

# AMERICA'S FORGOTTEN MIDDLE-SKILL JOBS

EDUCATION AND TRAINING REQUIREMENTS  
IN THE NEXT DECADE AND BEYOND



Harry J. Holzer  
Georgetown University and The Urban Institute

Robert I. Lerman  
American University and The Urban Institute

November 2007



# CONTENTS

---

3	Executive Summary
6	Introduction
8	Defining High-, Middle-, and Low-Skilled Jobs
9	Occupational Demand for Education and Training
15	BLS Occupational Projections
22	Projecting the Future Supply of Skills
25	Matching Projections of Supply and Demand
27	State- and Industry-Level Evidence for Middle-Skill Demand and Limited Supply
29	Conclusion
31	References

## FIGURES AND TABLES

9	FIGURE 1. Employment Shares by Occupational Skill Level, 1986 and 2006
15	FIGURE 2. Projected Job Openings by Skill Level and Occupational Category, 2004-2014
22	FIGURE 3. Actual Percent Change (1980-2000) and Projected Percent Change (2000-2020) of Workers 25+ by Educational Attainment
13	TABLE 1. Employment Trends by Industry, 1960-2006
13	TABLE 2. Occupational Patterns, 1986-2006
16	TABLE 3. BLS Demand Projections: By Education and Training Required on Jobs, 2004-14
20	TABLE 4. BLS Demand Projections for Broad Occupational Groups, 2004-14
21	TABLE 5. BLS Demand Projections for Detailed Middle-Skill Occupations, 2004-14
23	TABLE 6. Actual and Projected Supply of Workers, Ages 25+ by Educational Attainment

This paper has been written for The Workforce Alliance, Washington, DC, as part of its Skills2Compete Campaign.

The authors thank Andy Van Kleunen, Gwen Rubinstein, Rachel Unruh, and other members of the TWA staff for their comments and assistance.

The Skills2Compete Campaign gratefully acknowledges the support of **the Joyce Foundation, the Annie E. Casey Foundation, and the Ford Foundation.**





## EXECUTIVE SUMMARY

---

A strong public consensus now supports enhancing the skills of America's workers, especially through more and higher-quality education and training. But what kinds of skills, education, and training are most appropriate, in light of changes in the U.S. economy? Is the "information economy" resulting in rising demands only for workers with college and post-graduate education? Various economists have argued that future demands for workers will be strong in highly-educated professional jobs and low-paid service jobs, while much more modest at skill levels in between these sectors. Does this mean that education and training for jobs requiring less than four years of college are no longer worthwhile public investments?

Overall, we argue that **the demand for workers to fill jobs in the middle of the labor market—those that require more than high-school, but less than a four-year degree—will likely remain quite robust relative to its supply**, especially in key sectors of the economy. Accordingly, we see a need for increased U.S. investment in high-quality education and training in the middle of the skills range—not just for college graduates in science, technology, engineering, and math (STEM) fields.

In this paper, we review evidence on how the demand for workers with different levels of education and training will evolve over the next decade and beyond. We analyze data from the Bureau of Labor Statistics (BLS) on recent and projected future demand for jobs in the middle of the labor market. We also consider projected trends in the supply of workers at different levels of education.

### Current Demand for Middle Skills

Over the last two decades, employment has risen more in high-skill and low-skill occupational categories, thus reducing the proportion of workers in middle-skill jobs. These changes have been less dramatic than many think, however.

While it is true that middle-skill jobs have declined (from about 55 percent to about 48 percent) as a portion of total employment, **roughly half of all employment today is still in the middle-skill occupations**. What's more, this general finding is not very sensitive to exactly how we categorize occupations into skill groups.

We also note that a large number of middle-skill occupations continue to generate rapid increases in employment. For example, since 1986:

- ◆ Health technician jobs expanded rapidly, rising to over 1 million from about 400,000 positions.
- ◆ In construction occupations, many of which require substantial classroom and on-the-job training, the number of jobs jumped by about 4 million, nearly doubling the 1986 figure of about 5 million (and only partly due to the post-2000 housing "bubble").

In addition, although wage gains in middle-skill occupations have varied greatly, several have experienced rapid wage increases in recent years. For example, real pay for radiological technicians increased 23 percent between 1997 and 2005, speech/respiratory therapists saw real increases of 10 to 14 percent, and real pay for electricians rose by 18 percent. These increases compare very favorably with the overall 5 percent increase for the average American worker.

In addition, wage gains per year of schooling for those with associate's degrees are comparable to those with bachelor's degrees, relative to those without postsecondary education. Gains of this magnitude indicate strong labor market demand for middle skills.

## Projected Demand for Middle Skills

**BLS projects that nearly half (about 45 percent) of all job openings between 2004 and 2014 will be in middle-skill occupations.** This compares with one-third (33 percent) of job openings in the high-skill occupational categories and 22 percent in the service occupations.

For example, for middle-skill jobs, BLS projects that:

- ◆ Expected net growth in a range of health care jobs with sub-baccalaureate education and training requirements will vary from 20 to 40 percent, adding more than 1.5 million job openings.
- ◆ Employment in five skilled construction crafts is expected to grow by 10 to 15 percent and provide 4.6 million job openings, while those in installation/maintenance/repair and transportation will grow at similar rates and together generate more than 4 million additional openings.

These projections are all reinforced by a series of studies that examine skills gaps in specific states and regions and in particular industries.

## Projected Supply of Workers with Middle Skills

On the supply side of the labor market, projections from the Aspen Institute suggest that the share of adult workers with bachelor's degrees or more rose from 21.7 percent in 1980 to 30 percent in 2000 and is projected to rise to 33 percent in 2020. Although adult workers with at least some college rose from about 17 percent in 1980 of the labor force to about 28 percent in 2000, they will remain roughly at that share of workers in 2020. These projections are driven heavily by anticipated retirements of "baby boomers" and their replacement by immigrants in the labor force. **These projections suggest a serious slowdown in the growth of skills at both the top and middle of the labor market.**

## Conclusions

Our review leads us to conclude the following:

- ◆ **Substantial demand remains for individuals to fill skilled jobs in the middle of the labor market, with many of these jobs paying quite high wages.** This is particularly true for jobs that require an associate's degree or some particular vocational training and certification.
- ◆ **Reports that the middle of the job distribution has "hollowed out," creating an "hourglass economy," have been overstated.** Nearly half of the jobs in the labor market today remain in the middle-skill occupational categories (such as clerical, sales, construction, transportation, production and installation/repair jobs). Job growth and wage growth in a variety of middle-skill jobs in construction, health care, and other sectors have remained strong.

- ◆ **BLS projections indicate, at a minimum, that demand for middle-level skills and occupations will remain robust in the future**, with jobs requiring post-secondary education or at least moderate-term training growing substantially over the next decade. Demands for skilled labor in construction, health care, computer use, transportation and elsewhere are projected to grow at above-average rates. Replacement needs for retiring workers will also be strong, generating even more job openings in the middle than the top of the skills spectrum.
- ◆ **The retirements of “baby boomers” and their replacement by immigrants will likely shrink the future supply of educated workers relative to the demand for them, especially in the middle of the labor market.** Baby boomer retirements will likely occur most rapidly in the lower-to-middle ranges of skills, while immigrants are likely to fill the bottom and top jobs more easily than those in the middle.

All of these findings strongly suggest that demand for education in the U.S. labor market will remain strong for jobs requiring more than a high school diploma but less than a bachelor's degree. Greater public investments in education and skills training in all of these areas will likely generate important returns for the U.S. economy.

Without greater investments, future growth in the supply of educated workers will likely fall somewhat short of the growth in labor market demand. Employers will have greater difficulty and face greater costs meeting their skill needs, especially in key sectors and geographic areas where retirements are greatest and immigrants are least likely to meet their hiring needs. Even greater costs will be borne by less-educated workers.

While further aid for those enrolling in four-year college programs is clearly critical, **we must also provide other pathways to labor market success for those who cannot enroll in or complete such degrees.** Labor market opportunities will clearly be available to such individuals, and proven education and training paths exist for both the current and future workforce. It is time to invest more heavily in appropriate skill development for all of our nation's current and future workers, at all points in the labor market.



## INTRODUCTION

---

A strong public consensus now supports enhancing the skills of America’s workers, especially through more and higher-quality education and training. It is beyond dispute that high-level skills are more valued in the labor market than ever before, and that skills must rise the most among least-educated workers to reduce poverty and inequality in the United States.

But what kinds of skills, education, and training are most appropriate, in light of changes in the U.S. economy? Is the “information economy” resulting in rising demands only for workers with college and post-graduate education? Do the high and rising wage premiums for college-educated workers mean that education and training for jobs requiring less than four years of college are no longer worthwhile public investments?

