
THE EDUCATIONAL DEFICIT IN PHILADELPHIA

OPPORTUNITIES TO EXPAND LABOR
SUPPLY, REDUCE UNEMPLOYMENT AND
INCREASE EARNINGS THROUGH
INVESTMENTS IN EDUCATION

PAUL E. HARRINGTON
NEETA P. FOGG
KEVIN R. McCABE
CENTER FOR LABOR MARKET STUDIES
NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

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All who have meditated on the art of governing mankind have been convinced that the fate of empires depends on the education of youth.

Aristotle

INTRODUCTION

Education and its importance have predated the Information Age, the Knowledge Economy, and the Internet Revolution. Throughout history, education has been considered a positive and sometimes even a noble endeavor. Education has also taken on different meanings over time ranging from a broad-brush definition that includes all learning activities to more specific definitions such as the formal educational attained at an educational institution leading to a credential. Our research and discussion in this report adheres to the latter more specific definition of education.

Education in the broad or the narrow sense is beneficial to the individual who receives it as well as to the economy and the society at large. The benefits of education are too numerous to list and too widespread to measure completely. These benefits could be direct or indirect, short-term or long-term, and tangible or intangible. The focus of our analysis in this paper is mainly on the economic value of education. We have presented selected tangible and measurable labor market-related benefits of education to the individual such as greater access to employment, higher hourly earnings, access to more intensive and better quality jobs, and higher earnings. We have also presented tangible and measurable benefits of an educated citizenry to the city's economy such as an increase in the quantity and quality of labor supply, an increase in the city's taxable wage base, and a decrease in the number of unemployed residents in the city.

The economic value of education to the individual and the economy has sharply increased over the past quarter century. In particular, the economic fortunes of college graduates have improved considerably at the same time as their less-educated counterparts saw a sharp deterioration in their labor market fortunes. Underlying these divergent trends in the labor market fortunes of individuals with different levels of education, are sharp changes in the nature of labor demand. Over the last two decades, the industrial composition of employment in the American economy has changed sharply. The most striking change occurred in the employment levels in two major industries: the manufacturing or goods-producing industry and the services industry. Since 1983, manufacturing employment as a share of total employment in the American economy declined from 20 percent to about 13 percent whereas the employment share of the services industry increased from 22 percent to about one-third.

The manufacturing and services industries require a vastly different workforce with different levels of skills and educational attainment. Members of the workforce in these two industries are concentrated in very different occupations. The services sector has a large concentration of its workforce in the managerial, professional, technical, and high level sales occupations that are frequently labeled as "college labor market" occupations because of the high concentration of college graduates in these occupations. These occupations are usually

staffed with college-educated workers and those who possess the high skills levels necessary to perform the tasks in these jobs. The already high concentration of college labor market jobs in the services industry sector has increased overtime from 60 percent in 1983 to 65 percent today.

The manufacturing industry, in contrast, has a high concentration of employees in blue-collar occupations and a smaller share in college labor market occupations. Although changes in the production processes and technology have resulted in an increase in the share of college labor market occupations and a decline in blue-collar employment in this industry, the share of college labor market occupations in the manufacturing sector is relatively low. Thirty-four percent of workers in the manufacturing sector are employed in college labor market occupations; up from 25 percent in 1983. Blue-collar occupations comprise 55 percent of the jobs in the manufacturing sector; down from 60 percent in 1983.

There is a sharp difference between the education of the workforce in these two occupations. Less than 2 percent of the employees in college labor market occupations are high school dropouts compared to nearly 20 percent of blue-collar workers. In contrast, nearly six out of ten workers in professional, technical, managerial, and high-level sales occupations had a four-year college degree or a higher level of education compared to less than 6 percent of all workers in blue-collar occupations.

Changes in the industry composition of employment and the occupational staffing patterns within these industries have had a very profound effect on the demand for educational attainment in the American economy. As noted above, the manufacturing sector is more likely to employ individuals with lower levels of education whereas employment in the services sector is concentrated among highly educated workers. A decline in the share of manufacturing employment reduced the demand for less educated members of the workforce while increases in the share of service industry employment resulted in an increase in the demand for workers with high levels of education. As a consequence, the earnings of college-educated workers increased while the earnings of poorly educated workers declined. Although the supply of college graduates has increased, the increase in the demand for college-educated workers has outstripped the increase in the supply of these workers, resulting in a continued increase in their earnings and their earnings premiums relative to the earnings of their poorly educated counterparts.

The low skills labor market witnessed the reverse of what happened in the nation's high skill labor markets. Due to a decrease in labor demand (for workers with low levels of education) that was not matched by a commensurate decrease in the supply of these workers, the lower end of the labor market has witnessed a sharp decline in earnings of poorly educated workers. Although the overall educational attainment of the American workforce has improved, there is still a substantial oversupply of low skill workers relative to the demand for these workers.

The American workforce has responded to these labor market signals, which has resulted in a steady increase in the nation's postsecondary school enrollment rate and an improvement in the educational attainment of population. However, the improvements in educational attainment have been far from uniform across the nation. Many areas of the nation continue

to have sizable educational deficits among their residents, which result in lower levels of earnings and incomes and hamper economic development.

This report presents an assessment of the educational attainment of the resident population of Philadelphia within the context of the levels of education of the residents of the state of Pennsylvania and the entire nation. The associations between educational attainment and an array of labor market outcomes are presented to demonstrate the potential benefits of raising the educational attainment levels of the resident population in Philadelphia. The report presents estimates of an array of economic and labor market benefits that would accrue to Philadelphians if the city invested in raising the level of formal education of its residents.¹ Our focus will be on labor market benefits that accrue in the form of increased labor force participation, increased employment, increased earnings, and reduced unemployment among Philadelphians.

In the assessment of the benefits of increasing the educational attainment of Philadelphians, we employ two methodologies. The first methodology utilizes simulations to estimate the levels of labor force participation, employment, unemployment, and earnings of city residents if their education were raised to a hypothetical level. The second methodology quantifies the benefits of education within the framework of multivariate regression analysis which measures the benefits of alternative levels of educational attainment on labor market outcomes after statistically controlling for social, demographic, and other characteristics that are known to influence these outcomes. For example, the regression methodology would allow us to measure the earnings benefits that will accrue to a high school dropout if he or she were to graduate from high school.

This report begins with a comparison of the level of educational attainment of the residents of Philadelphia, Pennsylvania, and the U.S. In the next section we present the close associations between the level of educational attainment and alternative labor market outcomes in Philadelphia. We then present findings from our simulation exercises in the form of increases in the city's labor supply, employment, and earnings and decreases in the city's unemployment that would result from an increase in the educational attainment of Philadelphians. Simulations of labor market outcomes of Philadelphia residents are presented for two alternative scenarios: (i) if their educational attainment were increased to the level of all Pennsylvanians, and (ii) if their educational attainment was increased to the level of all Americans. The differences between the actual and simulated labor market outcomes are presented as measures of the benefits of investment in education and training in Philadelphia city. The final section of this paper presents findings from multivariate regression analysis of

¹ We would like to make the reader aware that the findings in this report are not based on a general equilibrium analysis. Rather all findings are based on a static analysis that measures the *potential* labor market benefits of increasing the educational capital in the city assuming that labor demand will adjust automatically to keep the wage structure intact. In other words, this analysis does not account for the wide array of changes such as an increase in the demand for the new quality and quantity of labor supply, retention of these better-educated residents within city boundaries and within the city's labor markets, and many other changes that need to occur for the city to fully realize the potential economic benefits from increasing the education of its residents.

the benefits of additional educational attainment on the hourly earnings, the probability of employment, the annual hours of employment, and the annual earnings of Philadelphians.

All analyses in this report are restricted to individuals between 16 and 64 who were not enrolled in school. The elderly population is excluded from the analysis because their labor market behavior is different from that of the non-elderly population since most of the elderly population are either retired or have intermittent participation in the labor market. Individuals who are enrolled in school are also excluded from the analysis in this report since they are not fully engaged in the labor force like their non-enrolled counterparts. Moreover since they are enrolled in school, their current level of education underestimates their true level of education when they complete school. All analysis in this report is based on the Public Use Microdata Sample (PUMS) data files from the 2000 decennial census.

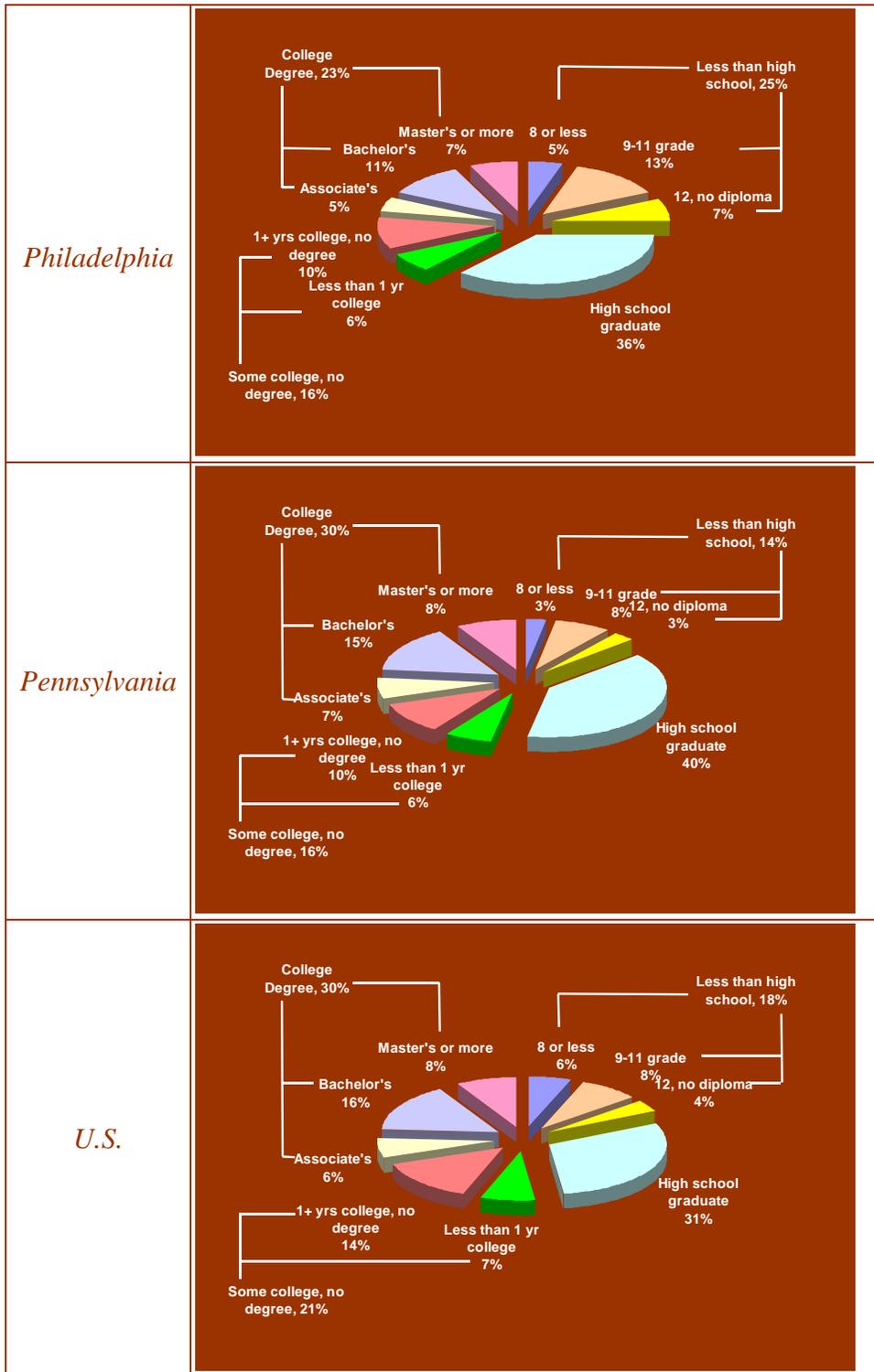
THE EDUCATIONAL ATTAINMENT OF THE POPULATION

The census questionnaire allows respondents to select the highest level of education that they had completed at the time of the census, from a list of 16 different levels of educational attainment ranging from no schooling completed to the completion of a professional or doctorate degree. We have aggregated these 16 educational categories into the following nine categories: 8th grade or lower, 9th to 11th grade, 12th grade no diploma, high school graduates (including GED), less than 1 year of college, 1+ years of college with no diploma, associate's degree, bachelor's degree, and master's degree or higher (doctorate or professional degrees). A percentage distribution of the out-of-school 16-64 year old population by these nine educational categories in Philadelphia, Pennsylvania, and the U.S. is presented in Chart 1.

