

The Industry and Occupational Job Access Implications of the Literacy Deficit in Philadelphia City

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Introduction

The economic growth of an area is very closely related to the skills and abilities of the working-age residents of the area. Access to quality jobs (requiring high levels of literacy and skills) is strongly associated with the level of literacy proficiencies of workers. The literacy levels of the resident workforce of an area also serve to attract businesses to locate in the area. Businesses that require highly skilled workers will be more likely to locate in areas with a highly literate workforce. Low literacy skills can act as a brake on the economic prosperity of an area. Low literacy levels among the workforce of an area restrict job growth and growth in the earnings and income of its residents.

Our previous report presented an assessment of the literacy proficiencies of the working-age resident population of the city of Philadelphia during 2005. The report found that Philadelphia city was home to an adult population with relatively low levels of literacy proficiencies. Also included in that report were comparisons between the literacy proficiencies of residents of the city with those of their counterparts in the surrounding suburban communities, the state of Pennsylvania, and the nation. In each of the three literacy areas—prose, document, and quantitative—the literacy of city residents was far behind their suburban counterparts. On the prose and document literacy areas, the mean score of the residents of Philadelphia city was 0.35 standard deviations below the mean score of their counterparts residing in the surrounding suburban communities and the rest of the state. The literacy gaps were even larger in the quantitative literacy area. The mean quantitative literacy score of Philadelphians was 0.43 standard deviations below that of residents of the surrounding suburban area and the state. A difference of this magnitude is considered to be sizable with important implications for access to employment, education, and a high standard of living.

In Philadelphia city, low literacy skills suggest diminished economic opportunities for residents. Moreover, low literacy levels among Philadelphians and the relatively higher levels of literacy proficiencies among residents of the surrounding suburban communities mean that employers in Philadelphia city would have to rely on the suburban communities for labor supply. It also suggests that economic growth will occur in these surrounding communities rather than in the city, since the gains from better labor market outcomes—

higher rates of employment and higher level of earnings—associated with a more literate and skilled workforce skills will accrue to the resident population of suburban Philadelphia who possess higher levels of literacy proficiencies.

In this report we have highlighted the mismatch between the literacy proficiencies of the residents of Philadelphia city and the literacy levels necessary to be employed in the jobs available in the city, and identified the ways in which employers overcome the literacy deficit in the city. The report begins with a review of the literacy requirements in various industry sectors and occupational groups. We have used the mean literacy proficiency scores in each of the three literacy areas and across 29 occupational groups and 20 industry sectors to represent the literacy requirements of these occupations and industry sectors. The literacy proficiencies of all employed respondents to the 2003 National Assessment of Adult Literacy survey (NAAL) across the nation are used to make estimates of these literacy requirements.

Following this section, the report presents the occupational and industry composition of jobs in Philadelphia city and a comparison of the city's job composition with that of the surrounding suburban communities and the state of Pennsylvania. The job composition of these areas represents the characteristics of the jobs located in these areas and not of jobs held by residents of these areas. In particular, comparisons are presented between the share of higher literacy, mid-level literacy and lower literacy industries and occupations among jobs located in the city and the surrounding suburban communities.

The two separate pieces of information—literacy requirements of occupations and industry sectors and the occupation and industry composition of the jobs located in the city and its suburbs—are then combined to produce the overall literacy requirements of the jobs located in these areas based upon their occupation and industry composition. Estimates of the literacy requirements specific to these areas are based upon simulated industry-based and occupation-based literacy scores. In our previous literacy report, we had simulated the literacy proficiency scores for all working age residents in the three areas based upon their gender, age, and race-ethnicity. In this report we have simulated the industry-based and occupation-based literacy proficiency scores for Philadelphia city, suburban Philadelphia, and the state of Pennsylvania based upon the occupation and industry composition of employment in each of the three areas. Simulated scores of the working-age resident population in these areas from our previous report are then compared with the occupation-

based and industry-based simulated scores to estimate the gaps between the literacy proficiencies of the residents in these areas and the literacy proficiencies required to work in the jobs that are located within the boundaries of these three areas.

We find that the literacy proficiencies required to work in the jobs in Philadelphia city are considerably higher than the literacy proficiencies of city residents. The large gaps between the literacy proficiencies of the city's working-age residents and the literacy levels needed to be employed in the city imply that the city's employers have found ways to adjust to the literacy deficits in the city. The report identifies one of the adjustments made by employers with a study of the residence of all workers who work in the city. Do employers with businesses located in Philadelphia city adjust to the literacy deficits in the city by drawing parts of their workforce from the suburban communities? Estimates of the share of workers that work in the city but do not live within city boundaries are presented to measure the extent to which employers located within Philadelphia city draw their workforce from suburban Philadelphia. The shares of out-of-city workers in each industry and occupation and literacy-based groupings of industries and occupations are presented to highlight the above average reliance on suburban workers in industries and occupations that require high levels of literacy proficiencies.

Literacy Proficiencies by Occupation

Discussions of the economy and the labor market frequently utilize the terms occupation and industry. Occupations describe the kind of work a person does on the job as determined by the description of the main activities that they perform on their job. Each occupation represents a set of tasks, skills, and abilities associated with a worker's performing a particular job. Industry refers to the general nature of the business carried out in the establishment where a person works. Industry categories describe a company's primary business activity. For example a hospital is part of the health services industry which describes its primary business activity—providing health services. Hospitals employ many people performing different activities and belonging to different occupations. For example, hospitals employ physicians and nurses (health diagnostic and treating occupations), nursing aides (healthcare support occupations), receptionists (administrative support occupations),

cafeteria workers (food service occupations), lawyers (legal occupations), and workers in many other occupations.

In this section we have examined the literacy proficiencies of U.S. workers by the occupation in which they are employed. Data in literacy proficiencies are derived from the 2003 National Assessment of Adult Literacy Survey or the 2003 NAAL. The 2003 NAAL assessment was conducted in three literacy areas: prose, document, and quantitative.¹ Our analysis will include each of the three literacy areas. Results from the NAAL literacy assessment are available in the form of average or mean scores in each of the three literacy scales. The literacy scores for each scale are based on a scale of 0 to 500.

Mean literacy scores of workers on the each of the three literacy scales by 29 occupational categories are presented in Table 1. These findings reveal large differences in the literacy proficiencies of workers employed in different occupations. The mean scores on the prose literacy scale across occupations range from highs of 336 and 333 among life, physical, and social science technicians and life and physical scientists to lows of 218 in farming, fishing, and forestry occupations, and 230 in building and grounds cleaning and maintenance occupations. The range between the highest and lowest scores on the prose scale is 118 points exactly equal to 2 times the standard deviation of 59 points on the prose scale. Most of the top scoring occupations—defined as occupations prose proficiency scores between 305 and 336, representing one-half to one full standard deviation above the mean prose score of 275 points—are among workers employed in the scientific, engineering, professional, and managerial occupations. Besides life and physical technicians and scientists, some of the top scoring occupations include architects and engineers, computer and mathematical occupations, legal occupations, and social scientists and teaching occupations.

¹ Prose literacy is a measure of the skill in using information presented in textual format such as editorials, news stories, brochures, and instructional materials. It refers to the knowledge and skills needed to perform prose tasks such as: to search, comprehend, and use continuous texts. Document literacy reflects the skill in using information presented in graphs, figures, or tables. It refers to the knowledge and skills needed to perform document tasks such as to search, comprehend, and use non-continuous texts in various formats. Document examples include job applications, payroll forms, transportation schedules, maps, tables, and drug or food labels. Quantitative literacy is a measure of the skill in using and performing arithmetic operations on numbers presented in text or in documents. It refers to the knowledge and skills required to perform quantitative tasks such as to identify and perform computations, either alone or sequentially, using numbers embedded in printed materials. Examples include balancing a checkbook, computing a tip, completing an order form, or determining the amount of interest on a loan form an advertisement. Source: *A First Look at the Literacy of America's Adults in the 21st Century*, U.S. Department of Education, Institute of Education Sciences, National Center for Educational Statistics, NCES 2006-470, December 2005.