### The Focus of Current Debates

Some policymakers and business leaders have focused on the importance of increasing the number of Americans with degrees in science, technology, engineering and math, or “STEM” workers. According to some analysts (e.g., Freeman, 2007; Kenney, 2007) and commissions (e.g., NCEE, 2007), the U.S. requires a much larger scientific workforce to remain a center of technological innovation, especially in the face of growing numbers of scientists and engineers in China and India and the potential “offshoring” of work by high-tech U.S. companies. Others (Gates, 2007) argue that current shortages of scientists and engineers in biotechnology, software development, and other sectors already hamper the ability of these industries to be fully productive and competitive.

Most labor market analysts see clear economic benefits for the U.S. in raising the number of college graduates, especially in the STEM areas. Certainly, improving access to higher education for young people in lower- to middle-income families is critical for their upward mobility prospects, given the huge pay gaps between college graduates and those with no more than a high school diploma, as well as the widening gaps in college attendance and completion between children of more- and less-affluent families (Turner, 2007).

### What We’re Leaving Out

But we hear much less discussion about the need to expand education and training in the *middle* of the labor market—specifically, for jobs requiring more than a high school diploma but less than a bachelor’s degree. One reason for this oversight is the perception of declining demand in the middle of the labor market. Various economists (e.g., Autor *et al.*, 2005; Levy and Murnane, 2004) argue that future demand for workers will be strong in highly-educated professional jobs and low-paid service jobs, while much more modest at skill levels between these sectors. Some observers have labeled this phenomenon the “hollowing of the middle,” generating a “dumbbell” labor market or an “hourglass economy.” On the supply side, observers see the pending retirement of “baby boomers” from the U.S. labor market, and their replacement primarily by immigrants, as generating a serious shortfall of college-educated workers. These projections of supply and demand reinforce the emphasis placed on expanding college enrollments (Aspen Institute, 2003).

In our view, researchers are **underestimating middle-skill job prospects in the labor market**, and policymakers are paying too little attention to strengthening skill development for these positions. “Baby boomer” retirements might lead to major gaps at the middle as well as the top of the labor market, especially if the most-highly educated “boomers” are those most likely to

postpone their retirement. Also, the fact that immigrants to the U.S. are concentrated both at the top and bottom of the education distribution (Borjas, 2007) suggests that “replacement demand” to offset retirements in the middle of the labor market will be the hardest to meet.

In this paper, we review evidence of how the demand for workers with different levels of education and training will evolve over the next decade and beyond. We focus on demand for jobs that require education or training above high school but below a four-year college degree. We consider data from the current distribution of jobs and wages, and how these have evolved in the recent past, as well as data on projected future occupational demand from the Bureau of Labor Statistics (BLS). We compare these demand-side trends with those for the supply of education and skills.

Overall, we argue that **the demand for middle-skill workers will likely remain quite robust relative to its supply**, especially in key sectors of the economy. Accordingly, we see a need for increased U.S. investment in high-quality education and training in the middle of the skills range—not only for college graduates and in STEM careers.



## DEFINING HIGH-, MIDDLE-, AND LOW-SKILLED JOBS

---

We define “middle-skill” jobs as those that generally require *some significant education and training beyond high school but less than a bachelor’s degree*.<sup>1</sup> These postsecondary education or training requirements can include associate’s degrees, vocational certificates, significant on-the-job training, previous work experience, or generally “some college” less than a bachelor’s degree.

In some of the analysis (especially when we consider BLS projections for occupational growth over the coming decade), we use BLS estimates of the demand for education and training in detailed occupational categories. But, when we analyze recent trends and future projections in broad occupational categories, we divide them into high-skill, middle-skill, and low-skill subcategories based on the average educational attainments and/or training of people in those jobs. Accordingly:

- ◆ High-skill occupations are those in the professional/technical and managerial categories.
- ◆ Low-skill occupations are those in the service and agricultural categories.
- ◆ Middle-skill occupations are the others, including clerical, sales, construction, installation/repair, production, and transportation/material moving.

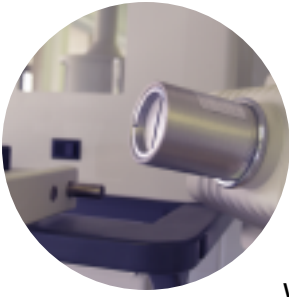
These skill categories reflect only average skill demands within broad occupational categories. Some detailed occupations within the technical and managerial categories really require less than a bachelor’s degree, some in the middle categories might require only high school, and some in the service category may require more than high school.<sup>2</sup> Therefore, whenever possible, we supplement our analysis of broad categories with those of detailed occupations.

---

1. Later in the analysis, we provide examples of some of these jobs. A more complete list of middle-skill jobs is available at [www.Skills2Compete.org](http://www.Skills2Compete.org).

2. For example, technical occupations within the professional category frequently require less than a bachelor’s degree, as do many managerial occupations. Within the sales category, retail sales jobs frequently do not require postsecondary education, while those for sales representatives and brokers as well as supervisors do. In the transportation and material moving occupations, operators of large trucks or buses require significant work experience while pilots require more advanced training and movers/haulers often require less. Among service jobs, cooks and barbers/cosmetologists frequently require postsecondary training or experience as well. For more detail, see Bureau of Labor Statistics (2006), pp. 46-89.





## OCCUPATIONAL DEMAND FOR EDUCATION AND TRAINING

What are the most convincing ways to measure the demand for skills in U.S. jobs over the next decade and beyond? BLS data allow us to take two different approaches to this question. Indeed, BLS itself has recently tried some new ways to address these projections. The first approach relies on occupational trends in the recent past, and the second is based on projections of future demand. Regardless of approach, however, we reach the same conclusion: **Skill demands in the labor market are poised to grow, for middle-skill as well as high-skill jobs.**

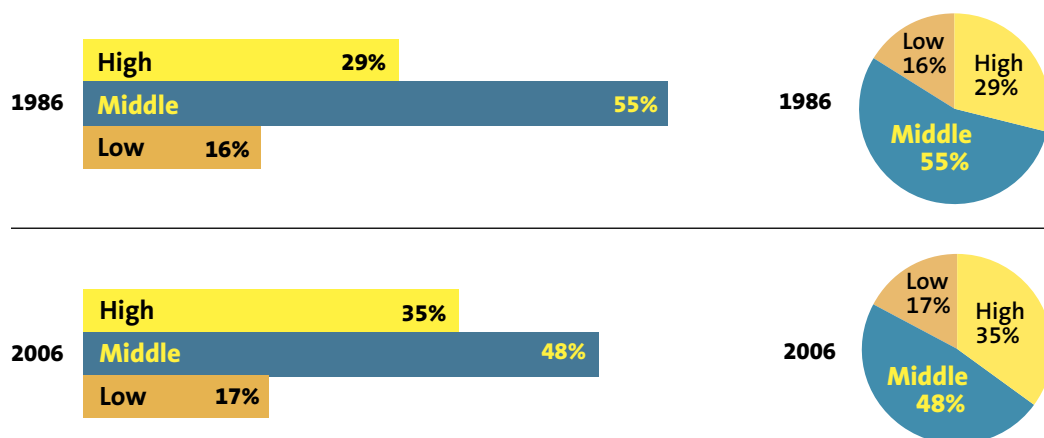
### Employment Trends by Education and Occupation

Data from the previous 20 years confirm the notion that employment has risen in both high-skill and low-skill occupational categories and that the proportion of employment in middle-skill jobs has declined. But the changes have been less dramatic than many think. (Methodology Discussion 1 provides more explanation for the methodologies used in this paper for measuring trends in demand for skills in the U.S. labor market. See page 10.)

**Middle-skill jobs still make up roughly half of all employment today, even though they decreased their share of total employment from about 55 percent to 48 percent between 1986 and 2006** (see Figure 1). What's more, this finding is not very sensitive to exactly which occupational categories we include in each broad skill group.<sup>3</sup>

In the other skill categories, between 1986 and 2006, high-skill jobs grew from about 29 percent of the workforce to about 35 percent. Low-skill (service) category jobs grew from just over 16 percent to just over 17 percent of total employment.

FIGURE 1. Employment Shares by Occupational Skill Level, 1986 and 2006



Source: Tabulations by authors from the Bureau of Labor Statistics web site.

Note: High-skill occupational categories are Management and Financial Operations and Professionals and Related Occupations; middle-skill categories are Sales and Related Occupations, Office Administrative Support, Construction, Installation and Repair, Production Occupations, and Transportation and Material Moving; and low-skill categories are Service Occupations and Farming, Fishing, and Forestry.

## METHODOLOGY DISCUSSION 1

### Measuring Trends in the Demand for Skills in the U.S. Labor Market

This paper takes two approaches to measuring the demand for skills in the U.S. labor market over the next decade and beyond, using data from BLS:

- ◆ First, we infer skill demands and their recent trends from data on current and recent wages and employment levels of workers, separately by education level and occupational category.
- ◆ Second, we consider projections of occupational demand over the next decade and compare it to projections of educational attainment.

