

Occupational changes during the 20th century

Professional, managerial, clerical, sales, and service workers (except private household service workers) grew from one-quarter to three-quarters of total employment between 1910 and 2000; laborers (except mine laborers), private household service workers, and farmers lost the most jobs over the period

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With occupation data from the 2000 census now available, it is an appropriate time to analyze occupational employment trends over the 20th century. The shift from a workforce composed mostly of manual workers to one comprising mostly white-collar and service workers is generally known. This article reveals just how radical that shift has been. It also shows that many of the projected employment changes over the 2004–14 period¹ are continuations of trends that began in the previous century.

The article analyzes changes in occupational staffing patterns—occupations and occupation groups as a percent of total employment in the economy—rather than numeric changes.² This methodology indexes employment growth to the average for all occupations over the period. Occupations and occupational groups growing faster than average appear as an increasing proportion of total employment, those growing as fast as average as a constant percent, and slower growing or declining ones as a declining percent.³ For clarity, however, numeric employment data also are given.

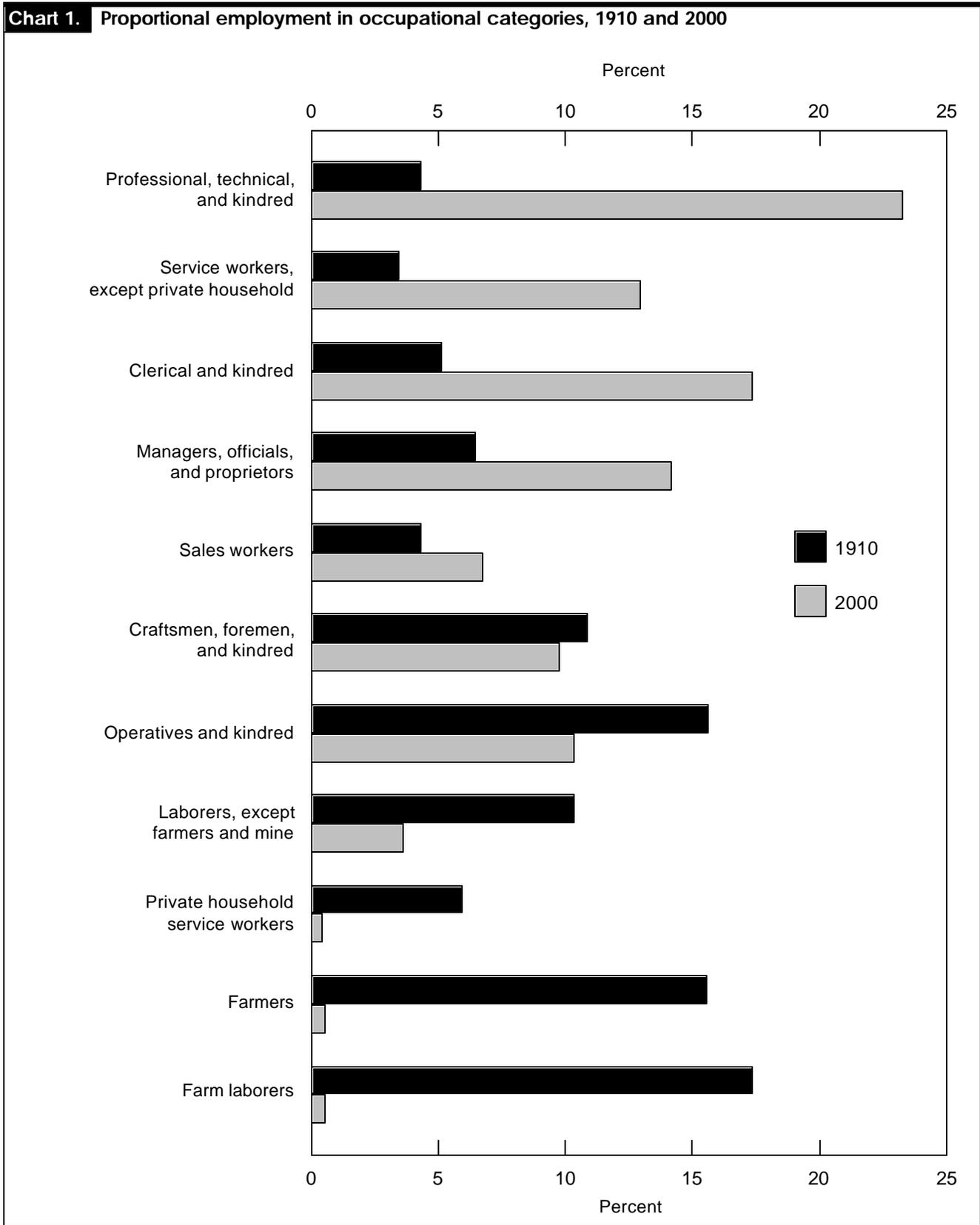
Data and methodology

Occupational data presented in this article are from decennial censuses, adjusted by the Integrated Public Use Microdata Series (IPUMS) from the University of Minnesota’s Minnesota

Population Center.⁴ Every census taken in the 20th century used a different system to classify occupations, so data between censuses are not necessarily comparable. IPUMS used the 1950 Index of Occupations and Industries to impose an occupational scheme on data from each census. Because of definitional changes and because some occupations in the 1950 index were components of broader occupations in other years, it was difficult to determine some decade-to-decade employment changes. That is, while the broad trends shown for larger occupation groups and many individual occupations are believed to be relatively accurate, some decade-to-decade changes may reflect data comparability problems between surveys rather than indicating actual changes in employment.⁵ Nevertheless, data estimates are shown to the closest thousand; readers should be aware that actual employment may have been somewhat different.