Table 1:
Mean Prose, Quantitative, and Document Literacy Scores by Major Occupation, U.S. 2003
(Ranked in Descending Order by Mean Score on the Prose Literacy Scale)

Major Occupation	Prose	Quantitative	Document
All occupations: Mean score	275	283	271
Standard deviation	59	61	57
Life, physical, & soc. science technicians	336	348	328
Life & physical scientists	333	343	314
Architects, engineers, & surveyors	331	351	312
Computer & math. occupations	329	338	311
Legal occupations	326	327	331
Social scientists & related workers	321	333	316
Teachers	317	322	309
Health diagnosing & treating practitioners	317	320	303
Media & comm.	317	323	297
Community & social services occupations	315	311	301
Drafters, engineering & mapping techs	314	335	315
Management occupations	306	319	295
Business & financial operations occupations.	305	321	303
Librarian, curator, archivist, and miscellaneous education occupations	301	299	287
Artists, entertainers, performers, sports, & related occupations	293	297	289
Protective service occupations.	291	290	278
Entertainment attendants & related workers	288	272	271
Office & administrative support occupations	287	293	283
Sales & related occupations	280	293	281
Installation, maintenance, & repair occupations	279	294	280
Healthcare techs. & support occupations	277	276	270
Personal care & service occupations	267	266	260
Food prep. & serving related occupations	263	264	264
Production occupations	256	269	254
Construction & extraction occupations	255	265	250
Trans. & material moving occupations	252	263	250
Food processing workers	246	253	246
Building/grounds cleaning & maintenance occupations	230	241	233
Farming, fishing, & forestry occupations	218	250	226

Source: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2003 National Assessment of Adult Literacy, Public Use Data Files, tabulations by authors.

At the low end of the distribution of occupations by the prose literacy proficiencies of workers, are service occupations like food preparation and food processing, healthcare

technicians and support, personal service, and cleaning and maintenance occupations, and blue-collar occupations such as farming and fishing occupations, production, and construction and extraction occupations, and transportation and material moving occupations. These occupations typically do not require workers to perform sophisticated job duties or possess high levels skills, literacy proficiencies, or educational attainment. The literacy scores at the very bottom among the two low scoring occupational groups range from a mean prose literacy score of 218 among agricultural workers, fishermen, and forestry workers, and 230 among building maintenance and cleaning occupations, representing a difference of three-quarters to one full standard deviation between these scores and the mean prose score for all workers, 275 points.

The quantitative and document proficiencies of workers also are very high in the same occupations that have the highest scores on the prose scale. For example, on the quantitative scale, architects and engineers have the highest mean score of 351 and the highest scoring workers on the document literacy scale are employed in legal occupations with a mean score of 331 points. Both these occupations fall within the list of the top five occupations that employ workers with the highest prose literacy scores. Similarities in the literacy proficiencies on the prose scale and the quantitative and document scales are also evident at middle and the lower end of the distribution of occupations by the mean prose literacy scores. The lowest mean score on the quantitative scale is found among cleaning and maintenance workers, 241 points, and the lowest mean score on the document scale is registered for workers in the farming, fishing, and forestry occupations. These two occupations also have the two lowest scores on the prose literacy scale. The range between the highest and lowest scoring occupations on the quantitative scale is 110 points or 1.8 standard deviations on the quantitative scale (61 points). On the document scale, the range between the highest and the lowest mean scores is 105 points or 1.84 standard deviations on the document scale (57 points).

Literacy Proficiencies by Industry

The literacy proficiencies also varied widely industry sector, albeit not as widely as the variations found in the literacy proficiencies of workers across occupational groups. This is not surprising since the occupations actually represent the job duties that workers perform

at their job which is more closely related to their skills and literacy proficiencies. Industries on the other hand, are characterized by less homogeneous literacy levels since they represent a company's primary business activity and are composed of workers employed in several different occupations that require differing levels of skills and literacy proficiencies. The occupational staffing patterns vary across different industries, and some industries contain higher concentrations of lower literacy service occupations, while others may be more concentrated with blue-collar occupations, and still others might have high concentrations of high-skill occupations that employ workers with higher literacy proficiencies. These occupations are staffed with large proportions of college graduates and are frequently labeled 'college labor market occupations.'

For example, across the nation in 2006, nearly 7 out of 10 workers in the finance, insurance and real estate industry, and 6 out of 10 workers in the professional services industry were employed in college labor market occupations. In contrast, only 11 percent of the nation's retail trade industry workers were employed in college labor market occupations. In the manufacturing industry, 31 percent of the workforce was working in college labor market jobs.² Within the manufacturing sector, some industries had higher concentrations of workers employed in college labor market occupations. These are manufacturing industries that employ more sophisticated production processes. The concentration of college labor market occupations is higher in the durable goods manufacturing industries than in the nondurable goods manufacturing industries.³

Using the 2003 National Assessment of Adult Literacy Survey data, we have produced estimates of the mean literacy scores of workers across 20 industry sectors. Findings are presented in Table 2. According to these findings, the highest prose, quantitative, and document literacy scores are found among workers in the education services industry (excluding elementary and secondary schools). Workers employed in this

² Authors' analysis of the 2006 American Community Survey (ACS) Public Use Microdata Samples (PUMS) data file.

³ Nondurable manufacturing industries include manufacturers of non-durable goods like food manufacturing, textile & apparel manufacturing, paper & printing manufacturing, and the like. These firms are less likely to use sophisticated production technologies and therefore less likely to higher college graduates than firms that manufacture durable goods such as electrical equipment, machinery and computing equipment, transportation equipment, and the like. However, even in the durable manufacturing industries, the concentrated in college labor market occupation is much smaller than in the professional services and the finance and insurance industries.

industry, which includes postsecondary educational institutions, professional schools, technical and trade schools, other schools of instruction, and educational support services, have an average score of 316 points on the prose literacy scale, 320 points on the quantitative literacy, and 311 points on the document literacy scale. A comparison of these average scores with the mean scores of all workers yields a difference of 41 points or 0.7 standard deviations on the prose scale, 37 points or 0.6 standard deviations on the quantitative scale, and 40 points or 0.7 standard deviations on the document scale.

Table 2:
Mean Prose, Quantitative, and Document Literacy Scores by Major Industry Sector, U.S. 2003 (Ranked in Descending Order by Mean Score on the Prose Literacy Scale)

Major Industry Sector	Prose	Quantitative	Document
All industries: Mean score	275	283	271
Standard deviation	59	61	57
Colleges, universities, professional schools & other educational services, ex. elementary & secondary schools	316	320	311
Information & communications	307	315	295
Public administration	305	308	295
Elementary & secondary schools	304	309	297
Finance, insurance & real estate	296	311	292
Professional, scientific, management, administrative, & waste management services	294	303	292
Utilities	294	311	281
Health services	287	288	277
Social assistance services	284	275	270
Manufacturing, durable goods	281	292	276
Personal services: arts, entertainment, recreation, accommodation services	280	282	275
Retail trade	277	288	276
Wholesale trade	275	289	274
Mining	272	285	263
Transportation & warehousing	272	283	267
Business services	270	273	263
Restaurants & other food services	267	268	268
Construction	263	276	259
Manufacturing, non-durable goods	258	274	257
Agriculture, forestry, fishing & hunting	238	273	250

Source: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2003 National Assessment of Adult Literacy, Public Use Data Files, tabulations by authors.

Among the other industries with a highly literate workforce are the industries of information and communication (examples, publishing, telecommunications, motion pictures, broadcasting, etc), public administration, elementary and secondary schools, finance and insurance industries, professional, technical, and management services, and the utilities industry. The prose literacy score of workers in these industries ranges between 294 and 316, or 21- to 41-points higher than the mean score of 275 points. On the quantitative scale, these seven industry sectors at the top have mean scores between 303 and 320 points or 20- to 37-points higher than the overall mean score of 283 points. The document literacy scores of workers in these seven industries range between a low of 281 in the utilities industry to a high of 311 points in the education services industry. In comparison with the mean document literacy score of 271 points among all workers, the mean scores of workers in the top 7 industries are 10- to 40-points higher than the overall mean score.

At the lower end of the distribution are workers in the agricultural, forestry, fishing, and hunting industry. On each of the three literacy scores, workers in this industry sector have the lowest mean scores. Relatively low mean literacy scores are also found among workers in the non-durable manufacturing industry, construction, restaurant and food services industry, business services, and transportation & warehousing industries. The gap between the mean score of workers in the industries with the highest and lowest mean scores is 78 points or 1.3 standard deviations on the prose scale, 47 points or 0.8 standard deviations on the quantitative scale, and 61 points or 1.1 standard deviations. Although these gaps are quite large, they are smaller than the literacy gaps between workers across the 29 occupational groups.

Employment by Occupation

The actual level of literacy proficiencies of workers in any industry or occupation are a reasonably accurate representation of the literacy requirements in that industry or occupation. The discussion in the previous section on the literacy levels of workers within occupational groups and industry sectors also provides insights into the literacy requirements of the different industries and occupations. Although the literacy scores that we have presented in that section are based upon the 2003 NAAL for the nation, they are representative of the literacy requirements of these sets of industries and occupations located

in any area within the nation—including Pennsylvania or metropolitan Philadelphia or even Philadelphia city.

