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Employment trends by typical entry-level education requirement

From May 2007 to May 2010, the U.S. economy lost nearly 7.4 million jobs in occupations that typically require a high school diploma or no formal educational credential for entry. In contrast, the economy had no statistically significant employment change in occupations that typically require postsecondary education for entry. During the recovery, the economy gained jobs in almost all the typical entry-level education categories. By May 2016, employment exceeded May 2007 levels for occupations that typically require no formal educational credential for entry and occupations that typically require postsecondary education. However, employment in occupations that typically require a high school diploma or the equivalent for entry remained nearly 1.3 million lower than in May 2007. This trend is projected to continue. From 2014 to 2024, occupations that typically require a high school diploma for entry are projected to grow more slowly than average, causing a further employment shift away from these occupations and toward occupations that typically require postsecondary education.

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From December 2007 to June 2009, the U.S. economy experienced the longest economic contraction since the Great Depression.[1] Approximately 8.7 million jobs were lost over the course of the business cycle, and the unemployment rate rose from 4.4 percent to 10.0 percent.[2] However, not all industries and occupations were equally affected by the downturn. Manufacturing and construction, which have high concentrations of occupations that typically require a high school diploma or the equivalent for entry, had large job losses. On the other hand, healthcare and educational services, which have high concentrations of occupations that typically require postsecondary education for entry, performed relatively well.

This article uses Occupational Employment Statistics (OES) data to examine recent employment trends by typical entry-level education requirement (hereafter in this article referred to as “entry education”). Following a brief explanation of the methodology, the article provides an overview of May 2016 national employment by entry education. The next section examines national job gains and losses by entry education from May 2007 to

May 2016 and for two subperiods, May 2007–May 2010 and May 2010–May 2016. This is followed by an analysis of employment trends by education category and industry over the same periods. The article concludes with a brief summary of 2014–24 employment projections by entry education.

Entry education and methodology

In the data constructed for this article, each occupation was assigned to one of eight categories used by the BLS Employment Projections program. These categories represent the typical entry-level education requirement for that occupation. The entry education for an occupation may differ from the education levels of some workers employed in that occupation. As a result, the employment data discussed in this article do not provide numeric estimates for changes in the demand for workers with a given level of education, nor do they reflect changes in the educational attainment of the workforce. See the technical appendix at the end of this article for more information.

We produced the estimates for May 2007 and May 2010 by assigning the most recent entry education categories—those from 2014—to the OES data for those years. Holding the education category assignments constant allows the analysis to focus on the types of occupations that gained or lost jobs over the analysis period rather than on changes to the entry education for individual occupations.

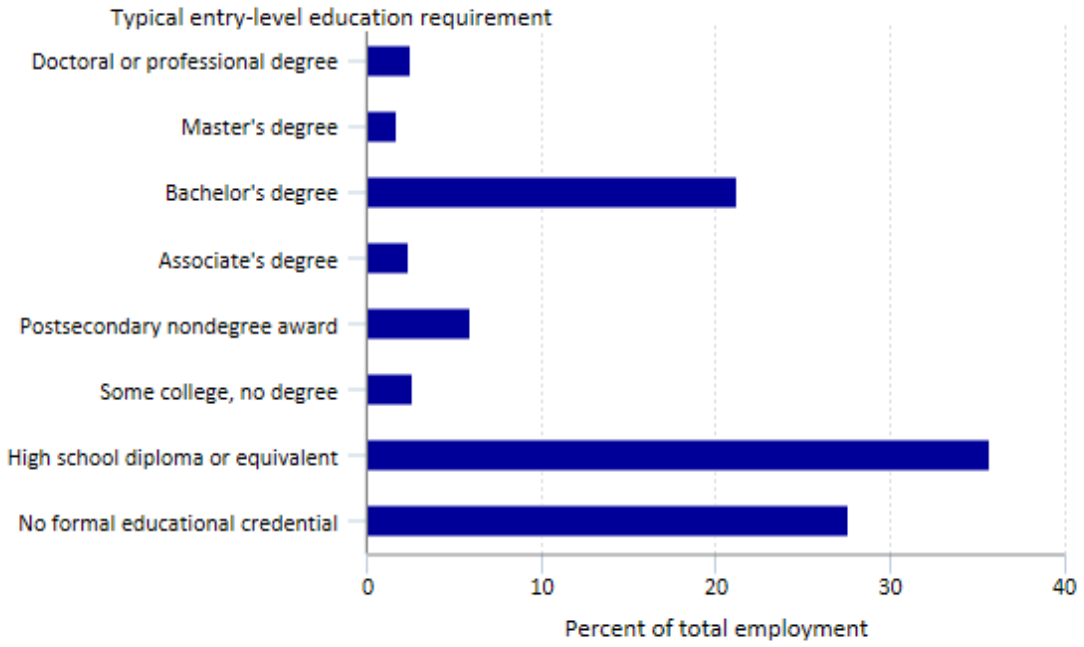
From May 2010 to May 2012, the OES program implemented a revised version of the federal Standard Occupational Classification (SOC) system. In the May 2007 and May 2010 data, occupations affected by the 2010 revision were assigned to the same entry education category as the most closely corresponding occupation in the revised 2010 SOC.

Challenges in using OES data for time series analysis include the OES 3-year sample design and changes to the occupational classification system, industry classification system, geographic area definitions, and OES methodology. However, because the data analyzed in this article are separated by at least 3 years, are presented at an aggregated level, and show strong trends, general conclusions can be drawn from them.

May 2016 employment by entry education

May 2016 employment by entry education is shown in figure 1. Nearly 28 percent of May 2016 employment was in occupations that typically require no formal educational credential for entry. This education category includes the two largest occupations: retail salespersons and cashiers. Other occupations that typically require no formal educational credential for entry include janitors, maids and housekeeping cleaners, stock clerks and order fillers, personal care aides, landscaping and groundskeeping workers, and most food preparation and serving related occupations.

Figure 1. In May 2016, a high school diploma was still the most common typical entry-level education requirement



Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics program.

Another 36 percent of employment was in occupations that typically require a high school diploma or the equivalent, such as a General Education Development credential (GED), for entry. This education category includes many occupations within the office and administrative support; production; construction; installation, maintenance, and repair; and protective service groups. Examples of specific occupations that typically require a high school diploma or the equivalent for entry include customer service representatives, team assemblers, carpenters, general maintenance and repair workers, and security guards.

The remaining 36.5 percent of employment was in occupations that typically require postsecondary education for entry, with a bachelor's degree being the most common entry education (21.3 percent of employment). Occupations that typically require a bachelor's degree for entry include teachers at the kindergarten through secondary levels, as well as many management, business and financial operations, computer, and engineering occupations.

Occupations that typically require some college but no degree for entry made up 2.6 percent of employment. This education category contains only six occupations, with the two largest—teacher assistants and bookkeeping, accounting, and auditing clerks—making up four-fifths of the category's total employment.

Occupations that typically require a postsecondary nondegree award, such as a certificate, for entry made up 6.0 percent of employment. Examples of occupations in this category are heavy and tractor-trailer truck drivers, nursing assistants, licensed practical and licensed vocational nurses, and automotive service technicians and mechanics.

Occupations that typically require an associate's degree for entry include preschool teachers, except special education; paralegals and legal assistants; computer network support specialists; and several types of engineering technicians and healthcare technicians and technologists. This education category made up 2.4 percent of May 2016 employment.