In 2000, Philadelphia had 777,500 residents between the ages of 16 and 64 who were not enrolled in school. Statewide, this group consisted of 6.6 million residents, whereas the entire nation had 152.8 million out of school, working-age, non-elderly residents. The educational attainment of this population varied widely across these three areas. Nearly one in four Philadelphians had failed to complete high school or obtain a GED certificate, compared to 14 percent in Pennsylvania and 18 percent nationwide. The above average concentration of high school dropouts may underlie some of the below average labor market outcomes in Philadelphia city. The high school dropout group in Philadelphia consisted of 5 percent with only an 8th grade or lower level of education, 13 percent with 9th to 11th grade education, and 7 percent who had completed the 12 grade without graduating with a high school diploma or a GED.

High school graduates accounted for 36 percent of the population in Philadelphia compared to 39 percent in the state and 30 percent nationwide. The share of the population with some postsecondary education (including those with or without a postsecondary degree) was smaller in Philadelphia (39 percent) compared to the state (47 percent) and the nation (52 percent). Many Philadelphia residents who had completed some postsecondary schooling had failed to earn a postsecondary degree. Nearly 17 percent of non-enrolled non-elderly population of Philadelphia and Pennsylvania had completed some college with no degree compared to over 21 percent across the nation.

Chart 1: Percentage Distribution of the 16-64 Year Old Out of School Population by Highest Level of Educational Attainment in 2000



Although each additional year of education is expected to improve earnings, the earnings premiums associated with additional education have been found to be somewhat higher when an educational credential is earned. This phenomenon is also known as the “sheepskin effect” which represents the sorting or screening behavior of employers in which they use credentials to measure desirable employee traits that cannot be observed directly.²

How many Philadelphians have these earnings-enhancing postsecondary educational credentials? Only 5 percent of the residents of Philadelphia had earned an Associate’s degree compared to nearly 7 percent of their state and national counterparts. The gap in the share of Bachelor’s degree holders was even wider (nearly 5-percentage points) between the city and the state and the nation (11 percent in Philadelphia, 15 percent in Pennsylvania and nearly 16 percent in the nation). The proportion of out-of-school, non-elderly working-age adults who possessed a Masters, a Doctorate, or a professional degree was about the same in Philadelphia, Pennsylvania and the nation (7 percent in Philadelphia versus 8 percent in Pennsylvania and the nation).

Clearly, the stock of educational capital or human capital among Philadelphia residents is much smaller than that among their counterparts in the entire state of Pennsylvania or the nation. The educational capital of a geographic area is very closely related to the standard of living and economic output of the area. Labor market participation, access to employment, intensity of employment, and the earnings of members of the workforce are very closely related to their educational attainment. Some of the key benefits of a better-educated citizenry accrue to the economy and the society in the form of a more qualified and more productive workforce, the production of a larger volume of economic output, higher levels of earnings and incomes, a reduced reliance on welfare, and lower levels of unemployment and criminal activities.

LABOR MARKET ACTIVITIES OF PHILADELPHIANS IN 2000

Economists use numerous measures to gauge the labor market activities and outcomes of the residents of an area. In this section of the paper, we have utilized six broad measures to gauge the labor market activities and outcomes of residents of Philadelphia, Pennsylvania and the nation. The first three measures that are frequently used to gauge labor market activity at a point in time are the labor force participation rate, the unemployment rate, and the employment to population ratio. The remaining three indicators of labor market outcomes pertain to earnings and employment intensity and are measured with the annual hours of

² According to an economic theory called the human capital theory which theorizes the relationship between human capital and earnings, education should affect earnings positively. Two interpretations are provided for the expected positive correlation between schooling and earnings. The first considers formal education as a productivity-enhancing activity. Education and earnings are positively related because workers with more schooling are more knowledgeable and therefore more productive. The productivity-enhancing effect of schooling leads to higher earnings among better-educated workers. The other signaling or screening interpretation of the relationship between education and earnings states that education sorts people by ability and potential employees use educational credentials to signal their abilities to employers. This interpretation regards earning premiums of better-educated persons as the price that employers are willing to pay to use educational credentials to “screen” job applicants for desirable traits that are not observed directly. The second interpretation is not a standard human capital interpretation.

employment, which measures the intensity of labor supply, the earnings per hour of work which is a proxy for worker productivity,³ and the total annual earnings, which is simply the product of the earnings per hour and the annual hours of employment.

While the latter three labor market outcomes are self-explanatory, the former three measures of labor market activity require some understanding of basic labor market concepts of labor market participation, unemployment and employment. Labor market measures are always restricted to the working-age population, which consists of individuals aged 16 years or older. Based upon their activity at the time of the 2000 decennial census survey (April 2000), individuals are classified into the following three groups: those who were working for pay (employed), those who were not working but actively looking for work and available for work (unemployed), and the remainder who were neither working nor looking for work (not in the labor force).

The labor force consists of individuals who are either working (employed) or looking for work and available to work (unemployed). Economists often use the labor force as a measure of labor supply. The labor force participation rate represents the share of the working-age population that is actively participating in the labor force by either working or by looking for work and is computed as: number of individuals in the labor force / number of individuals in the working-age population.

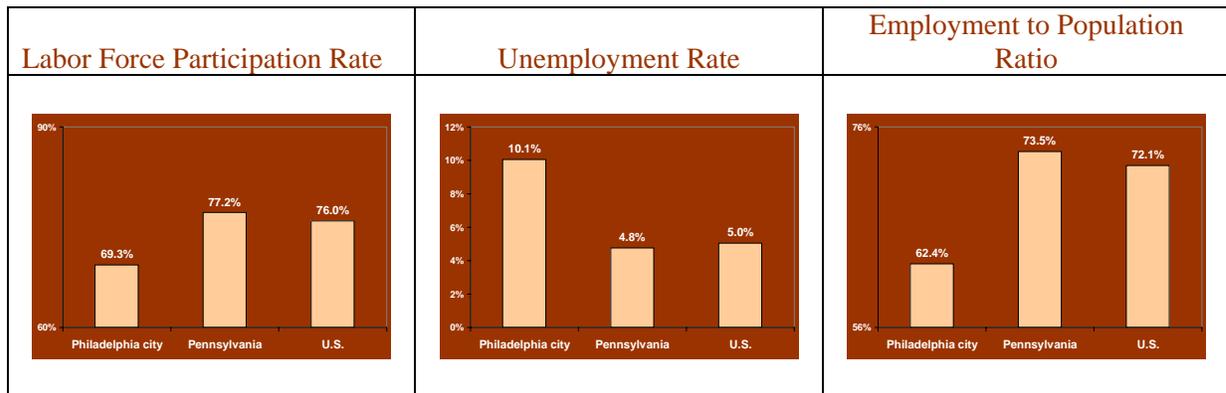
The unemployment rate represents the proportion of the labor force that is unable to find work (unemployed). It is computed as: number of unemployed individuals / number of individuals in the labor force. The employment to population ratio is also called the employment rate and measures the proportion of the working-age population that is employed at a given point in time. It is computed as: number of employed individuals / number of individuals in the working-age population.

A comparison of the labor market activities of non-enrolled and 16-64 year old Philadelphians with their counterparts in the entire state of Pennsylvania and the nation is presented in Chart 2. These findings reveal that residents of Philadelphia had a lower rate of labor force participation and employment and a higher unemployment rate compared to that of their counterparts in the state and the nation. The overall labor force participation rate of Philadelphia residents (out-of-school and non-elderly) was 69 percent compared to 77 in Pennsylvania and 76 percent in the nation. Only 69 out of every 100 out-of-school and non-elderly residents of Philadelphia were participating in the labor force at the time of the 2000 decennial census compared to 77 out of 100 in Pennsylvania and 76 out of 100 in the entire nation.

Among those who did participate in the labor force, residents of Philadelphia were less likely to find employment than residents of Pennsylvania and the nation. This is illustrated by a comparison of the unemployment rates of the residents in these three areas in Chart 2. In

³ Economists frequently use the hourly wage as a proxy for worker productivity since most employers pay employees at a wage rate commensurate with their contributions to the output of the firm.

Chart 2: Labor Force Activities of 16-64 Year Old Out of School Population in 2000, Philadelphia City, Pennsylvania, and the United States



the spring of 2000, the unemployment rate of the residents of Philadelphia was 10 percent or twice as high as that of their counterparts in the state (4.8 percent) and the nation (5 percent). One out of ten labor force participants in Philadelphia were unable to find employment. Not only were Philadelphians less likely to participate in the labor force, but they also had limited success in obtaining employment.

Since Philadelphia residents were less likely to participate in the labor market and more likely to be unemployed than the residents of the state and the nation, the city’s resident employment rate was also much smaller compared to the employment rate in the state or the nation. Out of 100 out-of-school Philadelphians between the ages of 16 and 64, only 62 were employed at the time of the 2000 census compared to 74 in Pennsylvania and 72 in the nation. The employment rate in Philadelphia was 12 percentage points lower than the Pennsylvania and 10 percentage points lower than the nation.

A part of the lower level of labor market attachment and inferior labor market outcomes among Philadelphia residents is attributable to the lower levels of education of the city’s residents. Comparisons of the labor market outcomes across educational groups in any population subgroup have consistently demonstrated a strong association between education and labor market outcomes. Participation in the labor market and access to employment consistently increases with the level of education whereas the likelihood of unemployment declines considerably as educational attainment increases.