In the context of the literacy requirements of industry and occupations presented above, we now present the structure of employment in Philadelphia city, suburban Philadelphia and the state of Pennsylvania. What is the industry and occupational composition of jobs in Philadelphia city? The answer to this question sheds light on the literacy levels that the residents of the city will need to possess in order to gain access to jobs in located in Philadelphia.

Utilizing the 2005 American Community Survey (ACS) public use data, we have identified all the jobs located within the boundaries of Philadelphia city based. This information is derived from ACS respondents' answers to the question regarding their "place of work." Respondents to the American Community Survey who were employed during the reference week of the survey were asked to provide the street address of the location of their job (individuals with multiple jobs were asked to provide the address of their primary job). Using the street address of the location of the job of individuals and their residential address, the ACS data files provide geographic information regarding the respondents' residence as well as their place of work. For example, if Jackie works in Philadelphia city but lives in Bucks County, her record on the ACS data file has Philadelphia County as her place of work and Bucks County as her residence. Conversely if Joe works in Delaware County and lives in Philadelphia city, the ACS assigns Delaware County as Joe's place of work and Philadelphia County as his residence. In our analysis of the industry and occupational composition of jobs in Philadelphia city, we have used the characteristics of the jobs of those individuals who "work" in the city, regardless of where they reside. In the example above, the characteristics of Jackie's job (industry & occupation, etc.) would be included in our description of jobs in Philadelphia city (even though Jackie lives outside the city). The characteristics of Joe's job would not be included in our description of the jobs in Philadelphia city because he does not work in the city even though he resides in the city.

In 2005, a total of 554,000 individuals were employed in jobs located within the boundaries of Philadelphia city. The suburban communities surrounding the city served as the place of work to 1.063 million workers, and a total of 5.446 million workers reported Pennsylvania as the state where their job was located. The major occupational groups that

comprise all of the jobs located in Philadelphia city, the surrounding suburban communities and the entire state of Pennsylvania are presented in Table 3. The occupations are ranked by the mean score on the NAAL prose literacy scale of workers in these occupations (Column E). Also presented in this table is the share of employment in occupations with literacy score of 300 or higher at the upper end, occupations with literacy scores at 267 or less at the lower end, and those in the middle with mean literacy scores above 267 and below 300 points.⁴

The distribution of these occupations in Philadelphia city is relatively more concentrated in higher literacy occupations compared to the surrounding suburban communities and the state. Nearly 39 percent of the total employment within the city's boundaries was concentrated in occupations with higher literacy scores reflecting the higher literacy requirements of the jobs in these occupations. The share of workers employed in these higher literacy occupation jobs was lower in the suburban communities and the entire state, 35 and 31 percent respectively. The proportion of the city's employment in the higher literacy occupations was 3.5 percentage points or 10 percent higher than the share of these jobs among workers employed in the suburbs, and nearly 7.5 percentage points or 24 percent higher than the 31 percent share of these occupations among workers across the state. The shares of the city's total employment in 9 out of the 14 higher literacy occupations were higher than the shares of these occupations among jobs located in suburban Philadelphia.

The share of Philadelphia's jobs in lower literacy occupations was 25.6 percent or about one percentage point smaller than the share of employment in these occupations among workers employed in the suburban communities (26.4 percent), and fully six percentage points lower than the share of lower literacy occupation jobs in the entire state

⁴ The NCES has classified the literacy proficiency scores into 4 levels (below basic, basic, intermediate, and advanced) using a set of cut scores for each literacy area. In the prose literacy area the four levels were defined by the following score ranges: below basic level=0-209, basic level=210-264, intermediate level=265-339, and advanced level=340 or higher. (For more details about the meaning and interpretation of these literacy levels, see: Paul E. Harrington, Neeta P. Fogg, and Alison H. Dickson, *The Literacy Proficiencies of the Working-Age Residents of Philadelphia City*, report prepared for The Philadelphia Workforce Investment Board, September 2007). Our classification of occupations into higher, mid-level and lower literacy categories is loosely guided by the score thresholds defining these four literacy levels. We have defined higher literacy occupations as those with mean prose literacy scores above 300 points. The 300 point threshold represents the middle of the range of prose literacy scores that define the intermediate level (265-339) on the prose literacy scale, and represents the upper half of the intermediate level and the advanced level of prose literacy proficiencies. Our definition of lower literacy occupations approximately includes occupations with mean prose literacy scores that fall within the thresholds defining the below basic level and the basic level of prose literacy proficiencies.

Table 3:
Percentage Distribution of Jobs by Major Occupation, 2005 (Ranked in Descending Order
by Mean Score on the 2003 NAAL Prose Literacy Scale)

Major Occupation	(A) Philadelphia City	(B) Suburbs	(C) PA	(D) Ratio (A)/(B)	(E) Mean Prose Score,U.S.
Total number of jobs	0.554 m.	1.063 m.	5.446 m.		
Total (mean prose score 301 or higher)	38.8%	35.3%	31.4%	1.100	
Life, physical, & social science techs.	0.4%	0.2%	0.3%	1.897	336
Life and physical scientists	0.7%	0.9%	0.5%	0.788	333
Architects, engineers, and surveyors	0.9%	1.6%	1.3%	0.583	331
Computer & mathematical occupations	2.5%	3.1%	2.2%	0.806	329
Legal occupations	2.5%	1.0%	1.1%	2.423	326
Social scientists & related workers	0.5%	0.4%	0.2%	1.384	321
Teachers	5.7%	4.8%	4.7%	1.187	317
Health diagnosing & treating	6.3%	4.1%	4.3%	1.541	317
Media and communication	1.1%	0.8%	0.7%	1.351	317
Community & soc. services occs.	2.9%	1.6%	2.0%	1.776	315
Drafters, engineering, & mapping tech.	0.4%	0.5%	0.5%	0.909	314
Management occupations	8.5%	10.4%	8.7%	0.824	306
Business & financial operations occs.	5.0%	4.9%	4.1%	1.025	305
Librarian, curator, archivist, & ed.	1.3%	1.0%	0.9%	1.247	301
Total (mean prose score 277-293)	35.6%	38.3%	37.1%	0.929	
Art. Design, entertainers, performers	1.2%	1.0%	0.9%	1.284	293
Protective service occupations	3.2%	1.4%	1.7%	2.302	291
Entertainment attendants & related	0.2%	0.1%	0.1%	2.726	288
Office & administrative support	15.8%	15.7%	15.4%	1.007	287
Sales & related occupations	8.1%	12.9%	10.9%	0.628	280
Installation, maintenance, & repair	2.5%	3.4%	3.6%	0.746	279
Healthcare tech & support	4.7%	4.1%	4.5%	1.162	277
Total (mean prose score 267 or lower)	25.6%	26.4%	31.6%	0.969	
Personal care & service occupations	3.2%	2.6%	2.6%	1.223	267
Food preparation & serving related	4.1%	5.6%	5.5%	0.728	263
Production occupations	4.6%	5.7%	7.2%	0.811	256
Construction & extraction	4.5%	4.6%	5.4%	0.973	255
Transportation & material moving	4.9%	4.3%	6.7%	1.127	252
Food processing workers	0.4%	0.3%	0.4%	1.218	246
Building/grounds cleaning & maintenance	3.7%	3.0%	3.2%	1.248	230
Farming, fishing, & forestry	0.2%	0.2%	0.5%	0.767	218

Sources: (i) U.S. Bureau of the Census, 2005 American Community Survey, Public Use Microdata Samples (PUMS) data file, tabulations by authors; (ii) U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2003 National Assessment of Adult Literacy, Public Use Data Files, tabulations by authors.

(31.6 percent). Blue collar occupations in production occupations and in construction and extraction occupations that pay relatively higher wages than the other lower literacy occupations, comprised a smaller proportion of jobs in the city compared to their share of suburban jobs. The remaining lower literacy occupations like cleaning occupations, food processing and personal services occupations employed a somewhat higher share of workers who worked in the city than among their counterparts who worked in the suburban communities.