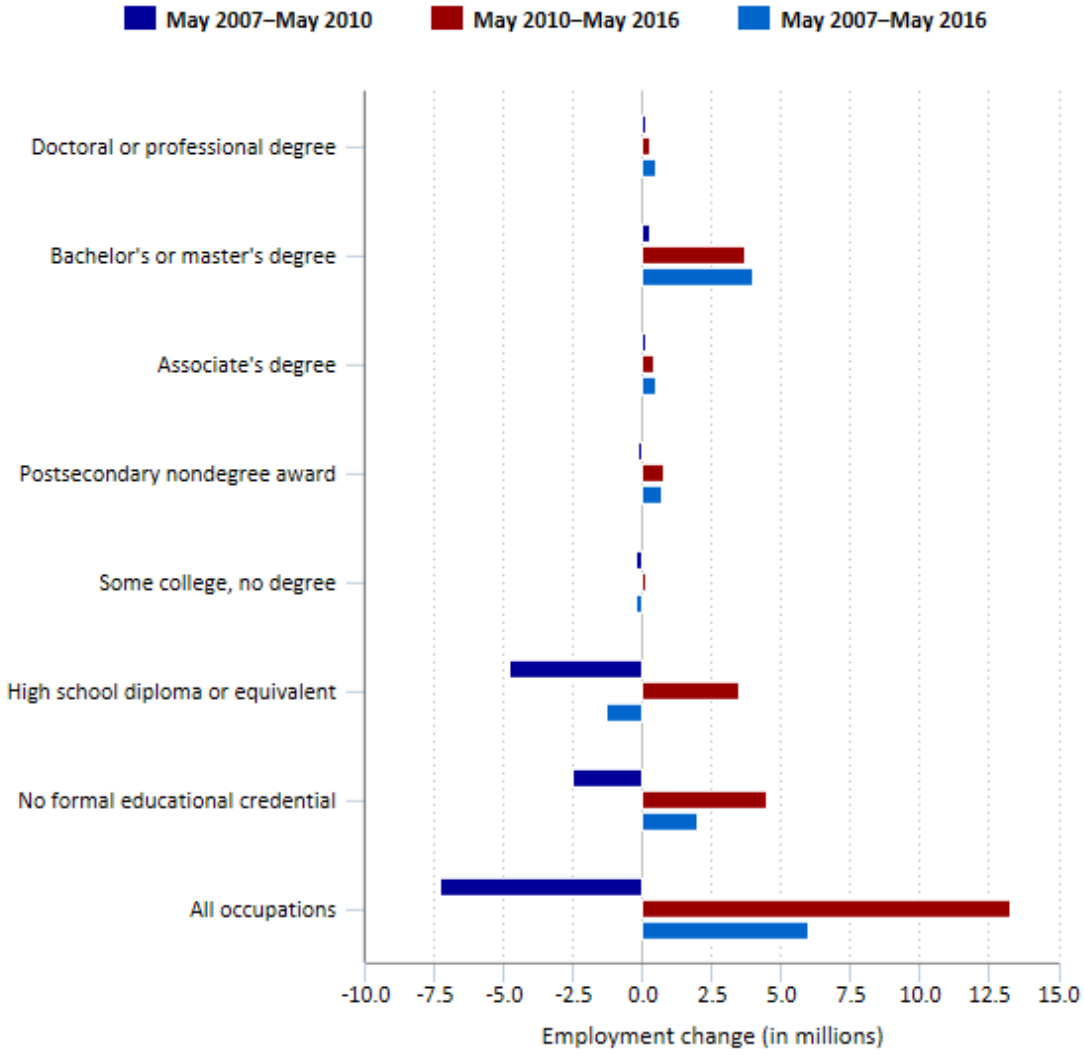
The two remaining education categories—master's degree and doctoral or professional degree—made up 1.7 percent and 2.5 percent of May 2016 employment, respectively. Occupations that typically require a master's degree for entry include several social and community service occupations, such as healthcare social workers and mental health counselors. Nurse practitioners, elementary and secondary school education administrators, librarians, and occupational therapists are also in this category. Lawyers, pharmacists, physicians and dentists, and most postsecondary teaching occupations are among the occupations that typically require a doctoral or professional degree for entry.

National employment trends by entry education

As noted earlier, the United States experienced an 18-month economic contraction beginning in December 2007, before entering a period of recovery beginning in June 2009.[3] This section of the article focuses on national employment trends by entry education from May 2007 to May 2016 and for two subperiods, the 3 years from May 2007 to May 2010 and the 6 years from May 2010 to May 2016. These subperiods were chosen to approximate the periods of recession and recovery while keeping the comparison points at least 3 years apart in order to avoid comparing OES estimates that share the same underlying survey data.

From May 2007 to May 2010, U.S. employment decreased by almost 7.3 million jobs. (See figure 2.) Over 4.8 million jobs were lost in occupations that typically require a high school diploma or the equivalent for entry.[4] This loss represents an employment decrease of 9.4 percent for these occupations, compared with a 5.4-percent employment decrease for all occupations combined. Employment fell by over 2.5 million, or 6.8 percent, in occupations that typically require no formal educational credential for entry. Among occupations typically requiring postsecondary education for entry, only the two categories with the lowest entry education levels—postsecondary nondegree award and some college, no degree—lost jobs during this period.

Figure 2. Since 2007, occupations that typically require a bachelor's or master's degree gained 4.0 million jobs



Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics program.

As the economic recovery progressed, the United States gained 13.3 million jobs from May 2010 to May 2016. (See figure 2.) During this period, employment grew in all education categories except some college, no degree. Employment increased by over 3.5 million in occupations that typically require a high school diploma or the equivalent for entry. This increase represents 7.6-percent growth, compared with 10.5-percent growth for all occupations combined. Employment in occupations that typically require no formal educational credential for entry increased by 4.5 million, or 13.1 percent.

Except for occupations with an entry education level of some college, no degree, employment increased from May 2010 to May 2016 for all the postsecondary education categories. Much of the increase—over 3.7 million jobs—was in occupations that typically require a bachelor’s or master’s degree for entry. Percentage increases

ranged from 10 percent for occupations typically requiring a postsecondary nondegree award for entry to 15 percent for occupations typically requiring an associate's degree.

Over the full 9-year period from May 2007 to May 2016, the U.S. economy gained about 6 million jobs, an increase of 4.5 percent. (See figure 2.) Only two education categories lost jobs over this period. Almost 1.3 million jobs were lost in occupations that typically require a high school diploma or the equivalent for entry, a decrease of 2.5 percent. Among occupations that typically require postsecondary education for entry, the only category that lost jobs from May 2007 to May 2016 had one of the lower entry education levels: some college, no degree.