Both approaches are useful, and both have limitations, although the trends they imply are broadly consistent with one another. The wage and employment data tell us what has happened in the recent past, although they give few indications of future labor market trends and reflect a mix of both supply and demand determinants.

In contrast, BLS does present demand projections for the next decade. They are highly uncertain, however, and likely understate growth in the demand for education in both the middle and upper educational categories. Various projections of the supply side also have their limitations.

We believe the data remain useful nonetheless for ascertaining which occupations and industries, and which skills that correspond to them, might be highly demanded or supplied over time. The supply and demand projections reflect different methodologies, each with their own biases. In some sense, they are “apples” and “oranges” and cannot be easily compared to one another.

But the demand projections for particular occupations and industries or different skill classes can be usefully compared to the projections for the overall labor market (with appropriate caution, given their uncertainty and biases), from which we might infer where demand growth will be relatively strong. The projections for supply of skills can be compared to past trends, to indicate whether the growth of particular skills might accelerate or slow. More reasonable inference might be drawn from these “demand-to-demand” or “supply-to-supply” comparisons than from those that compare demand and supply projections to each other.

Another conceptual caveat should also be kept in mind. On the demand side of the labor market, employers make decisions on whom to hire. On the supply side, workers decide in how much education and training to invest. Both sets of decisions are partly independent of one another but also partly interrelated.

In particular, employers’ skill needs are partly driven by technology and globalization opportunities, while supply outcomes are driven partly by demographics (involving retirement, immigration, and the like). But, labor markets mostly clear over time, with supply and demand brought into balance through wage adjustments and other adaptations in behavior by employers and workers.

“Shortages” of workers rarely persist for long periods of time, although they certainly can exist in the short term. For example, employers will adapt with different recruitment mechanisms and perhaps lower screening criteria if they have persistent difficulty in filling slots.

For this reason as well, it might be inappropriate to compare projections of labor demand and supply that will ultimately be brought into balance. But it is still useful to consider the directions in which the demand for and supply of skilled labor might move, according to the independent factors affecting each. This is, in fact, what we try to do in this paper.

What lies behind these broad trends? The changing patterns of jobs and wages depend largely on shifts in the composition of the demand for and supply of labor. What people buy and how firms produce goods and services ultimately determine the mix of labor demanded across industries and occupations.

The broad trends are well known. By industry, technological change has meant large increases in manufacturing productivity and reductions in manufacturing employment. Today, manufacturing jobs constitute about 10 percent of all jobs, down from 16 percent in 1990 and 28 percent in 1960 (see Table 1). Employment in the production of natural resources is also down, but jobs in construction have continued to grow in line with total employment.

As jobs in goods-production declined, jobs in services rose sufficiently to maintain high employment rates. Health care and education made up 13 percent of all jobs in 2006, up from 10 percent in 1990 and only 5 percent in 1960. Surprisingly, the combined share of jobs in finance and information industries has remained at about 8 percent of total employment since 1960.

With changes in industry demand have come shifts in employment by occupations. Because of the frequent changes in the classification of jobs into various occupations, we track trends in major occupations in Table 2 only from 1986.<sup>4</sup> It is noteworthy that the professional and related occupation category rose most in percentage terms, from 17 percent in 1986 to more than 20 percent in 2006. Managerial, business, and finance positions increased from 12.4 percent to nearly 15 percent of total employment. As of 2006, about 35 percent of all full-time positions were in professional or managerial positions.

Large reductions took place in sales and office occupations, which together fell from about 28 to 25 percent of all jobs over the last two decades. Production positions dropped as well, from 9 to 6.5 percent of employment. Sales, office, and production occupations still account for about one-third of all jobs.

Trends in specific occupations illustrate the growth in highly-skilled and less-skilled fields. According to BLS data, between 1986 and 2006:

- ◆ The number of financial managers more than doubled from 406,000 to 1 million.
- ◆ Medical and health managers quadrupled from 127,000 to 551,000.
- ◆ Accountants and auditors rose from about 1.3 to 1.7 million.
- ◆ Jobs in four teaching occupations—pre-K, elementary and secondary education, special education, and postsecondary education—rose from about 3.75 million to more than 6 million.

At the lower end of the labor market, waiter/waitress jobs rose by about 500,000 from about 1.4 million. Nursing and home health aides saw an increase from 1.6 to 1.9 million positions. Janitors, maids, and cleaning occupations added about 700,000 jobs, up from about 2.7 million in 1986.

**Many middle-skill jobs have shown rapid increases in employment as well, even within a slight decrease in their share of all jobs.** For instance, since 1986:

---

3. For instance, if we were to drop the less-skilled parts of the production, transportation, and even clerical and sales occupations from the middle category, but replace them with non-BA technicians and managers (from the professional and managerial occupations) and more skilled service workers, the results would be largely unchanged.

4. The figures cover all workers, including part-time and youth.

- ◆ The registered nursing occupation (which includes those with and without bachelor’s degrees) gained 1 million jobs, up from about 1.5 million.
- ◆ Health technician jobs were much more plentiful as well, rising to more than 1 million from about 400,000 positions.
- ◆ Emergency and health diagnosing positions jumped by nearly 40 percent.
- ◆ Job gains in construction occupations, many of which require substantial classroom and on-the-job training, amounted to about 4 million, nearly doubling the 1986 figure of about 5 million.

More recently, just between 2000 and 2006, similar patterns in employment growth in middle-skill occupations have emerged. For instance:

- ◆ Therapists (including mid-skill categories such as respiratory, recreational, and radiation) and their aides have expanded sharply, rising about 30 percent.
- ◆ Several blue collar positions rose briskly, including carpenters (by 20 percent), heavy vehicle maintenance (25 percent), and heating and air conditioning positions (21 percent).

These patterns illustrate the diverse occupational patterns of job growth over the last two decades in the U.S. economy. Only a small part of these occupational gains—such as those in construction—reflect positive short-term factors (such as the recent housing “bubble”).<sup>5</sup> Most of these trends are long-term. It is clear over time that high-skill, middle-skill, and low-skill occupations have all generated significant growth. Although managerial and professional jobs increased at the highest rates, these two broad categories—for which a college education is usually necessary—still only employ slightly more than one-third of all workers. **Middle-skill positions continue to account for most jobs in the U.S. economy.**

---

5. The data in Tables 1 and 2 indicate that the shares of employment in the construction industries and occupations have largely fluctuated in the 5-6 percent range over the past 20 years. Thus, our results are not driven by the increase in construction employment since 2000.

**TABLE 1**  
**Employment Trends by Industry, 1960-2006**

Industry Category	Percent of Wage and Salary Employment by Industry					
	1960	1970	1980	1990	2000	2006
Natural Resources	1.4	1.0	1.2	0.7	0.5	0.5
Construction	5.5	5.1	4.9	4.8	5.2	5.6
Manufacturing	28.4	25.1	20.7	16.2	13.1	10.4
Transportation and Utilities	20.5	19.9	20.3	20.7	19.9	19.3
Information	3.2	2.9	2.6	2.5	2.8	2.2
Financial Services	4.7	5.0	5.6	6.0	5.8	6.1
Professional Services	6.8	7.4	8.3	9.9	12.6	12.9
Education and Health	5.4	6.4	7.8	10.0	11.5	13.1
Leisure and Hospitality	6.4	6.7	7.4	8.5	9.0	9.7
Other Services	2.1	2.5	3.0	3.9	3.9	4.0
Government	15.6	17.9	18.1	16.8	15.8	16.1
Total Wage and Salary Employment (in thousands)	54,296	71,006	90,528	109,487	131,785	136,174

Source: Tabulations by authors from the Bureau of Labor Statistics web site.

**TABLE 2**  
**Occupational Patterns, 1986-2006**

Occupational Category	Percent of Total Employment by Occupation			
	1986	1990	2000	2006
Management and Financial Operations	12.4	13.0	14.3	14.7
Professionals and Related Occupations	16.8	17.5	19.5	20.2
Service Occupations	15.4	15.4	15.2	16.5
Sales and Related Occupations	11.6	11.6	11.5	11.5
Office Administrative Support	16.4	16.1	14.9	13.5
Farming, Fishing, Forestry	1.0	0.9	0.9	0.7
Construction	6.4	6.1	5.6	6.6
Installation and Repair	3.8	3.7	3.5	3.7
Production Occupations	9.1	8.8	8.4	6.5
Transportation and Material Moving	7.2	7.0	6.3	6.1
Total Employment (in thousands)	109,597	118,793	136,891	144,427

Source: Tabulations by authors from the Bureau of Labor Statistics web site.

## Wage Trends by Education and Occupation

When wages as well as employment grow relatively quickly for a given skill group, this indicates (to economists) that labor market demand is growing more rapidly for that category of workers than for others. Recent wage patterns paint a somewhat complex picture.

