, San Francisco, Minneapolis, Seattle [3] Ages 25-64
Source: Computed by NYC Comptroller's Office from ACS microdata

The obvious question is why New York City's percentage of college-educated residents is so far below those of the most-educated cities. Table 2 shows the percent of New York City's working-age residents who have an associate's degree or higher and the distribution of them by their place of birth. Also shown is the comparable data for the central cities of the five most-educated metropolitan areas combined. Ideally, we would know where the college-educated population of each city attended school at the elementary, secondary, and post-secondary level. Unfortunately, no such data set exists. As a proxy, we use their place of birth as reported in the American Community Survey (ACS). In the ACS, place of birth is listed for each individual by state or, if born abroad, by country. It can be assumed that most current residents of central cities who were born in the state in which that city is located were in fact born in the city itself and educated at schools within it. A smaller number were probably born in the city's suburbs or elsewhere within the state and migrated to the state's principal city. We also tabulated the number who

were born in the two most proximate adjacent states (for example, New Jersey and Connecticut for New York City), elsewhere in the United States, and abroad.

From Table 2 it immediately stands out that New York City's deficit in college-educated residents is primarily due to a paucity of college graduates who were born elsewhere in the United States and came to the city either as children or adults. Despite having populous states in immediate proximity, New York City receives relatively few college-educated residents from neighboring states. However, much more dramatic is the City's relatively small number of college graduates who were born elsewhere in the United States. In the five highly-educated cities, nearly one-quarter of the working-age population are college-degreed persons who were born in the United States but outside the home state or the most geographically proximate states. In New York City, that percentage is only 8.1.

"It is imperative that the City dramatically improve the educational outcomes of children who are raised and schooled in the five boroughs."

Somewhat offsetting New York City's disadvantage in having fewer college-degreed residents from its home state, nearby states, or the rest of the U.S., the City gets a disproportionate share of its college-educated residents from abroad. More than 40 percent of New York City college-degreed residents were born abroad, compared to 22.5 percent in the five most-educated cities. This underscores the critical importance of immigration to New York City's human capital accumulation.

If New York City were to approximate the educational attainment of the five most-educated cities, it would need to have more than 630,000 additional college degree-holders among its resident population. In order to close an education gap that large, it will need to enhance the three basic sources of its human capital flow: the education of children born and raised in New York City, the attraction of educated migrants from the rest of the U.S., and the attraction of educated immigrants from abroad. However, the source over which it has the most control (and the greatest moral obligation to address) is its native population. Consequently, it is imperative that the City dramatically improve the educational outcomes of children who are raised and schooled in the five boroughs.

The Educational Attainment of New York City Children

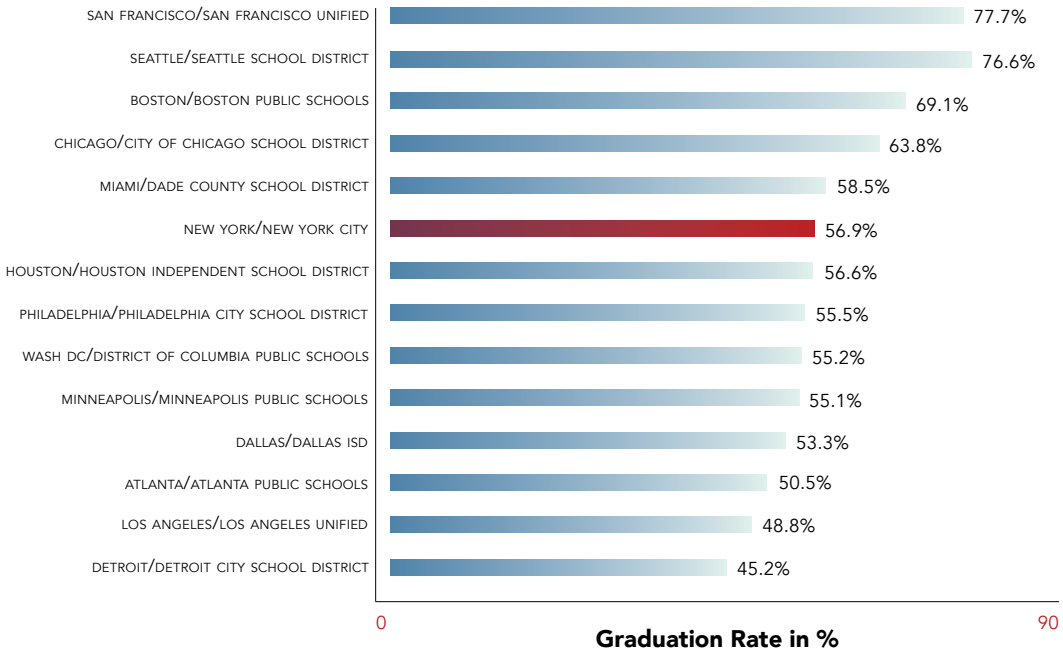
Although a shortfall in the educational attainment of New York City's resident children is not the only source of the City's human capital deficit, it is the most troubling. The inability of the City's public schools to prepare adequately its students for a college education and to direct them to appropriate college opportunities harms the City's competitiveness and deprives the next generation of a chance for prosperous and fulfilling lives.

It is difficult to compare the performance of public schools among the nation's largest cities. One of the major difficulties stems from the traditional fragmentation of responsibilities among school districts that may be independent from, and not coterminous with, municipal governments. About half of the central cities within the top 15 metropolitan areas have established public school systems that are coterminous

with the city's boundaries—New York City, Philadelphia, and San Francisco among them. However, other cities are fragmented or overlap with their suburbs. For example, the Los Angeles Unified School District, which is the second-largest school district in the nation after New York City's, does not cover all areas of the city but serves some suburban areas outside of the city's political boundaries. In Houston, there are nine different school systems headquartered within the city's limits. Thirty different school districts serve the City of Phoenix.

CHART 1

*Averaged Freshman High School Graduation Rates for Principal Central City School Districts, 2007-2008**



**The averaged freshman graduation rate (AFGR) provides an estimate of the percentage of students who receive a regular diploma within 4 years of entering ninth grade. The rate uses aggregate student enrollment data to estimate the size of an incoming freshman class and aggregate counts of the number of diplomas awarded 4 years later. The school districts shown represent the largest or most central school districts serving each city.*

Source: http://nces.ed.gov/pubs2010/100largest0809/tables/table_a12.asp. The AFGRs for Washington DC, Minneapolis, and Seattle were provided by the National Center for Education Statistics (NCES) to the NYC Comptroller by request.

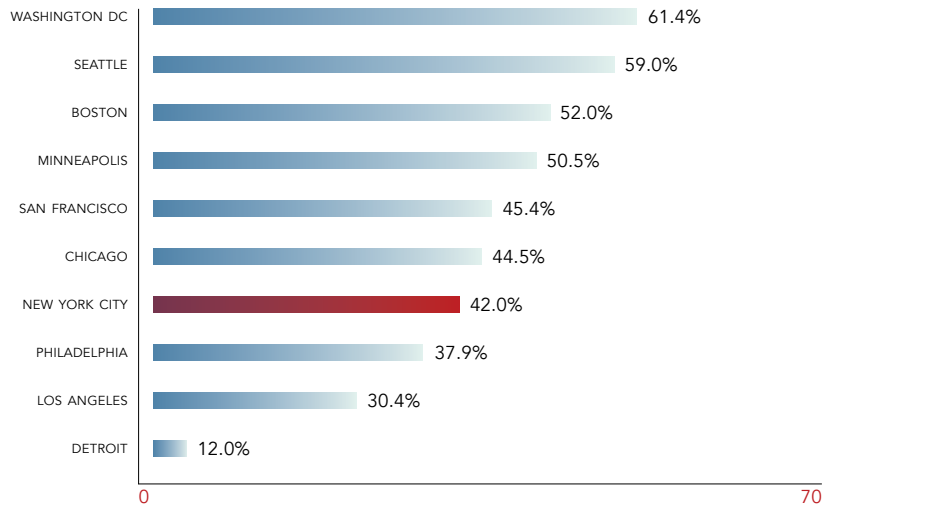
Chart 1 shows the four-year high school graduation rates of the major school districts serving 14 of the 15 principal central cities, as calculated by the National Center for Education Statistics (NCES) using data from the Common Core Database (CCD). These graduation rates have the advantage of being computed using a consistent methodology across districts.[4]

The reader should also be aware that it can be misleading to compare performance indicators across districts with much different proportions of poor students, of students with limited English proficiency, or of students with other special needs. Nevertheless, the chart suggests that the ranking of the school districts according to their high school graduation rates bears a strong similarity to the ranking of the principal cities according to their residents' educational attainment (Table 1). San Francisco Unified and Boston Public Schools rank at the high-end of the graduation rate spectrum, while Los Angeles Unified and Detroit Public Schools rank near the bottom. The school systems of New York City, Chicago, and Philadelphia rank in the middle of the spectrum, as do those central cities in overall educational attainment.

[4] In 2005, the federal Department of Education published an official federal estimate of state graduation rates and governors agreed to adopt a uniform calculation method. The standardized reporting was implemented through a federal order in 2008 but governors have until 2013 to adopt the agreed-upon methodology.

CHART 2

*Percent of Resident 23-Year Olds With an Associates Degree or Higher, 2010**



** The average freshman graduation rate provides an estimate of the percentage of students who receive a regular diploma within 4 years of entering ninth grade. The rate uses aggregate student enrollment data to estimate the size of an incoming freshman class and aggregate counts of the number of diplomas awarded 4 years later. The school districts shown represent the largest or most central school districts serving each city.*

Source: http://nces.ed.gov/pubs2010/100largest0809/tables/table_a12.asp. The AFGRs for New York City, Washington DC, Minneapolis, and Seattle were provided by NCES to the NYC Comptroller by request.

High school graduation rates have an economic importance in and of themselves, insofar as high school graduates have higher earnings and a lower unemployment rate than those who do not finish high school. However, they are also indicative of how many of a city's young people are positioned and prepared to go on to college, and therefore to contribute further to building the city's human capital advantage.