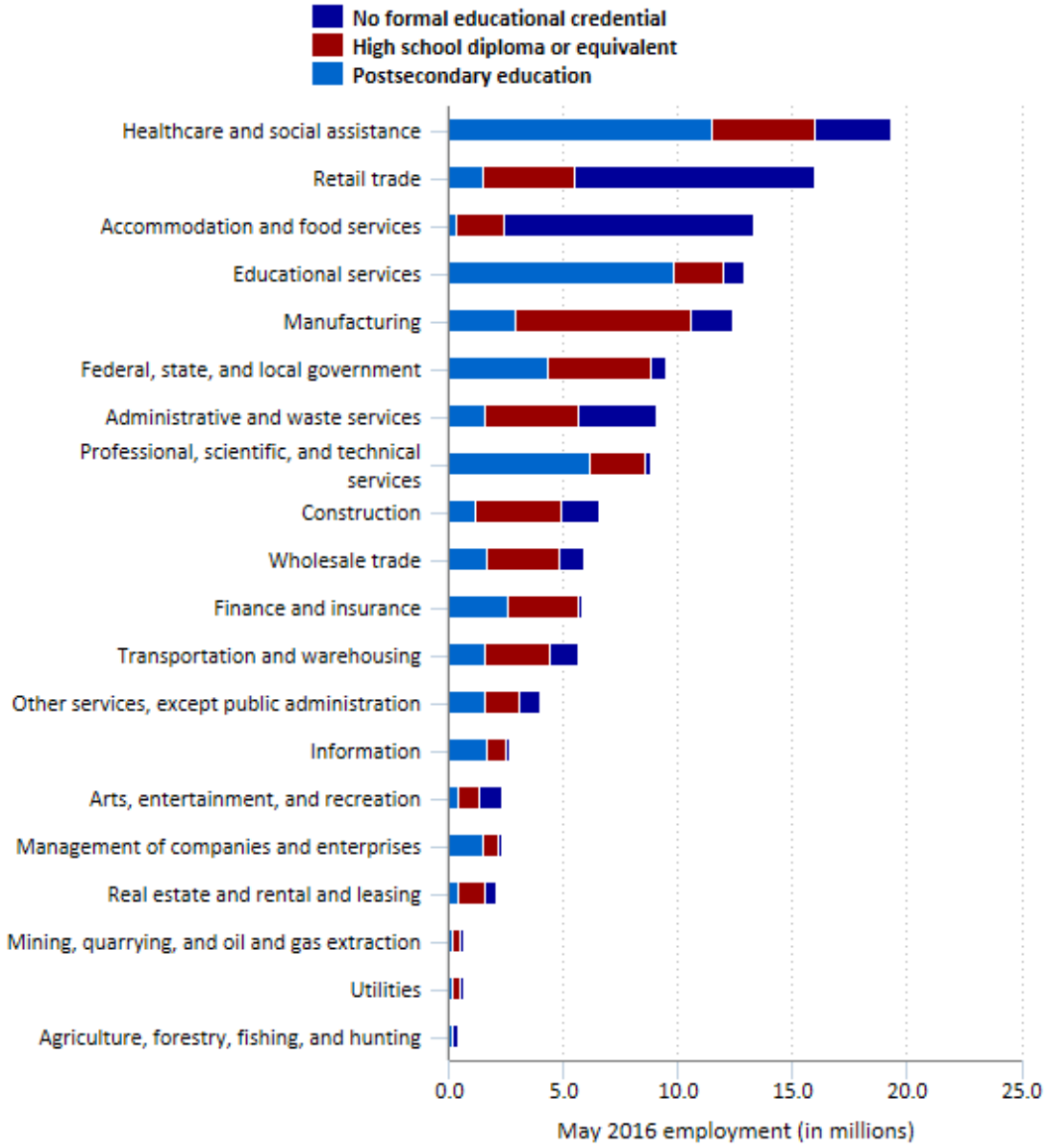
From May 2007 to May 2016, 2 million jobs were gained in occupations that typically require no formal educational credential for entry, a 5.4-percent increase. Employment also increased in all the postsecondary education categories except some college, no degree, including 4 million jobs gained in occupations that typically require a bachelor's or master's degree for entry. In percentage terms, employment gains ranged from 8.4 percent for occupations typically requiring a postsecondary nondegree award for entry to 15.6 percent for occupations typically requiring an associate's degree.

The result of these employment changes was to shift the composition of U.S. employment toward occupations with higher entry education. From May 2007 to May 2016, the share of U.S. employment in occupations typically requiring a high school diploma or equivalent for entry fell by nearly 2.6 percentage points, from over 38.3 percent to slightly less than 35.8 percent. Over the same period, the share of employment in occupations typically requiring postsecondary education for entry rose by 2.3 percentage points, from 34.2 to 36.5 percent. Occupations that typically require a bachelor's or master's degree for entry represented 21.1 percent of employment in May 2007 but 23.0 percent of employment in May 2016.

Employment trends by entry education and industry sector

Because industries vary in their occupational composition, employment trends by entry education are closely related to the economic performance of different industries over the course of the business cycle. May 2016 employment by industry sector and entry education is shown in figure 3. For simplicity, the analysis below uses a three-category version of entry education, with all the postsecondary education designations combined into a single category.

Figure 3. Healthcare and social assistance and educational services accounted for 42 percent of all jobs in occupations that typically require postsecondary education for entry



Note: Data for federal, state, and local government exclude state and local government schools and hospitals, which are included in the educational services and healthcare and social assistance sectors, respectively.
Source: U.S. Bureau of Labor Statistics.

Employment composition by entry education varies considerably across industry sectors. For example, 82.1 percent of May 2016 employment in the accommodation and food services sector was in occupations that typically require no formal educational credential for entry. This education category includes most food preparation and serving related occupations. Only 2.0 percent of employment in the accommodation and food services sector was in occupations that typically require postsecondary education for entry. Retail trade (65.5

percent) and agriculture, forestry, fishing, and hunting (70.9 percent) also had high concentrations of occupations that typically require no formal educational credential for entry.

In contrast, three-quarters of May 2016 employment in educational services was in occupations that require postsecondary education for entry. Included were kindergarten through secondary school teachers, who typically must have a bachelor's degree for entry, and teacher assistants, who typically are required to have some college but no degree. Other sectors with the majority of sector employment in occupations that typically require postsecondary education for entry included professional, scientific, and technical services; management of companies and enterprises; information; and healthcare and social assistance.