The wage gap between workers with college degrees versus high school diplomas has certainly widened for over 30 years, although it did not increase at all between 2000 and 2006. In 2006, the median worker with an associate's degree earned about 33 percent more than those with only a high school degree, while those with a bachelor's degree and no graduate degree earned 62 percent more.<sup>6</sup> Therefore, those with associate's degrees now earn, per year of education, a similar premium when compared to those with only a high school diploma.

Turning to occupational differences, several middle-skill occupations have experienced rapid wage increases in recent years. In the eight years between 1997 and 2005, the average American worker had an overall real wage increase (adjusting wage increases for inflation) of only about 5 percent. But:

- ◆ Registered nurses achieved an 18 percent increase.
- ◆ Speech and respiratory therapists saw real increases of 10 to 14 percent.
- ◆ Real pay for radiological technicians jumped by 23 percent.

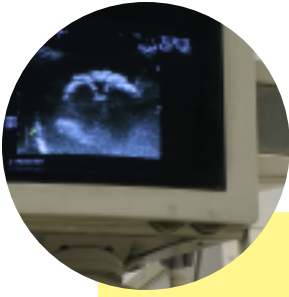
Wage increases for middle-skill, blue-collar positions varied, but several experienced above-average wage growth, as well. For example:

- ◆ Electricians experienced an 18 percent gain in real wages.
- ◆ Electrical and electronic technicians also saw healthy increases of 14 percent.
- ◆ The jump in real wages reached 22 percent for supervisors of electricians.
- ◆ Aircraft engine mechanics registered about a 10 percent increase.

Certainly, not all positions in middle-skill occupations pay well (or are well-situated on career paths with the promise of wage advancement) and not all middle-skill positions experienced these healthy increases in real wages. In other detailed categories (especially those not requiring postsecondary education or training), wage increases lagged behind the average. But the figures indicate that growth in demand for many middle-skill occupations is fast enough to generate not only strong employment growth, but also rapid growth in wages.

---

6. Tabulations from BLS web site on weekly earnings by education level for full-time workers ages 25 and over.



## BLS OCCUPATIONAL PROJECTIONS<sup>7</sup>

**BLS estimates that nearly half (about 45 percent) of all job openings in the next 10 years will be in the broad occupational categories that are mostly middle-skill.** (Figure 2 illustrates the broad trends.)

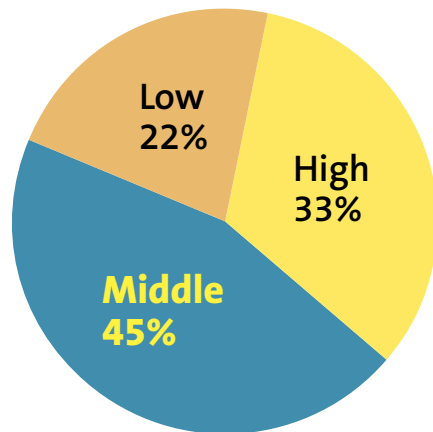
Another one-third (33 percent) will be in the high-skill occupational categories, with the other about 22 percent in the service occupations.

The estimated education and training requirements appear in Table 3, based on the mix of actual jobs in 2004 and those projected by BLS to exist in 2014. (Methodology Discussion 2 provides more information about how BLS makes these calculations. See page 17.) The differences between 2014 and 2004 employment levels yield the net absolute and percentage changes in each employment category. While the projected increases or decreases in employment levels in an occupation are useful, they do not reveal the number of total job openings that arise because of the need to replace existing workers who retire or change careers.<sup>8</sup>

This focus on “job openings,” as opposed to “new jobs” (or “net employment growth”) for any occupation, is important to understanding how many workers are projected to be needed in the future for any particular occupation. Many current commentaries on future skill demands—including those focusing on either the high-end or low-end extremes of the “hourglass economy” argument—often focus only on net new jobs or the fastest-growing occupations. By doing so, they often miss the true dimensions of future demand for workers across the labor market.

BLS projects total job openings based both on net employment growth and “replacement demand,” and these appear in the last column of Table 3. The effects of expected “baby boomer” retirements on job availability, based on current retirement patterns, are thus incorporated in the demand projections, as are average career changes by educational group.

**FIGURE 2. Projected Job Openings by Skill Level and Occupational Category, 2004-2014**



Source: Dixie Sommers, “Overview of Occupational Projections, 2014,” 2007. Note: High-skill occupational categories are Management and Financial Operations and Professionals and Related Occupations; middle-skill categories are Sales and Related Occupations, Office Administrative Support, Construction, Installation and Repair, Production Occupations, and Transportation and Material Moving; and low-skill categories are Service Occupations and Farming, Fishing, and Forestry.

7. BLS projects employment demand by occupations over a 10-year future period, with updates every two years. The most recent projections were released in late 2006 and cover the period 2004-14. BLS also calculates demand for education and training over this period, based on projected employment in the detailed occupations as well as average educational and training requirements across these categories.

8. The numbers of job openings do not include those generated by other kinds of turnover, like quits and discharges, as job openings in these cases are matched by a newly available worker.

**TABLE 3**  
**BLS Demand Projections: By Education and Training Required on Jobs, 2004-14**

	Employment (000,000s)		Net Change		Job Openings (000,000s)
	2004	2014	Number	%	
<b>A. Education and Training Categories<sup>1</sup></b>					
On-the-Job Training:					
Short-Term	51.8	57.7	5.9	11.4	22.2
Moderate-Term	29.0	31.4	2.4	8.3	8.9
Long-Term	11.0	12.0	1.0	9.1	3.4
Related Work Experience	11.1	12.1	1.0	9.0	3.4
Postsecondary					
Vocational Award	7.9	9.3	1.6	20.3	3.0
Associate Degree	5.4	6.8	1.4	25.9	2.4
Bachelor's Degree	17.0	20.4	3.3	19.4	6.5
Bachelor's or Higher					
Plus Work Experience	6.5	7.6	1.1	16.9	2.3
Master's Degree	2.2	2.6	0.4	18.2	0.8
Doctoral Degree	1.9	2.5	0.6	31.6	1.0
First Professional Degree	1.9	2.2	0.3	15.8	0.6
<b>Total</b>	<b>145.6</b>	<b>164.5</b>	<b>18.9</b>	<b>12.9</b>	<b>54.7</b>
<b>B. Educational Clusters<sup>2</sup></b>					
High School or Less	68.5	75.5	6.9	10.1	25.3
Some College	41.5	46.8	5.2	12.6	15.5
BA or Higher	35.6	42.3	6.8	19.0	13.9
<b>Total</b>	<b>145.6</b>	<b>164.5</b>	<b>18.9</b>	<b>12.9</b>	<b>54.7</b>

Source: U.S. Bureau of Labor Statistics, 2006.

1. These categories are defined as "the most significant postsecondary education or training pathway to employment in that occupation" by BLS.
2. Clusters are based on the educational levels of workers aged 25-44 by occupation. Clusters based on one educational level are those in which at least 60 percent of workers hold no more than that level, while those with two or more education levels are those in which at least 20 percent of these workers hold each educational level. BLS generates six educational clusters with mixed education levels and has aggregated these six clusters into the three presented above.



## METHODOLOGY DISCUSSION 2

### How Does BLS Project Future Job Openings for Specific Occupations?

BLS projections are derived largely from estimates of demand for goods and services by industry, conditional on aggregate measures of employment and productivity for the overall U.S. economy. Using “input-output” tables that capture the links between each industry’s production with that in all other industries, analysts use the resulting industry demands to generate demand for workers by industry. The number of workers by industry are, in turn, used to generate demands for workers in more than 700 detailed occupations (Sommers, 2007). Translating these occupational projections into education and training requirements is the next step.

Although BLS makes some adjustments for trends in production technology and productivity growth, the projections mostly reflect anticipated shifts in product demand across industries. In particular, the projected occupational demands are unlikely to capture fully the intra-industry shifts in the organization of work. As a result, the projected demands for education and training reflect few of the likely trends over time in skill requirements within occupations (Freeman, 2007).

Since demand for education in the labor market has clearly risen within occupations and industries as well as between them (Autor and Katz, 1999), the projections likely understate the growth of demand for skills over time. In fact, BLS projections have a history of understating the rising demand for skills in the economy (Bishop and Carter, 1991). Still, the estimates show useful “lower bounds” for the composition of worker demand by education and training requirements.

### Occupational Skill Requirements

BLS now calculates education and training requirements in its occupational projections two different ways: using an older method based on 11 education and training “categories” and a newer method involving six educational “clusters” that BLS then aggregates into three groupings (less than high school, some college, and bachelor’s degree or higher), as shown in Table 3. While each method has advantages and disadvantages, results are broadly consistent with one another. (Methodology Discussion 3 provides more information about the differences between the two grouping methods. See page 18.)