Chart 2 shows the proportion of the principal cities' residents who are 23 years old and hold at least an associate's degree. Age 23 was chosen because by that age most young people who attended college have returned home, but have not yet begun to migrate towards their ultimate residential destination. The table shows that even in this very early stage of educational competition, New York has already fallen far behind the most educated cities.

The education levels of young people shown in Chart 2 are a product of both the public and private school systems in each city. Private schools have higher high school graduation rates than public schools, and send a higher proportion of their students on to college.[5] In New York City, about 17.6 percent of children aged 6-to-17 attended private school in 2010, which places the City among the principal cities with a high level of private school attendance. San Francisco's is the highest at 22.1 percent; Detroit's is the lowest at 5.2 percent. The size of the private-school sector in New York is similar to that in Boston (18.6 percent), Washington D.C. (18.1 percent), and Philadelphia (16.5 percent).[6]

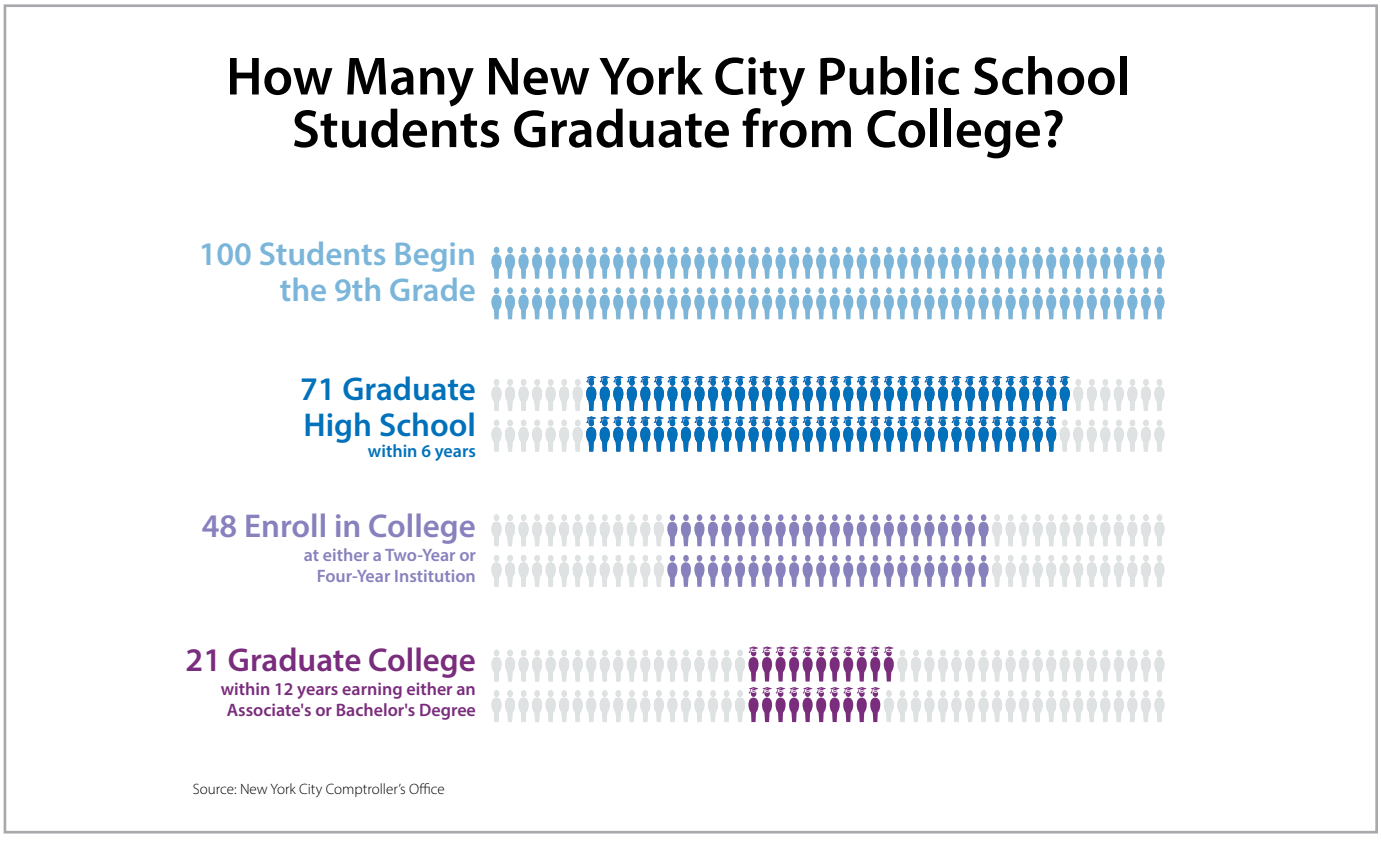
The Comptroller's Office estimates that just 21 percent of New York City public school students go on to complete a two- or four-year college degree within six years of graduating high school. According to the Department of Education (NYCDOE), 71 percent of the City's public school freshmen graduate

[5] Table 211. Graduation rates of previous year's 12th graders and college attendance rates of those who graduated, by selected high school characteristics: 1999-2000, 2003-2004, and 2007-2008," Digest of Education Statistics, National Center for Education Statistics, http://nces.ed.gov/programs/digest/d11/tables/dt11_211.asp, accessed on August 21, 2012.
[6] Calculated by the New York City Comptroller's Office from ACS microdata.

high school within 6 years.[7] Also according to NYCDOE, 48 percent of its graduates enroll in a degree program at a two- or four-year college or university by the end of that calendar year. Applying those percentages, it can be estimated that of every 100 freshmen entering a City high school, about 48 graduate and enroll in a college degree-program. The Comptroller's Office further estimates that about 21 of them (44%) will successfully complete an associate's or bachelor's degree.[8] This sequence of attrition from high school through college completion is dramatized in Diagram 1. Interestingly, this estimate of 21 percent of New York City Public School students graduating from college within a 12-year time period is nearly identical to the NYCDOE's finding that 21.6 percent of this cohort qualifies as college ready.

This analysis suggests that New York City is highly dependent on sources other than its own public school system to supply the educated workforce its economy needs. It appears that only one-fifth of the City's new college-degreed entrants to its workforce (age 23) are products of the City's school system.[9] The rest of the economy's demand for new, college-educated labor must be met by commuters, by migrants from other states, and from immigrants from abroad.

DIAGRAM 1



[7] Graduation Outcomes, Cohorts of 2001 through 2007 (Classes of 2005 through 2011)," New York City Department of Education. http://schools.nyc.gov/Accountability/data/GraduationDropoutReports/default.htm
[8] See Appendix II on page 20.
[9] Ibid.

The Earnings and Tax Benefits of Higher Education

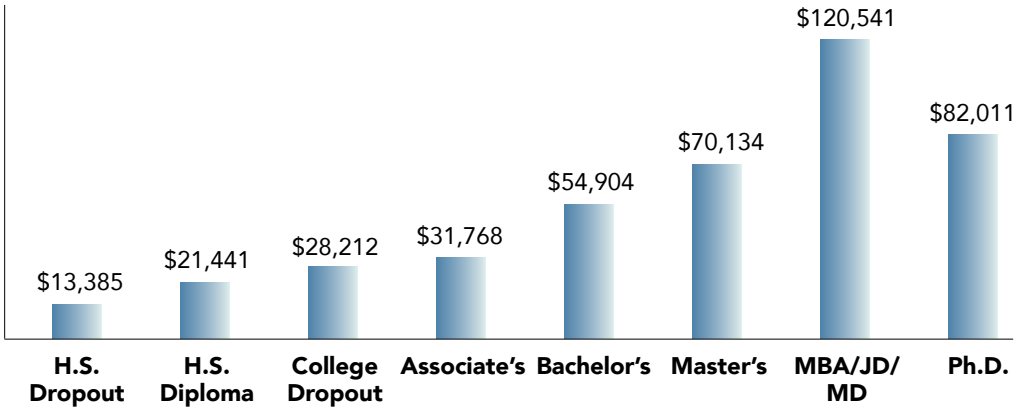
One of the most well-established findings in labor economics is that workers with college degrees earn more than those who do not have a college education.[10] Since only 21 percent of New York City public school students go on to receive a college degree, an enormous aggregate earnings potential is being squandered.

Education has a dramatic impact on the earnings of New York City residents. Those with higher levels of education are more likely to have a job and are more likely to have better paying jobs. Chart 3 shows the average annual earnings of New York City residents in 2010, by highest level of education attained.

The average holder of a bachelor's degree in New York City between the ages of 20 and 65 earned $54,904 in 2010, compared to $21,441 for a high school graduate, and $28,212 for those who attended college but didn't obtain a degree. Those figures are the product of the different groups' earnings when they work and the proportion of them that do work. About 70 percent of working-age New Yorkers who did not have a college degree were in the labor force in 2010, compared to nearly 85 percent of those who held at least an associate's degree.