The 1950 census classified all workers into 269 occupation categories, hereafter referred to as occupations;⁶ the same census also gives employment estimates for each occupation. In its effort to create a consistent time series, IPUMS reduced the number of occupations to 230. The 1950 census arranged all occupations into 11 major groups, as shown in chart 1, but, with a few exceptions, no subgroups—all occupations were just listed alphabetically.⁷ To better analyze growth patterns within these 11 major groups, this article classifies the majority of occupations into subgroups, closely corresponding to 2000 Standard

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Occupational Classification (soc) major or minor groups.⁸

Some 1950 occupation and group names are gender specific or differ in other ways from those in current use, and their coverage of occupations also may differ. In addition, in 1950, some occupations were classified into major groups different from those they were classified into in 2000. For example, cashiers, judged a sales occupation in 2000, constituted a clerical occupation in 1950, and the category of farmers and farm managers, which formed a minor occupation group within management occupations in the 2000 census, was one of the 11 major occupation groups in the 1950 classification. Therefore, the 2000 employment levels shown in this article for certain occupations or occupation groups may not match the employment levels listed in the 2000 census for those same occupations or occupation groups.

The 1900 and 1930 data sets were unavailable from IPUMS at the time the research that led to this article was being carried out. Therefore, the time series begins with 1910 and covers eight additional data points: the year 1920 and the years 1940 through 2000. An employment status filter was applied to the 1940–2000 samples, eliminating those who were not actively employed. During that period, the census asked these people what the last occupation they held was if it was within the previous 5 or 10 years (depending upon which census year was in question). Including those employed within the previous 5 or 10 years would create some distortions, and the data obtained would not match other publicly available data. By contrast, no filter was applied to the 1910 or 1920 data. In both of these censuses, the question on occupation was restricted to those who were either employed or actively looking for work. Those who were retired or out of the labor force for any other reason were not included. When the employment filter was applied to the 1910 sample, certain occupations nearly disappeared. Applying an employment filter to the 1920 survey was not possible, because that census did not ask any question about the respondent's employment status. Therefore, the 1910 and 1920 data include some persons not employed in those years. Altogether, the census data show that employment increased 2.3 times over the 9 decades, from 39.2 million to 129.7 million.