In Table 3, we have also included data for both of the ways in which BLS now uses its occupational projections to estimate education and training requirements in the labor market—both by “Education and Training Categories,” as reflected in Section A of Table 3 and by “Education Clusters,” as reported in Section B of the table.

As reflected in both sections of Table 3, BLS expects total employment to grow by almost 19 million jobs between 2004 and 2014, or by just less than 13 percent. But it also anticipates that almost 55 million jobs will become available during that time period, or almost three times the total number of net new jobs created. Job openings are nearly three times the number of new jobs because of replacement demand for retiring workers and workers changing occupations.

According to BLS, the highest rates of net job changes among the 11 education and training categories will occur in jobs requiring at least some postsecondary certification or college degree. The precise growth rates vary, ranging from 16 to more than 30 percent. In contrast, jobs requiring only on-the-job training or related work experience are expected to grow by only 8 to 11 percent, or less than the 13 percent growth in total employment.

### METHODOLOGY DISCUSSION 3

## BLS “Training Categories” Versus “Educational Clusters”

In Table 3, we have included data for both of the ways in which BLS estimates education and training requirements in the labor market—by “Education and Training Categories,” as reflected in Section A, and by “Education Clusters,” as reported in Section B.

BLS categorizes each occupation according to “...the most significant postsecondary education or training pathway to employment in that occupation” (BLS, 2006). BLS classifies jobs into 11 categories of education and training, including several levels of postsecondary education (such as associate’s degrees, bachelor’s degrees, and graduate degrees), vocational awards, related work experience, and three levels of on-the-job training (short-, moderate- and long-term). Because each occupation can only be assigned into one education or training category, the projections tell us little about multiple skill demands within the various singular training categories that BLS deems “most significant.”

For that reason, BLS recently started to categorize its occupations into a second set of “Education Clusters,” based on the educational attainment of prime-age workers (defined as ages 25-44) who actually hold a particular job today—regardless of the specific skill standard it has identified for that occupation under the “categories” method.

For example, while the job of “waiter” may, according to the Method A of “education and training requirements,” be assessed as only requiring short-term on-the-job training to do the job adequately, under Method B, “waiter” may be classified as “high school/some college” because workers at varying education levels actually hold that job today (i.e., 53.6% high school diploma or less, 31.7% some college, and 14.7% bachelor’s degree or higher). Conversely, the occupation of construction manager, which is rated under Method A as requiring a bachelor’s degree, is mostly filled by workers with a high school diploma or some college (70.4%).

Because workers in some occupations are predominantly at one educational level and those in others have a mix of attainment levels, some clusters reflect one level of education, while others reflect two or even three.<sup>1</sup> Allowing for a mix of skills within occupations offers a more nuanced way of projecting demand for skills. But BLS can also aggregate these six clusters to generate three broad categories of educational requirements—high school or less, some college, or bachelor’s degrees and higher— which are easier to interpret. Also, according to cross-tabulations among the 11 categories and six education clusters (BLS, 2007, p. 4), jobs requiring moderate- or long-term training, related work experience, a postsecondary award or an associate’s degree can be considered “middle skill” jobs. These positions require high school or some college but less than a bachelor’s degree.<sup>2</sup> Thus, the two different methods are largely consistent with one another (although the “clusters” generate higher educational requirements overall than the “categories”).

- 
1. Clusters based on one educational level are those occupations in which at least 60 percent of workers aged 25-44 hold no more than that level, while those with two or more education levels are those in which at least 20 percent of these workers hold each educational level.
  2. For instance, more than 60 percent of jobs requiring “moderate-term” or “long-term” on-the-job training fall in the high school/some college cluster, while more than 85 percent of jobs requiring related work experience fall in that cluster or the one for high school, some college, and college. About two-thirds of those for postsecondary vocational awards fall in the high school/some college category.

More specifically, BLS projects that:

- ◆ Jobs in *all* of the middle-skill categories combined (including positions requiring substantial on-the-job training) will generate about 21 million openings over the decade, or nearly 40 percent of the total. Within this category, jobs specifically requiring postsecondary vocational awards or associate's degrees will grow at more than 20 percent, a rate above the growth in jobs requiring only a bachelor's degree or a bachelor's degree plus work experience (though total employment in these latter two categories combined).
- ◆ Jobs requiring only short-term training and little other formal education will provide about 22 million openings, or another 40 percent of the total.
- ◆ Jobs requiring bachelor's degrees or more will account for 11.7 million openings, or about 20 percent of all openings.

The projections using the education clusters in part B of Table 3 suggest that jobs requiring a high school diploma or less will grow by only 10 percent over the coming decade, although they will still account for about 40 percent of job openings (given the higher rates of retirement and career changes in these jobs relative to others). But substantial numbers of net new jobs and job openings will require some college or bachelor's degrees and higher. Indeed, BLS projects that:

- ◆ Jobs requiring bachelor's degrees or higher will grow at the highest rate, or 19 percent, while those requiring some college will grow by nearly 13 percent.
- ◆ But those requiring some college will generate more job openings (15.5 million, or 28 percent of the total) than those requiring bachelor's degrees or higher (13.9 million, or 25 percent of the total).

## **Projections by Occupational Category**

In Tables 4 and 5, we turn to projections by occupational category, again showing employment in 2004 and 2014, net job growth, and total job openings. Table 4 presents all occupational categories, while Table 5 offers information on detailed occupations that require middle-level skills.

As was the case in considering recent trends in occupational growth, BLS projects that employment growth in professional and managerial as well as service jobs will generally exceed that in the middle occupational categories. But quite substantial growth in the middle categories is still expected. For example, expected net growth rates in transportation, construction, and maintenance/repair jobs are all projected to be 11 to 12 percent, only slightly below expected average growth for all jobs (12.9 percent).

Compared to the picture that emerges from education and training requirements, the occupational pattern in this part of the analysis is somewhat more consistent with the argument that jobs are increasing most at the top and bottom of the skills distribution and least in the middle. But, again, projected overall job openings in the middle occupational groups are not much smaller than those at the top or the bottom.<sup>9</sup>

---

9. The differences between the projected educational and occupational requirements—with the former showing more growth at the top of the labor market and less at the bottom than the latter—will ultimately be reconciled by growing educational requirements and worker attainments *within* occupational categories.

The projections for detailed occupations listed in Table 5 point to average or even above-average growth in several high-wage job categories that require a middle level of skills. For instance:

- ◆ Expected net growth in computer specialist jobs requiring less than a bachelor’s degree will average about 20 percent and should generate more than 1 million job openings.
- ◆ Expected net growth in a range of health care jobs with sub-baccalaureate education and training requirements will vary from 20 to 40 percent, with more than 1.5 million job openings.
- ◆ Employment in five skilled construction trades is expected to grow by 10 to 15 percent and provide 4.6 million job openings, while jobs in installation/maintenance/repair and transportation will grow at similar rates and together generate more than 4 million additional openings.

All in all, the projections of Tables 4 and 5 clearly demonstrate that **ample employment opportunities will remain in a variety of good-paying jobs in the middle of the labor market over the next decade and beyond.**

**TABLE 4  
BLS Demand Projections for Broad Occupational Groups, 2004-14**

	Employment (000,000s)		Net Change		Job Openings (000,000s)
	2004	2014	Number	%	
Professional and Related	28.5	34.6	6.0	21.2	13.2
Service	27.7	32.9	5.3	19.0	11.5
Management, Business and Financial	15.0	17.1	2.2	17.4	4.9
Sales and Related	15.3	16.8	1.5	10.6	6.5
Office and Adm. Support	23.9	25.3	1.4	5.8	7.4
Transportation and Material Moving	10.1	11.2	1.1	11.1	3.5
Construction and Extraction	7.7	8.7	.9	12.0	2.4
Installation, Maintenance and Repair	5.7	6.4	.7	11.4	2.0
Farming, Fishing and Forestry	1.0	1.0	-.0	-1.3	0.3
Production	10.6	10.5	-.1	-0.7	2.9
<b>Total</b>	<b>145.6</b>	<b>164.5</b>	<b>18.9</b>	<b>12.9</b>	<b>54.7</b>

Source: Dixie Sommers, “Overview of Occupational Projections, 2014,” 2007.