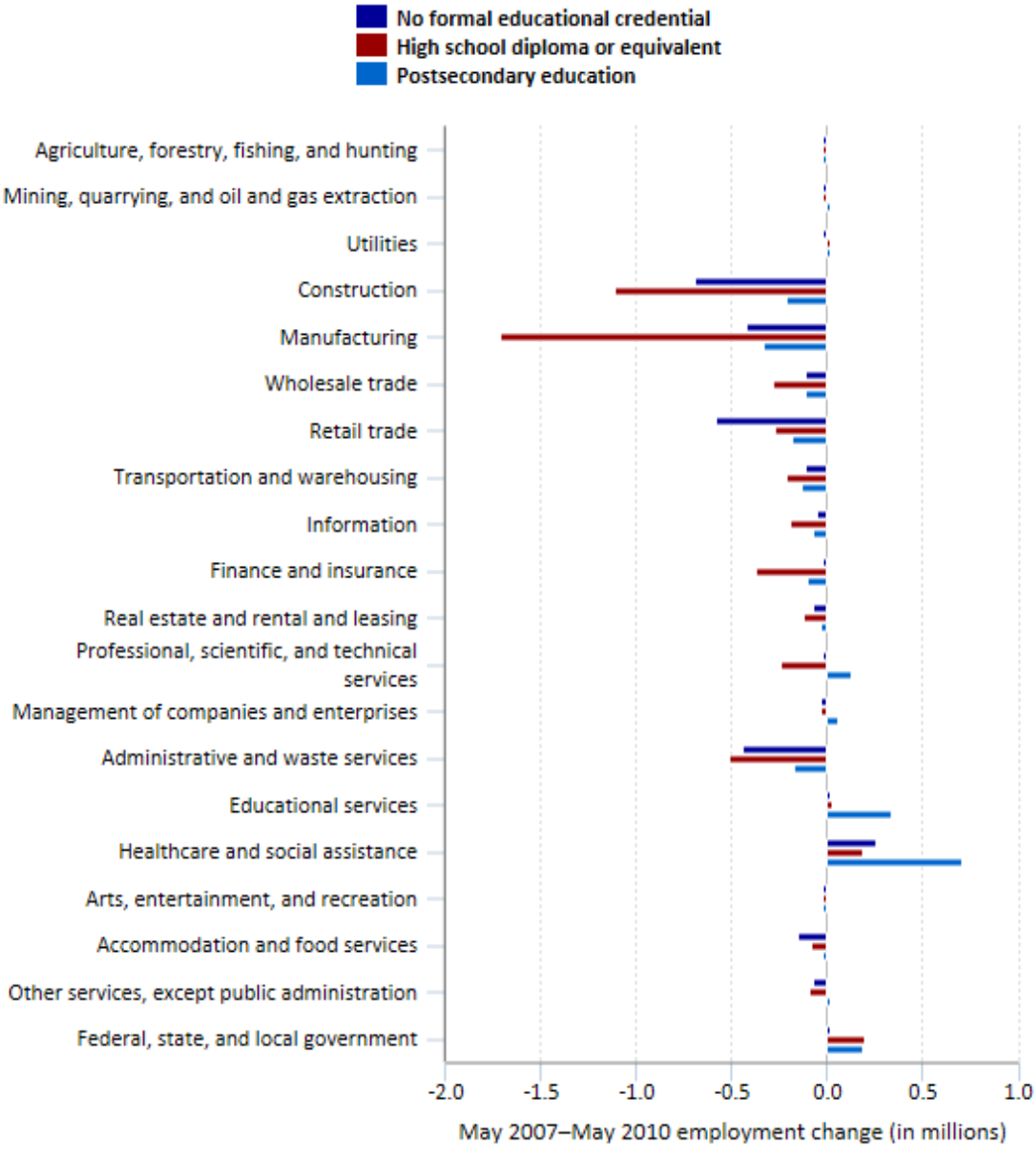
Sixty-two percent of manufacturing employment was in occupations that typically require high school or the equivalent for entry. Sectors with relatively high shares of employment in this education category also included utilities, real estate and rental and leasing, and construction.

Employment trends by industry sector, May 2007–May 2010

The May 2007 to May 2010 period was characterized by employment decreases that affected most education categories in most industries. Only one sector, healthcare and social assistance, had significant job gains in all three entry education categories during this period.[5] Federal, state, and local government (excluding state and local government schools and hospitals) was the only other sector with significant job gains among occupations that do not typically require postsecondary education for entry. Many sectors—including manufacturing, construction, retail trade, and transportation and warehousing—lost jobs in all three education categories.

Healthcare and social assistance was the only sector with significant employment increases for occupations that typically require no formal educational credential for entry, gaining over 255,000 jobs in this education category. (See figure 4.) All other sectors either lost jobs or had no significant employment change for occupations in this category. Sectors with the largest employment decreases in this education category included construction (−688,910); retail trade (−578,290); administrative and waste services, which includes the temporary help services industry (−436,980); and manufacturing (−423,530).

Figure 4. From May 2007 to May 2010, manufacturing and construction lost 2.8 million jobs in occupations that typically require a high school diploma or the equivalent for entry



Note: Data for federal, state, and local government exclude state and local government schools and hospitals, which are included in the educational services and healthcare and social assistance sectors, respectively.
Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics program.

Only two sectors had significant employment increases among occupations that typically require a high school diploma or the equivalent for entry: federal, state, and local government (197,570) and healthcare and social assistance (190,080). (See figure 4.) The remaining 18 sectors either lost jobs or had no significant employment change in this category. Manufacturing lost over 1.7 million jobs in occupations that typically require a high school diploma or the equivalent for entry, and construction lost over 1.1 million jobs in this category.

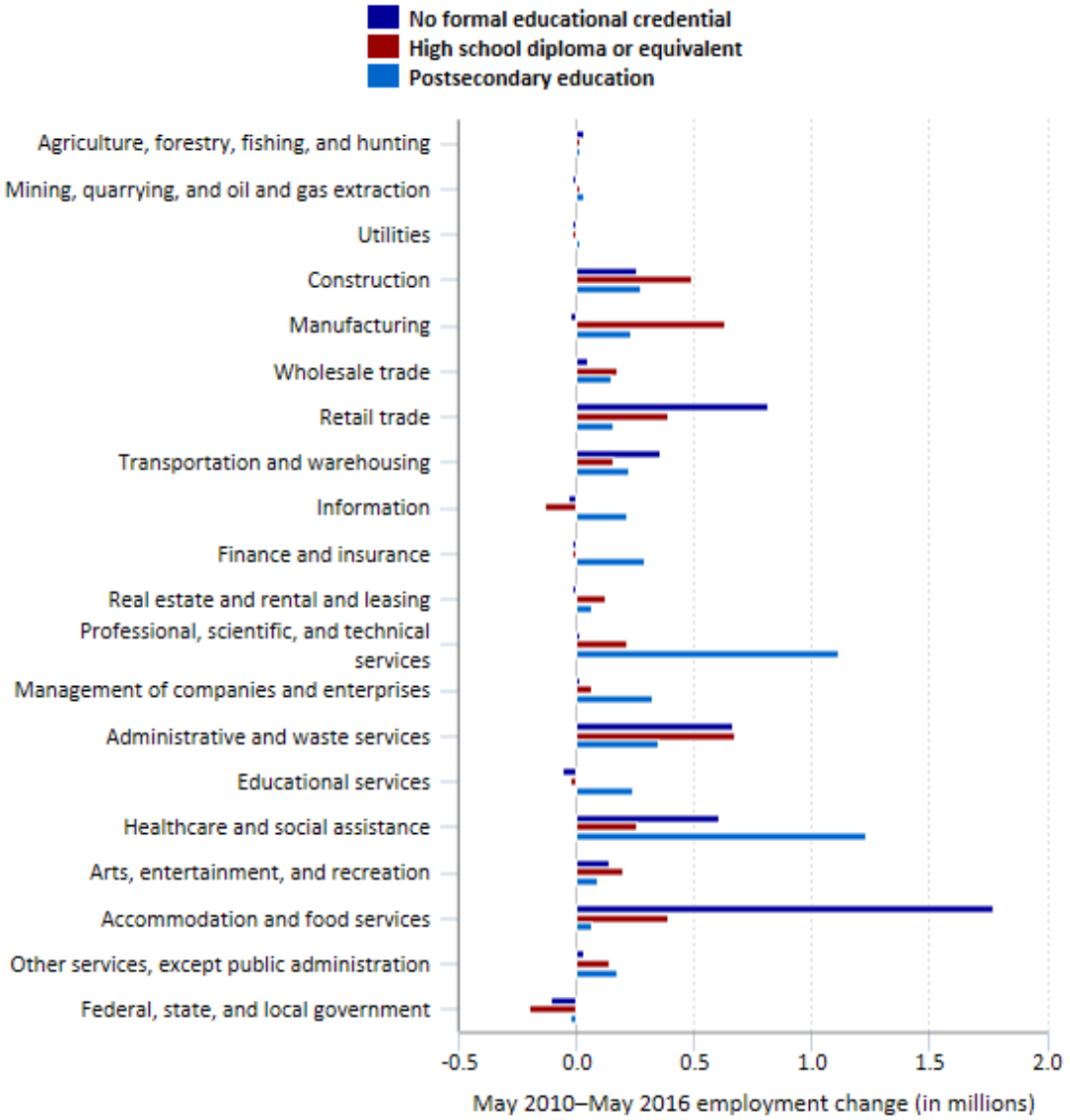
Unlike occupations that typically require high school or have no formal educational credential for entry, occupations that typically require postsecondary education for entry had no significant employment change from May 2007 to May 2010. (See figure 4.) However, the relatively strong performance of this education category during the recession was driven largely by jobs gains in a few sectors: healthcare and social assistance, which gained over 700,000 jobs in this category; educational services (340,710); federal, state, and local government (191,350); professional, scientific, and technical services (128,990); and management of companies and enterprises (59,970). Occupations that typically require postsecondary education for entry had either no significant employment change or job losses in 15 out of 20 sectors, including manufacturing (−333,600), construction (−212,780), and retail trade (−175,060).