The strong association between the level of education and the labor market activities of the population in Philadelphia city is evident in the findings presented in Chart 3 which contains a comparison of the labor force participation rate, the unemployment rate, and the employment to population ratio across the nine educational subgroups of Philadelphians. Findings in Chart 2 reveal that nearly 7 out of 10 non-elderly and out of school working-age residents of Philadelphia were active labor force participants in the spring of 2000. There were sizable differences between the labor force participation rates among the city’s residents with different levels of formal educational attainment. Higher levels of educational attainment were closely associated with higher levels of labor force participation. While only 35 out of 100 Philadelphians who had completed 8th grade or lower level of education were

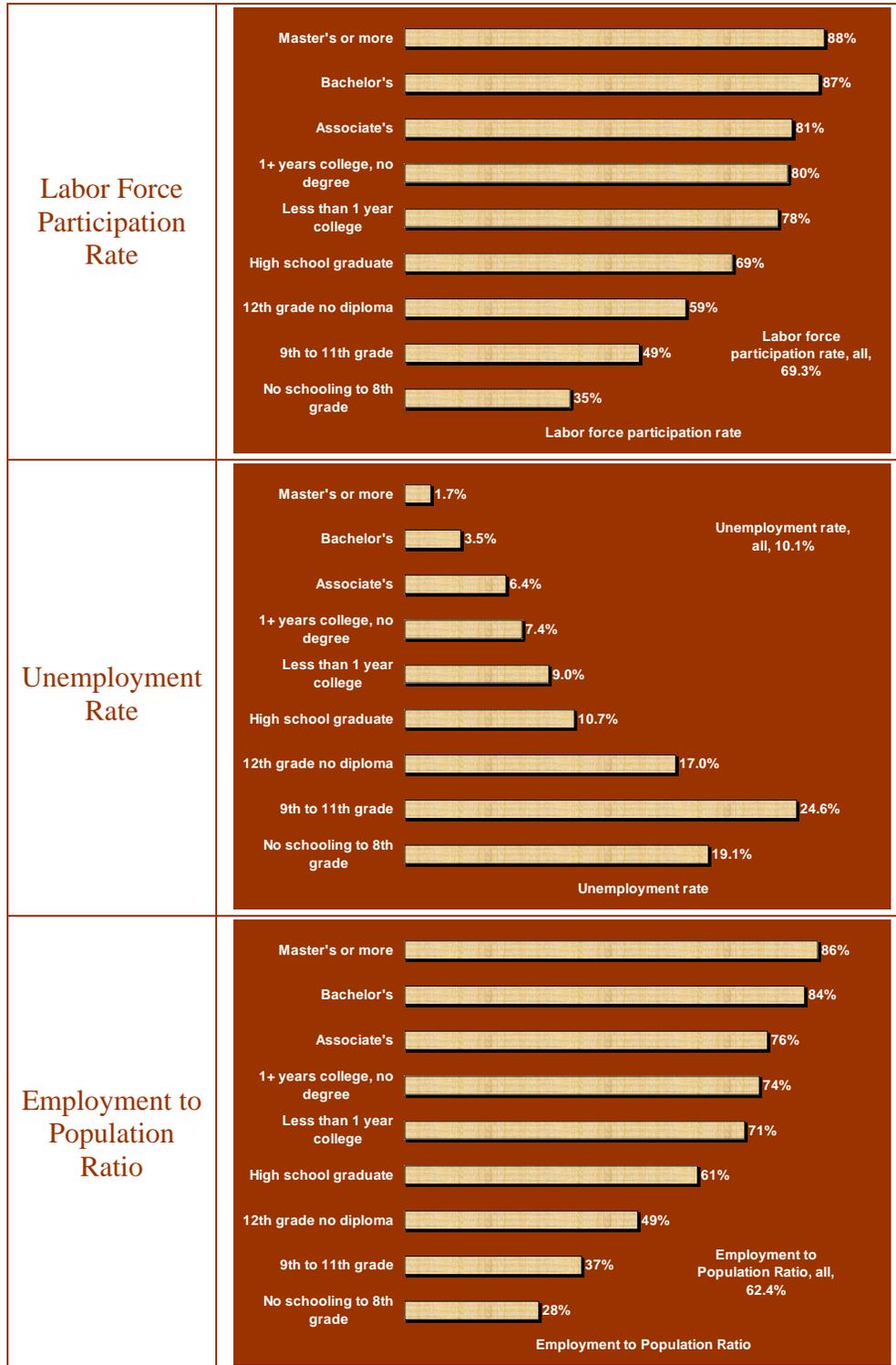
participated in the labor market. In sharp contrast, 88 out of 100 of their counterparts with a Master's degree or higher level of education actively participated in the labor market. Between the two extremes, the labor force participation rate increased steadily among groups with successively higher levels of educational attainment. The labor force participation rate was 49 percent among city residents with a 8th to 11th grade education, 59 percent among 12 grade completers without a high school diploma, 69 percent among high school graduates, and 81 and 87 percent, respectively, among residents with an Associate's degree or a Bachelor's degree.

Not all individuals who participate in the labor force find employment. As defined above, individuals who are not employed but are looking for and available to work are considered unemployed. Economists measure the magnitude of the unemployment problems in the population with the unemployment rate, which measures the proportion of the labor force that consists of unemployed individuals. In 2000, one in ten Philadelphia residents who participated in the labor force were unemployed, representing a 10 percent unemployment rate. The unemployment rate varied widely across educational subgroups. The unemployment rate among those with an 8th grade or lower level of education was 19 percent, representing a level that was more than 10 times as high as the unemployment rate among college graduates with a Master's degree or higher level of education (1.7 percent). One in four labor market participants with a 9th to 11th grade education were unemployed compared to 17 percent among those with just a 12th grade education (without a high school diploma), 11 percent among high school graduates, 6 percent among those with an Associate's degree, and only 3.5 percent among Bachelor's degree holders.

The third measure of the labor market activity of Philadelphians (employment to population ratio or the employment rate) is presented at the bottom of Chart 3. The employment to population ratio, which measures the proportion of the working age population that was employed, is a summary measure of job access that incorporates labor force participation as well as the ability to find a job. The unemployment rate only measures the unemployment problems among labor force participants and does not measure the lack of job access among people who are not participating in the labor force. The unemployment rate therefore underestimates the problems of unemployment among groups with a lower rate of labor market attachment (participation).

For example, the unemployment rate among Philadelphians with higher among those with 9th to 11th grade schooling than those with 8th grade or lower level of schooling (25 percent versus 19 percent). However, the relatively better-educated group (with 9th to 11th grade schooling) had a higher rate of labor force participation (49 percent compared to only 35 percent among their counterparts with 8th grade or lower level of education). Consequently, the employment rate of the city's residents with 9th to 11th grade education was 37 percent or 9-percentage points higher than that among their counterparts with an 8th grade or lower level of schooling (28 percent). The employment to population ratio was 61 percent among the city's residents with a high school diploma, three-quarters among Associate's degree holders, 84 percent among those with a Bachelor's degree and 88 percent among city's residents with a Masters, professional, or a doctorate degree.

Chart 3: Labor Force Participation Rate, Unemployment Rate, and Employment to Population Ratio of 16-64 Year Old Out of School Population in Philadelphia, by Highest Level of Educational Attainment in 2000



EMPLOYMENT INTENSITY AND EARNINGS OF EMPLOYED PHILADELPHIANS IN 1999

The previous section illustrated the differences between the labor market activities (the first three out of six labor market outcomes) of Philadelphians and their counterparts in the state and the nation. The findings discussed in the previous section also demonstrate the differences in the level of labor market participation and access to employment among Philadelphians with different levels of education. In this section, we present findings from our analysis of the next three labor market outcomes—intensity of employment, hourly earnings, and annual earnings. We have compared these outcomes of Philadelphia residents with that of the residents of Pennsylvania and the nation. We have also presented a comparison of these outcomes of Philadelphia residents by their educational attainment. In making these comparisons, our discussion is limited to only those city residents who were employed for at least one week during the 1999 calendar year.

We have measured employment intensity by the number of annual hours of employment among those who were employed at some time during the 1999 calendar year. Respondents to the decennial census long form questionnaire were asked to report the number of weeks during the year and the numbers of hours per week that they were employed during 1999. We used the annual weeks and weekly hours of employment of individuals to compute the annual hours of employment. Respondents to the decennial census long-form questionnaire were also asked to report their annual earnings during 1999. We divided the annual earnings by the annual hours of employment to compute hourly earnings of employed Philadelphians in 1999.

Prior to an examination of the associations between education and employment intensity and earnings in the city, we have presented a comparison of these labor market outcomes between residents of Philadelphia city, Pennsylvania, and the U.S. in Table 1. The findings presented in Table 1 reveal that on each one of these labor market outcomes, residents of Philadelphia performed poorly compared to residents of Pennsylvania and the nation. Philadelphians were much less likely to be employed during 1999, and had a lower level of annual earnings, annual hours of employment, and hourly earnings compared to their counterparts in the state and the nation.

One of the first outcomes presented in Table 1 measures the proportion of non-elderly working age out of school residents who were employed for one or more weeks during the 1999 calendar year. Only 73 out of every 100 residents of the city held a job for one or more weeks during 1999. The remaining 27 percent were not employed at any time during the entire year. In Pennsylvania and the nation, over 81 percent of the residents had one or more weeks of employment during 1999; a proportion that was over 8 percentage points higher than that in Philadelphia.

The mean annual hours of employment was only computed for those residents who were employed for at least one week during 1999. Among Philadelphians who were employed for one or more weeks during 1999, the mean annual hours of work was 1,820; a level that was more than 100 hours lower than the mean annual hours of employment among workers in

Pennsylvania and the nation. The mean annual hours of employment among workers was 1,924 hours in Pennsylvania and 1,928 hours in the nation. The employment intensity of working Philadelphians was about 95 percent as high as the intensity of employment among their state and state and national counterparts.

We have examined two outcomes that measure earnings. The first one measures the total earnings of employed workers during the year and the second measures earnings per hour of employment. Given their lower employment intensity, it is not surprising to find that the annual earnings of employed residents of Philadelphia were lower than that of the residents of the state and the nation. The mean annual earnings of working residents of the city were \$30,000, a level that was, respectively, only 88 and 85 percent as high as the mean annual earnings of workers in Pennsylvania (\$34,200) and the nation (\$35,385). For every \$1 earned by residents of Pennsylvania and the U.S., Philadelphians earned only 88 cents and 85 cents, respectively

Table 1: Mean Annual Earnings, Annual Hours, and Hourly Earnings of 16-64 Year Old Out of School Employed Residents of Philadelphia, Pennsylvania, and the U.S. in 1999

	Percent Employed in 1999	Mean Annual Hours of Employed	Mean Annual Earnings of Employed	Mean Hourly Earnings of Employed
Philadelphia city	72.7%	1,820	\$30,030	\$18.06
Pennsylvania	81.5%	1,924	\$34,189	\$18.72
U.S.	81.1%	1,928	\$35,385	\$19.86
Philadelphia / Pennsylvania	89%	95%	88%	96%
Philadelphia / U.S.	90%	94%	85%	91%

The annual earnings gaps between workers in Philadelphia and their counterparts in the state and the nation were much larger than the gaps between their employment intensity. The hourly earnings of Philadelphians also were lower than that of residents of the state and the nation. The mean hourly earnings of workers in Philadelphia city were \$18.06 compared to \$18.72 among workers in the state and \$19.86 among the nation’s workers. The mean hourly earnings of working Philadelphia residents was respectively, only 96 percent and 91 percent as high as the mean hourly earnings of workers in Pennsylvania and the nation. Compared to their counterparts in Pennsylvania and the nation, Philadelphia residents were less likely to have worked during the 1999 calendar year, worked for fewer annual hours during the year, and earned lower levels of hourly earnings and annual earnings.