A comparison of the shares of jobs in occupations with mid-level literacy proficiencies, represented by mean prose literacy scores above 267 points and below 300 points, reveals a much smaller concentration of these occupations in Philadelphia city than in the suburbs and the entire state. About 36 percent of all workers employed within city boundaries were working in the mid-level literacy occupations such as office & administrative support, sales occupations, healthcare technicians & support, and protective service occupations. The share workers employed in these occupations in the suburbs was 38.3 percent or nearly 3 percentage points higher than the 35.6 percent share in the city. Statewide, 37 percent of the workers were employed in these mid-literacy occupations. The above analysis of the occupational composition of jobs in the city and the suburban areas indicates that the city has a larger share of employment in higher literacy occupations and a lower share of employment in occupations with mid-level and lower level literacy requirements compared to the suburban areas and the state.

Employment by Industry

A comparison of the industry composition of jobs in the three areas mirrors the findings from a comparison of the occupational composition of jobs in these areas. Philadelphia city had sizable proportions of employment in industries characterized as intensive users of college graduates. The professional, technical, and managerial services industry employed 11 percent of all workers within the city's boundaries, about the same share as the suburbs (12 percent). The city also had a high concentration of jobs in the health services industry. This industry comprised nearly 16 percent of the city's jobs, a share that was 4 percentage points or nearly one-third higher than the share of these jobs among workers employed in the suburbs (12 percent).

Table 4:
Percentage Distribution of Jobs by Major Industry, 2005 (Ranked in Descending Order by
Mean Score on the 2003 NAAL Prose Literacy Scale)

Major Industry Sector	(A) Philadelphia City	(B) Suburbs	(C) PA	(D) Ratio (A)/(B)	(E) Mean Prose Score,U.S.
Total number of jobs	0.554 m.	1.063 m.	5.446 m.		
Total (top 7 industries, mean prose score: 294 or higher)	41.0%	35.0%	31.5%	1.172	
Colleges, universities, professional schools & other educational services, ex. elementary & secondary schools	5.5%	2.5%	3.2%	2.230	316
Information & communications	2.3%	2.5%	2.0%	0.923	307
Public administration	8.6%	2.5%	4.1%	3.499	305
Elementary & secondary schools	6.3%	5.8%	5.5%	1.085	304
Finance, insurance & real estate	6.0%	9.4%	6.8%	0.633	296
Professional, scientific, management, administrative, & waste management services	10.8%	11.8%	9.0%	0.920	294
Utilities	1.3%	0.4%	0.9%	3.061	294
Total (middle 6 industries, mean prose score 275-287)	37.3%	44.5%	44.5%	0.839	
Health services	15.9%	12.1%	12.9%	1.316	287
Social assistance services	3.1%	2.1%	2.2%	1.445	284
Manufacturing, durable goods	5.7%	11.9%	11.7%	0.476	281
Personal services: arts, entertainment, recreation, accommodation services	2.8%	2.3%	2.5%	1.219	280
Retail trade	7.6%	12.4%	11.7%	0.610	277
Wholesale trade	2.3%	3.7%	3.5%	0.641	275
Total (bottom 7 industries mean prose score below 275)	21.7%	20.6%	24.0%	1.055	NA
Mining	0.0%	0.1%	0.3%	0.000	272
Transportation & warehousing	5.1%	2.9%	4.2%	1.772	272
Business services	5.4%	4.7%	4.8%	1.149	270
Restaurants & other food services	4.7%	5.3%	5.4%	0.893	267
Construction	4.8%	6.1%	6.4%	0.782	263
Manufacturing, non-durable goods	1.5%	1.1%	1.9%	1.325	258
Agriculture, forestry, fishing & hunting	0.3%	0.4%	1.0%	0.677	238

Sources: (i) U.S. Bureau of the Census, 2005 American Community Survey, Public Use Microdata Samples (PUMS) data file, tabulations by authors; (ii) U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2003 National Assessment of Adult Literacy, Public Use Data Files, tabulations by authors.

The top 7 industries with the highest prose literacy scores accounted for 41 percent of the employment in Philadelphia city.⁵ This share was 6 percentage points or 17 percent higher than the 35 percent share of employment in these industry sectors among workers who were employed in the suburban communities. The largest concentration of employment in these high literacy industries in the city as well as the suburbs was in professional, technical, and managerial services. The literacy score of workers in the other large industry in Philadelphia city, the health services industry, is not high enough to place it among the top 7 industries.⁶ Rather, this industry is placed at the very top of the group of industry characterized by mid-level literacy proficiencies. Differences in the concentration of employment in the city versus the suburbs were largest in the public administration sector, postsecondary education including colleges and universities, and the elementary and secondary education sectors. Statewide the higher literacy industries accounted for only 31.5 percent of all jobs, representing a share that was nearly 10 percentage points lower than the share of these industries among workers employed in Philadelphia city.

The middle tier of the six industries comprised only 37 percent of the city's employment compared to 44 percent of the jobs located in the suburban communities and the same share across the state. The health services industry, which ranks at the very top of the middle tier of literacy proficiencies—rank number 8—accounted for 16 percent of the city's employment versus only 12 percent of the suburban employment, a difference of 4 percentage points or nearly 32 percent. Employment shares in the social assistance and personal services industries were also higher in the city than in the suburbs. The remaining

⁵ Workers in industries span across many different occupations and perform a variety of tasks. Although industries have different concentrations of high skill or high literacy occupations (also called college labor market occupations) and could be broadly characterized as higher skill or lower skill industries, the literacy proficiencies of workers employed in specific industries are not as homogeneous as the literacy proficiencies of workers employed in specific occupations. Therefore we have not used the same prose literacy score thresholds as we did for our analysis of occupations, to define higher, middle, and lower literacy level industries. Instead, we have divided the 20 industry sectors into three groups, the top 7 industries with the 7 highest mean prose literacy scores, 294 points or higher; the bottom 7 industries with the 7 lowest mean prose literacy scores, 272 points or lower; and middle containing the remaining six industries with mean prose literacy scores that are higher than 275 points (the overall mean score for all workers) but lower than 287 points.

⁶ The mean prose literacy score of workers in the health services industry place it at rank number eight and therefore in the middle literacy tier of industries. The health services industry employs workers in very high skill occupations such as health care diagnosis and treating occupations like physicians and registered nurses, as well as in low skill and low literacy health care support occupations such as home health aides, nursing aides, attendants, etc. Therefore, the mean literacy scores of all workers in this industry are not as high as those of workers who are only employed in the healthcare diagnosis and treating occupations.

three industries including durable manufacturing, retail trade, and wholesale trade comprised larger shares of suburban employment than city employment.

At the lower end, over one-fifth of all the jobs in Philadelphia city (22 percent) were concentrated in the 7 industries with the lowest mean prose literacy scores. These industries include nondurable manufacturing, construction, food services, business services and transportation industries.⁷ The share of lower literacy industries in the suburban areas was 21 percent or just 1 percentage point smaller than their share in the city's employment. Statewide, 24 percent of all jobs were found in these lower literacy industries. Jobs in Philadelphia city were more likely than jobs in the suburban communities, to be concentrated in industries that required higher levels of literacy proficiencies. These findings match the findings from our analysis of the occupational composition of jobs in the city compared to those in the suburbs. Comparisons of the occupation and industry composition of jobs in Philadelphia city with the jobs in the surrounding suburban communities imply that the literacy proficiencies required to access employment in the city might be somewhat higher than the literacy proficiencies required to work in jobs located in the suburban areas.

Comparisons of the Literacy Requirements of Jobs and the Literacy Proficiencies of Residents