CHART 3

Mean Annual Earnings of NYC Residents, by Educational Attainment



Source: 2010 ACS 1-year Public Use Microdata Samples (PUMS), NYC residents age 21 to 65

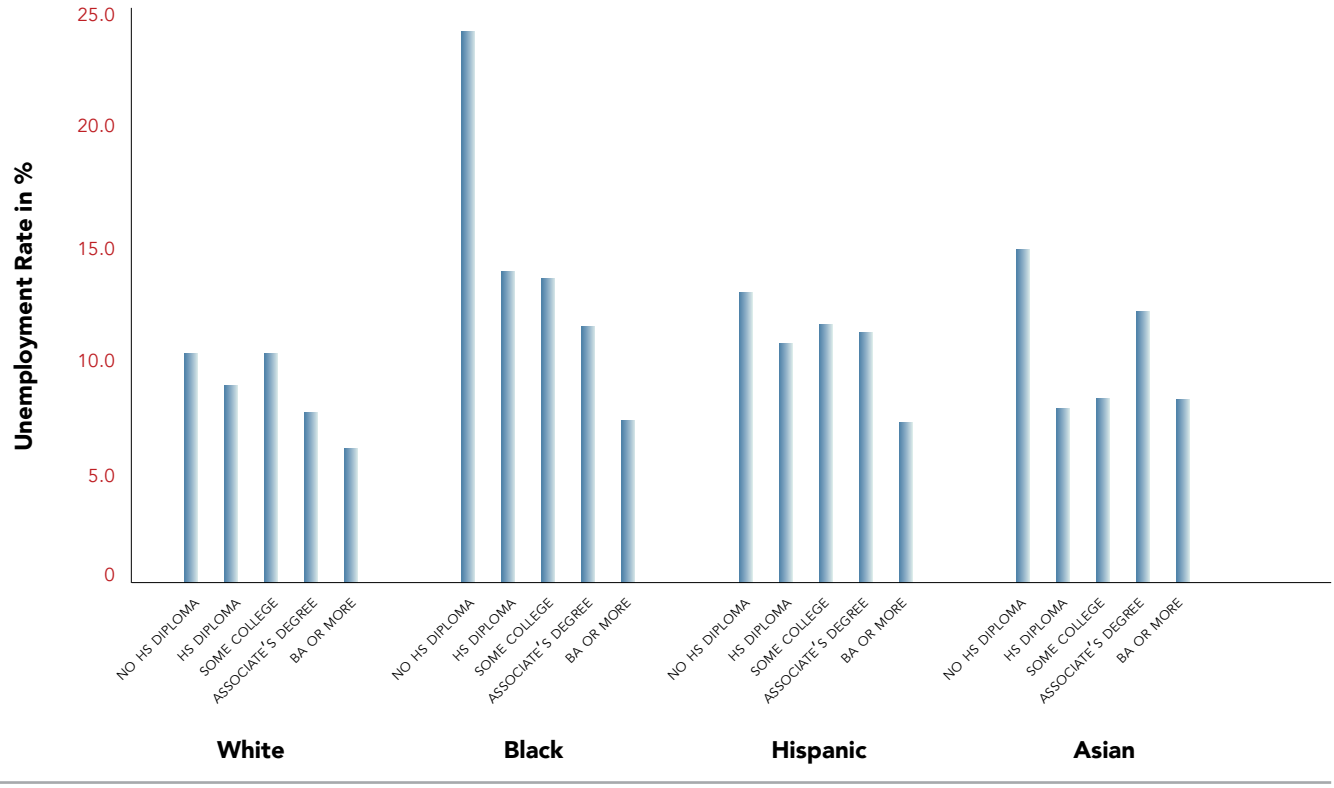
[10] Jacob Mincer (1958), "Investment in Human Capital and Personal Income Distribution," *Journal of Political Economy* 66; Gary Becker and Barry Chiswick (1966), "Education and the Distribution of Earnings," *American Economic Review* 56; Finis Welch (1973), "Black-White Differences in Returns to Schooling," *American Economic Review* 63; Geoffrey Carliner (1976), "Returns to Education for Blacks, Anglos, and Five Spanish Groups," *Journal of Human Resources* 11; Robert Hauser and Thomas Daymont (1977), "Schooling, Ability and Earnings: Cross Sectional Findings 8 to 14 Years After High School," *Sociology of Education* 50; Susan Bartlett (1978), "Education, Experience and Wage Inequality: 1939-1969," *Journal of Human Resources* 13; Orley Ashenfelter and Alan Krueger (1994), "Estimates of the Economic Return to Schooling from a New Sample of Twins," *American Economic Review* 84; Joshua Angrist and Alan Krueger (1995), "Split-Sample Instrumental Variables Estimates of the Return to Schooling," *Journal of Business & Economic Statistics* 13; Orley Ashenfelter and David Zimmerman (1997), "Estimates of the Return to Schooling from Sibling Data: Fathers, Sons and Brothers," *Review of Economics and Statistics* 79; Claudia Golden and Lawrence Katz (2000), "Education and Income in the Early Twentieth Century: Evidence From the Prairies," *Journal of Economic History* 60; David Card (2001), "Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems," *Econometrica* 69; Christopher Dougherty (2005), "Why Are the Returns to Schooling Higher for Women than for Men?," *Journal of Human Resources* 40; James Heckman, Lance Lochner and Petra Todd (2008), "Earnings Functions and Rates of Return," *Journal of Human Capital* 2.

When they are in the labor force, the unemployment rates of less-educated workers are generally higher than their more educated peers. Chart 4 shows unemployment rates, by level of education and race, for New York City in 2010. In 2010, the overall unemployment among New Yorkers between 24- and 65-years old was 9.6 percent, but there was a wide variation by education and race. For example, the overall unemployment rate for working-age New Yorkers with a high school diploma was 10.5 percent, but for residents with a bachelor's or higher degree it was only 6.5 percent.

CHART 4

Unemployment Rates for New York City Residents, 2010

By Educational Attainment and Race



Source: 2010 ACS 1-Year PUMS, NYC residents age 21 to 65

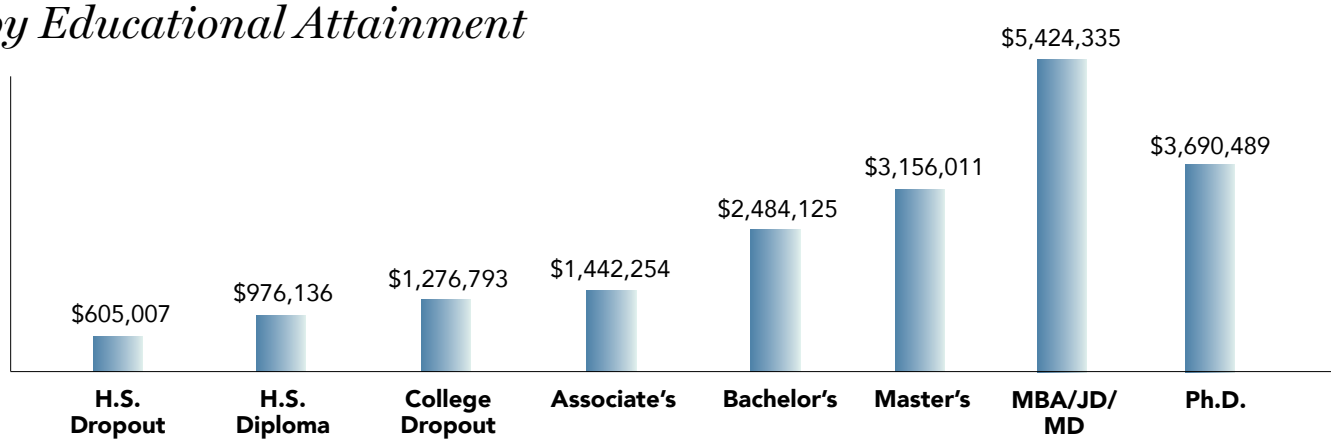
In 2010, the overall unemployment rate for white, working-age New Yorkers was 7.0 percent, but for African-Americans it was 12.9 percent and for Hispanics it was 10.7 percent. As the chart shows, the racial differential in unemployment rates is far narrower among college-educated workers. Among New Yorkers with a bachelor's or higher degree, the unemployment rate for blacks was 7.1 percent, compared to 5.8 percent for whites. That compares to a 4.8-percentage point differential among blacks and whites who have no formal education beyond high school. In fact, the difference in the unemployment rate between college graduates and those who didn't finish high school was largest among blacks—17.1 percentage points. Among Hispanics and Asians that differential was 5.5 percentage points and 6.6 percentage points, respectively.

Using cross-sectional earnings data at a point in time it is possible to gain a rough estimate of the lifetime earnings of New Yorkers in each educational group. To do so we used a methodology similar to that used by the Census Bureau for a similar purpose.[11] The method assumes that the relative earnings among groups do not change over time, which of course is unlikely. However, since it is impossible to predict in what way they will change and when, it is an acceptable assumption for formulating a "best guess" on lifetime earnings.

Chart 5 shows the lifetime earnings estimates for New York City residents with differing levels of educational attainment. The figures are expressed in 2010 dollars (i.e., they do not account for future inflation and are not discounted to present value). The analysis shows that over the course of a working life a New York City resident with a bachelor's degree can expect to earn roughly $2.5 million, roughly twice that of someone who attended college but did not complete a degree. The lifetime earnings premium for a person with an associate's degree, relative to a person with only a high school diploma, is about $466,000. The lifetime earnings premium for a person with a master's degree, relative to a person with a high school diploma, is about $2.2 million.

CHART 5

Estimated Lifetime Earnings of NYC Residents, by Educational Attainment



Source: 2010 ACS 1-year PUMS, NYC residents age 18 to 65

The higher lifetime earnings of the college educated allow them to live in higher levels of material comfort and security. Moreover, their earnings are also associated with greater benefits to the City as a whole. For example, under current tax law, the greater earnings a holder of an associate's degree would enjoy over someone with a high school diploma would translate into about $6,795 additional personal income tax payments to the City over their working life, discounted to present value. The difference in expected income tax payments of a bachelor's degree holder, relative to a high school graduate, would be about $25,210 over their working lives, discounted to present value.

As in most cities, residents of New York are also taxed when they spend their incomes on certain items. Overall, households spend about 18 percent of their gross incomes on items that are subject to New York City and New York State sales taxes, so that households with higher levels of education and higher

In 2005, the federal Department of Education published an official federal estimate of state graduation rates and governors agreed to adopt a uniform calculation method. The standardized reporting was implemented through a federal order in 2008 but governors have until 2013 to adopt the agreed-upon methodology.