Within Philadelphia city, there were large differences by educational attainment in the annual hours of employment, annual earnings, and hourly earnings of employed city residents. Chart 4 presents the mean annual hours, mean annual earnings, and mean hourly earnings of Philadelphians who were employed in 1999. Residents with higher levels of

education had higher annual earnings, higher hourly earnings and worked for many more hours annually than their counterparts with lower levels of education.⁴

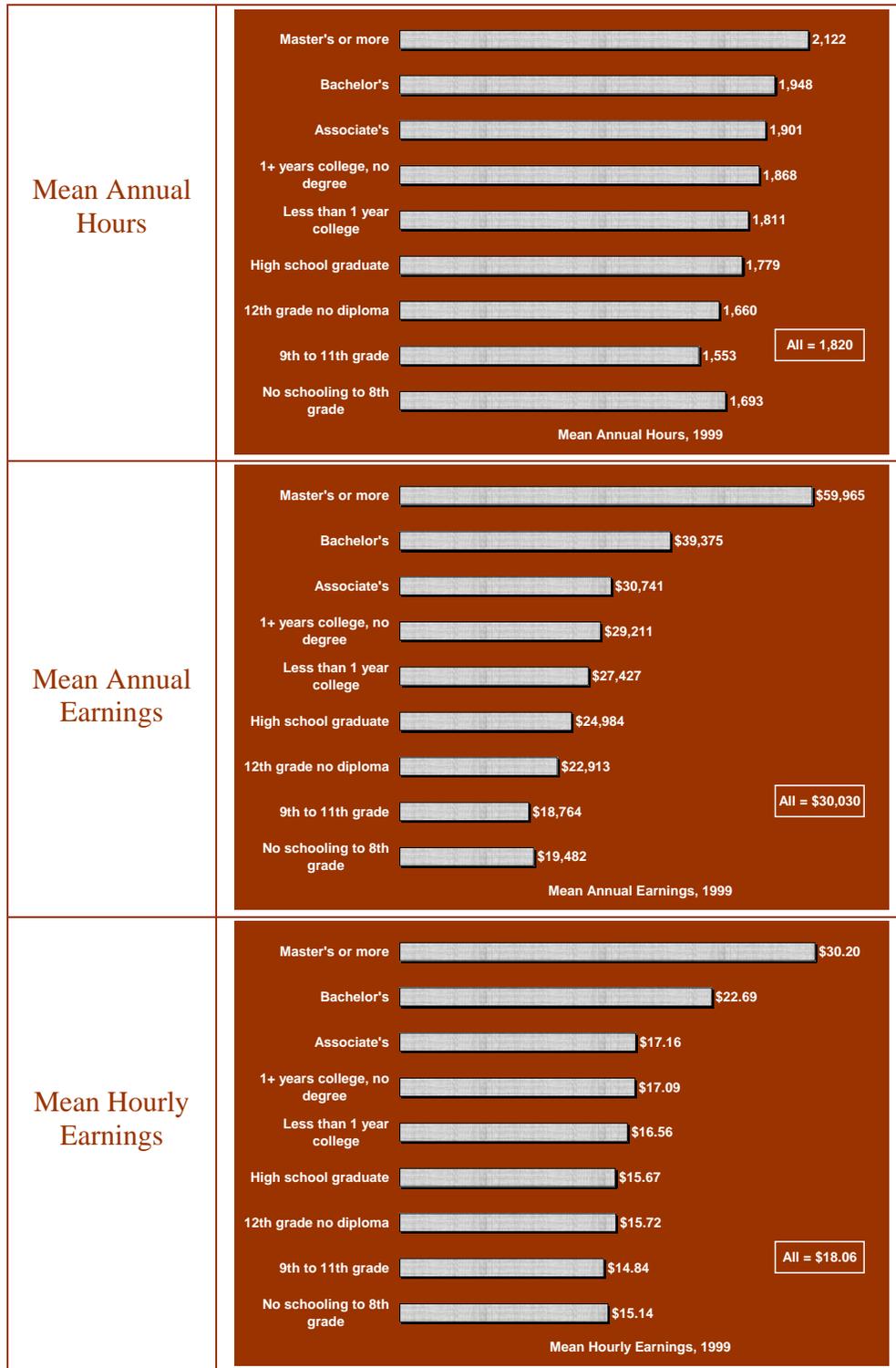
On average, an employed non-elderly and out-of-school Philadelphian worked for 1,820 hours during 1999, which amounts to full-time and year-round employment (50 or weeks per year at 35 or more hours per week). There was a wide variation around this average. Individuals with an 8th grade or lower level of education were employed for nearly 1,700 hours during 1999, compared to nearly 1,800 hours among high school graduates, 1,900 hours among those with an Associate's degree, 1,950 hours among Bachelor's degree holders, and over 2,100 hours among the city's residents with a post-baccalaureate degree. Individuals who were poorly educated not only had poor access to employment, but when employed they worked fewer hours per year than their better-educated counterparts.

Sharp differences in the mean annual earnings of Philadelphians with different levels of education are also evident in the findings presented in Chart 4. The mean annual earnings of employed, out-of-school, and non-elderly Philadelphians was \$30,000. Those with an 8th grade or lower level of education earned an average annual salary of \$18,800; a level that was less than one-third of the mean annual earnings of their counterparts with a Master's, professional, or a doctorate degree (\$60,000). The mean annual earnings increased steadily with education. High school graduates earned \$25,000 per year, whereas those with an Associate's degree earned \$30,700 and those with a Bachelor's degree earned an average of \$39,400 during the 1999 calendar year.

The mean hourly earnings of employed residents of Philadelphia also increased with education. City residents with the lowest levels of education (8th grade or less) earned half as much as their counterparts with a Master's or higher level of education (\$15 versus \$30 per hour). The mean hourly earnings of city residents with a high school diploma are only modestly higher than that of the three groups of high school dropouts, indicating that almost a large part of the annual earnings differentials between high school graduates and high school dropouts in the city is attributable to more intensive employment among high school graduates. City residents with any postsecondary schooling have a sizable hourly earnings premium compared those without postsecondary education. The mean hourly earnings of those with an Associate's degree were over \$17 per hour and those with a Bachelor's degree earned an average of nearly \$23 for each hour that they were employed during 1999.

⁴ The labor supply intensity and earnings outcomes of Philadelphians increase consistently with education. The only exception was observed in the two most poorly educated groups. The outcomes of city residents with 8th grade or lower level of education were slightly better than those of their counterparts with 9th to 11th grade education. A further analysis of these two educational groups reveals that the differences are primarily attributable to age. The median age of those with an 8th grade or lower level of education was 44 years compared to 39 years among their counterparts with a 9th to 11th grade education. Residents with an 8th grade or lower level of education had disproportionately high concentrations of immigrants. Over 59 percent of this group consisted of immigrants compared to 14 percent among those with 9th to 11th grades education and 13 percent among all (out of school and non elderly) employed residents. The disproportionate concentration of immigrants in this group underlies their considerably higher median age and therefore their slightly better hours and earnings outcomes.

Chart 4: Mean Annual Hours, Annual Earnings, and Hourly Earnings in 1999 of Employed 16-64 Year Old Out of School Philadelphians, by Highest Level of Educational Attainment



The Impacts on the Labor Market Outcomes of Raising the Education of Philadelphia Residents to the Level of Pennsylvania Residents

The preceding analyses of the education attainment and the labor market outcomes of Philadelphians reveal that the compared to the residents of Pennsylvania and the nation, the labor market outcomes and the educational attainment of Philadelphians were considerably lower. Philadelphians have lower levels of education, are less likely to be in the labor force, less likely to be employed, and more likely to be unemployed than residents of Pennsylvania and the nation. Employed Philadelphians work for fewer hours per year, earn a smaller annual salary, and a lower level of hourly earnings compared to their counterparts in the state and the nation. We also found a close association between the educational attainment of Philadelphians and their labor market outcomes indicating that a part of the poorer labor market outcomes of city residents are attributable to their lower levels of educational attainment.

This section of the paper explores the impact on the labor market outcomes of raising the educational attainment of Philadelphians to the level of their counterparts in the state and the nation. We begin with an estimation of the impact on labor market outcomes of Philadelphians if their educational attainment levels were raised to the level of all Pennsylvanians. In other words, if the educational attainment of Philadelphians was identical to that of the residents of the entire state, how would the labor supply and earnings of city residents change?

Findings from our examination of the changes necessary to raise the educational attainment of city residents to the educational level of state residents are presented in Table 2. These findings reveal that, in order to raise the educational attainment of Philadelphia residents to the level of state residents, there will have to be a sizable reduction in the number of city residents without a high diploma or a GED and a compensating increase in the number of high school graduates and residents with a postsecondary education. The number of residents without a high school diploma would have to decline by 45 percent or by 85,700. Within the group with less than a high school diploma or a GED, there would have to be 15,400 or 41 percent fewer residents with an 8th grade or lower level of education, 42,300 or 42 percent fewer residents with a 9th to 11th grade education, and 29,700 or 54 percent fewer residents with a 12th grade education and no high school diploma or a GED credential.

The number of high school graduates would have to increase by 24,700 representing a relative increase of nearly 9 percent. The number of residents with some postsecondary education would have to increase by 62,800 or 21 percent consisting of a growth of 800 or 1 percent in the number of residents with some college (with no degree); nearly 16,000 or 43 percent more residents with an Associate's degree, an addition of 34,300 or 41 percent growth in the number of residents with a Bachelor's degree, and nearly 11,700 additional

Table 2: The Distribution of the 16-64 Year Old Out of School and Non Elderly Population of Philadelphia by Educational Attainment, Actual and Simulated to Reflect the Educational Distribution of the Residents of Pennsylvania, 2000

Educational Attainment	Actual	Simulated	Absolute Change	Relative Change
Total with less than high school diploma	194,021	106,564	-87,457	-45.1%
No schooling to 8th grade	37,465	21,989	-15,476	-41.3%
9th to 11th grade	101,689	59,378	-42,311	-41.6%
12th grade no diploma	54,867	25,196	-29,671	-54.1%
High school graduate	281,860	306,536	24,676	8.8%
Total with postsecondary education	301,644	364,426	62,782	20.8%
Less than 1 year college	48,552	48,507	-45	-0.1%
1+ yrs. college, no degree	79,845	80,704	859	1.1%
Associate's	37,014	52,942	15,928	43.0%
Bachelor's	83,398	117,745	34,347	41.2%
Master's or more	52,835	64,527	11,692	22.1%
Total	777,525	777,525	NA	NA

residents with a Master's degree or higher level of education representing a growth rate of 22 percent in this educational group.

If these changes in the education of the population of Philadelphia were attained, the city would have a larger labor force, more employed residents, fewer unemployed residents, a greater number of annual hours of labor supply, and a higher level of annual earnings. The actual and simulated levels of these measures are presented in Table 3. In 2000, Philadelphia had 539,100 residents (16-64 years old and not enrolled in school) who were actively participating in the labor force. If the educational attainment of the city's residents were raised to same level as the state, the labor force would increase to 566,100, representing an increase of nearly 27,000 or 5 percent. The number of employed residents would increase from the current level of nearly 485,000 to 517,100, representing an increase of 32,200 employed Philadelphians or 6.6 percent.

Raising the educational attainment of the population would not only increase the labor force participation of the population but also increase the ability of these labor force participants to secure employment resulting in a lower number of unemployed residents. In the year 2000, the number of Philadelphia residents who were unemployed stood at 54,100. If the education of the residents of Philadelphia were increased to the education level of the residents of Pennsylvania, the number of unemployed residents in the city would decline to 49,000 representing a decline of nearly 10 percent or 5,200 fewer unemployed Philadelphians.

Table 3: The Number of Philadelphia Residents (16-64 years old and out of school) in the Labor Force, Employed, and Unemployed, and the Number of Annual Hours of Labor Supply and Aggregate Annual Earnings, Actual and Simulated to Reflect the Educational Distribution of the Residents of Pennsylvania, 1999-2000

	Actual	Simulated	Absolute Change	Relative Change
Total Number	777,525	777,525	NA	NA
Labor Force	539,115	566,099	26,984	5.0%
Employed	484,924	517,113	32,189	6.6%
Unemployed	54,191	48,985	-5,206	-9.6%
Aggregate Annual Hours	1,027,689,643	1,096,352,084	68,662,441	6.7%
Aggregate Annual Earnings	\$16,954,119,522	\$18,764,989,841	\$1,810,870,319	10.7%

Better-educated workers are employed at higher rates than their counterparts who are poorly educated. When employed, better-educated workers also work for many more hours per week and weeks per year resulting in a greater number of annual hours of employment. If the education of Philadelphia residents were increased to the statewide level, the annual hours of labor supply by city residents would increase by 68.6 million hours representing a growth of nearly 7 percent. The productivity-enhancing effect of education translates into a higher level of earnings per hour. An increase in the annual hours of employment and the hourly rate of earnings will result in a higher level of earnings per annum. In 1999, the aggregate of the annual earnings of all employed residents of Philadelphia was \$16.954 billion. A more educated citizenry would lead to an aggregate earnings level of \$18.765 billion, representing an increase of \$1.810 billion or nearly 11 percent. Investments in raising the educational attainment of Philadelphians to the levels of the residents of the entire state would sharply increase the city's labor supply, decrease its unemployment problems, and increase the earnings of its residents.