Employment trends by industry sector, May 2010–May 2016

As the economy moved into recovery, each of the three education categories gained jobs in most sectors. However, although occupations that typically require postsecondary education for entry gained jobs in almost every sector, occupations with lower entry education requirements gained jobs in some sectors but not in others. Federal, state, and local government was the only sector that had significant job losses in all three education categories from May 2010 to May 2016.[6] Eleven out of twenty sectors had significant employment increases in all three education categories, including accommodation and food services, healthcare and social assistance, and administrative and waste services.

From May 2010 to May 2016, 11 out of 20 sectors had employment increases in occupations that typically require no formal educational credential for entry. (See figure 5.) Accommodation and food services gained nearly 1.8 million jobs in this education category. Retail trade (817,560), administrative and waste services (665,730), and healthcare and social assistance (608,980) also were among the sectors with the largest employment increases in this category.

Figure 5. From May 2010 to May 2016, retail trade and accommodation and food services gained 2.6 million jobs in occupations that typically require no formal educational credential for entry



Note: May 2010–May 2016 sector employment changes reflect changes to the industry classification of local government gambling establishments and casino hotels. These establishments were previously classified in federal, state, and local government but, beginning with the May 2014 OES estimates, were moved to the arts, entertainment, and recreation and accommodation and food services sectors. Local government gambling establishments had May 2016 employment of 129,020 in the arts, entertainment, and recreation sector and 69,030 in the accommodation and food services sector. Data for federal, state, and local government exclude state and local government schools and hospitals, which are included in the educational services and healthcare and social assistance sectors, respectively.
Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics program.

Employment increased significantly in 14 of 20 sectors for occupations that typically require a high school diploma or the equivalent for entry. (See figure 5.) Sectors with the largest job gains in this education category included administrative and waste services (671,280), manufacturing (631,600), construction (493,580), and accommodation and food services (394,240). Sectors that lost jobs in occupations that typically require high

school or the equivalent for entry included federal, state, and local government (−203,140); information (−130,010); and utilities (−14,170).

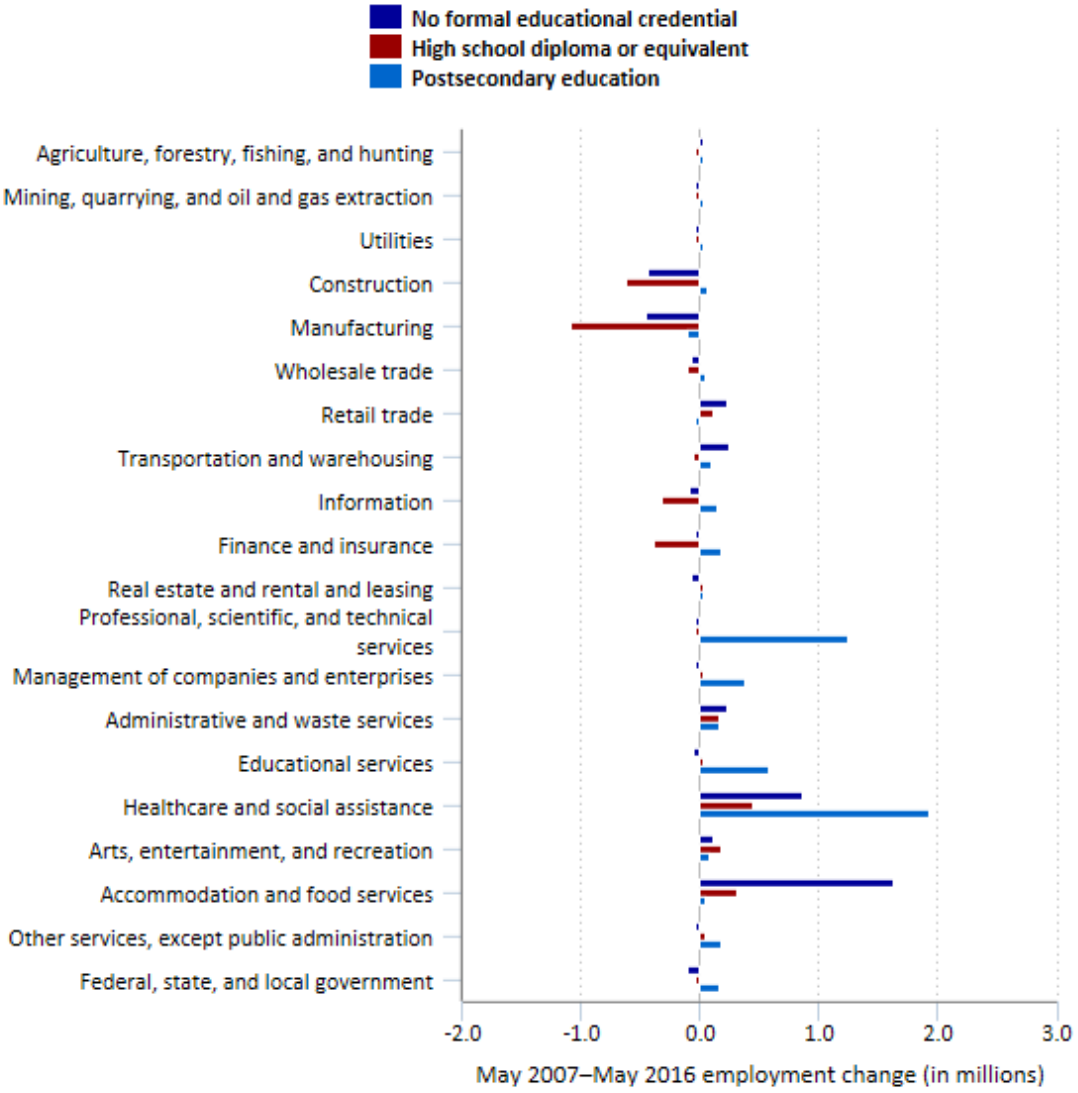
Occupations that typically require postsecondary education for entry showed the most consistent employment trend across sectors, gaining jobs in every sector except federal, state, and local government. (See figure 5.) Sectors with the largest job gains in this education category included healthcare and social assistance (1,233,350) and professional, scientific, and technical services (1,118,690).