Occupation categories

Occupational staffing patterns changed radically over the 1910–2000 period in response to changes in the mix of goods and services produced and the methods used to produce them. Of the 11 major occupation groups listed in the 1950 census, professional, technical, and kindred workers had the largest percent (and numeric) increase, while the farmer and farm laborer groups had the largest percent (and numeric) decreases. (See chart 1.) Professional, technical, and kindred workers rose from ninth largest to the largest occupation

group, while the two farm groups dropped from largest and third largest, respectively, to the smallest, except for private household workers.⁹

Five of the major occupation groups increased as a share of the total, while six declined. All of the ones that declined, except for private household workers, consist of occupations that produce, repair, or transport goods and are concentrated in the agriculture, mining, construction, manufacturing, and transportation industries. The five that increased are the so-called white-collar occupations, plus service workers, except private household. The four major groups that are white-collar occupations include mostly occupations having to do with information, ideas, or people (many in the service group also work with people); are more concentrated in services-producing industries; and, at least for professional and managerial occupations, have higher-than-average education requirements. In aggregate, the five groups that increased went from 24 percent to 75 percent of total employment, while the six groups that declined went from 76 percent to 25 percent over the 90-year period.¹⁰

The analysis that follows presents charts and discusses decade-by-decade trends for

- the aforementioned 11 major occupation groups;
- selected occupation subgroups, generally corresponding to major or minor groups in the 2000 soc system; and
- individual occupations that are large, that help explain group trends, or that run counter to group trends.

Occupations and occupation groups are discussed in the order of their staffing pattern changes, from the largest increase to the largest decrease. Those which increased as a proportion of the total tend to be concentrated in industries that grew more rapidly than average or that were a growing proportion of employment in their industries. For example, attendants in hospitals and in medical and dental offices grew particularly fast, because they were employed in rapidly growing health services industries and, over the century, they assumed many routine duties formerly performed by physicians, nurses, and other healthcare workers. In contrast, railroad brakemen and switchmen declined very sharply, both because demand for railroad services grew much more slowly than average and because their work became increasingly mechanized.

Changes in the mix of goods and services produced, in technology, and in business practices, as well as broad economic and social trends, are discussed to the extent that they explain changes in occupational staffing patterns. For example, the mechanization of the production of goods and services and the development of technology are discussed in

the sections on production operatives and engineers, respectively; the spread of motor vehicle use is discussed in the context of road vehicle operators, mechanics and repairers, and police; and the growth of large bureaucratic organizations is examined in the discussion of accountants, clerical workers, and managers.

Some occupation groups exhibited sharp, steady growth as a percent of total employment over the entire period.¹¹ These occupations include professional occupations overall and several professional subgroups, such as accountants, college teachers, and healthcare workers except for physicians, as well as protective service workers. Computer specialists had especially sharp growth from 1960, when data on that occupation were first collected. Managers, officials, and proprietors also grew, but more slowly. Other groups grew rapidly after 1910, but slowed some time after midcentury. Among these groups are engineers; teachers, except college; and food service workers. Sales workers, mechanics and repairers, and road vehicle operators stopped growing altogether. Judges and lawyers' and physicians and surgeons' employment showed no growth through 1970, but rose—particularly sharply for lawyers—after 1970. For both groups, the early lack of growth was due, at least in part, to artificial limits on supply. (See the discussion on pages 10–11.)

Both operatives and clerical workers rose as a proportion of employment for a number of decades, but then declined.

Production and other craftsmen, laborers, mine operatives, and farmers and farm managers all rose from 1910 to 1920, but then declined for the rest of the century, some sharply. Construction workers declined slowly throughout the period.