Would raising the education level of Philadelphia residents to that of all Pennsylvanians close the gap between the rate of labor force participation, the unemployment rate, and the employment to population ratio of city residents and the residents of the entire state? Hypothetical (simulated) levels of these measures for city residents and the actual levels of these measures for residents of Pennsylvania are presented in Table 4. These findings reveal that raising the educational attainment would raise the labor force participation rate of city residents from 69.3 percent to 72.8 percent, which would reduce the gap between the rate of labor force participation in the city and the state from 7.9 percentage points to 4.4 percentage points. The city's unemployment rate would decline from 10 percent to 8.7 percent thereby reducing the city-state unemployment rate gap from 5.3 percentage points to 3.9 percentage points. The city's employment to population ratio would increase from 62.4 percent to 66.5 percent resulting and a reduction in the city-state gap from 11.2 percentage points to 7 percentage points.

Table 4: The Labor Force Participation Rate, Unemployment Rate and Employment to Population Ratio of 16-64 Year Old Out-of-School Philadelphians, Actual and Simulated to Reflect the Educational Distribution of all Their Counterparts in Pennsylvania, 2000

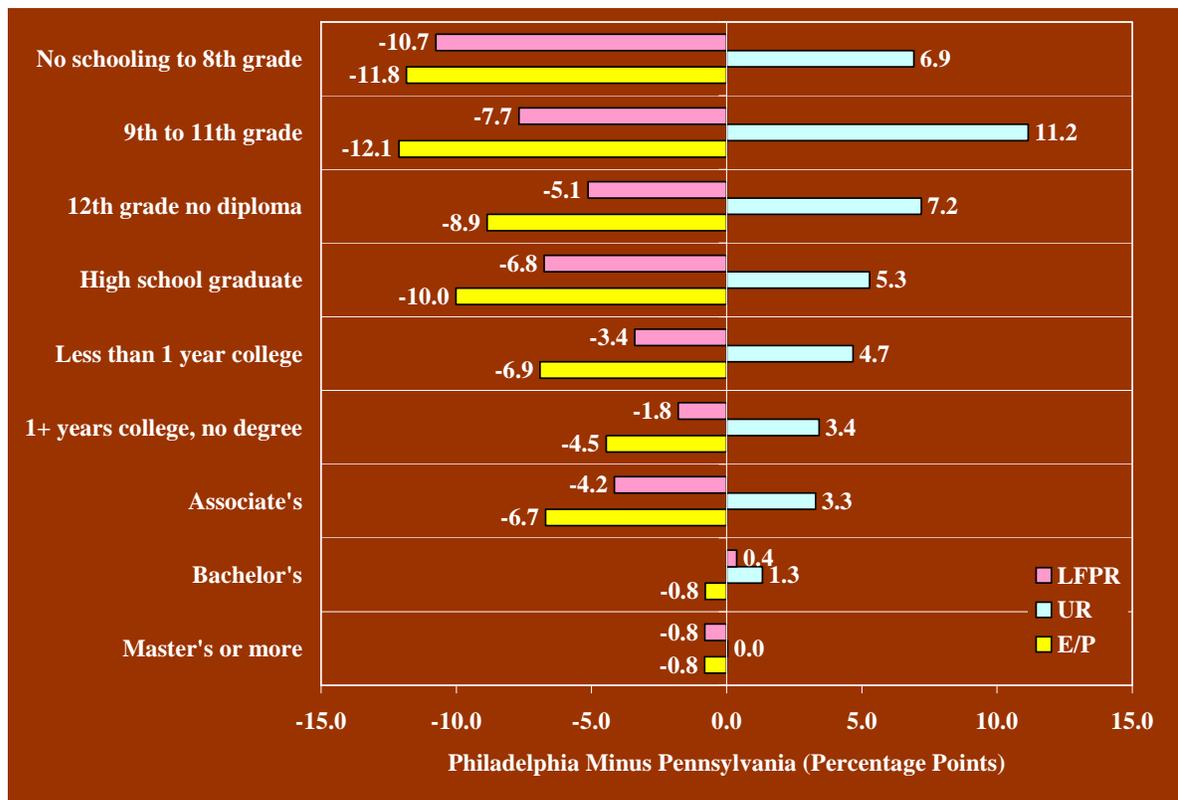
	Philadelphia Actual	Philadelphia Simulated	Pennsylvania	Pennsylvania Minus Philadelphia Actual	Pennsylvania Minus Philadelphia Simulated
Labor force participation rate	69.3%	72.8%	77.2%	7.9%	4.4%
Unemployment rate	10.1%	8.7%	4.8%	-5.3%	-3.9%
Employment to population ratio	62.4%	66.5%	73.5%	11.2%	7.0%

Raising the education levels of city residents to those of the residents of Pennsylvania would reduce the gaps between the labor force activities of Philadelphia and Pennsylvania residents but not remove them entirely. Underlying these remaining gaps in the labor market activities among Philadelphians even if their education were identical to that of the residents of the state are the lower levels of labor market activities of Philadelphians compared to Pennsylvanians within the same education subgroups. The gaps between the labor force participation rate, the unemployment rate, and the employment to population ratio of residents of Philadelphia and their counterparts in Pennsylvania within 9 education subgroups are presented in Chart 5. These findings reveal that the labor market outcomes of Philadelphians in each educational subgroup were weaker than those of their state counterparts. Philadelphians had a lower labor force participation rate, a higher unemployment rate, and a lower employment to population ratio compared to all Pennsylvanians in each educational category.

The largest gaps between the labor market outcomes of the residents Philadelphia and Pennsylvania existed at the lowest educational levels. The size of the gaps declined in subgroups with successively higher levels of educational attainment. The labor force participation rate and the employment rate of Philadelphians with an 8th grade or lower level of education were between 11 and 12 percentage points lower and their unemployment rate was 7 percentage points higher than that of all Pennsylvanians. Philadelphians with a 9th to 11th grade education were 8 percentage points less likely to participate in the labor force and 12 percentage points less likely to be employed and had an 11 percentage point higher unemployment rate than that of similarly educated residents of the entire state.

Although the sizes of the gaps were smaller among high school graduates compared to those who did not finish high school, there were still considerably large. Philadelphia residents with a high school diploma had were 5 percentage point less likely to participate in the labor force, 10 percentage points less likely to be employed, and had a 5 percentage point higher unemployment rate than all high school graduate residents of Pennsylvania. Sizable gaps between the residents of the city and the state existed even among those who had an Associate's degree. Philadelphians with an Associate's degree were 4.2 percentage points

Chart 5: Percentage Point Difference Between the Labor Force Participation Rate (LFPR), the Unemployment Rate (UR), and the Employment to Population Ratio (E/P) of Residents of Philadelphia and Pennsylvania, 2000



less likely to participate in the labor market, 3.3 percentage points more likely to be unemployed, and nearly 7 percentage points less likely to be employed than Associate’s degree holders in the entire state of Pennsylvania. Among residents with a Bachelor’s or higher level of education, the rate of labor force participation, employment and unemployment of Philadelphia residents were very similar to those of the residents of the entire state.

The simulated estimates of the labor market outcomes of all Philadelphians are based on the hypothetical or simulated number of Philadelphians in each educational category and the actual labor market outcomes (labor force participation rate, employment rate, unemployment rate, etc.) of Philadelphians. In other words, the hypothetical numbers of Philadelphians in each educational category were assigned the actual labor market outcomes of city residents in these educational categories. Since the actual labor market outcomes of Philadelphians in each educational category (except the Bachelor’s and higher level) are weaker than those of their statewide counterparts, the overall simulated labor market outcomes in Philadelphia remain inferior to those of the entire state, even if the educational attainment of city residents was exactly the same as that of state residents.

The Impacts on the Labor Market Outcomes of Raising the Education of Philadelphia Residents to the Level of U.S. Residents

We have also made hypothetical estimates of the level labor supply and earnings of Philadelphia city residents if their education were raised to the levels of their national counterparts. Matching the educational attainment of the nation’s non-elderly and non-enrolled 16-64 year old population would require somewhat different magnitudes of changes among the lower and upper educational subgroups than those required to match the education of the residents of Pennsylvania. In order to match the educational distribution of the nation’s population, Philadelphia would have to reduce the numbers of high school dropouts by 52,600, representing a relative decline of 27 percent. The number of residents with a 9th to 11th grade education would have to decline by 35 percent or by 35,800 and the number with a 12th grade education but no diploma would have to decline by 24,400 or 45 percent. Compared to the nation, Philadelphia’s actual share of residents with an 8th grade or lower level of education was smaller. Therefore to match the nation’s education, Philadelphia could add 7,600 additional residents with an 8th grade or lower level of education, representing an increase of about 20 percent.

Table 5: The Distribution of the 16-64 Year Old Out of School and Non Elderly Population of Philadelphia by Educational Attainment, Actual and Simulated to Reflect the Educational Distribution of Their Counterparts in the U.S., 2000

Educational Attainment	Actual	Simulated	Absolute Change	Relative Change
Total with less than high school diploma	194,021	141,395	-52,626	-27.1%
No schooling to 8th grade	37,465	45,091	7,626	20.4%
9th to 11th grade	101,689	65,879	-35,810	-35.2%
12th grade no diploma	54,867	30,424	-24,443	-44.6%
High school graduate	281,860	233,055	-48,805	-17.3%
Total with postsecondary education	301,644	403,076	101,432	33.6%
Less than 1 year college	48,552	58,100	9,548	19.7%
1+ yrs. college, no degree	79,845	107,259	27,414	34.3%
Associate's	37,014	50,430	13,416	36.2%
Bachelor's	83,398	122,301	38,903	46.6%
Master's or more	52,835	64,985	12,150	23.0%
Total	777,525	777,525	NA	NA

The city will have to reduce the numbers of high school graduates by nearly 49,000 or 17 percent in order to match its education with that of the nation. These declines at the lower educational levels will have to be matched by a one-third increase in the number of residents with some postsecondary education. The city would have to increase the number of college-educated residents by 101,400 consisting of an additional 37,000 residents with some college but no degree, 13,400 additional residents with an Associate’s degree, nearly 39,000 more

Bachelor’s degree holders, and 12,200 additional residents with a Master’s degree or higher level of education. The increases represent sizable relative increases in the number of college-educated residents ranging from 47 percent increase in the number of residents with a Bachelor’s degree, 36 percent increase in those with an Associate’s degree, 29 percent increase in the number of residents with some college but no degree, and 23 percent increase in the number of residents with a Master’s degree or higher level of education.

Such advances in the education of its residents are expected to result in a sizable increase on the labor supply and earnings among city residents. Similar to the simulations based on raising the education of Philadelphians to the education level of all Pennsylvanians, increasing the education of city residents to the national level would result in an increase in the labor supply in the form of more labor force participants, fewer unemployed residents, more employed residents, more annual hours of employment, and an increase in the hourly and annual earnings of the city’s residents. However, since there was a greater concentration of the nation’s residents within the poorer educational subgroups, particularly among high school dropouts and especially among those with 8th grade or lower levels of education, the simulated levels of earnings and labor supply based upon raising the city’s education to the nation’s educational levels were lower than those that are based on raising the education of city residents to Pennsylvania’s educational levels (presented in Table 3).