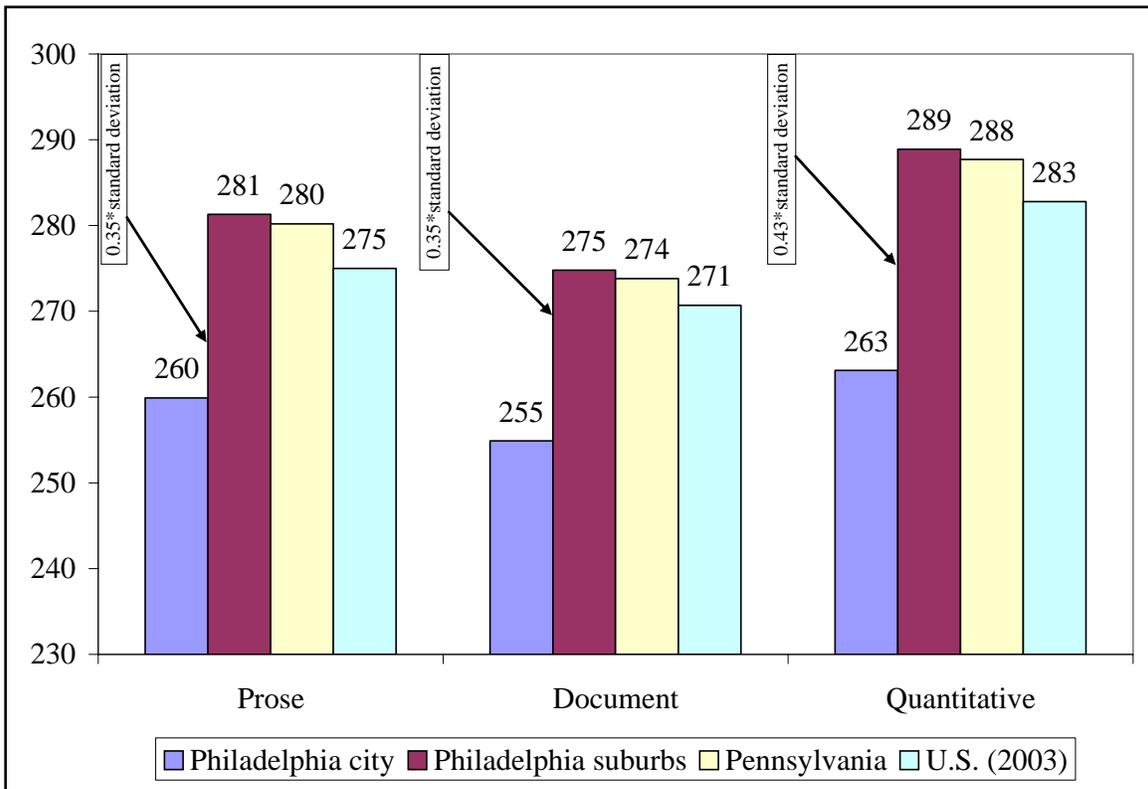
The jobs in Philadelphia city are somewhat more concentrated in higher skill occupations and industries than the jobs that are located in the surrounding suburban communities. What does this imply about the level of literacy proficiencies needed to gain access to the jobs in Philadelphia city? What is level of literacy proficiencies required to gain access to the jobs in Philadelphia city? How do these required literacy levels compare with the literacy proficiencies of the working-age residents of Philadelphia city? In this section of the report, we present a comparison of the two estimates of literacy proficiencies. Estimates of the literacy proficiencies of residents are derived from our previous report. In that report, we had provided age-gender-race-based simulated estimates of the literacy proficiencies of the working-age residents of Philadelphia city with a comparison of how the literacy levels of

⁷ Agriculture, forestry, fishing, hunting, and mining industries also belong among the bottom 7 industries but they account for very small shares of the employment in the city and suburban areas.

the city’s residents stacked up against those of their counterparts who lived in the surrounding suburban communities, the state of Pennsylvania, and the nation.⁸

The findings on the simulated literacy scores of the working-age residents of the four areas from that report, presented in Chart 1, portray stark differences between the literacy proficiencies of the residents of Philadelphia city and those of the residents of suburban Philadelphia, Pennsylvania and even the nation. Philadelphia city residents had considerably lower literacy levels. The differences were particularly large between the city and suburban residents. The simulated literacy score of the city’s working-age residents was 260 on the

Chart 1: Prose, Document, and Quantitative Literacy Scores of Working-Age Residents of Philadelphia City, Philadelphia Suburbs, and Pennsylvania (Simulated 2005) U.S. (Actual NAAL 2003)



Source: Paul E. Harrington, Neeta P. Fogg, and Alison H. Dickson., The Literacy Proficiencies of the Working-Age Residents of Philadelphia City, report prepared for The Philadelphia Workforce Investment Board, September 2007, p.31.

⁸ For a detailed description of the methodology used to simulate the literacy scores of residents, see: Paul E. Harrington, Neeta P. Fogg, and Alison H. Dickson, *The Literacy Proficiencies of the Working-Age Residents of Philadelphia City*, report prepared for The Philadelphia Workforce Investment Board, September 2007.

prose scale compared to 281 among residents of the surrounding suburban communities, representing a difference of 21 points or 0.35 standard deviations. The simulated document literacy of city residents was 255 compared to 275 among suburban residents. The difference of 20 points represents 0.35 standard deviations. The quantitative literacy proficiency gap between the residents of Philadelphia city and its suburbs were even larger. The simulated score for city residents was 263 points compared to 289 points among their suburban counterparts. The difference of 26 points represents 0.43 standard deviations.

In order to compare these estimates of literacy proficiencies of residents with the literacy proficiencies required to access jobs in the occupations and industries that are located in these areas, we have computed occupation-based and industry-based simulations of prose, quantitative, and document literacy proficiencies of workers in these areas. These represent the literacy requirements based upon the industry and occupation employment structure of these areas. The industry and occupation-based literacy simulations utilize the weighted average methodology that uses the percentage distribution of jobs in an area by industry and occupation as weights along with the mean literacy scores of the nation's workers in these industries and occupations. In the weighted average methodology, for example, the industry-based simulated literacy score for Philadelphia city is the sum of the product of the following two variables: the mean literacy scores of the nation's workers in each industry sector and the share of all workers employed in Philadelphia city that worked in each industry sector (used as weights).

For example, if we were to simulate industry-based prose literacy scores for City X that employed workers in the following 6 industry sectors—durable manufacturing, nondurable manufacturing, health services, education, and personal services, and construction—we would require information on the national prose literacy scores of workers employed in these 6 industry sectors and the share of all workers employed within the boundaries of City X that were working in each of the 6 industry sectors. Based upon this information, an industry-simulated prose literacy score for city X would be computed as illustrated in Table 5. First, the national mean prose score of one industry sector—Construction (263) is multiplied by the weight associated with that industry sector—the share of all workers in City X employed in that industry sector (0.07) to produce one component of the simulated prose literacy score ($263 \times 0.07 = 18.41$, see Row 1, Table 5. The

Table 5:
An Illustration of the Industry-Based Simulation of the Prose Literacy Score

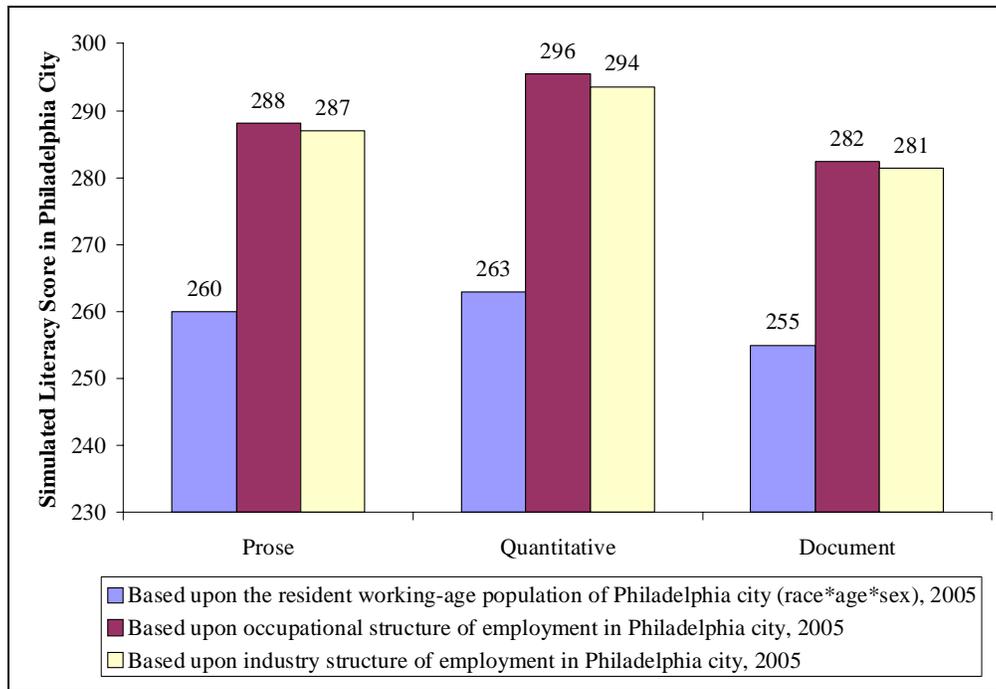
Row		(A) Mean Prose Scale Score, U.S.	(B) Gender Distribution of Philadelphia's 16+ Population	(C) Weighted Prose Score (Column A* Column B)
1	Construction	263	0.07	18.41
2	Durable Mfg.	281	0.08	22.48
3	Nondur. Mfg.	258	0.14	36.12
4	Health services	287	0.26	74.62
5	Education	304	0.22	66.88
6	Personal serv.	280	0.23	64.40
Simulated prose scale score for City X (Row 1+ Row 2+Row 3+ Row 4 + Row 5+ Row 6--in Column C)				282.91

process is then repeated for the remaining 5 industry sectors to produce the remaining 5 components of the simulated prose literacy score. The sum of these five components (Column C, Table 5) is the industry-based prose literacy score. For City X in the illustration presented in Table 5, the industry-based prose literacy score is 282.91. The industry-based and occupation-based simulated literacy scores for Philadelphia city, suburban Philadelphia and Pennsylvania are based upon 20 industry sectors and 29 occupation groups.