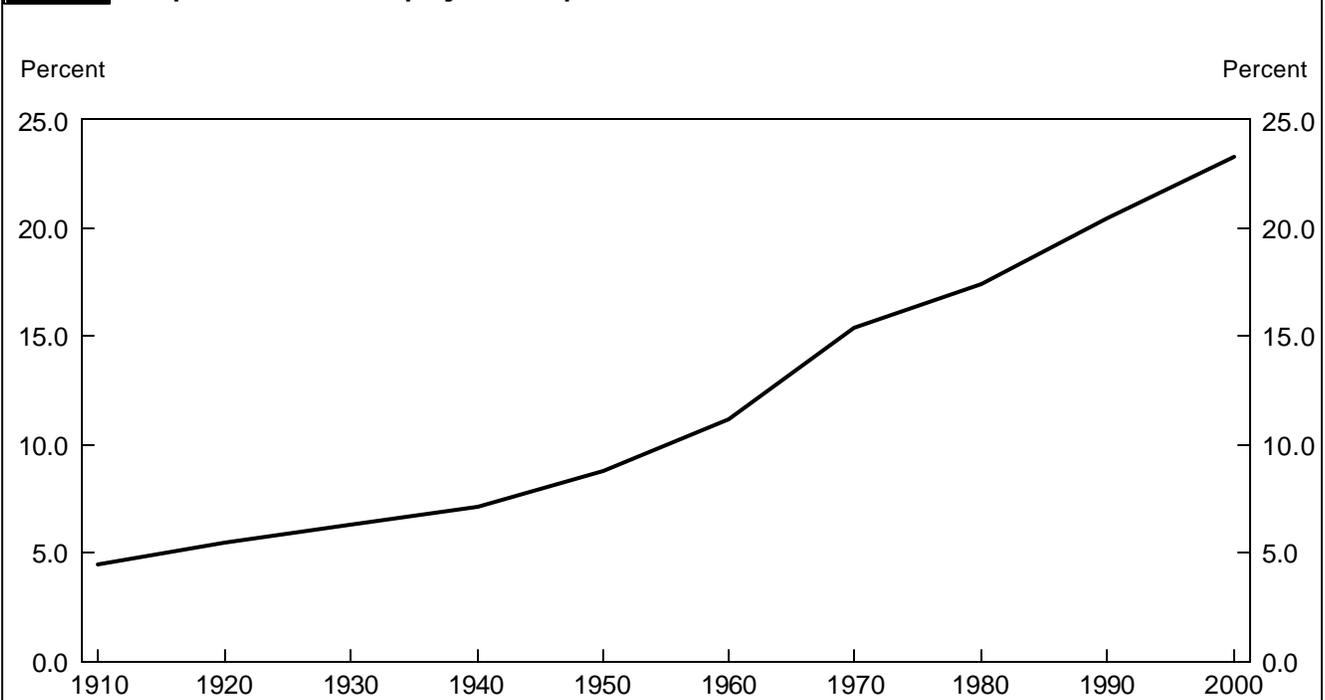
Farm laborers and foremen, as well as private household workers, dropped sharply after 1910. As a result, the occupational staffing patterns in 2000 were vastly different from those in 1910.

Professional, technical, and kindred workers

Between 1910 and 2000, the employment of professional, technical, and kindred workers increased more than fourfold as a proportion of total employment, from 4.4 percent to 23.3 percent. (See chart 2.) Numerically, employment grew from 1.7 million to 30.2 million. Industrialization, technological development, and the growing size and complexity of organizations; rapid growth in healthcare, education, and social services; and the expanded role of government all contributed to the increase. Charts 3–5 show occupational detail for this major group. The occupation groups correspond to two- and three-digit 2000 soc categories included in the professional and related occupations aggregation.¹²