Table 6: The Number of Philadelphia Residents (16-64, out of school) in the Labor Force, Employed, and Unemployed, and the Number of Annual Hours of Labor Supply and Aggregate Annual Earnings: Actual and Simulated to Reflect the Educational Distribution of the Residents of the U.S., 1999-2000

	Actual	Simulated	Absolute Change	Relative Change
Total Number	777,525	777,525	NA	NA
Labor Force	539,115	561,069	21,954	4.1%
Employed	484,924	512,361	27,437	5.7%
Unemployed	54,191	48,708	-5,483	-10.1%
Aggregate Annual Hours	1,027,689,643	1,087,394,079	59,704,436	5.8%
Aggregate Annual Earnings	\$16,954,119,522	\$18,725,838,063	\$1,771,718,541	10.5%

If the education of Philadelphia residents were raised to the national level, the city would have access to nearly 22,000 additional labor force members representing a 4 percent increase in its labor force. The number of employed Philadelphians would increase by 27,400 or by nearly 6 percent and the number of unemployed city residents would fall by nearly 5,500, representing a 10 percent decline in unemployment. Employed city residents would engage in an additional 59.7 million annual hours of employment representing a 6 percent increase in the annual aggregate hours of labor supplied by city residents. Higher rates of employment, higher employment intensity, and higher hourly earnings from improved

educational attainment would result in a larger earnings pie for the city. The aggregate earnings of all employed Philadelphians would increase from \$16.95 billion to 18.72 billion, representing an increase in the city’s earnings and the potential tax base of \$1.77 billion or 10.5 percent.

Better education levels in the population would result in a greater level of labor force participation among city residents. Higher levels of education would also result in a higher rate of success in securing employment and would therefore increase the city’s employment rate (employment to population ratio) and decrease its unemployment rate. Findings presented in Table 7 reveal that if the educational attainment of Philadelphians (16-64 years old and out of school) were raised to the levels of their national counterparts, their labor force participation rate would increase to 72 percent (up from 69 percent); their employment to population ratio would increase to nearly 67 percent (from 62 percent), and their unemployment rate would decline to 8.7 percent (from 10.1 percent).

Table 7: The Labor Force Participation Rate, Unemployment Rate and Employment to Population Ratio of 16-64 Year Old Out-of-School Philadelphians, Actual and Simulated to Reflect the Educational Distribution of the Residents of the U.S., 2000

	Philadelphia Actual	Philadelphia Simulated	U.S.	U.S. Minus Philadelphia Actual	U.S. Minus Philadelphia Simulated
Labor force participation rate	69.3%	72.2%	76.0%	6.6%	3.8%
Unemployment rate	10.1%	8.7%	5.0%	-5.0%	-3.6%
Employment to population ratio	62.4%	65.9%	72.1%	9.8%	6.2%

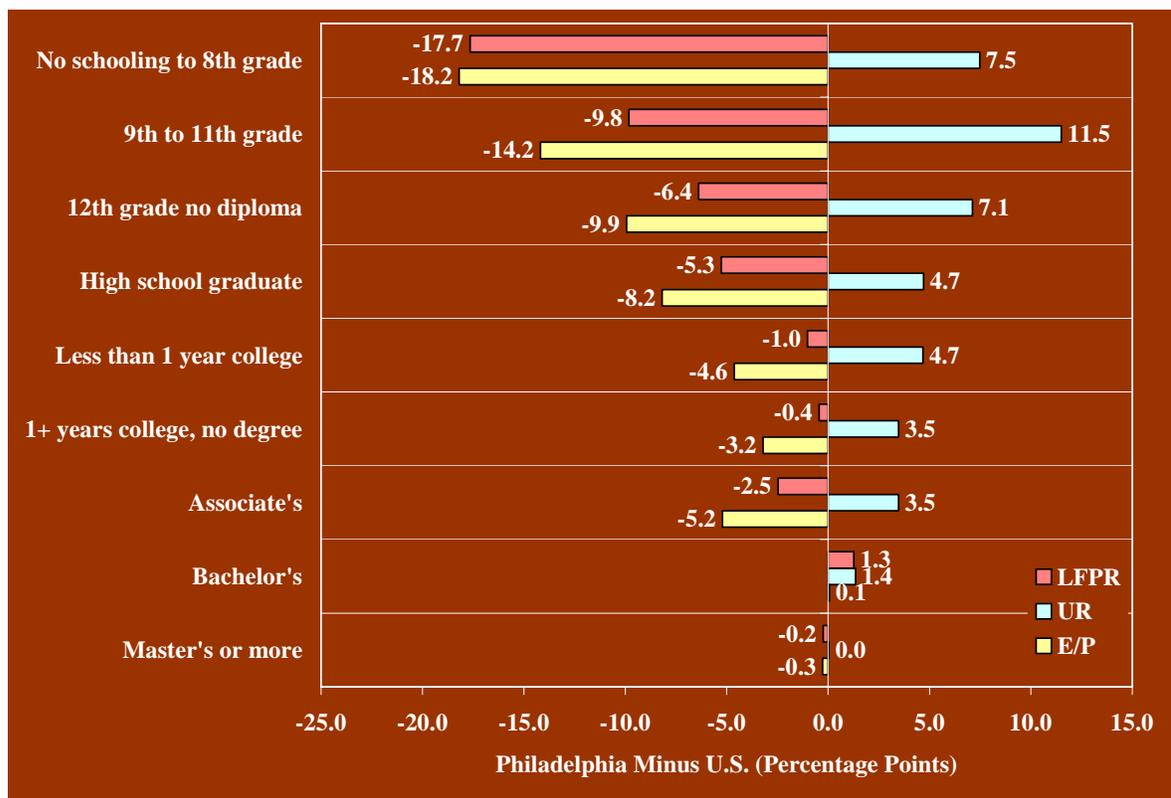
Improvements in the educational attainment of city residents by raising it to the level of the education of the nation’s residents would reduce but not eliminate the gaps between the labor market outcomes of the residents of Philadelphia and the nation. Even if the education of Philadelphia residents were identical to that of the nation’s residents, the rate of labor force participation and employment among Philadelphians would still be lower and their unemployment rate would still remain higher (albeit by smaller amounts) than that of the residents of the entire nation. The existence of these gaps between the labor market outcomes of the residents of the city and the nation despite the (simulated) equality in their educational attainment are attributable to the gaps between the labor market outcomes of the residents of these two areas within each educational subgroup.

The labor market outcomes of residents of Philadelphia in each educational subgroup were inferior compared to their national counterparts. These gaps were particularly large among the most poorly educated groups of residents. For example, among individuals with an 8th grade or lower level of education, the labor force participation rate and the employment rate of Philadelphians were each nearly 18 percentage points lower the rates among all residents of the nation. The unemployment rate of this group of Philadelphia residents was nearly 8 percentage points higher than that of their national counterparts. The

gaps between the labor force participation rate and the unemployment rate of high school graduate Philadelphians and their national counterparts were 5 percentage points each whereas the employment rate of Philadelphia residents with a high school diploma or a GED was 8 percentage points lower than that of their counterparts in the nation.

Among groups with higher levels of educational attainment, these gaps were somewhat smaller relative to the gaps between poorly educated subgroups of residents of Philadelphia and the nation. The rate of labor force participation of Philadelphia residents with an Associate’s degree was 2.5 percentage points lower, the unemployment rate was 3.5 percentage points higher, and the employment rate was over 5 percentage points lower than that of their national counterparts. Among residents with a Bachelor’s degree Philadelphians were one percentage point more likely to participate in the labor market and were equally likely to be employed as their national counterparts. Their unemployment rate was one percentage point higher the unemployment rate of Bachelor’s degree holders in the entire nation. The three labor market outcomes of Philadelphia residents with a Master’s degree or higher level of education were almost the same as their national counterparts.

Chart 4: Percentage Point Difference Between the Labor Force Participation Rate (LFPR), the Unemployment Rate (UR), and the Employment to Population Ratio of Residents of Philadelphia and their Counterparts in the U.S., 2000



The findings presented above, provide clear and strong evidence of the sizable gains that would accrue to the city and its residents from investments in raising the level of education of Philadelphians. The simulation exercises provided estimates of the potential labor supply and earnings gains that would accrue to the city and its residents if the education of its residents were raised to the level of the residents of Pennsylvania and the entire nation. The findings from these simulation exercises clearly reveal considerable returns to increasing the educational attainment of Philadelphians. However, even if the education level of Philadelphians were increased to exactly the same levels as their counterparts in the state and the nation, the gaps between the labor force outcomes of Philadelphians and their counterparts in the Pennsylvania state and the nation were reduced but not eliminated entirely. The reason for the continued existence of gaps is the differences between the labor market outcomes of Philadelphians and the residents of Pennsylvania and the nation within the same educational groups, particularly among those with lower levels of education.

MULTIVARIATE REGRESSION ESTIMATES OF THE IMPACT OF EDUCATION ON THE EMPLOYMENT RATES, ANNUAL HOURS, HOURLY EARNINGS, AND ANNUAL EARNINGS OF PHILADELPHIANS

In addition to the simulated gains in the labor supply and earnings from raising the education of Philadelphians to the educational levels of the residents of the state and the nation, we have also estimated multivariate regression models to measure the impact of increases in the education of Philadelphians on their labor market outcomes of Philadelphians. Although the multivariate regression technique also measures the impact of educational attainment on labor market outcomes, it uses a different methodology that allows for the measurement of the contribution of each additional level of education on the labor market outcomes of individual residents after statistically controlling for other variables that are known to influence these labor market outcomes. The simulation technique provides estimates of raising the educational attainment of the resident population on the citywide labor force, employed population, unemployed population, and aggregate annual hours of labor supply and earnings. The multivariate regression technique that is presented in this section complements the simulation technique presented in the previous section.

We have targeted the multivariate regression analysis on four key labor market outcomes—the hourly earnings, the likelihood of employment (employment rate), the annual hours of employment, and the annual earnings. Educational attainment has a direct and an indirect affect on the labor supply and hourly earnings of residents, which in turn influence the annual earnings and therefore the standard of living of the residents of Philadelphia. Citywide, the impact of higher levels of educational attainment result in an increase in the city’s labor supply, an improvement in the quality of the city’s labor supply, and an increase in the earnings of the city’s residents which in turn expands the city’s potential tax base.

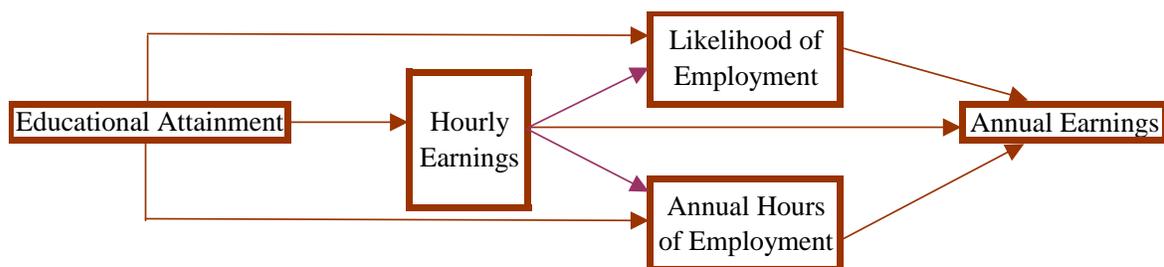
The direct and indirect influence of education on labor supply and annual earnings is presented in Figure 1. Educational attainment has a direct and positive impact on hourly earnings. Higher levels of educational attainment are associated with higher levels of hourly earnings. Higher hourly earnings in turn increase the labor market attachment of individuals.