Findings from the industry-based and occupation-based simulated literacy scores for Philadelphia city are presented along with the simulated literacy scores of the residents of the city in Chart 2. These findings clearly reveal that the literacy proficiencies of the residents in Philadelphia city are considerably lower than the average level of literacy proficiencies required to work in the jobs located within the city's boundaries. For example, the prose literacy score of the residents of Philadelphia is 266 points whereas the occupation- and industry-based prose literacy scores representing the literacy levels required to be employed in the city, range between 287 and 288 points. The difference between the two is 27 to 28 points representing nearly one-half standard deviation. The quantitative literacy score of the city's residents (263) is 31 to 33 points lower than the level of prose literacy required to work in the industries and occupations of the jobs within the city (294 to 296 points). The difference is equivalent to over one-half (0.51 to 0.54) of one standard deviation. Large gaps

equivalent to one-half standard deviation, are also estimated between the document proficiencies of the city’s residents and those required by the industry and occupational structure of the jobs located in the city.

Chart 2:
Simulated Prose, Document, and Quantitative Literacy Scores of Based Upon Age-Gender-Race Characteristics of Working Age Residents of Philadelphia City and the Industry and Occupational Composition of Jobs Located in Philadelphia City, 2005



Sources: (i) U.S. Bureau of the Census, 2005 American Community Survey, Public Use Microdata Samples (PUMS) data file, tabulations by authors; (ii) U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2003 National Assessment of Adult Literacy, Public Use Data Files, tabulations by authors.

While the literacy proficiencies of city residents was significantly lower than the literacy requirements of the jobs in the city, similar comparisons in suburban Philadelphia and the entire state of Pennsylvania reveal much smaller literacy gaps (Charts 3 and 4). The gaps between the literacy proficiencies of the residents and literacy proficiency requirements of the jobs located in both areas are considerably smaller than the gaps found in Philadelphia city. For example, the prose literacy score of the residents of suburban Philadelphia is only 3 to 5 points lower than the prose literacy requirements of the jobs located in the region. In

Chart 3: Simulated Prose, Document, and Quantitative Literacy Scores of Based Upon Age-Gender-Race Characteristics of Working Age Residents of **Philadelphia Suburbs** and the Industry and Occupational Composition of Jobs Located in Philadelphia Suburbs, 2005

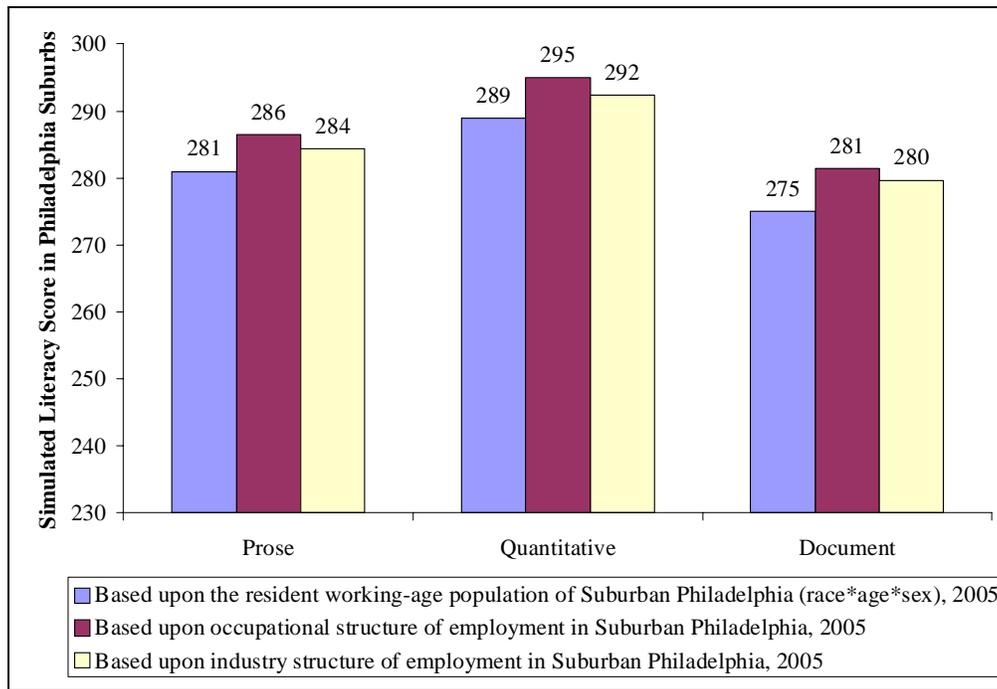
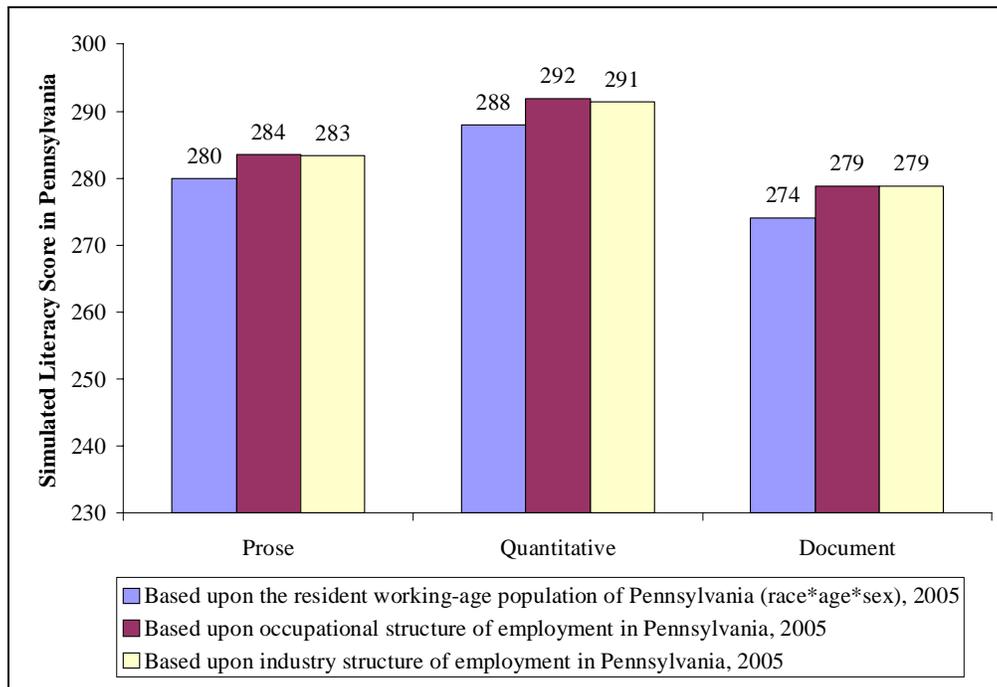


Chart 4: Simulated Prose, Document, and Quantitative Literacy Scores of Based Upon Age-Gender-Race Characteristics of Working Age Residents of **Pennsylvania** and the Industry and Occupational Composition of Jobs Located in Pennsylvania, 2005



the city, this gap is estimated at 27 to 28 points. This gap between the quantitative literacy of residents and jobs in the suburbs is also much lower than the city—3 to 6 points in the suburbs versus 31 to 33 points in the city. The document proficiencies of suburban residents are also just 3 to 6 points lower than the proficiencies required in the jobs that are located in the suburban communities, a gap that is much smaller than the 26 to 27 point gap between the document proficiencies of city residents and city jobs.

The residents of the entire state also had literacy levels that were quite similar to the literacy proficiencies needed to staff the jobs available in the state. In each literacy area, the literacy scores of the state's residents were within 3 to 5 points of the literacy scores required to work in the industries and occupations across the state.