Employment trends by industry sector, May 2007–May 2016

Over the full May 2007–May 2016 period, most sectors had employment increases in occupations that typically require postsecondary education for entry. However, the majority of sectors either lost jobs or had no significant employment change for occupations that typically require high school or no formal educational credential for entry. Although some sectors either gained jobs in all three education categories or lost jobs in all three categories, several sectors gained employment in occupations that typically require postsecondary education for entry while losing employment in one or both of the categories with lower entry education.

Seven out of twenty sectors had employment increases from May 2007 to May 2016 in occupations that typically require no formal educational credential for entry. (See figure 6.) Sectors with the largest employment increases in this category included accommodation and food services (1.6 million), healthcare and social assistance (864,440), transportation and warehousing (247,110), and retail trade (239,270). The remaining 13 sectors had either employment decreases or no significant employment change for occupations in this category, including manufacturing (−444,690) and construction (−433,270).

Figure 6. From May 2007 to May 2016, healthcare and social assistance and professional, scientific, and technical services gained 3.2 million jobs in occupations that typically require postsecondary education for entry



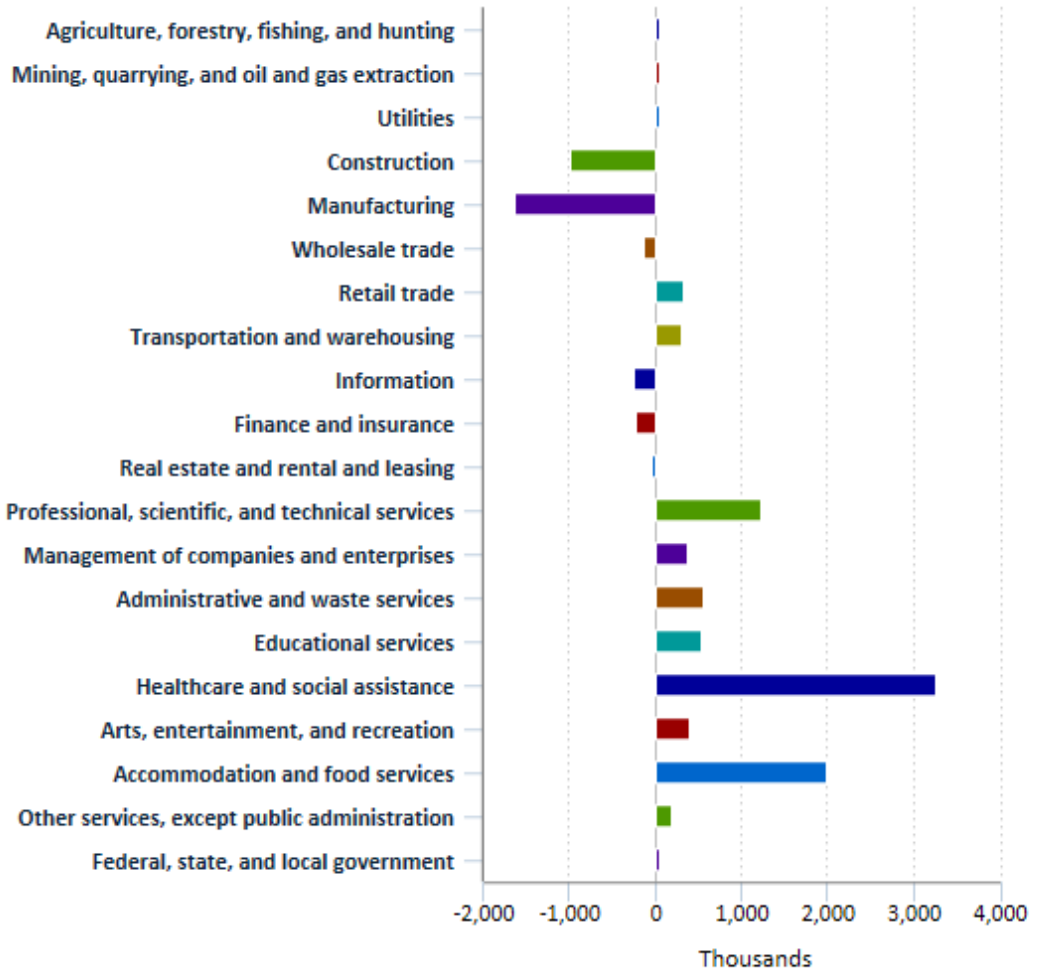
Note: May 2007–May 2016 sector employment changes reflect changes to the industry classification of local government gambling establishments and casino hotels. These establishments were previously classified in federal, state, and local government but, beginning with the May 2014 OES estimates, were moved to the arts, entertainment, and recreation and accommodation and food services sectors. Local government gambling establishments had May 2016 employment of 129,020 in the arts, entertainment, and recreation sector and 69,030 in the accommodation and food services sector. Data for federal, state, and local government exclude state and local government schools and hospitals, which are included in the educational services and healthcare and social assistance sectors, respectively.
Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics program.

Seven out of twenty industry sectors had significant employment increases for occupations that typically require a high school diploma or the equivalent for entry. (See figure 6.) Sectors with employment increases in this category included healthcare and social assistance (446,430), accommodation and food services (311,050), and arts, entertainment, and recreation (188,630). The remaining 13 sectors either lost jobs or had no significant employment change for occupations in this category. Manufacturing lost nearly 1.1 million jobs in occupations

with high school or the equivalent entry education, and construction lost over 613,000 jobs in this category. Finance and insurance (−379,840), information (−321,930), and wholesale trade (−108,250) also had among the largest employment decreases for occupations that typically require high school or the equivalent for entry.

Manufacturing and retail trade were the only two sectors that had employment decreases for occupations that typically require postsecondary education for entry. (See figure 6.) Manufacturing was the only sector that lost jobs in all three education categories. (See figure 7.) In addition to large employment decreases in the two lower education categories, this sector lost 100,750 jobs in occupations that typically require some type of postsecondary education for entry. Retail trade lost 20,150 jobs in occupations that typically require postsecondary education for entry, but gained jobs in both the no formal educational credential (239,270) and high school diploma or equivalent (120,700) categories.

Figure 7. From May 2007 to May 2016, healthcare and social assistance gained over 1.9 million jobs in occupations that typically require postsecondary education for entry



Note: Because of rounding, employment changes for entry education categories within a sector may not sum to sector totals. May 2007–May 2016 sector employment changes reflect changes to the industry classification of local government gambling establishments and casino hotels. These establishments were previously classified in federal, state, and local government but, beginning with the May 2014 OES estimates, were moved to the arts, entertainment, and recreation and accommodation and food services sectors. Local government gambling establishments had May 2016 employment of 129,020 in the arts, entertainment, and recreation sector and 69,030 in the accommodation and food services sector. Data for federal, state, and local government exclude state and local government schools and hospitals, which are included in the educational services and healthcare and social assistance sectors, respectively.
Source: U.S. Bureau of Labor Statistics.

Seventeen of the twenty sectors had employment increases for occupations that typically require postsecondary education for entry, including healthcare and social assistance (over 1.9 million) and professional, scientific, and technical services (over 1.2 million). (Agriculture, forestry, fishing, and hunting had no significant employment change in this category.)