According to economic theory⁵ the level of market wages that a person can expect to earn influences the decision to work. A higher level of expected wage rate is associated with an increased likelihood of employment. Since educational attainment has a strong positive impact on the hourly wage rate, it also influences the labor supply decision indirectly. Educational attainment also has a direct impact on labor supply. Better-educated individuals are more likely to work because they have a stronger commitment to work or a stronger taste for work. This effect is independent and in addition to the impact of education on the likelihood of employment through the hourly wage rate.

Higher hourly earnings also influence the intensity of work among employed individuals. According to economic theory⁶, an increase in the hourly wage is expected to increase the number of hours of employment (the intensity of employment). Individuals make labor supply decisions by allocating their time between work (labor) and leisure (all other activities). The hourly wage rate is considered as the price (opportunity cost) of “consuming” leisure. As the wage rate increases, the price of leisure increases which results in a decline in the number of hours of leisure and a reallocation of those hours towards labor. A higher hourly wage therefore is expected to increase the hours of labor supply. Since educational attainment influences the hourly wage, it indirectly influences the intensity of employment (hours of labor supply).

In addition to the indirect impact of education (through hourly earnings) on the intensity of employment, educational attainment also has a direct impact on the annual hours of labor supply. Better-educated workers are likely to work a greater number of hours per year compared to their less educated counterparts because of their stronger desire or taste for employment. This effect is independent of the effect on the employment intensity due to higher hourly earnings of better-educated workers.

Figure 1: The Pathways Through Which Educational Attainment Influences Labor Supply and Earnings



⁵ The neoclassical theory of labor supply postulates this relationship between hourly wage and labor supply.

⁶ Ibid.

Educational attainment influences the hourly wage, the likelihood of employment and the hours of labor supply among employed individuals. These variables in turn have a sizable cumulative impact on the annual earnings of workers. The annual earnings of an individual are determined by whether they are employed, the number of hours that they are employed during the year, and their hourly earnings. Among individuals who are already employed, the total earnings are influenced by market wage rates (hourly earnings) and the total hours of work (employment). The relationship between each of these three variables and annual earnings is positive. In other words higher hourly earnings, a higher the likelihood of employment, and higher annual hours of employment, result in higher annual earnings.

Hourly Earnings

Utilizing multivariate regression analysis, we have estimated the impact of educational attainment on each of the labor supply and earnings variables presented in Figure 1 separately for the male and female residents of Philadelphia. All regression models are restricted to Philadelphia residents who were not enrolled in school and were between the ages of 16 and 64 at the time of the 2000 decennial census. Our first regression model presents estimates of the impact of educational attainment on hourly earnings after statistically controlling for other variables known to influence hourly earnings. This model is based upon the human capital theory. According to human capital theory, education should affect earnings positively because workers with more schooling are more knowledgeable and therefore more productive. The productivity-enhancing effect of schooling leads to higher earnings among better-educated workers.

Findings from a multivariate regression analysis of the hourly earnings of men and women in Philadelphia based on human capital earnings functions are presented in Table 8.⁷ These estimates are derived from multivariate regression equations that were estimated with hourly earnings as the dependent variable. The explanatory variables in these equations include the work experience and education variables listed in Table 8 and the race-ethnicity, nativity status, and marital status of workers. We have not included in these regression models, variables representing quality of jobs (such as occupation, industry, or full-time status) because access to quality jobs is one of the pathways through which education enhances hourly earnings. Individuals who are employed in certain occupations or who are employed in full-time jobs earn higher hourly wages than those who do not gain access to these jobs. Access to these high quality jobs is closely associated with higher levels of educational attainment.

Findings presented in Table 8 reveal that work experience and education have a sizable impact on the hourly earnings of men and women in Philadelphia. Every additional year of work experience is expected to increase the hourly earnings by 2.9 percent among men and 2.1 percent among women. These findings highlight a serious negative effect of joblessness

⁷ Data presented in table 8 is restricted to the impact of educational attainment and work experience on hourly earnings. These findings are obtained from regression models containing other variables that are known to influence hourly earnings. Coefficients and standard errors of other variables included in the regression equations as well as entire multivariate regression output from the regression estimated to model hourly earnings will be made available by the authors upon request.

among city residents, particularly among the city’s youth. One out of five 16-24 year old residents in the city were out of school and jobless at the time of the 2000 decennial census.⁸ Jobless youth not only lose the earnings that they could have secured from employment, but also lose the opportunity to amass the labor market work experience that, according to findings presented in Table 8, would considerably enhance their future hourly earnings.

Education also has considerably large impacts on the hourly earnings of Philadelphians. Additional education at the secondary and postsecondary level is expected to significantly enhance the hourly earnings of Philadelphians, especially among women. Male Philadelphia residents with an 11th grade or lower level of education are expected to earn a 14 percent lower hourly wage compared to the hourly earnings of high school graduates. Even completion of a 12th grade education without a high school diploma or a GED is expected to result in an hourly wage that is 11 percent lower than that of high school graduates. Postsecondary education has a sizable impact on the hourly earnings of men. Men with a postsecondary education below an Associate’s degree are expected to draw nearly 12 percent higher hourly earnings compared to high school graduates. The hourly earnings premium of male residents relative to high school graduates is expected to be 18 percent among those with an Associate’s degree, 36 percent among those with a Bachelor’s degree and nearly 53 percent among men with a Master’s degree or higher level of education.

Table 8: Regression-Adjusted Impacts of Work Experience and Educational Attainment on the Hourly Earnings of 16-64 Year Old Out of School Philadelphians Employed During 1999

WORK EXPERIENCE/EDUCATION	MEN		WOMEN	
Work experience (years)	2.9%	***	2.1%	***
<u>Educational Attainment:</u>				
8th grade or less	-13.9%	***	-13.3%	***
9th to 11th grade	-14.3%	***	-17.1%	***
12th grade, no diploma	-11.0%	***	-2.8%	
<i>High school graduates/GED</i>	<i>Reference group</i>			
Postsecondary education, 1 year or less	12.6%	***	13.2%	***
Postsecondary education, 1+ yrs, no degree	12.0%	***	20.2%	***
Associate's degree	18.3%	***	35.3%	***
Bachelor's degree	36.3%	***	60.7%	***
Master's degree or more	52.8%	***	89.5%	***

*** Statistically significant at .01 level

Among the city’s female residents, the hourly earnings penalty from finishing just an 11th grade or lower level of education was about the same as that among their male counterparts. Women with a 12th grade education without a high school diploma are expected to have the same hourly earnings as high school graduates. The hourly earnings premiums of

⁸ See: Neeta P. Fogg, Paul E. Harrington, and Kevin R. McCabe, “Youth Disconnection in Philadelphia City: The Youth Job Deficit,” August 2005.

postsecondary education among female residents of the city are expected to be sharply higher than that among their male counterparts. Relative to high school graduates, the hourly earnings of women with just 1 year of postsecondary education (no degree) is expected to be 13 percent higher and among their counterparts with 1+ years of postsecondary education (without any postsecondary degree) it is expected to be 20 percent higher. The earnings premium of an Associate's degree among the city's women is estimated to be nearly twice as high as their male counterparts (35 percent versus 18 percent). Women with a Bachelor's degree are expected to earn 60 percent more per hour and those with a Master's degree or more are expected to earn nearly 90 percent more per hour than high school graduates.

Employment

The next labor market outcome that we have analyzed utilizing multivariate regression models is the employment rate. Estimation of the influence of educational attainment on the likelihood of employment is based upon the neoclassical theory of labor supply. According to this theory, the employment decision of individuals is based on three sets of variables: the expected wage rate, the amount of unearned income (income from sources other than personal earnings), and a final category of variables that include demographic and other variables that may influence the employment decision by representing taste for work or by changing the reservation wage⁹ due to the presence of young children in the household or by a physical inability to work. Included in this final class of variables are race and ethnic origin, age of youngest child in the household, and existence of health problems.

The regression model used to estimate the impact of education on the likelihood of employment is specified to include statistical controls for the effect of the variables described above on the probability that a resident of Philadelphia would be employed at the time of the 2000 decennial census. The multivariate regression equations for men and women were estimated with a dependent variable representing the employment status at time of the 2000 decennial census taking the value of 1 if the individual was employed and 0 if the individual was not employed. The explanatory variables in these equations include other sources of income (unearned income), age, race-ethnicity, nativity status, disability status, educational attainment, and marital status. An additional set of variables representing the presence of children in the household by age of the child was included in the regression equation estimated for women.

The impacts of educational attainment on the probability of employment among male and female residents of Philadelphia presented in Table 9 include the direct and indirect impact of education. The indirect impact pathway runs through hourly earnings as specified in Figure 1. Unfortunately the decennial census does not provide hourly wages data for respondents who were employed in 2000.¹⁰ The omission of the hourly wage variable from the employment regressions means that the coefficients of the education variables capture the

⁹ The reservation wage is the wage rate below which an individual will not be willing to work since at that wage, the opportunity cost of employment (work) would be higher than the wage rate.

¹⁰ Hourly earnings regressions described in the previous section are derived from the annual earnings and annual hours of employment among those who were employed at any time during the 1999 calendar year.

direct as well as the indirect impact of education on the likelihood of employment at the time of the 2000 decennial census among residents of Philadelphia city.

There is a very close association between the level of education of Philadelphia residents and their probability of employment at the time of the 2000 decennial census. Among male residents, compared to high school graduates, the probability of employment is expected to be 22 percentage points lower among men with an 8th grade or lower level of education, 20 percentage points lower among men with 9th to 11th grade education, and 11 percentage points lower among males who had complete the 12th grade but do not graduate from high school with a diploma or a GED (Table 9).

Male residents of the city with postsecondary education are considerably more likely than high school graduates to be employed at the time of the 2000 decennial census. Postsecondary schooling of just one year or less is expected to increase the likelihood of male employment by 5 percentage points compared to high school graduates. Postsecondary degrees are associated with sizable employment advantages. Those with more than one year of postsecondary education or an Associate's degree are 11 to 12 percentage points more likely to be employed relative to high school graduates. The regression-adjusted employment advantage of a Bachelor's degree among male Philadelphians is estimated at 19 percentage points whereas men with a Master's degree or higher level of education are 27 percentage points more likely to be employed than the city's male high school graduates.

Table 9: Regression-Adjusted Impacts of Educational Attainment on the Likelihood of Employment in Spring 2000 Among 16-64 Year Old Out of School Residents of Philadelphia (Percentage Points)

EDUCATION	MEN		WOMEN	
8th grade or less	-22.6%	***	-29.9%	***
9th to 11th grade	-19.9%	***	-21.3%	***
12 th grade, no diploma	-11.3%	***	-10.5%	***
<i>High school graduates/GED</i>	<i>Reference group</i>			
Postsecondary education, 1 year or less	5.0%	***	14.5%	***
Postsecondary education, 1+ yrs, no degree	11.6%	***	15.8%	***
Associate's degree	10.5%	***	19.4%	***
Bachelor's degree	18.9%	***	31.3%	***
Master's degree or more	27.2%	***	39.2%	***

*** Statistically significant at .01 level

The relationship between education and employment was even stronger among female residents of Philadelphia. Data in table 9 represent a clear and sizable improvement in the employment probability among women at each successively higher educational level. Compared to high school graduates, women with less than an 8th grade education are nearly 30 percentage points less likely to be employed, those with a 9th to 11th grade education are 21 percentage points less likely to be employed and women who finished 12th grade without

graduating from high school or earning a GED are expected to have a nearly 11 percentage points lower employment rate compared to high school graduates.