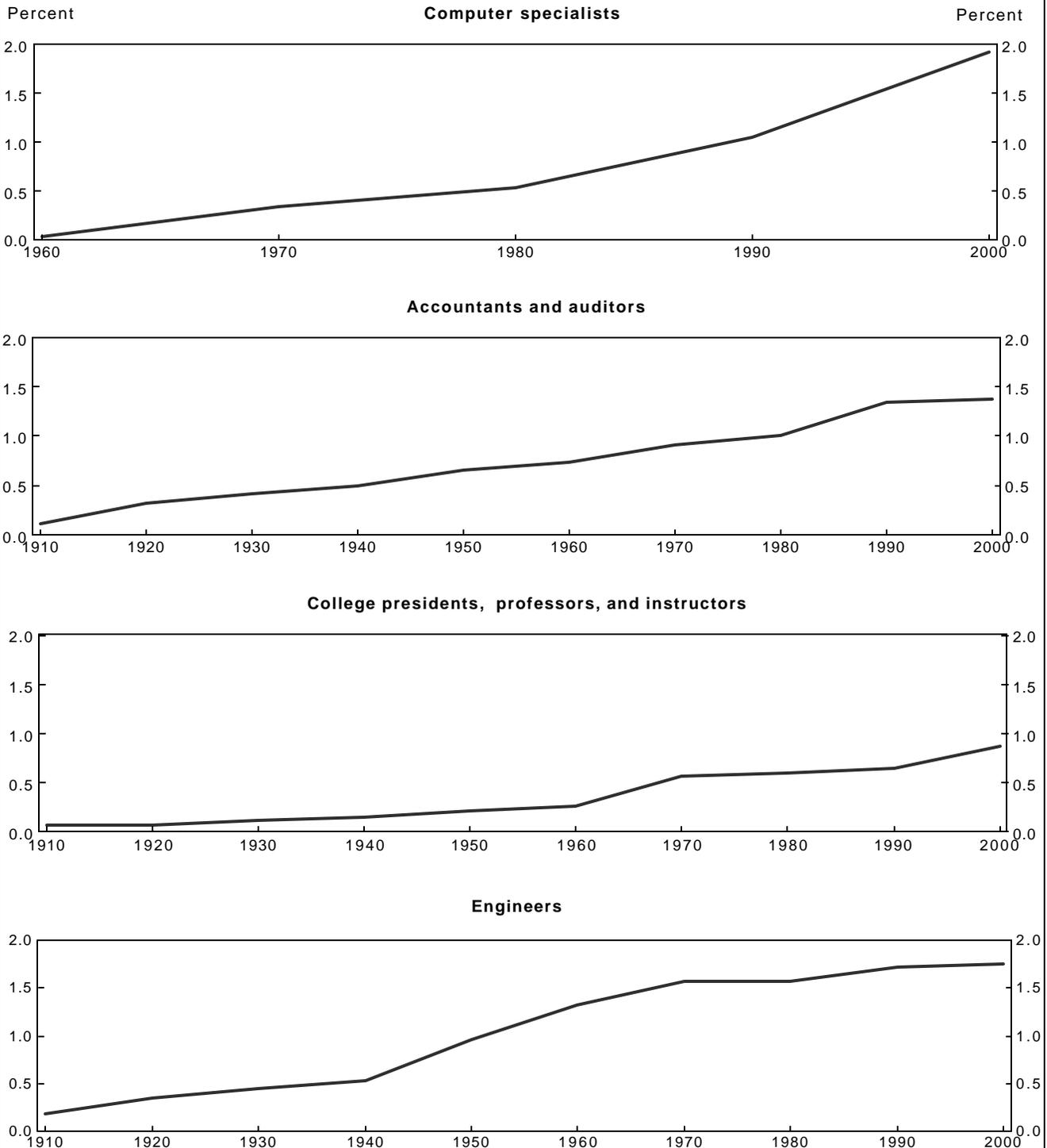
Computer specialists did not exist in 1910, and there were few, if any, in 1950, so they do not appear in the 1950 census

Chart 2. Proportion of total employment of professional, technical, and kindred workers, 1910–2000



NOTE: Data for 1930 are an average of 1920 and 1940 data because 1930 data were unavailable when this article was written.

Chart 3. Proportion of total employment of computer specialists; accountants and auditors; college presidents, professors, and instructors; and engineers, 1910–2000



NOTE: Employment of computer specialists was first included as an occupation in 1960. Data for 1930 are an average of 1920 and 1940 data because 1930 data were unavailable when this article was written.