These findings clearly reveal that while suburban Philadelphia is home to a workforce that possesses sufficient skills to be able to staff the jobs available in the area, the city of Philadelphia has a yawning gap between the literacy of its residents and the literacy requirements of its jobs. How do employers in Philadelphia city fill these literacy gaps? Where do the city's employers who need a highly literate workforce find workers? Do they look for workers outside the city? Analysis of the place of residence of workers who are employed in Philadelphia city can provide answers to these questions. Utilizing the place of work data from the 2005 American Community Survey, we have identified all workers who were employed in jobs located within the boundaries of Philadelphia city. We then used the ACS data to identify the place of residence of these workers and estimated the proportion of all workers in Philadelphia city who lived outside the city. These workers are labeled as out-of-city workers. We have produced these estimates for all workers and for workers in each of the 20 industries and the 29 occupations. These data provide valuable insights into geographic source of the workforce employed in Philadelphia city and the extent to which Philadelphia city employers across different occupations and industries rely on the workforce that resides outside the city to staff jobs located within the city.

Philadelphia City Employers' Reliance on Out-of-City Workers

Analysis of the ACS data reveals that the large gaps between the literacy proficiencies of residents and the literacy proficiencies required to access jobs located in Philadelphia city

do indeed force city employers to look for workers beyond city boundaries. In 2005, there were a total of 554,000 workers employed in jobs that were located in Philadelphia city. A total of 151,000 or 27 percent of these workers lived outside the city. Nearly 3 out of 10 workers in the city's workforce consisted of commuters from outside the city. The reliance of employers on out-of-city residents to staff jobs within the city was closely associated with literacy requirements of the job. Occupations characterized by high literacy levels had higher shares of out-of-city workers. Among the higher literacy occupations (with prose literacy scores of 300 or higher), 40 percent of the city's workforce consisted of commuters from outside the city. The shares of out-of-city workers were particularly high among engineering technicians and drafters, and engineers and architects. A majority of workers employed in these occupations in the city (70 and 58 percent, respectively) lived outside the city. One half of all scientists and workers in legal occupations in the city were commuters who lived outside the city. Health diagnosing and treating occupations, management occupations, and computer and mathematical were also very reliant on out-of-city workers. Between 42 and 45 percent of workers in these occupations lived outside the boundaries of Philadelphia city.

The reliance among Philadelphia city employers on out-of-city workers is only half as high among lower literacy occupations (mean prose literacy scores 267 points or lower). Only 19 percent of these workers were out-of-city residents. Within this group, the construction and extraction occupations have a much higher share of out-of-city workers. Excluding this occupation reduces the out-of-city share in the lower literacy occupations to only 14 percent. Almost all workers in the cleaning and maintenance occupations were city residents, with only 5 percent out-of-city residents. The share of out-of-city residents was also smaller in personal service and food service occupations. These three occupations with the highest shares of in-city workers are also low-wage occupations, which means that even within the lower literacy occupations, city residents had greater access to the lower wage occupations than to higher wage blue collar construction and extraction occupations.

The middle tier occupations that are characterized by mid-level literacy proficiencies employed one in five workers who were residing outside city boundaries. Within this subgroup of occupations, installation, maintenance, and repair occupations and sales occupations had a somewhat higher reliance on out-of-state workers, 35 and 25 percent, respectively. Employers have adjusted to the mismatch between the literacy levels required in

Table 6:
Number and Percent of Workers who were Employed in Philadelphia City and Lived
Outside the City Boundaries, by Major Occupation, 2005 (Ranked in Descending Order by
Mean Score on the 2003 NAAL Prose Literacy Scale)

Major Occupation	(A) Total Employed in Philadelphia City	(B) Number Living Outside the City	(C) Percent Living Outside the City (B)/(A)	(D) Mean Prose Score, US
Total number of workers employed in Philadelphia city	554,036	151,004	27%	
Total (mean prose score 301 or higher)	215,123	85,168	40%	
Life, physical, & social science techs.	2,440	993	41%	336
Life and physical scientists	4,025	1,978	49%	333
Architects, engineers, and surveyors	5,231	3,025	58%	331
Computer & mathematical occupations	13,701	5,794	42%	329
Legal occupations	13,942	6,820	49%	326
Social scientists & related workers	2,894	1,496	52%	321
Teachers	31,495	9,047	29%	317
Health diagnosing & treating	34,754	15,745	45%	317
Media and communication	6,299	2,230	35%	317
Community & soc. services occs.	15,910	3,817	24%	315
Drafters, engineering, & mapping tech.	2,280	1,595	70%	314
Management occupations	47,325	20,729	44%	306
Business & financial operations occs.	27,654	11,292	41%	305
Librarian, curator, archivist, & ed.	7,173	607	8%	301
Total (mean prose score 277-293)	197,319	39,543	20%	
Art. Design, entertainers, performers	6,805	1,365	20%	293
Protective service occupations	17,534	1,853	11%	291
Entertainment attendants & related	853	0	0%	288
Office & administrative support	87,444	15,459	18%	287
Sales & related occupations	44,687	11,804	26%	280
Installation, maintenance, & repair	13,900	4,903	35%	279
Healthcare tech & support	26,096	4,159	16%	277
Total (mean prose score 267 or lower)	141,594	26,293	19%	
Personal care & service occupations	17,743	2,107	12%	267
Food preparation & serving related	22,439	2,922	13%	263
Production occupations	25,581	4,962	19%	256
Construction & extraction	24,779	9,815	40%	255
Transportation & material moving	27,115	5,041	19%	252
Food processing workers	2,278	414	18%	246
Building/grounds cleaning & maintenance	20,712	1,032	5%	230
Farming, fishing, & forestry	947	0	0%	218

Sources: (i) U.S. Bureau of the Census, 2005 American Community Survey, Public Use Microdata Samples (PUMS) data file, tabulations by authors; (ii) U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2003 National Assessment of Adult Literacy, Public Use Data Files, tabulations by authors.

in city jobs and the literacy proficiencies of city residents by hiring a higher share of out-of-city workers, particularly in higher literacy jobs.

Analysis of the shares of out-of-city workers across the major industry sector mirror the findings of the out-of-city employment across occupations. Industry sectors that are characterized by higher literacy levels have higher shares of out-of-city employment. Three out of ten workers in Philadelphia city employed in the top seven industries with higher literacy requirements (prose literacy score of 294 points or higher) were residents of the communities outside the city (Table 7). With the exception of government workers (public administration) and workers in elementary and secondary schools (most of whom are teachers), all of the high literacy industry sectors had between 34 and 39 percent out-of-city workers. One-quarter of elementary and secondary school workers and only 17 percent of public administration workers were out-of-city residents.

The share of out-of-city workers among the bottom 7 industries (mean prose literacy scores of 272 points or lower) was 27 percent, or just 3 percentage points lower than the share of out-of-state workers in the top seven industries. The highest share of out-of-city workers in this group of industries was in the construction sector. Over 40 percent of construction workers who were employed in Philadelphia city lived outside the city. Many of the city's construction jobs are staffed by out-of-city workers. The out-of-city worker share across occupations reflected this trend. Among occupations in the lower literacy groups all had fewer than 19 percent out-of-city workers except construction and extraction occupations where 4 out of 10 workers employed in these occupations in the city lived outside the city. Most of the construction and extraction workers are employed in the construction industry. The share of out-of-city workers in the bottom 7 industries (with the lowest literacy proficiency scores) falls from 27 percent down to 23 percent if workers employed in the construction industry are excluded. The wages are relatively higher in the construction industry than other industries in the lower literacy group of industries. The above average reliance on out-of-city workers in the construction industry means that Philadelphians have limited access to construction industry jobs even though the literacy levels of workers in this industry are well within the range of literacy proficiencies of the resident population of Philadelphia.

Table 7:
Number and Percent of Workers who were Employed in Philadelphia City and Lived
Outside the City Boundaries, by Major Industry, 2005 (Ranked in Descending Order by
Mean Score on the 2003 NAAL Prose Literacy Scale)

Major Industry Sector	(A) Total Employed in Philadelphia City	(B) Number Living Outside the City	(C) Percent Living Outside the City (B)/(A)	(D) Mean Prose Score, US
Total number of workers employed in Philadelphia city	554,036	151,004	27%	
Total (top 7 industries, mean prose score: 294 or higher)	226,957	68,334	30%	
Colleges, universities, professional schools & other educational services, ex. elementary & secondary schools	30,456	10,230	34%	316
Information & communications	12,990	5,015	39%	307
Public administration	47,875	8,214	17%	305
Elementary & secondary schools	35,112	9,119	26%	304
Finance, insurance & real estate	33,074	11,257	34%	296
Professional, scientific, management, administrative, & waste management services	60,027	22,261	37%	294
Utilities	7,423	2,238	30%	294
Total (middle 6 industries, mean prose score 275-287)	206,715	50,382	24%	
Health services	88,142	25,464	29%	287
Social assistance services	17,018	2,200	13%	284
Manufacturing, durable goods	31,425	8,952	28%	281
Personal services: arts, entertainment, recreation, accommodation services	15,317	2,197	14%	280
Retail trade	41,843	7,537	18%	277
Wholesale trade	12,970	4,032	31%	275
Total (bottom 7 industries mean prose score below 275)	120,187	32,288	27%	
Excluding Construction	93,787	21,500	23%	
Mining	0	0	NA	272
Transportation & warehousing	28,096	7,980	28%	272
Business services	29,637	6,905	23%	270
Restaurants & other food services	26,085	4,862	19%	267
Construction	26,400	10,788	41%	263
Manufacturing, non-durable goods	8,303	1,753	21%	258
Agriculture, forestry, fishing & hunting	1,666	0	0%	238

Sources: (i) U.S. Bureau of the Census, 2005 American Community Survey, Public Use Microdata Samples (PUMS) data file, tabulations by authors; (ii) U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2003 National Assessment of Adult Literacy, Public Use Data Files, tabulations by authors.