Just as lower levels of education are associated with sharply lower employment rates, female Philadelphians are expected to reap sizable employment advantages by finishing any level of postsecondary education. Just completing some postsecondary schooling without earning a degree raises the probability of employment by 15 to 16 percentage points. Those with an Associate's degree are over 19 percentage points more likely to work whereas the employment advantage of a Bachelor's degree and a Master's degree or higher level of education are estimated at 31 and 39 percentage points, respectively.

The regression-adjusted gap between the employment rate of residents with an 8th grade or lower level of education and their counterparts with a Master's degree or higher level of education is nearly 50 percentage points among men and 69 percentage points among women. In Philadelphia, increasing the educational attainment of the population is a critical component in increasing employment among its residents. However as noted earlier at the beginning of this paper, all of our analysis is static in nature and does not account for other factors such as an increase in the employment opportunities necessary to employ the additional and more qualified city residents in the labor market and several other factors that are necessary to absorb the additional labor supply that would be created with increased education of the city's residents.

Annual Hours of Employment

Although securing a job is an important first step towards labor market success, another aspect of labor market success is the intensity of employment among those who are employed. We have utilized the annual hours of employment as a measure of employment intensity. How much impact does education have on the annual hours of employment during the 1999 calendar year among employed Philadelphia residents? We have estimated multivariate regression models based on the neoclassical theory of labor supply to measure this impact. According to this theory, an increase in the hourly wage is expected to increase employment intensity.

Economic theory also states that beyond a certain level of hourly earnings, an increase in the wage rate will lead to a decline in the annual hours of employment. Individuals choose to supply fewer hours of labor beyond this threshold wage rate because at that wage their earnings are high enough to make additional leisure (other activities) more affordable. Since additional leisure comes at a cost of fewer hours of employment, an increase in the consumption of leisure results in a decrease in the labor supply (hours of employment). For most workers, however, the level of this threshold wage—where the relationship between the hourly wage and annual hours of employment becomes negative—is observed at wage rates that are considerably higher than the market rate. Our regression models estimate the threshold wage rate at \$18.75 for male residents and \$19.13 for female residents of Philadelphia. Two-thirds of employed men and over than three-quarters of the city's employed women earned hourly wages that were lower than the average hourly wage threshold levels estimated in the regression models.

An increase in the wage rate (before it reaches the “threshold” wage level, is expected to result in an increase in the annual hours of labor supply. Since educational attainment has a strong and positive impact on the hourly wage, it has an indirect impact on the intensity of labor supply through the hourly wage rate. Education also has a direct impact on the quantity of labor supply of individuals. Better-educated workers are more likely to work a greater number of hours per year compared to their less educated counterparts because of their stronger desire (taste) for employment. This effect is independent of the effect on the employment intensity due to higher hourly earnings of better-educated workers.

Findings from our multivariate regression models of the determinants of the intensity of labor supply of male and female residents of Philadelphia are presented in Table 10. Although these findings contain the impact of just the hourly wage and education on the intensity of labor supply, additional variables that are known to influence the intensity of labor supply were included in these models. The impacts of education and hourly wage on the intensity of the labor supply are therefore measured after statistically controlling for these variables.¹¹

Hourly earnings have a sizable impact in the labor supply intensity of Philadelphians. An increase in the hourly earnings by \$1 is expected to increase the annual hours of employment by 34 hours (or one week per year) among men and 46 hours or (1.3 weeks per year) among women. The labor supply of Philadelphians is very responsive to the hourly wage. Our earlier findings indicate that the hourly wage itself is very closely associated with the level of education. Efforts to boost the education of Philadelphians will sharply increase not just their hourly earnings but also attract more residents into the labor market, increase their likelihood of employment, and increase their labor supply intensity.

After controlling for hourly earnings, the impacts of education presented in Table 10 measure the non-wage impact of educational attainment on the intensity of labor supply. The non-wage impact could measure taste for work as well as availability of work. Frequently poorly educated workers are not able to find sufficient hours of employment and their employment intensity is therefore lower than the level that they prefer or desire. These workers may have the “taste” for work but may be underemployed involuntarily. Thus the non-wage impacts of education on the intensity of labor supply may also measure the impact of education on access to the desired hours of employment.

The non-wage impacts of education on the intensity of labor supply of Philadelphians are greater at the two ends of the educational distribution. For example, employed Philadelphian men with a 9th to 11th grade education are expected to work 106 fewer hours during the year compared to high school graduates. Even men with a 12th grade education who did not graduate from high school are expected to work 65 fewer hours during the year compared to those who did graduate from high school. Among men with postsecondary education, the

¹¹ Additional explanatory variables in the labor supply intensity models include: age, race-ethnicity, nativity status, marital status, disability status, and non-labor income or other sources of income (excluding personal earnings). The regressions for women contain an additional set of variables that represent the presence of children in the household and the ages of these children.

labor supply intensity of those with an Associate’s degree or lower level of education is not expected to be different from that of high school graduates. However, men with a Bachelor’s degree and those with a Master’s degree or higher level of education are, respectively, expected to work 71 and 103 hours more per year compared to high school graduates.

Table 10: Regression-Adjusted Impacts of Educational Attainment and Hourly Earnings on the Annual Hours of Labor Supply During the 1999 Calendar Year Among Employed 16-64 Year Old Out of School Residents of Philadelphia

HOURLY EARNINGS/EDUCATION	MEN		WOMEN	
Hourly Earnings (\$)	34	***	46	***
<u>Educational Attainment</u>				
8th grade or less	-61	**	-42	
9th to 11th grade	-106	***	-133	***
12 th grade, no diploma	-65	***	-75	***
<i>High school graduates/GED</i>	<i>Reference group</i>			
Postsecondary education, 1 year or less	10		14	
Postsecondary education, 1+ yrs, no degree	25		48	***
Associate's degree	21		44	**
Bachelor's degree	71	***	65	***
Master's degree or more	103	***	199	***

*** Statistically significant at .01 level, ** Statistically significant at .05 level

Among employed female residents of Philadelphia, those who have not graduated from high are expected to work much less than high school graduates. Women with a 9th to 11th grade education are expected to work 133 fewer hours compared to high school graduates and women with a 12th grade education (without a high school diploma) are expected to work 75 fewer hours per year compared to high school graduates. Unlike men, women with some postsecondary education even under the Associate’s degree level are expected to work more intensively than high school graduates—48 additional hours among those with 1+ years of postsecondary below the Associate’s degree level, 44 additional hours among those with an Associate’s degree, 65 additional hours among Bachelor’s degree holders, and 133 additional hours among women with the highest levels of education (Master’s degree or higher).

Through wage and non-wage channels, education has a strong and positive impact on the work intensity of Philadelphians. The effect of education on labor supply intensity is particularly strong among women. Even small increases in the education of Philadelphians has the potential of sizable benefits in the form of attracting Philadelphians to participate in the labor market and gain employment, increasing their hourly earnings, and increasing their annual hours of labor supply. These benefits of education on the obtaining employment, on the hourly earnings, and the annual hours of employment of Philadelphians combine into sizable impacts on their annual earnings.

Annual Earnings

The final regression models for men and women that we have estimated capture the magnitude of the impact of education on the annual earnings of the employed residents of Philadelphia. The annual earnings of employed workers are the product of their annual hours of work and their earnings per hour of work. Given the strong affect of education on both these components of annual earnings, one would expect a very strong and positive relationship between the education and the annual earnings of Philadelphians, even after statistically controlling for work experience, and the demographic and social variables known to influence annual earnings. According to the human capital theory, education enhances the productivity of workers, which results in higher earnings. Education also increases workers' access to higher quality jobs—jobs in high level and high wage occupations, and jobs that provide full-time year-round employment. Our annual earnings regression models include as explanatory variables, the basic human capital measures--work experience and education—and race-ethnicity, and nativity status of workers. The regression model for men includes their marital status since research has shown that even after controlling for other variables known to influence earnings, married men earn more than single men. Job quality measures, however, are excluded from our regression models.¹²

Higher levels of education and additional years of work experience are expected to confer sizable annual earnings benefits among Philadelphians. An additional year of work experience is expected to increase annual earnings by 5.5 percent among men and 4.5 percent among women. The earnings gains from additional work experience are expected to increase at a decreasing rate and maximized at 29.6 years of work experience among men and 30.4 years of work experience among women. Sizable future earnings benefits can be reaped from increasing the rate of employment among the city's residents, particularly among youth. The negative consequences of joblessness among the city's youth are not just confined to the present but continue into the future in the form of fewer years of labor market work experience, which in turn will reduce their future potential earnings.

Even after controlling for work experience, there is a strong and positive association between the education and the annual earnings of Philadelphians. The annual earnings of male residents of Philadelphia with less than a high school education are expected to be much lower than those with a high school diploma or a GED--nearly 25 percent lower among those with an 11th grade or lower level of education and 17 percent lower among those who finished a 12th grade education without graduating from high school. Males with postsecondary education of even one year or less are expected to earn 14 percent more per year than high school graduates. Those with more than one year of postsecondary education even without earning any postsecondary degree are expected to earn nearly one-fifth more per year than high school graduates. The regression-adjusted annual earnings premiums among the city's men relative to high school graduates is expected to be 23 percent for an

¹² Findings from the annual earnings regressions that include job quality measures can be obtained from the authors upon request.

Associate's degree, nearly 60 percent for a Bachelor's degree, and 106 percent a Master's, Doctorate or a professional degree.

Table 11: Regression-Adjusted Impacts of Work Experience and Educational Attainment on the Annual Earnings During the 1999 Calendar Year Among Employed 16-64 Year Old Out of School Residents of Philadelphia

WORK EXPERIENCE/EDUCATION	MEN		WOMEN	
Work experience (years)	5.5%	***	4.5%	***
<u>Educational Attainment</u>				
8th grade or less	-23.0%	***	-19.9%	***
9th to 11th grade	-25.4%	***	-35.7%	***
12 th grade, no diploma	-16.8%	***	-11.8%	***
<i>High school graduates/GED</i>	<i>Reference group</i>			
Postsecondary education, 1 year or less	13.8%	***	18.3%	***
Postsecondary education, 1+ yrs, no degree	18.9%	***	29.2%	***
Associate's degree	23.1%	***	49.6%	***
Bachelor's degree	59.6%	***	88.7%	***
Master's degree or more	106.9%	***	148.6%	***

*** Statistically significant at .01 level

The annual earnings gains from education, particularly postsecondary education, are expected to be much higher among the city's female residents than their male counterparts. Postsecondary education of just one year or less is associated with an 18 percent earnings premium relative to high school graduates among the city's female residents. Women who complete more than one year of postsecondary without earning a postsecondary degree are expected to earn 29 percent more per year than their counterparts with just a high school diploma. For every \$1 earned by a female high school graduate in Philadelphia, her counterpart with a college degree will earn \$1.50 if she has an Associate's degree, \$1.90 if she has a Bachelor's degree and \$2.49 if she has a Masters, Doctorate or a professional degree.

These regression-adjusted annual earnings benefits associated with the education of Philadelphia residents measure the benefits of education on the employment intensity and hourly earnings. Improving the education of Philadelphia residents comes with sizable gains in the labor market attachment and employment among the city residents thereby reducing joblessness. Improving education also is expected to affect the hourly earnings and annual hours of employed residents resulting in very impressive cumulative gains in annual earnings of employed city residents. The multiple economic payoffs from improving the education of the residents of Philadelphia and the sizable magnitude of these payoffs provide a solid rationale for investments in the educational attainment of the residents of Philadelphia and opportunities to increase the city's labor supply and earnings and to widen the potential tax base of the city.