[11] Tiffany Julian and Robert Kominski (2011), *Education and Synthetic Work-Life Earnings Estimates*, United States Census Bureau.

levels of income will also pay more sales taxes. However, the Bureau of Labor Statistics' Consumer Expenditure Survey[12] indicates that the share of income spent on taxable items declines as income grows, so there is not a dollar-for-dollar relationship between income and sales tax payments. Based on the estimated lifetime earnings by educational attainment shown in Chart 5, patterns of consumer expenditures revealed in the Survey of Consumer Spending, and New York City's current local sales tax rate, we estimate that a resident holding an associate's degree will pay, on average, about $3,194 more in local sales taxes during their working years than a person with just a high school diploma, and a four-year college graduate will pay about $5,220 more than someone with a high school diploma on a present value basis.

Education, primarily through its effect on worker earnings, can also be expected to raise City property tax collections. Taxes on residential property accounted for more than half of the City's property tax levy in FY 2012 and totaled more than $10 billion. However, the educational effect on property taxes is much more complicated to estimate than is the effect on income taxes, because living arrangements, and hence property tax obligations, vary among individuals and groups of individuals.

In 2010, about 82 percent of working-age City residents with an associate's degree or more were identified as a household head, or the spouse, unmarried partner, or roommate/housemate of the householder. Only 69.5 percent of working-age residents without a college degree were so identified. The difference was made up by a much higher percentage of non-degreed residents living in households in which a parent, or another relative, was identified as the householder. When non-degreed residents were householders or co-householders (spouse, partner, roommate), they were more likely to be renters than owners, compared to degreed householders. When they were renters, they paid less rent, and when they were owners, they owned homes of lower value. Based on these patterns, and on the City's current rates of taxation on rental and ownership housing, we estimate that the average person with a bachelor's degree pays about $18,916 more in lifetime property taxes than does a person with just a high school diploma, on a present value basis.

Estimated Present Value of NYC Income, Sales and Proerty Taxes by Level of Educational Attainment

	H.S. Dropout	H.S. Diploma	Associate's	Bachelor's
Income Tax	$3,509	$8,200	$14,995	$33,410
Sales Tax	$7,724	$10,272	$13,466	$15,492
Property Tax	$21,112	$24,919	$33,393	$43,835
Total Tax	**$32,345**	**$43,391**	**$61,854**	**$92,737**

** Tax payments estimated from ages 18-70, discounted at 3% rate.*
Source: NYC Comptroller's Office

[12] Bureau of Labor Statistics, *Consumer Expenditure Survey* 2010, Table 2. http://www.bls.gov/cex/2010/Standard/income.pdf

Education and Income Inequality

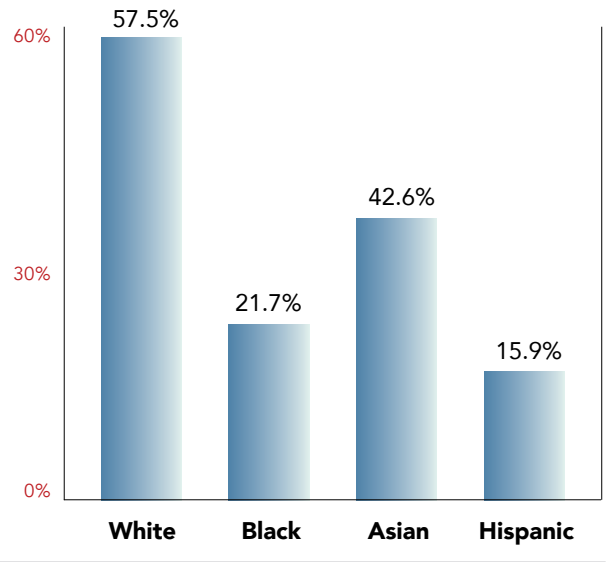
One of the defining features of the American economy during the past several decades has been the concentration of income among the top one percent, and even more so, among the top one-tenth of one percent, of households. That polarization of income has relatively little to do with the human capital the top earners possess, but much to do with the institutional changes in American corporations, politics, and society.[13] However, even among the other 99 percent, there are large and growing differences in earnings and wealth, and those differences are highly correlated with differences in educational attainment.[14]

In New York City, as well as the nation, there are large differences in earnings that are highly correlated with educational attainment. Charts 3 and 5 show the large differences in annual earnings and estimated lifetime earnings for New York City residents according to their level of education. New Yorkers with BA degrees are estimated to have lifetime earnings that are two and one-half times greater than New Yorkers with just a high school diploma.

Differences in educational attainment also underlie much of the inequality among groups in New York City. Charts 6A and 6B show the average earnings of White, Black, Hispanic, and Asian residents of New York City and the percentage of the working-age members of each group that have a bachelor's degree. Although the proportion with bachelor's degrees is not the only or most complete measure of educational attainment by group, group earnings line up fairly well with that percentage. The Chart

CHART 6A

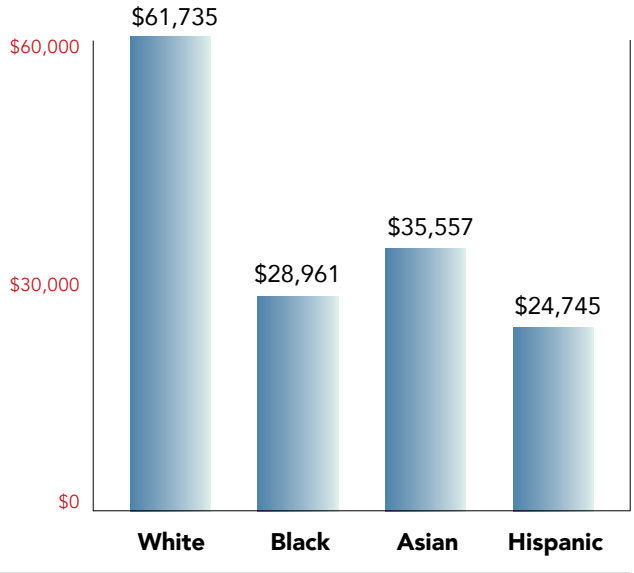
Share of NYC Residents with at least a Bachelor's Degree, by Race



Source: 2010 ACS 1-year PUMS, New York City Residents over age 24, under age 65

CHART 6B

Average Earnings of NYC Residents, by Race



Source: 2010 ACS 1-year PUMS, New York City Residents over age 24, under age 65

[13] Joseph Stiglitz (2012), *The Price of Inequality, How Today's Divided Society Endangers Our Future*, W.W. Norton and Company. Paul Pierson and Jacob Hacker (2010), *Winner Take All Politics: How Washington Made the Rich Richer and Turned Its Back on the Middle Class*, Simon & Schuster. Timothy Noah (2012), *The Great Divergence: America's Growing Inequality Crisis and What Can Be Done About It*, Bloomsbury Press.
[14] Claudia Goldin and Lawrence Katz (2010), *The Race Between Education and Technology*, Harvard University Press. Robert Gordon and Ian Dew-Becker (2008), *Controversies About the Rise of American Inequality: A Survey*, National Bureau for Economic Research Working Paper No. 13982. David Card and John DiNardo (2002), "Skill-Biased technological Change and Rising Wage Inequality: Some Problems and Puzzles." *Journal of Labor Economics* 20.

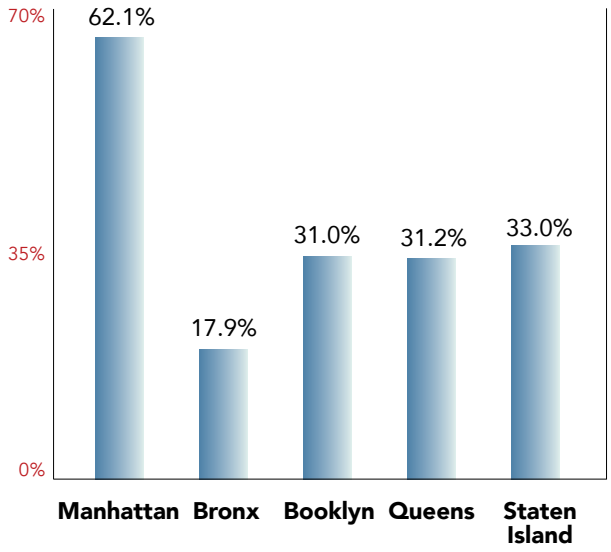
shows, for example, that average earnings for non-Hispanic White city residents are about $61,700, and about 58 percent of those residents have at least a bachelor's degree. For Hispanics, the average earnings are about $24,500, and 16 percent of those residents have a bachelor's degree or more.

Closing the educational gap among groups in New York City would not eliminate the earnings gap among those groups, but it would help to narrow it. We estimate that if non-Hispanic blacks in the City had a distribution of educational attainment similar to non-Hispanic whites, about 37 percent of the black-white earnings gap would be eliminated.[15] In the case of Hispanics and Asians, the proportion of the gap that would be eliminated would be about 42 percent and 29 percent, respectively.

The inequalities that characterize earnings by race are also manifested geographically across the five boroughs of the City, and could also be mitigated by further investment in human capital. Charts 7A and 7B show the average earnings of working-age residents of each borough and the proportion of them that hold a bachelor's or higher degree. In Manhattan, with the highest average earnings at about $71,200, 62 percent of adults have a bachelor's or higher degree. In the Bronx, the borough which has the lowest average earnings at $23,800, also has the lowest amount of residents with a bachelor's or higher degree, at 18 percent. Although the distribution of earnings and education across the boroughs is in part a result of the continuous process of residential sorting into expensive and inexpensive neighborhoods, it also works to reinforce educational and income inequalities. While the city has made impressive gains in community development through physical investments over the past several decades, much remains to be done in terms of investment in human capital.