**TABLE 5**  
**BLS Demand Projections for Detailed Middle-Skill Occupations, 2004-14**

	Employment (000,000s)		Net Change		Job Openings (000,000s)
	2004	2014	Number	%	
<b>Computers</b>					
Support Specialist	518	638	119	23.0	870
Specialist, Other	149	177	28	19.0	150
<b>Construction</b>					
Carpenters	1,349	1,535	186	13.8	2,100
Electricians	656	734	77	11.8	680
Painters	471	531	60	12.6	1,020
Operating Engineers	382	426	44	11.6	370
Plumbers	499	577	78	15.7	610
<b>Health Care</b>					
Dental Hygienist	158	226	68	43.3	170
Licensed Practical Nurse	726	850	124	17.1	840
Medical Lab Technician	147	183	37	25.0	140
Physical Therapy Assistant	59	85	26	44.2	70
Radiology Technician	182	224	42	23.2	170
Respiratory Therapist	94	120	27	28.4	70
Surgical Technologist	84	109	25	29.5	120
<b>Installation, Maintenance and Repair</b>					
Aircraft Mechanic	119	135	16	13.4	110
Auto Mechanic	803	929	126	15.7	930
Bus/Truck Mechanic	270	309	39	14.4	320
Heating and AC Installer	270	321	51	19.0	330
Heavy Equipment Mechanic	178	189	12	6.7	200
Industrial Machinery	1,700	1,907	207	12.2	1,780
<b>Transportation</b>					
Bus Driver (Transit)	270	309	39	14.4	340
Heavy Truck Driver	1,738	1,962	223	12.9	274
<b>Other</b>					
Chef	125	146	21	16.7	110
Claims Adjuster	250	288	38	15.1	280
Legal Secretary	272	319	47	17.4	410
Paralegal	224	291	67	29.7	28

Source: Dixie Sommers, "Overview of Occupational Projections, 2014," 2007.

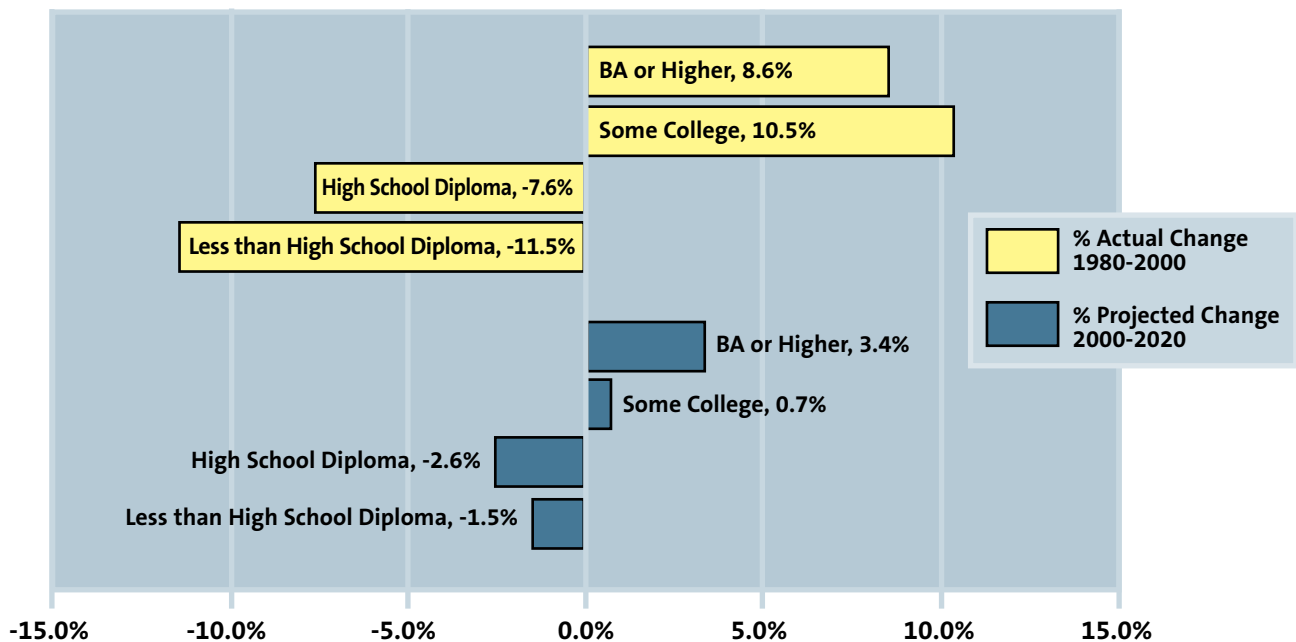


## PROJECTING THE FUTURE SUPPLY OF SKILLS

Projections of future demand for skilled labor, despite all of their limitations, can be useful, especially in the context of expectations about the supply of these skills within the U.S. working population over the same time periods. A 2003 report by the Aspen Institute, using projections generated by David Ellwood, offers a good starting point for expected levels of educational attainment over the two decades beginning in 2000. (Figure 3 summarizes these projections.) **These projections indicate a dramatic slowdown in the growth of skills over the next two decades, at both the top and middle of the labor market. In fact, the slowdown in growth among workers with some college exceeds that among workers with bachelor's degrees or more.**

Projecting the growth in the supply of worker skills requires a number of assumptions about future demographic trends and about the tendency of different groups to invest in skill formation. These assumptions, in turn, reflect expectations about future immigration, retirement, and educational enrollments. These changes, in turn, will depend on public policy choices as well as private behavior, and in the costs and institutional capacities of the education and training system in the U.S.<sup>10</sup>

**FIGURE 3. Actual Percent Change (1980-2000) and Projected Percent Change (2000-2020) of Workers 25+ by Educational Attainment**



Sources: U.S. Bureau of Labor Statistics, *Occupational Projections and Training Data*, 2006, and Aspen Institute, *Grow Faster Together. Or Grow Slowly Apart*, 2003.

10. See also Ellwood (2001) for more information on how these projections were calculated. They are based primarily on projected changes in the age and racial/ethnic distribution of U.S. workers, along with recent patterns of educational attainment for these groups.

**TABLE 6**  
**Actual and Projected Supply of Workers, Ages 25+ by Educational Attainment**

	Labor Force (in millions)			Change in Labor Force (in millions)	
	1980	2000	2020	1980-2000	2000-2020
Less than High School Diploma	17.3	12.0	11.9	-5.3	-0.1
High School Diploma	31.5	37.8	40.4	6.3	2.6
Some College	13.8	32.9	39.2	19.1	6.3
BA or Higher	17.3	35.9	46.4	18.6	10.5
Total	79.9	118.6	137.9	38.7	19.3

	Percent of Workers			Change in Percent	
	1980	2000	2020	1980-2000	2000-2020
Less than High School Diploma	21.7%	10.1%	8.6%	-11.5%	-1.5%
High School Diploma	39.4%	31.9%	29.3%	-7.6%	-2.6%
Some College	17.3%	27.7%	28.4%	10.5%	0.7%
BA or Higher	21.7%	30.3%	33.6%	8.6%	3.4%
Total	100.0%	100.0%	100.0%	0.0%	0.0%

Sources: U.S. Bureau of Labor Statistics, *Occupational Projections and Training Data*, 2006, Aspen Institute, *Grow Faster Together. Or Grow Slowly Apart*, 2003.

The projections classify current and future adult workers (ages 25 and over) into four educational categories: less than high school diploma, high school diploma (or GED), some college, and four-year college degree or higher. Table 6 reproduces these projections in more detail, along with actual levels of educational attainment in the labor force in 1980 and 2000.

The figures show the share of adult workers with bachelor's degrees or more rising from 21.7 percent in 1980 to 30 percent in 2000, and projected to rise to 33 percent in 2020. At the same time, the proportion with a high school diploma or less declined between 1980 and 2000 from 61 to 42 percent and is projected to drop further to 37 percent in 2020.

On the one hand, the results capture a workforce with continuing increases in academic attainment. On the other hand, the Aspen projections suggest a serious slowdown in the growth of skills at both the top and middle of the labor market. This slowdown might not fully materialize, especially if more educated workers choose to retire later (perhaps motivated by their improved health and meager savings), if more young people or adults choose to attend college, and if more highly educated immigrants enter the U.S. (perhaps due to changing immigration laws). But some slowdown in educational growth is almost certain to occur.

But, **if at least some of these projected changes in the growth of educational supply occur, they are more likely to shrink the pool of skilled labor in the middle than at the top of the education ladder.** If anything, retirement is more likely to be delayed among the most educated than those with some college or postsecondary training, especially those who have worked in physically demanding blue-collar jobs (Munnell, 2007). Immigration disproportionately provides workers at the top and bottom of the education distributions rather than the middle (Borjas, 2007), and that is unlikely to change, even if immigration laws are amended.<sup>11</sup> Thus, the projected slowdowns in the growth of skills might well be more severe in the middle, rather than at the top, of the labor market.

11. The reforms most recently under discussion would likely shift the mix of immigrant workers from the bottom to the top of the educational groups without greatly changing the smaller numbers with some college or postsecondary training.

## **An Even Greater Basic Skills Crisis?**

Even with the level of sophistication that BLS brings to developing its educational demand projections, it is likely that the data underplay what will be an increasing need for more broadly-based basic skills education—even among workers who have achieved traditional education credentials.