The middle tier of industries with mean prose literacy scores between 275 and 287 have about 50,400 out of 206,700 workers or nearly one-quarter of the workforce who reside outside Philadelphia city. There is a wide range of out-of-city workers among this group of industries. The share of out-of-city workers in the social assistance services, personal services, and retail trade industries was between 13 and 18 percent, whereas wholesale trade, durable goods manufacturing, and health services industries were more dependent on out-of-city workers. Nearly 30 percent of the city's workforce in each of the three industries comprised of out-of-city workers.

Summary of Key Findings

Our estimates of the literacy of Philadelphia residents found very low levels of literacy proficiencies among the city's working-age residents. In each of the three literacy areas—prose, document, and quantitative—the literacy of city residents was far behind their suburban, state, and national counterparts. Literacy deficits of the magnitude estimated in Philadelphia city have important implications for residents' access to employment, education, and a high standard of living. This report presents a comparison of the literacy proficiencies of the residents of Philadelphia with the literacy levels required to gain access to employment in the city. The literacy requirements for employment in the city are estimated in the context of the industry and occupational composition of the jobs that are located within the city's boundaries.

A review of the literacy proficiencies (representing the literacy requirements) of workers in various occupational groups and industry sectors finds that:

- There are large differences in the literacy proficiencies of workers employed in different occupations. The range between the highest and lowest prose, quantitative, and document literacy scores is equivalent to 1.8 to 2 standard deviations in each of the three literacy areas. The highest literacy proficiencies are found among scientific, engineering, professional, and managerial occupations. At the low end are service and blue collar occupations.

- The literacy proficiencies also varied widely industry sector, albeit not as widely as the variations found in the literacy proficiencies of workers across occupational groups. The gaps between the highest and lowest mean scores in each of the three literacy areas are equivalent to 0.8 to 1.3 standard deviations. The highest literacy scores are found among workers in the education services industry, information and communication, public administration, finance and insurance industries, professional, technical, and management services, and the utilities industry. At the lower end of the distribution are workers in the agricultural, forestry, fishing, and hunting industry, non-durable manufacturing, construction, restaurant and food services industry, business services, and transportation & warehousing industries.

The occupational and industry composition of jobs in Philadelphia city and a comparison of the city's job composition with that of the surrounding suburban communities and the state of Pennsylvania find that:

- The distribution of occupations in Philadelphia city is relatively more concentrated in higher literacy occupations compared to the surrounding suburban communities and the state. Nearly 39 percent of the total employment within the city's boundaries was concentrated in higher literacy occupations, compared to 35 percent in the suburbs and 31 percent in the state. The share of Philadelphia city's jobs in lower literacy occupations was 25.6 percent compared to 26.4 percent in the suburban communities and nearly 32 percent in the entire state.
- The top 7 industries with the highest literacy requirements accounted for 41 percent of the employment in Philadelphia city, compared to 35 percent in the suburban communities, and only 32 percent across the state. At the lower end, over one-fifth of all the jobs in Philadelphia city (22 percent) were concentrated in the 7 industries with the lowest literacy requirements, compared to 21 percent in the suburbs and 24 percent statewide.

The literacy requirements of occupations and industry sectors and share of employment in these occupations and industries underlie estimates of the simulated industry-based and occupation-based literacy proficiency levels needed to gain access to employment within Philadelphia city, suburbs, and the entire state. A comparison of the literacy requirement

represented by these industry-based and occupation-based simulated literacy scores, with the literacy scores of the working-age residents of these areas provide estimates of the gaps between the literacy proficiencies of the residents and the literacy proficiencies required to work in the jobs that are located within the boundaries of these three areas. These comparisons find that:

- The literacy proficiencies of the residents in Philadelphia city are considerably lower than the average level of literacy proficiencies required to work in the jobs located within the city's boundaries. The literacy deficit in each of the three literacy areas in Philadelphia city is equivalent to nearly one-half standard deviation. The literacy deficits were much smaller in suburban communities surrounding the city—3-5 points in the suburbs compared to 27-28 points in the city in the prose literacy area, 2-6 points in the suburbs versus 31-33 points in the city in the quantitative literacy area, and 3-6 points in the suburbs compared to 26-27 points in the city in the document literacy area. Statewide, the literacy scores of the state's residents were within 3 to 5 points of the literacy scores (in each of the three literacy areas) required to work in the industries and occupations across the state.

The large gaps between the literacy proficiencies of the city's working-age residents and the literacy levels needed to be employed in the city imply that the city's employers have found ways to adjust to the literacy deficits in the city. One of the adjustments made by employers is to draw parts of their workforce from the suburban communities. The shares of out-of-city workers in each industry and occupation and literacy-based groupings of industries and occupations highlight the above average reliance on suburban workers in industries and occupations that require high levels of literacy proficiencies.

- Nearly 3 out of 10 workers in the city's workforce were commuters from outside the city. Among the higher literacy occupations 40 percent of the city's workforce consisted of commuters from outside the city. The reliance among Philadelphia city employers on out-of-city workers is only half as high (19 percent) among lower literacy occupations.
- The shares of out-of-city workers across the major industry sector mirror the findings of the out-of-city employment across occupations. Industry sectors that are characterized by higher literacy levels have higher shares of out-of-city employment.

Out-of-city workers accounted for 30 percent of employment within the top seven higher literacy industries in Philadelphia city. With the exception of government workers and workers in elementary and secondary schools, all of the high literacy industry sectors had between 34 and 39 percent out-of-city workers. One-quarter of elementary and secondary school workers and only 17 percent of public administration workers were out-of-city residents.

- The share of out-of-city workers among the bottom 7 industries was 27 percent. Although this share was just 3 percentage points lower than the share of out-of-state workers in the top seven industries, we find that one industry among the lower literacy group of industries—construction—had a much higher share of out-of-city workers. Over 40 percent of construction workers who were employed in Philadelphia city lived outside the city. The overall share of out-of-city workers in the lower literacy industries falls from 27 percent down to 23 percent if workers employed in the construction industry are excluded.

Employers who are unable to find skilled workers in the city will either not locate their business in the city or they could locate the business within the boundaries of the city and hire skilled workers from the surrounding communities to fill positions that require higher levels of literacy. Our analysis of the industry and occupational composition of employment in Philadelphia city clearly reveals that the literacy proficiencies required to work in the city's jobs are much higher than the literacy proficiencies of the city's working-age residents. This mismatch has led to above average shares of out-of-city workers working in the city, particularly in higher skill occupations and industries. Employers in Philadelphia city rely heavily on out-of-city workers to staff positions that require higher literacy proficiencies.

The low levels of literacy proficiencies of city residents diminish their access to jobs and economic opportunities even though these opportunities are present within the very city in which they reside. Philadelphians' access to the best set of jobs is restricted and consequently their economic opportunities are diminished as employers are forced to higher skilled workers from outside the city by tapping into the more literate suburban workforce. The earnings and income from the jobs held by out-of-city residents will flow into the communities where they reside and not into Philadelphia city, bringing about economic

growth in surrounding areas but not in the city. Moreover, there are likely a whole set of employers who just choose to not locate their business in the city because of the literacy deficits of the city's resident workforce. In addition to the loss of income and earnings for Philadelphians, the city itself has to bear the cost of the low literacy proficiencies in the form of a slow pace of economic growth or a complete lack of economic growth. The lower employment, earnings, and incomes, and diminished economic opportunities due to the literacy deficits among Philadelphia city's residents are also likely to lead to a whole host of social problems related to poverty and income inadequacy, which in turn reduce economic opportunities even further, resulting in a downward spiral in the economic fortunes of the city and its residents.