CHART 7A

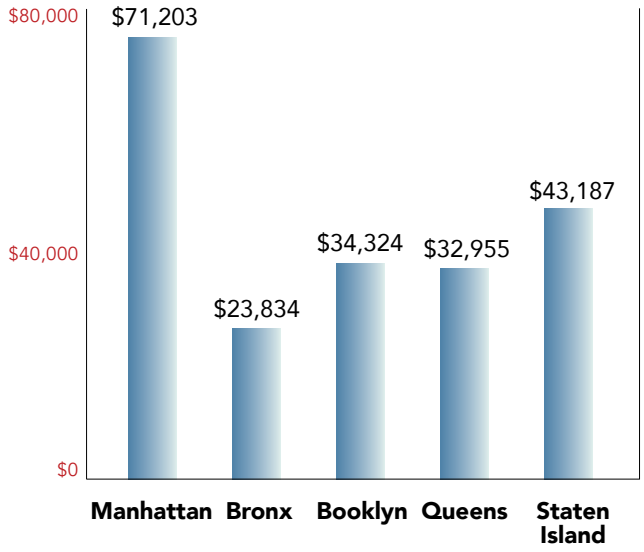
Share of NYC Residents with at least a Bachelor's Degree, by Borough



Source: 2010 ACS 1-year PUMS, New York City Residents over age 24, under age 65

CHART 7B

Average Earnings of NYC Residents, by Borough



Source: 2010 ACS 1-year PUMS, New York City Residents over age 24, under age 65

[15] These estimates do not factor in the effects of the male-female earnings gap. For instance, among Whites in the City, about 53 percent of the holders of bachelor's or higher degrees are female. Among blacks, the proportion female is 63 percent. Consequently, the overall black-white earnings gap at any given level of education is exacerbated by the male-female earnings gap.

Human Capital Investment and City Expenditures

While additional investment in human capital has the potential to increase individual earnings and welfare, increase local tax revenues, and mitigate growing inequality, it can also contribute to containing City government expenditures, especially though not exclusively in the area of social services.

One of the most direct relationships between education and City expenditures in is the area of income support. A connection between educational attainment and welfare receipt is well established.[16] Less-educated individuals are more likely to be unemployed, and if they are employed, less likely to be able to cover the costs of working and raising a family without income support. Under New York State's social service law, the City is required to cover 25 percent of the cost of Temporary Assistance to Needy Families (TANF) payments, and to cover 50 percent of the cost of Safety Net payments. In Fiscal Year 2013, cash assistance payments under these programs are projected to cost the City about $532 million combined. To the degree that the City can better educate its children so that they can find stable and well-paying jobs in adulthood, it will directly minimize its budget outlays for income support.

Health care for low-income individuals and families is a much larger expense for the City government, but the picture is also more complex. As noted above, those with lower educational attainment levels are more likely to be unemployed or to work in low-wage jobs, both of which are associated with a lack of access to health insurance. In New York State, Medicaid, the federal health insurance program for low-income individuals and families, requires a local match, which traditionally has been 25 percent from New York City for general Medicaid expenses. Since 2005, the growth in the City's direct contribution has been capped at 3 percent, and the State will assume full responsibility for any future increases phased-in over a three-year period. In Fiscal Year 2012, the City's total local share for Medicaid is projected to total $6.1 billion. Approximately 3 million City residents were enrolled in Medicaid as of July 2011, and over 1 million New Yorkers are uninsured, many of whom receive care through the Health and Hospitals Corporation (HHC), the largest municipal healthcare organization in the country.

"Less-educated individuals are more likely to be unemployed, and if they are employed, less likely to be able to cover the costs of working and raising a family without income support."

HHC, with a total annual expense budget of about $8 billion, has faced increasing budget shortfalls related to its care of large numbers of uninsured and under-insured patients. While the full financial impact of the implementation of the Affordable Care Act (ACA) will become clearer in the coming years, there will continue to be individuals who are uninsured and under-insured who will rely heavily on HHC, which may see its Medicaid reimbursements for such care reduced under the ACA. This could potentially

[16] Michael Coelli, David Green, and William Warburton (2004), *Breaking the Cycle? The Effect of Education on Welfare Receipt Among Children of Welfare Recipients*, Department of Economics, University of British Columbia. Howard Chernick and Cordelia Reimers (2004), "The Decline in Welfare Receipt in New York City: Push vs. Pull." *Eastern Economic Journal* 30.

create increased pressure on the City to expand its financial support for this provider of last resort. Other City healthcare-related costs include medical treatment for individuals incarcerated at City jails, many of whom are less-educated. Lastly, low-income individuals, particularly those who are uninsured or under-insured, are more likely to experience adverse health impacts and contribute to higher overall health expenditures by the City. The City Department of Health and Mental Hygiene, with an annual budget of about $1.7 billion, devotes significant resources to directly and indirectly addressing conditions such as heart disease, obesity, diabetes and asthma and other health concerns associated with income status. By increasing educational outcomes that lead to higher-paying work opportunities, the City is likely to be able to slow the rate of growth and, in some cases, reduce its healthcare-related expenditures.

There are a variety of other social expenditures made by the City which could be minimized by investment in education. For example, in Fiscal Year 2012 the City appropriated $908 million to its Department of Homeless Services, of which $420 million represented City funds. While it is unclear whether certain educational characteristics, such as lack of a high school diploma, contribute directly to homelessness once income is controlled for, it is almost universally acknowledged that poverty itself is a major precondition of homelessness for both families and individuals. Insofar as low educational attainment is a major predictor of poverty, it is not surprising that the heads of homeless families have been found to be more than twice as likely to lack a high school diploma as members of the overall adult population, and single homeless individuals are found to be about 50 percent more likely.[17]

"The heads of homeless families have been found to be more than twice as likely to lack a high school diploma as members of the overall adult population."

While the budgetary impacts of low educational attainment are most directly identifiable in income support and other social assistance programs, there are other basic City services that are made more costly because of the City's (and entire country's) educational failures. In particular, the costs of public safety and criminal justice are increased because of the association between educational deficits and crime. In New York City, crime imposes huge costs on City government and the public at large. In Fiscal year 2012, the City's Police Department and Department of Corrections had a combined budget of nearly $6 billion, a figure which does not include smaller agencies such as the Department of Juvenile Justice and the five borough District Attorneys.

[17] Nancy Smith, Zaire Dinzey Flores, Jeffrey Lin, and John Markovic (2005), *Understanding Family Homelessness in New York City: An In-Depth Study of Families' Experiences Before and After Shelter,* Vera Institute of Justice; Angela Fertig and David Reinghold (undated), *The Characteristics and Causes of Homelessness among At Risk Families with Children in Twenty American Cities*, http://www.fcs.uga.edu/childfamilypolicy/publications/homelessness.pdf; Dennis Culhane, Chang-Moo Lee, and Susan Wachter (1996), "Where the Homeless Come From: A Study of the Prior Address Distribution of Families Admitted to Public Shelters in New York City and Philadelphia," *Housing Policy Debate* 7: Martha Burt, Laudan Aron, Toby Douglas, Jesse Valente, Edgar Lee, and Britta Iwen (1999), *Homelessness: Programs and the People They Serve|Findings of the National Survey of Homeless Assistance Providers and Clients*, The Urban Institute.

A 2011 Census Bureau study found that 40 percent of male inmates in state prisons did not have a high school diploma or GED, while only 22 percent had any college education. This compares to 15 percent and 56 percent in the nation's overall adult male population, respectively. It would be misleading to attribute the higher incarceration rates of less-educated men to their educational status, however, since certain personality and behavioral traits could be the source of both criminal behavior and educational failure. To account for that possibility, economists and other researchers have used various statistical techniques to identify the independent effect of education on criminal behavior and incarceration. For example, Lochner and Moretti[18] estimated that one additional year of average schooling in a state reduces arrests for murder and assault by almost 30 percent, motor vehicle theft by 20 percent, arson by 13 percent, burglary and larceny by about 6 percent, and overall arrest rates by about 11 percent. The impact of graduation on crime is similar. A 10 percent increase in the high school graduation rate is estimated to reduce arrests for murder and assault by about 20 percent, motor vehicle theft by about 13 percent, and arson by 8 percent.

"Lochner and Moretti estimated that one additional year of average schooling in a state reduces arrests for murder and assault by almost 30 percent, motor vehicle theft by 20 percent, arson by 13 percent, burglary and larceny by about 6 percent, and overall arrest rates by about 11 percent."

In the discussion above we have focused on the expenditure effects of educational attainment for City government. However, the overall fiscal benefits for New York State and the federal government are likely to be even larger, insofar as their share of total tax collections and social welfare spending is even larger than the local share. Some researchers have tried to estimate the overall fiscal effects of enhanced educational attainment on all levels of government, as well as the overall social rate of return on enhanced education. For example, a study conducted by The Campaign for Educational Equity of Teachers College at Columbia University estimated that the present value of lifetime federal expenditures on a high school dropout compared to a person with some college or an associate's degree is $47,030, and the present value of lifetime expenditures by state and city government is $47,290 greater.[19] The authors also estimated the lifetime present value of the total social impact of a bachelor's degree, relative to a high school drop-out, at $1.9 million.

[18] Lance Lochner and Enrico Moretti (2004): "The Effect of Education on Crime: Evidence From Prison Inmates, Arrests, and Self-Reports," *American Economic Review* 94.
[19] Clive Belfield, Fiona Hollands, and Henry Levin (2011), *Achievable + Affordable: Providing Comprehensive Educational Opportunity to Low-Income Students. What are the Social and Economic Returns?* The Campaign for Educational Equity, Teachers College, Columbia University.

The Way Forward

Like nearly all other municipalities, New York City continually struggles to balance the financing of needed public services with the practical limits on its revenue-raising capacity. The City's legal requirement to balance its budget each year is the strict embodiment of that struggle. Sometimes, the City achieves the required balance through abrupt and counter-productive service reductions, or by short-changing the necessary maintenance and improvement of its infrastructure. Other times, it raises taxes in ways that impose hardship on its residents or that are inimical to long-term growth. Occasionally, unexpected and ultimately unsustainable private asset price bubbles inflate tax revenues and provide brief periods of fiscal relief, but those bubbles inevitably burst and the fiscal dilemma re-emerges with even harsher consequences.[20]

At the present time, the City is coping with the aftermath of one of those private asset bubbles that has brought worldwide economic disruption, fiscal stress, and individual hardship. The City has weathered the storm relatively well, having used wisely some of the tax surpluses of the boom years to insulate its budget from the aftershocks of the financial crisis. However, neither the world, the country, nor the City have yet returned to economic normalcy and the City now faces an imposing budget challenge. According to the Mayor's most recent budget forecasts, the City must close projected deficits ranging from $3.0 billion to $3.7 billion for fiscal years 2014 through 2016.