In particular, the school attainment data and projections do not show the changing composition of workers with valued occupational qualifications and critical academic and non-academic skills. Although we generally lack good measures of the occupational qualifications and non-academic skills of the workforce, the National Assessment of Adult Literacy (NAAL) provides data on prose, document, and quantitative literacy for the adult population of the U.S.

Somewhat surprisingly, despite the increases in educational attainment in the last 20 years, literacy scores between 1992 and 2003 improved only slightly for quantitative skills and not at all for prose and document literacy. Although African- American and Asian-American adults raised their literacy levels, Hispanic adults experienced declines and non-Hispanic whites experienced little change.

The data reveal sharp differences in literacy by race and ethnicity that are relevant to projecting the skills of the future workforce. The Aspen report projects that while African-American and Hispanic workers accounted for about 20 percent of the adult workforce in 2000, these groups will make up 64 percent of the 19.3 million increase in the adult labor force between 2000 and 2020. Given that the two groups with lower than average literacy levels are the groups that will be increasing their share of the workforce, the U.S. may not experience any increases in the skill composition of the workforce, despite a rise in projected educational attainment.





## **MATCHING PROJECTIONS OF SUPPLY AND DEMAND**

---

Taken together, the demand projections for education (in Table 3) and supply projections (in Table 6) look roughly in balance over the first two decades of the 21st century. The Aspen Institute projections suggest modest growth in the attainment of bachelor's degrees, stability in overall college attendance without the attainment of these degrees, and a continuing but slowing drop in the fraction of workers with high school or less education. These supply estimates seem consistent with the modest growth of demand for college-educated workers projected by BLS, the rough stability of demand for middle-level skills, and some decline in demand for high school or less education. Indeed, these two sets of projections suggest few imbalances between supply of and demand for skills in the labor market, either at the very top or the middle of the labor market.

But will the growth in actual capabilities be smaller than the growth in educational attainment? And will the actual growth in the demand for skills be as low as projected? Given the past record of BLS and the assumptions on which it projects demand, those projections likely understate the growth in demand for skills, especially for those with bachelor's degrees and above. Between 1980 and 2000, in spite of rising educational attainment (Autor and Katz, 1999), the growth in demand for college-educated workers outpaced the supply of skills, leading to a sharp increase in the wages of college-educated workers relative to those with a high school diploma or less.

Yet this dramatic growth in demand for higher education was not reflected in the BLS projections for that period (Bishop and Carter, 1991; Freeman, *op. cit.*). In the coming decade or

### **Off-Shoring and Middle-Skill Jobs**

The trends identified in this analysis might become exacerbated over the next several years, as jobs increasingly become offshored to China, India, and elsewhere. Estimates of the share of all jobs in the U.S. that could potentially be transferred overseas routinely fall in the range of 10 to 20 percent (Blinder, 2005), and the risks of job flight can be found at all levels of education. Of course, it is not certain that all of these jobs will move (Leamer, 2007). If they do move offshore, they will certainly be replaced by new jobs in the economy. Indeed, our economy already creates and destroys several million jobs each year (Brown *et al.*, 2006), reflecting the ongoing reality of a highly turbulent labor market that constantly presents new opportunities for earnings while old ones disappear.

What does this mean for the projections we presented above? Future trends in offshoring of jobs are likely not captured in our data on recent occupational trends or in the BLS projections for the next decade. Exactly how this future development will affect the mix of jobs across skills categories is very hard to predict. Nevertheless, it is clear that many jobs in the middle of the skills spectrum—particularly those in sectors like construction and health care—will not be offshored, as proximity to the market will still be necessary. Certain jobs at the highest end of the market (such as those in radiology and accounting) or the lowest end (as in call centers) are, in fact, more likely to be offshored or eliminated domestically by their competitors. Again, this implies that offshoring and other new competitive forces in the future do not dampen our estimate of demands in the middle of the labor market.

two, within-occupations skills demands are likely to continue to grow in ways not reflected by the current BLS projections. As a result, future supplies of skills may again fall short of demand, further widening wage gaps between high-skill and low-skill workers.

In our view, the BLS projections should be regarded as useful lower-bound estimates of the likely growth in demand for skills, based on likely shifts in employment across industries and occupations in the middle of the labor market as well as the top. But overall growth in demand for education at both skill levels will likely be higher than what Table 6 shows. Indeed, other projections that rely more heavily on simply extrapolating past growth in college employment into the future generate much higher projections of demand in the “some college” and “college” categories, although these projections are questionable as well.<sup>12</sup>

Another consideration is that educational attainment patterns may understate skill mismatches resulting from weaknesses in qualifications for occupations in high demand. Openings for registered nurses, for example, are expected to jump dramatically over the next 10 to 15 years. Having enough workers with general education at the BA or sub-BA level will do little to meet the increasing demand for nurses unless enough workers gain the relevant occupational qualifications. Without initiatives that do better to link the emerging occupational requirements with the education and training obtained by current and future workers, employers will have to import workers, alter their production strategies, and/or alter their production strategy in ways that eliminate potentially good jobs.

Overall, we conclude that **demand for both mid-level and high-level skills are likely to grow more rapidly than their supply over the next decade and beyond—both overall and within key sectors.** The imbalances are likely to affect workers and employers in the *middle* of the labor market, as well as those at the top. Although these imbalances will probably generate limited shortages of skilled labor in the short run, they are unlikely to generate long-lasting shortages, as employers will adjust to tight labor markets in a variety of ways—such as lower skill demands, higher wages, and more aggressive recruitment. But some of these adjustments, such as accepting employees with less skill than required, might entail their own costs in terms of lower performance and productivity.

---

12. Anthony Carnevale, among others, has used this approach to project demand for skills in testimony before Congress. Goldin and Katz (2007) have argued that growth was slower between the 1980s and the 1990s, thus casting some doubt on whether we should simply project past growth in employment and assume that demand for skills will continue to grow at that pace.



## **STATE- AND INDUSTRY-LEVEL EVIDENCE FOR MIDDLE-SKILL DEMAND AND LIMITED SUPPLY**

---

These findings are also fully consistent with a number of other studies that have been done using other data and research methods.<sup>13</sup> For instance, several studies done for particular states have recently concluded that demand for work in key middle-skill as well as high-skill jobs will remain robust, and that the supply of workers to fill these jobs will be limited. For instance:

- ◆ In 2002-2003, West Central Minnesota experienced a significant increase in the percent of difficult-to-fill jobs that were skilled jobs (63 percent) (West Central Initiative, 2003).
- ◆ State vacancy surveys routinely identify a significant number of jobs requiring some postsecondary education. For example:
  - In Connecticut, in fall 2004, of the 53,145 job vacancies in the state, more than one-third (34%) required postsecondary education (Connecticut Department of Labor, 2005).
  - In Washington State, of 70,653 job vacancies (April 2004-May 2005), more than one-third (35%) required a professional license or certificate (Washington State Employment Security Department, 2005).
- ◆ Researchers at the Weldon Cooper School for Public Service at the University of Virginia analyzing labor market information found that most skilled jobs in the state's economy require more than high school, but less than a four-year degree.
- ◆ Washington State compiled labor market data and interviewed employers and found that the greatest demand in the state is for workers with postsecondary vocational training (Washington State Workforce Training and Education Coordinating Board, 2007). Job forecasts show that, over the next five to seven years, employers in the state will need more workers with some form of postsecondary vocational training than any other educational level.

While exact numbers vary across states and regions, this broad pattern will likely hold in most geographic areas over time.

Already, a number of employer surveys indicate difficulty filling not only jobs requiring the highest levels of education, but those in the middle as well. Specifically:

- ◆ In a study by the National Association of Manufacturers, 90 percent of respondents indicated a moderate to severe shortage of qualified skilled production employees (such as machinists and technicians), a result that did not vary significantly after controlling for company size, industry segment, or region (NAM, 2005).
- ◆ Two-thirds of New Jersey employers surveyed in mid-2006 reported difficulty in hiring qualified applicants over the last year, including nearly 30 percent who reported having a lot of difficulty (John J. Heldrich Center for Workforce Development, 2006).

---

13. We thank The Workforce Alliance, and Gwen Rubinstein in particular, for providing us with much of this information.

- ◆ More than half of the employers surveyed by the U.S. Chamber of Commerce considered it hard or very hard to find qualified workers to fill job openings, even in the midst of a slow economy (U.S. Chamber of Commerce, 2003).

Of course, some of the reported difficulties might be eliminated by employers if they paid higher wages to attract more skilled applicants. But, when the aggregate supply of skills is relatively low, the ability of higher wages to generate more skilled employees in the aggregate is quite limited, especially in the short term.



## CONCLUSION

---

Recently, a great deal of attention has focused on the need for the U.S. to invest more heavily in its college-educated workforce, and particularly in the STEM fields. Much less attention has gone to the need for more education and training for *middle-skill jobs*—those that require postsecondary education, but not a bachelor’s degree. Indeed, some have argued that the middle-skill jobs are shrinking rapidly, so there is little need to invest resources in training for those jobs. Others have argued that it is only bachelor’s degrees and above that really pay well enough to justify further public investments in education and training.