Four sectors had significant employment gains in all three education categories from May 2007 to May 2016. The healthcare and social assistance sector gained over 1.9 million jobs in occupations that typically require postsecondary education for entry, 864,440 jobs in occupations that typically require no formal educational

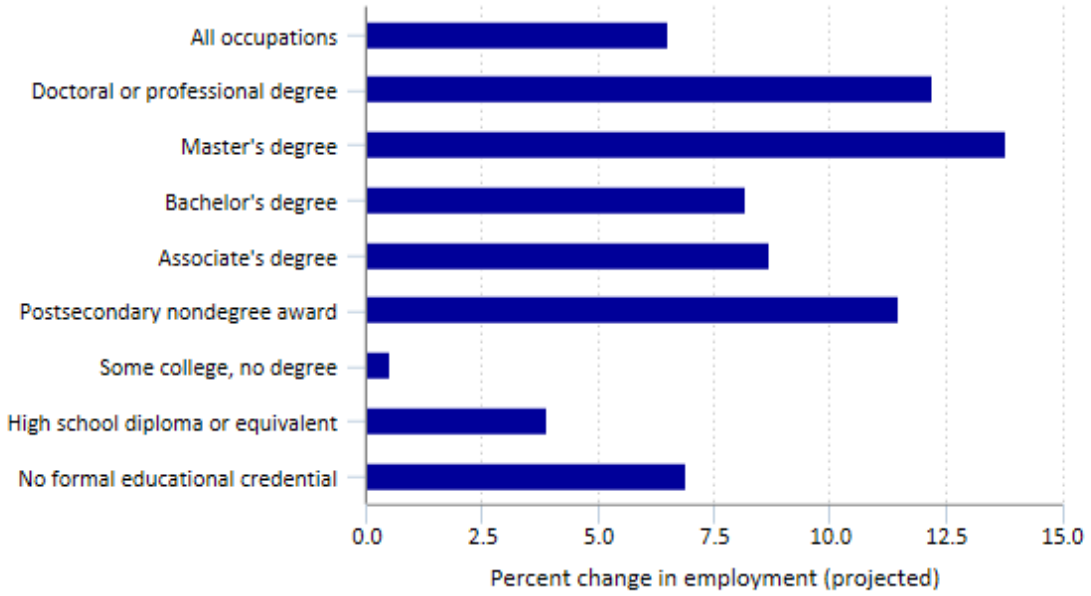
credential for entry, and 446,430 jobs in occupations with entry education of a high school diploma or the equivalent. Employment gains in accommodation and food services were concentrated in occupations that typically require no formal educational credential for entry; these gains reflected the occupational composition of this sector. However, this sector also gained 311,050 jobs in occupations that typically require high school or the equivalent for entry and 56,560 jobs in occupations that require postsecondary entry education. Administrative and waste services and arts, entertainment, and recreation also had employment increases in all three education categories.

Several sectors had employment increases in the postsecondary category but either lost employment or had no significant employment change in one or both of the other education categories. This pattern suggests a shift in occupational composition toward occupations with higher entry education. For example, the professional, scientific, and technical services sector gained over 1.2 million jobs in occupations that typically require postsecondary education for entry, but had no significant employment change in the other two education categories. Other sectors showing a similar pattern included educational services, finance and insurance, and information.

Employment projections by entry education

During the May 2007–May 2016 period, U.S. employment shifted away from occupations with high school diploma or the equivalent entry education and toward occupations that typically require postsecondary education for entry. But is this trend expected to continue? Some insight can be gained from the BLS Employment Projections program's most recent 10-year industry and occupational employment projections covering the period from 2014 to 2024. Employment projections by entry education are shown in figure 8. Projections are based on 2014 entry education. BLS does not project education requirements, and it is possible that entry education for a given occupation will change in the future.[7]

Figure 8. Master's degree is projected to be the fastest growing typical entry-level education category during the 2014–24 period



Note: The growth rates shown in this table include projected growth in all jobs from 2014 to 2024, not just entry-level jobs. Entry-level education reflects 2014 requirements. BLS does not project education requirements.
Source: U.S. Bureau of Labor Statistics, Employment Projections program.

Employment for all occupations combined is projected to increase by 6.5 percent from 2014 to 2024. However, projected employment change varies across education categories. Occupations with entry education of at least a postsecondary nondegree award are projected to grow more rapidly than occupations with lower entry education.

Employment in occupations that typically have no formal educational credential for entry is projected to increase by 6.9 percent from 2014 to 2024, similar to the 6.5-percent projected increase for all occupations combined. Occupations that typically require a high school diploma or the equivalent for entry are projected to grow by 3.9 percent over the same period. Occupations that typically require some college, but no degree are projected to grow by less than 1 percent.

All the entry education categories of postsecondary nondegree award or higher are projected to grow more rapidly than the overall rate of 6.5 percent. Employment in the largest postsecondary education category—occupations that typically require a bachelor's degree for entry—is projected to grow by 8.2 percent. Employment in occupations that typically require an associate's degree for entry is projected to grow by 8.7 percent. Occupations that typically require a postsecondary nondegree award for entry are projected to grow by 11.5 percent. Occupations with entry education of a doctoral or professional degree or a master's degree are projected to grow by 12.2 and 13.8 percent, respectively.

Employment projections by entry education are related to differences in projected growth rates by industry sector and to the large size of some occupations classified in the high school or no formal educational credential

categories. For example, manufacturing, which lost over 2.1 million jobs from 2004 to 2014, is projected to lose 814,100 more jobs from 2014 to 2024. This projected job loss would tend to reduce demand for occupations that typically require a high school diploma or the equivalent for entry, although this decline would be partially offset by projected employment growth in the construction sector. In contrast to the projections for occupations in the high school or no formal educational credential categories, strong projected growth in healthcare and social assistance and professional, scientific, and technical services would tend to increase demand for occupations that typically require postsecondary education for entry, which are prevalent in those sectors.

If employment follows these projections from 2014 to 2024, the overall effect will be to continue the trends observed from May 2007 to May 2016. Specifically, occupations that typically require high school or the equivalent for entry will continue to fall as a share of U.S. employment, while the share of occupations that typically require postsecondary education for entry will rise.

Conclusion

During the May 2007–May 2010 period, the U.S. economy lost over 4.8 million jobs in occupations with entry education of a high school diploma or the equivalent. In addition, the economy lost over 2.5 million jobs in occupations that typically require no formal educational credential for entry. By May 2016, employment levels had recovered for occupations that typically require no formal educational credential for entry, exceeding May 2007 employment for this education category by nearly 2 million jobs. However, employment in occupations with entry education of a high school diploma or the equivalent remained almost 1.3 million below May 2007 levels, affected by employment trends in manufacturing and construction, in which occupations in this category are prevalent.

Over the same period, employment in occupations that typically require postsecondary education for entry increased by over 5.3 million. Every postsecondary education category gained jobs except some college, no degree, which had one of the lowest postsecondary education requirements. Employment growth in occupations that typically require postsecondary education for entry was related to job growth in sectors in which these occupations are common, such as healthcare and social assistance, educational services, and professional, scientific, and technical services. In addition, some industry sectors have adjusted their employment composition from May 2007 to May 2016 toward occupations that typically require postsecondary education for entry and away from occupations with lower entry education.

As a result of these employment trends, occupations that typically require a high school diploma or the equivalent for entry fell as a share of U.S. employment by nearly 2.6 percentage points from May 2007 to May 2016. Over the same period, the share of occupations that typically require postsecondary education for entry rose by 2.3 percentage points. BLS employment projections suggest that this trend will continue to 2024. Occupations that typically require a high school diploma or the equivalent for entry are projected to grow more slowly than occupations that typically require a postsecondary nondegree award or higher.