"Greater educational attainment in the City could enhance its economy and fiscal balance."

In the immediate future there will be no painless solutions to the budget challenge. There are no new economic bubbles on the horizon that will suddenly fill the City's tax coffers and allow it to avoid painful trade offs between services and revenues. In the long-term, however, there are ways the City can relieve its fiscal tensions without undercutting its future prosperity and quality of life.

The purpose of this study was to examine New York City's rank in educational attainment relative to competing cities, and to outline the major ways greater educational attainment in the City could enhance its economy and fiscal balance. It did not attempt to identify how the Department of Education could contribute to elevating the educational attainment of the City's population nor identify the costs associated with such an effort. In the coming months, however, the Comptroller's Office will issue additional reports on specific educational reforms that the Comptroller believes will accomplish the aims of this report in a cost-efficient manner.

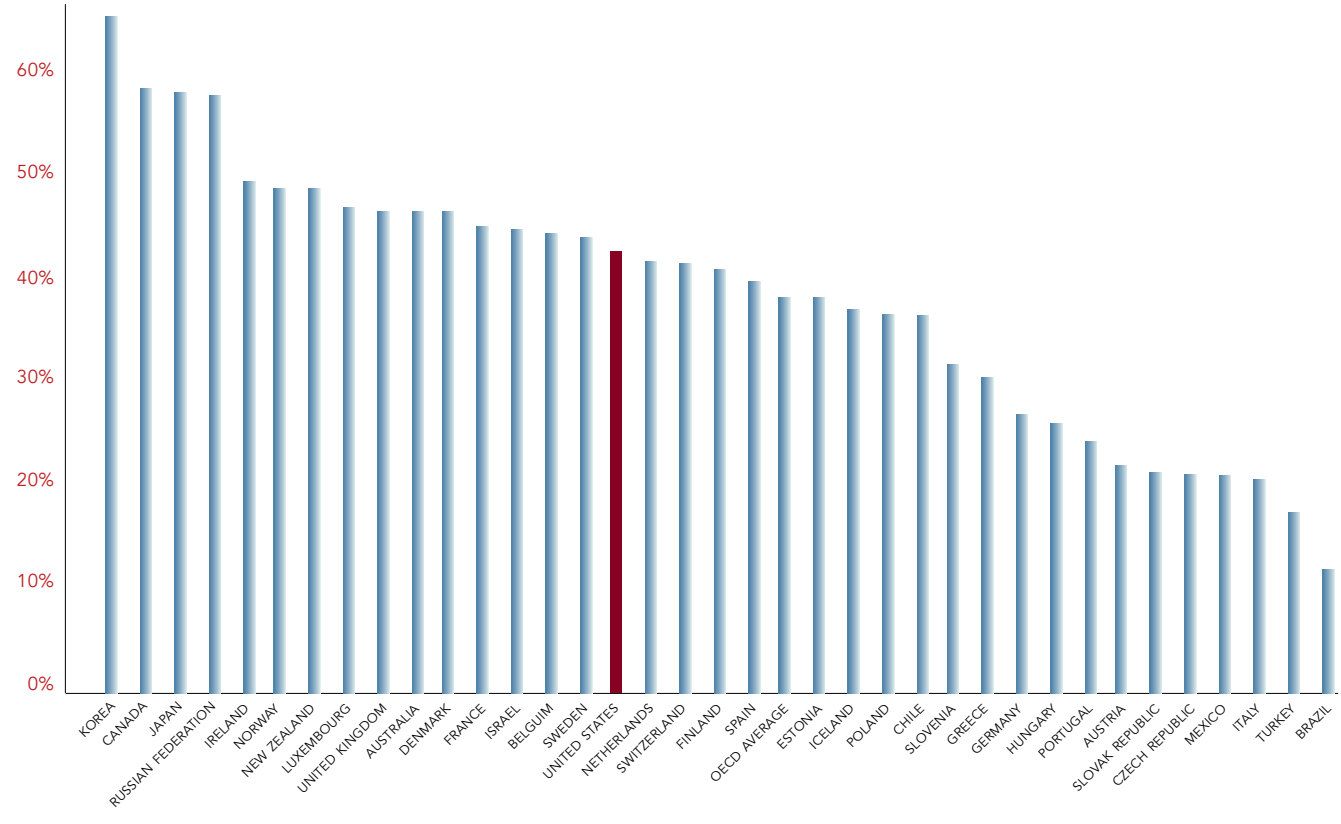
[20] The two most recent examples are the "dot com" bubble from 1995-2000, and the real estate bubble, 2003-2008.

Appendix I

The International Context

The connection between educational attainment and national economic health seems to be something that nearly everyone agrees on.[1] In his first State of the Union address, President Obama captured the essence of the argument when he said: "Countries that out-educate us today will out-compete us tomorrow…"[2] Although economists and others have cautioned that educational attainment is not a zero-sum competition,[3] there remains an inherent logic in the competitive argument. Even if citizens of all countries benefit from scientific and commercials innovations pioneered in countries with high-performing educational systems, it is likely that the source countries will benefit first and most.

Percentage of 25- to 34-Year Olds With an Associate's Degree or Higher, 2009, OECD Countries



[1] Karen Elzey (2010): *Education: The Key to Global Competitiveness*, Institute for a Competitive Workforce, U.S. Chamber of Commerce. http://icw.uschamber.com/newsletter-article/education-key-global-competitiveness.
Diana Epstein (2011): *Investing in Education Powers U.S. Competitiveness: Education Funding Must Be Preserved, Center For American Progress.* http://www.americanprogress.org/issues/education/report/2011/09/06/10376/investing-in-education-powers-u-s-competitiveness/
[2] Barak Obama (2010): *The 2010 State of the Union Address*, The White House. http://www.whitehouse.gov/photos-and-video/video/2010-state-union-address#transcript
[3] Arne Duncan (2010): "Back to School: Enhancing U.S. Education and Competitiveness," *Foreign Affairs*, Council on Foreign Relations.

While it is notoriously difficult to compare educational attainment across countries because of the different educational systems that have evolved in each nation, some international organizations, such as the Organization for Economic Cooperation and Development (OECD), have attempted to define and measure the educational attainment of various countries on a standardized basis.[4] The comparisons are not flattering to the United States. Chart A1 shows the percentage of the population aged 25- to 34-years old which has attained the equivalent of what is considered an associate's degree in the United States.

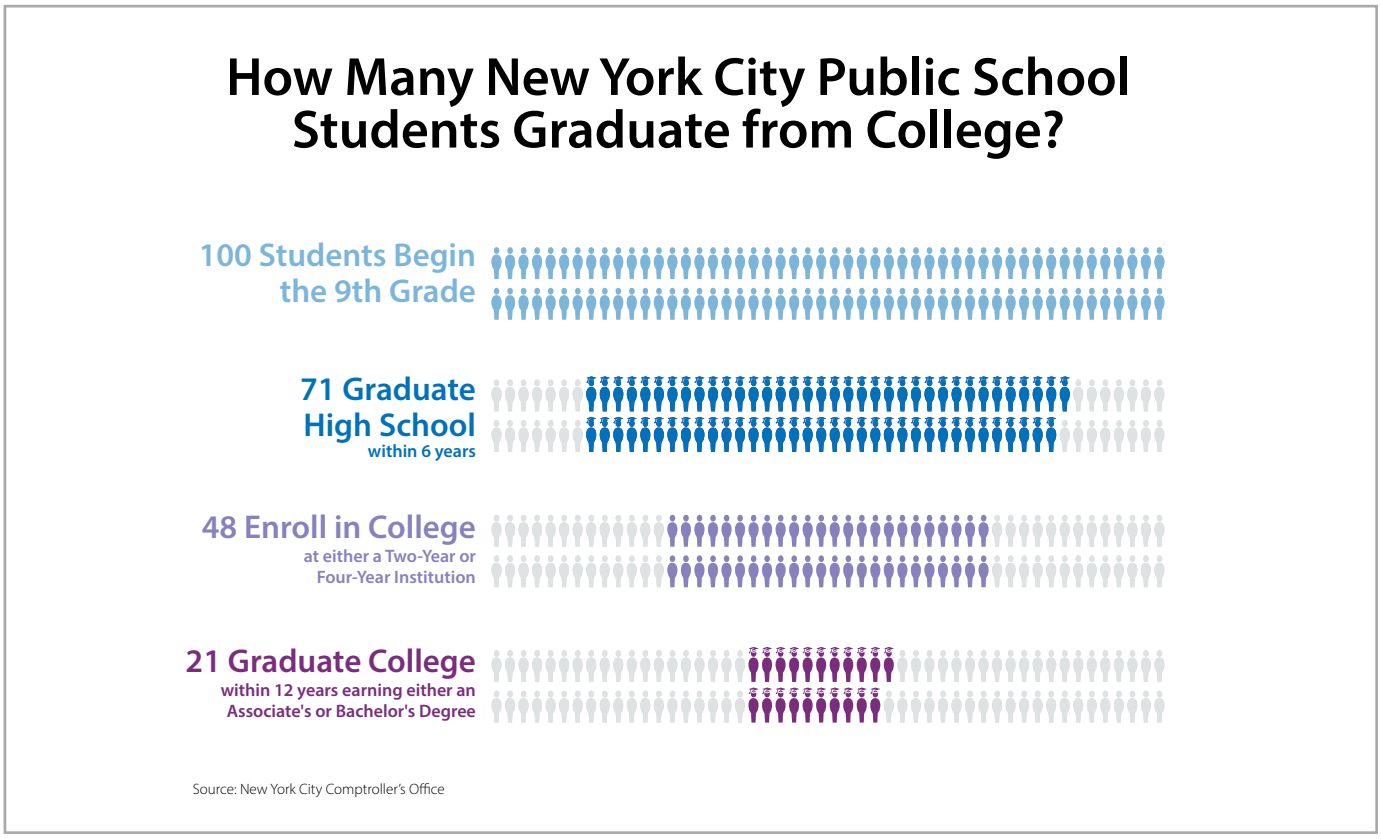
At 41 percent, the United States ranks only sixteenth in the OECD's measure, trailing far behind Korea, Japan, The Russian Federation, Ireland, and Norway. Interestingly, the U.S. also trails far behind Canada, a country that has had a similar development history. Looked at in a historical perspective, the U.S. had a tremendous educational lead on its economic competitors a generation ago, but that lead has entirely disappeared. In the U.S., for example, the percentage of college degree holders 55- to 64-years old is essentially the same as that for 25- to 34-year olds. In Korea, in contrast, the younger cohort has a 63 percent rate, compared to only a 13 percent rate among the older cohort.[5]

As a global finance and commercial center, New York City competes not only with other cities in the United States, but with global cities abroad as well. London, Frankfort, Tokyo, and Singapore have often been cited as cities that compete directly with New York for global market share in financial services and other key industries. When comparing educational attainment among international cities, however, the problems of varying national educational classifications are compounded by differences in geographic definitions.