In this paper we review the evidence on what kinds of jobs are being produced in the labor market and at what rates of pay. We consider trends in the recent past, as well as projections for the future, on the demands for and supply of education at different parts of the labor market. Our review leads us to conclude the following:

- ◆ **Substantial demand remains for individuals to fill skilled jobs in the middle of the labor market, with many jobs there paying quite high wages.** This is particularly true for jobs that require an associate’s degree or some particular vocational training and certification.
- ◆ **Reports that the middle of the labor market has “hollowed out,” creating an “hourglass economy,” have been overstated.** Nearly half of the jobs in the labor market today remain in the middle-skill occupational categories (such as clerical, construction, transportation, production and installation/repair jobs). Job growth and wage growth in a variety of middle-skill jobs in construction, health care and other sectors have remained strong.
- ◆ **BLS projections indicate, at a minimum, that demand for mid-level skills and occupations will remain robust in the future,** with jobs requiring postsecondary education or at least moderate-term training growing substantially over the next decade. Demands for skilled labor in construction, health care, computer use, transportation, and elsewhere are projected to grow at above-average rates. Replacement needs for retiring workers will also be strong, generating even more job openings in the middle than the top of the skills spectrum.
- ◆ **The retirements of “baby boomers” and their replacement by immigrants will likely shrink the future supply of educated workers relative to the demand for them, at both the top and middle of the labor market.** Indeed, baby boomer retirements will likely occur most rapidly in the lower-to-middle ranges of skills, while immigrants are likely to fill the bottom and top jobs more easily than those in the middle.

What all of these findings suggest is that **the demand for postsecondary education and training in the U.S. labor market will remain strong. It will remain strong not only for workers with bachelor’s and advanced degrees, but for those with more than high school, but less than a four-year degree.** Greater public investments in education and skills training in all of these areas will likely generate important returns for the U.S. economy.

Without greater investments, future growth in the supply of educated workers will likely fall somewhat short of the growth in labor market demand. This imbalance will not necessarily generate large-scale and persistent shortages, as labor markets have tendencies to adapt and to

clear over time. Adjustments will include higher wages and salaries for those with the requisite skills, increasing use of technology and offshoring to replace skilled workers in short supply, and employers tolerating workers with fewer qualifications than they would like. Indeed, this is what occurred in the tight labor markets of the late 1990s in many sectors (Holzer *et al.*, 2006). But employers will have greater difficulty and face greater costs meeting their skill needs, especially in key sectors and geographic areas where retirements are greatest and immigrants are least likely to meet their hiring needs.

Even greater costs will be borne by less-educated workers. Right now, many millions of young people fail to graduate high school on time; their labor market prospects are particularly grim. Those current workers with high school diplomas only—even many in middle-skill occupations—have seen their earnings stagnate or decline for several decades.<sup>14</sup> Millions more take some classes in college without obtaining any kind of degree or occupational certification; their earnings are only scarcely higher than those of high school graduates. The gaps in college attendance and especially completion are growing higher between people from high-income families and those from lower-to-middle income families (Turner, *op. cit.*).

While further aid for those enrolling in four-year college programs is clearly critical, we must also provide other pathways to labor market success for those who cannot enroll in or complete such degrees. Labor market opportunities will clearly be available to such individuals, and proven education and training paths exist for both the current and future workforce. It is time to invest more heavily in appropriate skill development for all of our nation's current and future workers, at all points in the labor market.

---

14. The relative decline in the earnings of less-educated workers and rising inequality across groups reflects many factors, including institutional and policy developments—such as declining relative value of the minimum wage, declining collective bargaining, and immigration—as well as underlying supply and demand forces in the labor market.

## REFERENCES

---

- Aspen Institute. 2003. *Grow Faster Together. Or Grow Slowly Apart: How Will America Work in the 21st Century?* Boulder, CO: Domestic Strategy Group.
- Autor, David and Lawrence Katz. 1999. "Changes in the Wage Structure and Wage Inequality." In O. Ashenfelter and D. Card eds. *The Handbook of Labor Economics*. Vol. 3A. Amsterdam: North Holland.
- Autor, David, Lawrence Katz and Melissa Kearney. 2005. "Trends in U.S. Wage Inequality: Revising the Revisionists." National Bureau of Economic Research Working Paper.
- Bishop, John and Shani Carter. 1991. "How Accurate are Recent BLS Occupational Projections?" *Monthly Labor Review*.
- Blinder, Alan. 2005. "Fear of Offshoring." Working Paper, Princeton University.
- Borjas, George. 2007. "Immigration Policy and Human Capital." In H. Holzer and D. Nightingale eds. *Reshaping the American Workforce in a Changing Economy*. Washington, DC: Urban Institute Press.
- Brown, Clair, John Haltiwanger and Julia Lane. 2006. *Economic Turbulence*. Chicago: University of Chicago Press.
- Bureau of Labor Statistics. 2006. *Occupational Projections and Training Data*. Bulletin 2602, U.S. Department of Labor. Washington, DC: U.S. Government Printing Office.
- Connecticut Department of Labor. 2005. *Connecticut Job Vacancy Study: Help Wanted*. Wethersfield.
- Ellwood, David. 2001. "The Sputtering Labor Force of the 21st Century: Can Social Policy Help?" In A. Kruger and R. Solow eds. *The Roaring Nineties: Can Full Employment Be Sustained?* New York: Russell Sage Foundation.
- Farber, Henry. 2005. What Do We Know About Job Displacement? NBER Working Paper, Cambridge, MA.
- Freeman, Richard. 2007. "Is a Great Labor Shortage Coming? Replacement Demand in a Global Economy." In H. Holzer and D. Nightingale eds. *Reshaping the American Workforce in a Changing Economy*. Washington, DC: Urban Institute Press.
- Gates, Bill. 2007. Testimony before U.S. Senate, Committee on Health, Education, Labor and Pensions, March 7.
- Goldin, Claudia and Lawrence Katz. 2007. "The Race between Education and Technology: The Evolution of U.S. Education Wage Differentials, 1890 to 2005." NBER Working Paper.
- Hacker, Jacob. 2006. *The Great Risk Shift*. New York: Oxford University Press.
- Holzer, Harry J., Steven Raphael and Michael Stoll. 2006. "Employers in the Boom: How Did the Hiring of Less-Skilled Workers Change in the 1990s?" *Review of Economics and Statistics*, Vol. 88 (2), 283-99.
- John J. Heldrich Center for Workforce Development, *New Jersey Employer Survey*. New Brunswick, NJ.
- Kenney, Martin. 2007. "The Globalization of Knowledge Work." Luncheon Address, National Academies of Science, Workshop on Research on Future Skill Demands, Washington, DC, May 31 and June 1.
- Leamer, Edward. 2007. "A Flat World, A Level Playing Field, A Small World After All, or None of the Above?" *Journal of Economic Literature*, No. 1, Vol. 45, 83-126.
- Leigh, Duane. 1990. *Does Training Work for Displaced Workers? A Survey of Existing Evidence*. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.
- Levy, Frank and Richard Murnane. 2004. *The New Division of Labor*. New York: Russell Sage Foundation.
- Munnell, Alicia. 2007. Policies to Increase the Labor Force Participation of Older Workers." In H. Holzer and D. Nightingale eds. *Reshaping the American Workforce in a Changing Economy*. Washington, DC: Urban Institute Press.

- Nafziger, Richard. 2007. <http://nafzblog.blogspot.com/2007/06/equality-and-growth.html>.
- National Association of Manufacturers and Deloitte Consulting. 2005. *Skills Gap Report—Survey of the American Manufacturing Workforce*. Washington, DC.
- Sommers, Dixie. 2007. “Overview of Occupational Projections, 2014.” Office of Occupational Statistics and Employment Projections, U.S. Bureau of Labor Statistics, Washington, DC.
- Turner, Sarah. 2007. “Higher Education Policies Generating the 21st Century Workforce. In H. Holzer and D. Nightingale eds. *Reshaping the American Workforce in a Changing Economy*. Washington, DC: Urban Institute Press.
- U.S. Chamber of Commerce, Center for Workforce Preparation. 2003. *Rising to the Challenge*. Washington, DC.
- Washington State Employment Security Department. 2005. *Washington State Job Vacancy Survey*. Olympia.
- Washington State Workforce Training and Education Coordinating Board. 2007. *Postsecondary Career and Technical Education Works*. Olympia.
- Weldon Cooper Center for Public Service. *Career Prospects in Virginia*. Unpublished PowerPoint presentation. Charlottesville: University of Virginia.
- West Central Initiative. 2002. *Study of Skilled Labor Shortages in West Central Minnesota*. Fergus Falls, MN.