Technical appendix

This article is based on a special tabulation of Occupational Employment Statistics (OES) data, grouped by typical entry-level education requirements assigned to each occupation by the BLS Employment Projections

(EP) program. OES estimates are published annually with a May reference date and measure occupational employment and wage rates for over 800 occupations for the nation, states, and nearly 600 metropolitan and nonmetropolitan areas and for more than 430 industry classifications at the national level. The survey covers wage and salary workers in nonfarm establishments and does not include the self-employed and owners, partners, and proprietors of unincorporated businesses. More information about the OES survey is available at www.bls.gov/oes/oes_ques.htm and in the technical documentation at www.bls.gov/oes/oes_doc.htm. Publicly available OES data are available at www.bls.gov/oes/.

The EP program develops industry and occupational employment projections at the national level for over 800 occupations and over 300 industries. The projections are released every 2 years and are 10-year projections, with the most recent projections covering the period 2014 to 2024. More information about EP and detailed projections data are available at www.bls.gov/emp.

The EP program assigns each detailed occupation to one of eight designations representing the typical entry-level education requirement for that occupation. These typical entry-level education requirements are part of a three-category system of designations that represents the most typical path for entering and becoming proficient in the occupation. (The other two categories are for on-the-job training and work experience in a related occupation and are not discussed in this article.) Definitions of the education and training designations and more information on how they were developed are available from the EP program.

These typical entry-level education requirements are conceptually different from workers' educational attainment, and for a variety of reasons, the typical entry-level requirement for a given occupation may differ from the education levels of workers employed in that occupation or from the level of education required by an employer. The OES employment data include both entry-level and experienced workers and cannot differentiate between them. Applying the entry-level education designation to the total OES employment for an occupation therefore includes experienced as well as entry-level workers in aggregations of employment by entry-level education. The education levels of experienced workers may be different from those of entry-level workers, either because workers tend to get more education as they remain in the occupation or because entry-level requirements have changed over time. Also, the typical entry-level education requirement represents a single pathway for entry, but individual jobs in an occupation may have different requirements, and individual workers may follow a variety of paths to entry. Finally, workers may have education levels that are not typical for their occupations. For example, nearly 21 percent of retail salespersons had a bachelor's degree in 2014–15, according to data from the American Community Survey.[8]

Because the system of education and training categories was not introduced until 2010 and was subsequently revised, we produced the estimates for May 2007 and May 2010 by assigning the most recent (2014) typical entry-level education categories to the OES data for those years. This procedure allows us to examine employment trends while we control for shifts caused by reassigning occupations from one education category to another.

From May 2010 to May 2012, the OES program implemented a revised version of the federal Standard Occupational Classification (SOC) system. As a result, the 3 years of data used in this analysis are based on three different occupational classification systems: the typical entry-level education requirements and the May

2016 OES data are based on the revised 2010 SOC, the May 2007 OES data are based on the 2000 SOC, and the May 2010 data used a transitional coding system that includes some OES-specific codes.

In the May 2010 and May 2007 data, occupations affected by the 2010 revision were assigned the typical entry-level education requirement associated with the most closely corresponding 2010 SOC occupation. In some cases, the revision did not affect the assigning of the most appropriate education category—if, for example, the changes involved splitting or combining occupations within the same education category. In other cases, changes in the occupational classification system affect the comparability of the education categories through time.

For example, as part of the SOC revision, three advanced practice nursing occupations were broken out of the registered nurses occupation: nurse practitioners, nurse anesthetists, and nurse midwives, all of which typically require a master's degree for entry. Employment in these advanced practice nursing occupations is relatively small: approximately 196,360 jobs combined in May 2016, compared with employment of nearly 2.9 million for registered nurses who are not advanced practice nurses. Therefore, the older version of the registered nurses occupation, which included advanced practice nurses, was assigned the typical entry-level education requirement associated with registered nurses who are not advanced practice nurses. As a result, the May 2016 data contain some advanced practice nurses in the master's degree category who would have been classified in the bachelor's degree category in the May 2007 and May 2010 data constructed for this article, a shift which would tend to overstate employment growth in occupations that typically require a master's degree for entry. For this reason, we combined the master's degree and bachelor's degree categories in order to analyze national employment trends by education category.

Employment changes by industry sector reflect changes to the industry classification of local government gambling establishments and casino hotels. These establishments were previously classified in federal, state, and local government but, beginning with the May 2014 OES estimates, were moved to the accommodation and food services sector (casino hotels) and the arts, entertainment, and recreation sector (other local government gambling establishments). Local government gambling establishments had May 2016 employment of 129,020 in the arts, entertainment, and recreation sector and 69,030 in the accommodation and food services sector.

In addition to the comparability issues discussed above, there are other challenges in using OES data to make comparisons through time. These include changes to the industry classification system, geographic definitions, and data collection and processing, as well as permanent features of the OES methodology. In particular, because each set of OES estimates is produced by pooling survey data collected over a 3-year period, the OES employment estimates represent a moving-average staffing pattern and may reflect sudden employment changes for specific occupations only gradually. More information on OES data and time series analysis is available in the OES Frequently Asked Question "Can OES data be used to compare employment and wages over time?" at www.bls.gov/oes/oes_ques.htm.

Because of the challenges involved in using OES data to analyze changes through time, the comparisons presented in the article are approximate and should be interpreted with caution.

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NOTES

1 Business cycle peak and trough dates are from the National Bureau of Economic Research (NBER) Business Cycle Dating Committee, www.nber.org/cycles.html.

2 National employment data are from the BLS Current Employment Statistics (CES) program, www.bls.gov/ces/. CES employment peaks and troughs differ from the NBER business cycle dates: CES seasonally adjusted employment peaked in January 2008 at 138.4 million and reached a trough of 129.7 million in February 2010, a difference of approximately 8.7 million jobs. Unemployment rate data are from the Current Population Survey, www.bls.gov/cps/. The seasonally adjusted unemployment rate fell to 4.4 percent four times before the beginning of the downturn—in October 2006, December 2006, March 2007, and May 2007—and reached 10.0 percent in October 2009, several months after the beginning of the recovery.

3 NBER Business Cycle Dating Committee, www.nber.org/cycles.html.

4 The employment changes discussed later in this article represent net employment increases or decreases for all occupations with the same entry education. Individual occupations within an education category may have had different employment trends from the category as a whole. Because a considerable proportion of growth in the master's degree category was caused by the creation of three new advanced practice nursing occupations as part of the 2010 SOC revision, the bachelor's and master's degree categories were combined for this analysis.

5 Wherever the word "significant" appears in this article, the change being discussed meets criteria for statistical significance.

6 Job losses in this sector reflect in part the reclassification of local government gambling establishments and casino hotels, which were moved to the arts, entertainment, and recreation and accommodation and food services sectors beginning with the May 2014 OES data.

7 For more information on 2014–24 occupational employment projections, see Andrew Hogan and Brian Roberts, "Occupational employment projections to 2024," *Monthly Labor Review*, December 2015, https://doi.org/10.21916/mlr.2015.49.

8 American Community Survey (ACS) Public Use Microdata, U.S. Department of Commerce, U.S. Census Bureau, 2014 and 2015. A table of ACS educational attainment data by detailed occupation is available from the BLS Employment Projections program at www.bls.gov/emp/ep_table_111.htm.

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