In Greater London, the percentage of the working-age population with "Level 4" or higher qualifications is 45.9 percent.[6] A Level 4 qualification in England is roughly equivalent to one year of college in the United States, so the equivalent percentage in New York City is, at 55 percent, somewhat higher. Singapore has created a highly-regarded educational system.[7] In that city-nation, about 52 percent of the population age 25- to 64- years old has the equivalent of an associate's degree, a much higher proportion than in either New York City or the New York metropolitan area, but the share of the population with the equivalent of a bachelor's degree is significantly lower.[8] Demographic data for Tokyo is harder to come by, but it appears that about 29 percent of the residents 25 years-old or over in the Tokyo metropolitan region are college graduates,[9] a lower percentage than in the New York metropolitan area. Germany conducted its first census in 24 years in 2011, but at this writing no demographic data on the Frankfort area was yet available.

[4] Some recent research has found that "cognitive skills" are much more important to economic growth than years of schooling or degrees earned, due to the wide disparities in educational quality within and among countries. However, due to the paucity of data on cognitive skills, traditional measures such as years of schooling and degrees earned will continue to be used here and elsewhere as the primary measures of educational attainment. For further discussion see Eric Hanushek and Ludger Wößmann (2007): *Education Quality and Economic Growth*, The World Bank.
[5] *Education at a Glance 2011: OECD Indicators*. Organization for Economic Cooperation and Development.
[6] *Borough Profiles*, Greater London Authority, http://data.london.gov.uk/search/node/demographics
[7] *Top Performing Countries*, Center on International Education Benchmarking, http://www.ncee.org/programs-affiliates/center-on-international-education-benchmarking/top-performing-countries/
[8] *Census of Population 2010 Statistical Release 1*, Ministry of Trade and Industry, Republic of Singapore, http://www.singstat.gov.sg/pubn/popn/c2010sr1.html
[9] Iuichi Takeuchi, "The Tokyo Region," in Roger Simmonds (2001): *Global City Regions: Their Emerging Forms*. Taylor & Francis

DIAGRAM 1



Appendix II

Methodology for Calculating New York City Public School Attrition Rates

The methodology that follows explains how we estimated the number of 2- and 4-year degrees that students entering 9th grade today will attain if the status quo in public schools persists. It is noteworthy that the New York City Department of Education (DOE) has not made information of this type publicly available. However, a project called Graduate New York City! is working on compiling such data.

Part One: 71 of every 100 9th graders will graduate from high school

We used the Citywide 6-year graduation rate for the 2005 cohort (70.9%) which is reported in the New York City Department of Education's "Graduation Outcomes, Cohorts of 2001 through 2007 (Classes of 2005 through 2011)," which is accessible at http://schools.nyc.gov/Accountability/data/GraduationDropoutReports/default.htm. The DOE defines a cohort as those students who first entered 9th grade in a given year. Graduates are defined as those earning either a Local or Regents Diploma and exclude either a special education (IEP) diploma or GED.

We chose this particular rate, the highest of all years and cohorts, to be as generous as possible since graduation rates vary by year and cohort.

Part Two: 48 of every 100 9th graders will enroll in college

In the 2010-2011 Progress Report, the DOE defines college enrollment as the percentage of students who first entered 9th grade in the 2006-2007 school year and graduated and enrolled in a degree program at any two- or four-year college or university by December 31, 2010. This college enrollment rate does not account for students who enroll in college several months or several years after graduating from high school. We calculated a college enrollment rate of 48.3% (explained below). This means that out of 100 students who enter 9th grade today, 48 will *graduate* and *enroll* in college within six years of entering high school by the end of the calendar year they graduate.

We calculated the 48.3% college enrollment rate by taking an average of this metric for the 365 DOE non-charter high schools and transfer schools for which the DOE reported 2010-2011 high school enrollment, high school graduation, college enrollment, and college-readiness data. We used this academic year because it was the most recent data available. We isolated these 365 high schools from those listed in the 2010-2011 DOE Progress Reports for high schools and transfer high schools (two separate sources that are both available here: http://schools.nyc.gov/Accountability/tools/report/default.htm.) The high schools report included 426 schools. Of that total, we excluded 77 because they lacked college enrollment, high school graduation, and/or college readiness metrics. We also excluded the 20 listed charter high schools. We excluded one additional school because its graduation results were suppressed in the DOE's "Graduation Outcomes" spreadsheet mentioned in part one. After subtracting these 98 (77 + 20 + 1 = 98) schools, we were left with 328 high schools. There were 47 schools in the transfer high schools' 2010-2011 Progress Report. Of that total, we excluded 10 from our analysis: the 9 that lacked college enrollment and the 1 charter school. When adding the 37 (47-10=37) transfer high schools to our 328 regular high schools, we had a total of 365 schools. This total does not include District 75 (Special Education) schools.

Part Three: 21 of every 100 9th graders will earn degrees

Estimating the number of DOE students who will earn degrees within 12 years of entering high school was a multi-step process. We categorized college-bound DOE graduates as those who will enroll in CUNY at 2- or 4-year colleges and those who will enroll in 2- or 4-year colleges elsewhere. We then further categorized them by whether they will earn an associate's or bachelor's degree. We used DOE and CUNY published data to estimate the percent of DOE students who will enroll in and will graduate from CUNY. We used graduation rate data from The Chronicle of Higher Education to estimate how many DOE graduates will earn degrees elsewhere in New York State. By using data exclusively from New York colleges as our proxy for non-CUNY DOE graduates, we assumed that all DOE graduates will remain in state.

Step One: Obtain DOE enrollment at CUNY.

CUNY's Collaborative Programs Research and Evaluation Center provides DOE enrollment numbers for first-time freshmen cohorts from 2007 through 2010. The Center provides a breakdown of the total number of DOE graduates enrolled in CUNY as first-time freshmen compared to the number of DOE graduates who were also College Now participants enrolled in CUNY as first-time freshmen. This data is available for the fall of 2007, 2008, and 2009 at "College Now Alumni in CUNY, Postsecondary Data Snapshot," accessible at https://cuny.edu/academics/k-to-12/databook/CollegeNowStudents/CN_PSDG_10.pdf. For fall 2010, this data was available at: http://www.cuny.edu/academics/k-to-12/databook/CollegeNowStudents/PS_DG.pdf

We did not obtain a breakdown of full- or part-time DOE graduates at CUNY. These enrollment numbers are limited to first-time students and thus exclude those who may have previously enrolled at CUNY. We discuss this in the limitations section.

Step Two: Estimate the share of DOE college-bound graduates who will enroll at CUNY (from base of 100). We divided the number of first-time DOE students per freshmen class at CUNY (Step One) by our estimation for the pool of college-bound DOE high school graduates in a given year. This latter metric was estimated using the cohort numbers from the DOE's "Graduation Outcomes," mentioned in Part One. We assumed that a CUNY freshmen cohort could potentially receive high school graduates who took between 4-6 years to graduate. For instance, in our analysis, the total potential number of DOE enrollees in the 2007 CUNY freshman cohort would include the 4-year graduates that entered 9th grade in 2003, 5-year graduates that entered 9th grade in 2002, and the 6-year graduates who entered 9th grade in 2001. All of these graduates completed high school in time to enroll in CUNY in the fall of 2007. These ninth grade cohorts had 73,888, 74,511, and 74,143 students respectively. We averaged the three cohorts and multiplied that number (74,181) by the college enrollment rate (48.3%). This yielded a potential pool of 35,829 DOE students at CUNY in 2007. From our source in Step One, we found that the actual number of DOE students at CUNY in 2007 was 20,484 for both 2- and 4-year colleges. A ratio (20,484/35,829) reveals that an estimated 57% of college-bound 4-, 5-, and 6-year public high school graduates enrolled in CUNY in 2007. We repeated this methodology for the 2008-2010 CUNY cohorts. Through this exercise, we estimated that the average share of DOE college-bound graduates that will attend CUNY is 61%.

By multiplying our estimated CUNY enrollment rate among college-bound DOE graduates (61%) by the 48 college-bound DOE graduates, we approximated that 29 of every 100 students entering 9th grade today will enroll in CUNY within six years.

Step Three: Estimate the number of DOE students at CUNY who will earn an associate's vs. bachelor's degree. First, we obtained the number of first-time, full-time freshmen enrolled in associate's and bachelor's programs at CUNY. The data is provided by CUNY's Office of Institutional Research. For Associate's Enrollment, see "System Retention and Graduation Rates of Full-time First-time Freshmen in Associate Programs by Year: Total University," accessible at http://owl.cuny.edu:7778/RTGS_0001_FT_FTFR_ASSOC_TOT_UNIV.rpt.pdf, and for Bachelor's Enrollment, see "System Retention and Graduation Rates of Full-time First-time Freshmen in Baccalaureate Programs by Year: Total University," accessible at http://owl.cuny.edu:7778/RTGS_0007_FT_FTFR_BACC_UNIV_TOT.rpt.pdf.

It's important to note that our graduation rates and CUNY program enrollment numbers used to calculate them are limited to *full-time* students. CUNY does not provide graduation rates for part-time students. However, CUNY data, accessible here http://owl.cuny.edu:7778/ADMS_0008_FTFR_DEGPR_FTPT.rpt.pdf, indicates that a relatively small share of first-time freshmen are part-time. Of first-time freshmen pursuing a bachelor's degree in the fall of 2011, 1.7% were part-time. Of first-time freshmen pursuing an associate's degree, 12.5% were part-time. We assumed that different graduation rates for part-time students would not dramatically influence our analysis. Please see the limitations section for a more detailed discussion.

We added the number of first-time, full-time freshmen in both programs and then calculated the share of students in each program by dividing respective program enrollment by the total. We averaged these percentages for the 2005-2010 cohorts and found that on average, 61.5% of first-time, full-time CUNY

students pursuing an associate's or bachelor's degree enroll in an associate's program and 38.5% enroll in a bachelor's program. As such, of the 29 DOE students we estimated to be enrolled at CUNY, we projected that 18 will initially enroll in an associate's program and 11 will initially enroll in a bachelor's program.

We then used CUNY's 6-year graduation rates (provided in the same "System Rates" document used for program enrollment referenced above) to approximate the number of DOE graduates who will earn degrees within 6 years of enrolling at CUNY. Specifically, we used the associate's and bachelor's 6-year graduation rates for CUNY's 2005 cohort as our proxy since those were the most recent 6-year rates available. Since students could earn an associate's or bachelor's degree regardless of which degree they initially pursued, we used enrollment and graduation data from both program sources to calculate the 6-year graduation rates for each type of degree. We projected that of the estimated 18 DOE graduates pursuing an associate's degree, 19.8% (4) will earn a degree within 6 years. Of the estimated 11 DOE graduates seeking a bachelor's degree, 67.8% (8) will earn a degree within 6 years. Therefore, of the estimated 29 DOE graduates in a CUNY first-time, full-time freshmen cohort, we projected 12 will earn a degree within 6 years. CUNY's System Retention and Graduation Rates do not double count students who earned both an associate's and a bachelor's degree. Rather, such students are simply counted for earning a bachelor's. In addition, these rates capture degrees earned by students who may have started their degree at one CUNY school and finished at another within the system.

Step Four: Estimate the number of degrees to be earned by DOE graduates who will not go to CUNY. Since we estimated 61% of college-bound DOE 4-, 5-, and 6-year graduates immediately went to CUNY after graduating (Step Two), we projected that the remaining 39%, or 19 of the 48 students, went elsewhere. We assumed that all of the estimated 19 college-bound students went to 2- or 4-year schools in New York State and used The Chronicle for Higher Education's College Completion data for 4- year public colleges, 2-year public colleges, 4-year private colleges, 4-year for-profit colleges, and 2-year for-profit colleges. We assumed these numbers would persist for today's 9th grade students who enroll in college four to six years from now. The Chronicle uses graduation data from the National Center for Education Statistics' Integrated Post-Secondary Education System, which tracks completions for groups of first-time, full-time degree-seeking students at the undergraduate level. The 4-year public college data can be downloaded at the following link, and the data for the 4 other types of institutions can be found at tabs on this link as well: http://collegecompletion.chronicle.com/state/#state=ny&sector=public_four.

Together, the data show that 32.8% of New York State college students are enrolled at two-year colleges, representing 6 of the estimated 19 non-CUNY graduates from the DOE. 67.3% of students are enrolled at four-year colleges, or 13 of the estimated 19 non-CUNY college-bound DOE graduates. To obtain the number that actually earned a degree, we used The Chronicle of Higher Education's 150% graduation rate, which captures the percent of first-time, full-time degree seeking undergraduates who earned a degree in 150% of the expected graduation time (3 years for an associate's degree and 6 years for a bachelor's degree). This is the longest graduation timeframe that The Chronicle provides. Notably, The Chronicle provides the same timeframe that we used in our analysis of CUNY's bachelor's degree students, but a smaller time frame for the associate's degree students (3 years instead of 6). The average 150% graduation rate of two-year schools in New York State was 32.4% in 2010. Using that rate, we projected that 2 of our 6 DOE graduates pursuing an associate's degree outside of CUNY will earn one within three years of enrolling. In addition, the average 150% (6-year) graduation rate at four-

year colleges in New York State was 57.6% in 2010. From this rate, we approximated that 7 of our 13 non-CUNY students pursuing a bachelor's degree will earn one within six years of enrolling.

Therefore, of the estimated 19 non-CUNY students, we projected that 9 will earn a degree.

In total, 12 CUNY grads + 9 non-CUNY grads = 21 grads from the initial 100 9th graders (21%).

Limitations

This analysis is predicated on several assumptions and limited by certain simplifying techniques.

The High School Graduation Rate

We assumed a constant 6-year rate of 71%, which is from the 2005 cohort. In years with higher or lower 6-year rates, this may result in under- or over-counting the number of graduates. If we had used a 4-year graduation rate, that would have changed our outcomes. We chose a generous rate, which assumes a best-case scenario.

It's important to note that the graduation rate we used also includes students who earned Local Diplomas, which have less strict requirements than the Regents Diploma. The 2011-2012 academic year was the first in which general education students had to earn a Regents Diploma to be counted as graduating, so future graduation rates will likely go down.[1]

The College Enrollment Rate

Our college enrollment rate of 48.3% is an average of the rates reported at 365 schools for the 2010-2011 academic year. Since it is an average, schools with many students are given the same weight as schools with fewer students. This may result in over- or under-counting of students enrolled in college, depending on the relative academic success of larger or smaller schools. Further, our 365 schools do not include the 20 charter high schools. However, only six of these charters reported college enrollment in the 2010-2011 High School Progress Report, with an average rate of 52.8%. Thus, they would likely not have resulted in a significant over-counting of students.

More importantly, the college enrollment metric may cause us to under-count the number of students pursuing a degree because it only includes those who graduated in 2010 and *were enrolled by December 31st of that year*. Students who choose to take a year off or enroll in the spring of the following year are not accounted for.

However, it's also notable that we applied the same college enrollment rate to all 4-to 6-year DOE graduates. Students who graduated in 6 years are likely to have lower college enrollment rates than their peers who graduated on time. Therefore, this may have resulted in over-counting the number of DOE students enrolled in college.

Full-time vs. part-time students

Our graduation rates are limited to full-time students since neither CUNY nor The Chronicle of Higher Education provide graduation rates for part-time students. However, as noted above, the share of part-timers is relatively small for first-time freshmen students enrolled in bachelor's degree programs

[1] Phillips, Anna, "State to Propose New Graduation Requirements for Students with Disabilities," School Book, April 20, 2012, http://www.schoolbook.org/2012/04/20/state-to-propose-new-graduation-requirements-for-students-with-disabilities/, accessed on August 28, 2012.
[2] "Time is the Enemy The surprising truth about why today's college students aren't graduating…AND WHAT NEEDS TO CHANGE," Complete College America, September 2011, http://www.completecollege.org/docs/Time_Is_the_Enemy.pdf, accessed on August 28, 2012.

(1.7% in fall 2011). While the share of first-time freshmen part-timers in associate's degree programs is higher (12.5% in fall 2011), the 6-year graduation rate for full-time students pursuing an associate's degree of 19.8% was quite close to a national estimate that less than one quarter of part-time students ever graduate.[2] We therefore assumed that part- and full-time students had relatively similar 6-year graduation rates and would not significantly influence our analysis.

First-time freshmen students

We used DOE enrollment numbers at CUNY that only included first-time freshmen. As such, we did not consider those students who may have dropped out of CUNY and re-enrolled later on to ultimately graduate. Given that our analysis is restricted to the 12-year period starting when a student begins the 9th grade and ends after a student has completed 6 years of high school and 6 years of college, it's not likely that including dropouts, given the longer time-period it would take to graduate, would significantly increase the number of degrees earned.

Estimate of the percent of DOE graduates who enroll at CUNY

To determine a percentage of DOE college-bound graduates who enroll at CUNY, we limited our analysis to 4-, 5-, and 6-year graduates from public high schools. In the example provided above for the 2007 CUNY cohort, we calculated a pool of 35,829 potential DOE college-bound graduates who could enroll at CUNY based on an average of the 4-, 5-, and 6-year cohorts. However, our analysis attempts to discern how many 9th graders will earn college degrees within 12 years of entering high school, and therefore capturing this population is out of the scope.

The CUNY 6-year graduation rate for the 2005 cohort

In using the overall CUNY cohort graduation rate to estimate graduation rates for public high school students, we assumed that DOE students graduate at the same rate as all CUNY students. If there is something inherently different about DOE first-time, full-time CUNY freshmen compared to their peers at CUNY, this may have resulted in an over- or under-counting of graduates. However, since DOE students comprise about 70% of the CUNY student body, this is unlikely. By using the 2005 cohort 6-year graduation rate we also assumed that the 2005 cohort rate would not be dramatically different from more recent cohorts.

The Estimate of DOE graduation rates at non-CUNY Schools

One of the major assumptions in this analysis is that DOE graduates who did not go to CUNY schools stayed in state. The extent to which this decreased the total number of degrees earned by New York City public school students is unclear. It is reasonable to assume that it may have resulted in under-counting if we believe that students who leave the state for a post-secondary degree are more committed to earning a degree than others.

Finally, The Chronicle uses a different graduation timeframe for associate's degrees. Instead of capturing the rate of students graduating 6 years after starting an associate's degree, it only captures the graduates after 3 years, since that is 150% of the expected time in which one would complete that particular degree program. This not only means that we do not have an apples-to-apples comparison of CUNY and non-CUNY associate's-degree attainment, but also that one or two more degrees may have been attained by non-CUNY students pursuing an associate's degree in the three additional years for which The Chronicle does not provide.

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