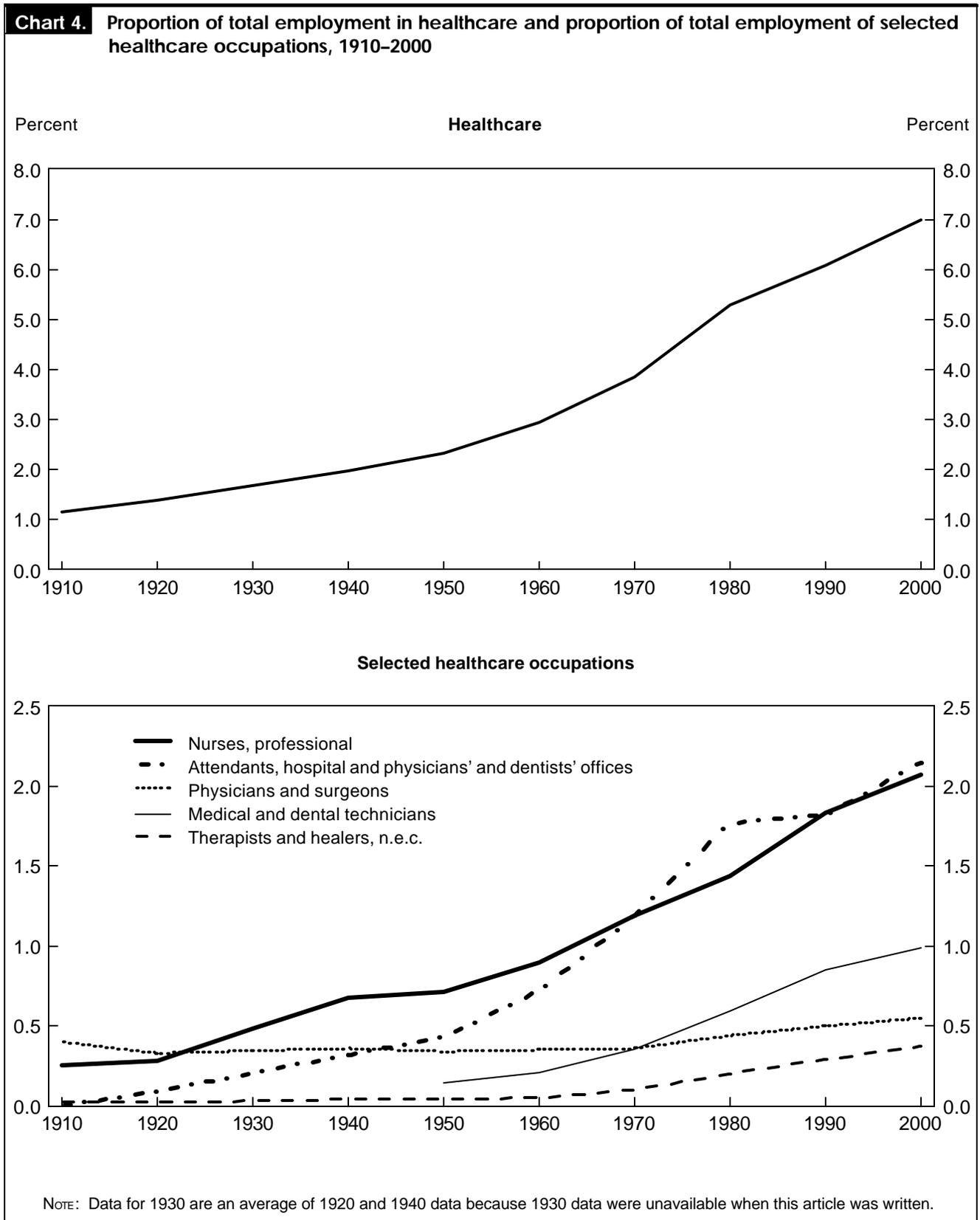
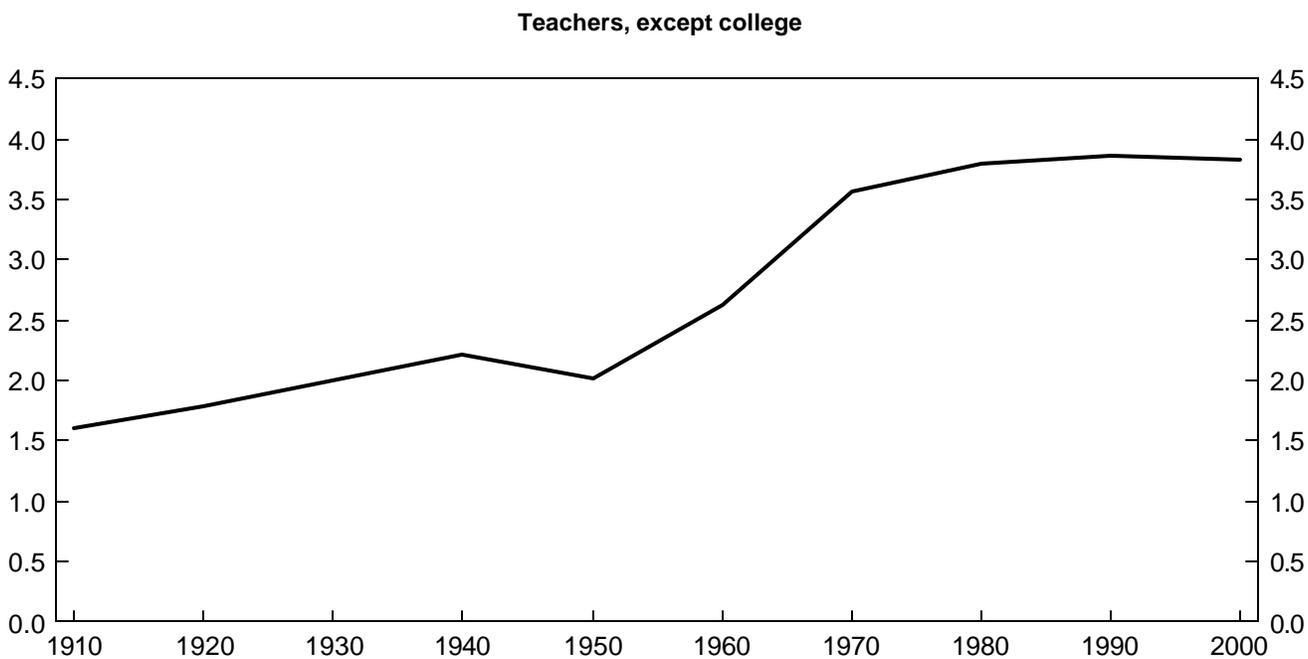
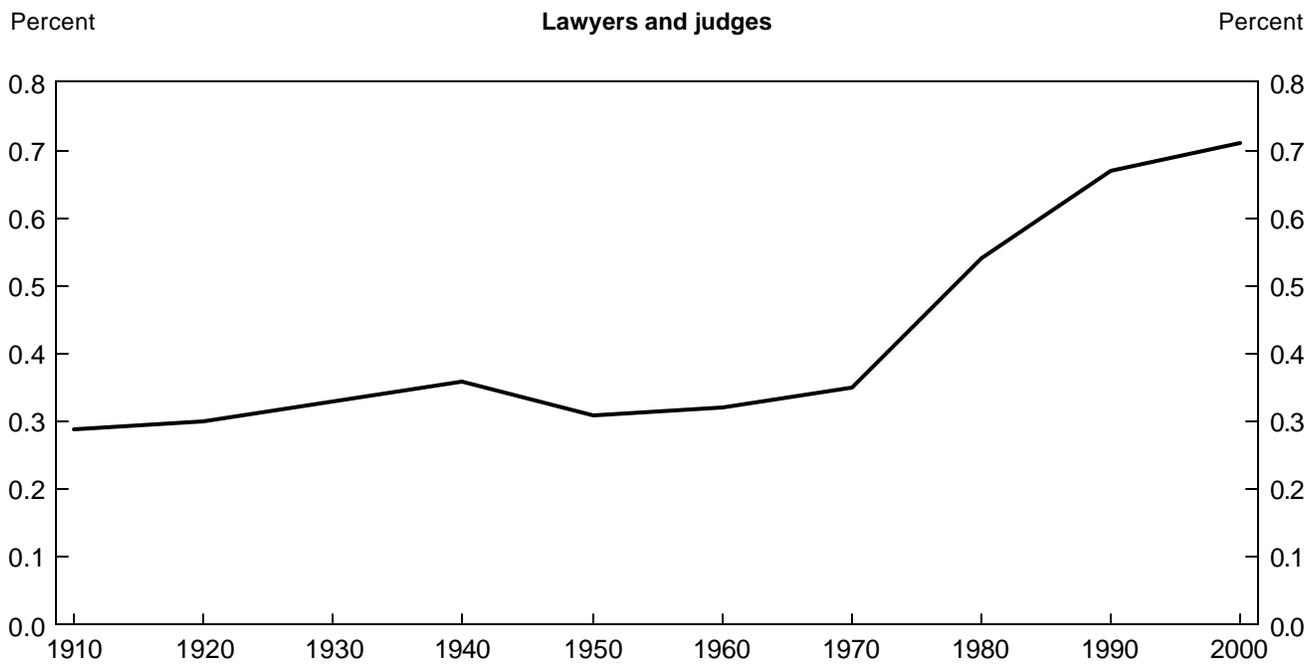


Chart 5. Proportion of total employment of lawyers and judges and of teachers, except college, 1910-2000



NOTE: Data for 1930 are an average of 1920 and 1940 data because 1930 data were unavailable when this article was written.

or the IPUMS classification system. The first commercial electronic computer was delivered in 1951, and employment data on computer specialists were first collected in the 1960 Census.¹³

Computer specialists grew 95 times as a proportion of total employment between 1960 and 2000, from 0.02 percent to 1.92 percent. (See chart 3, top panel.) Employment grew from 12,000 to 2,496,000.¹⁴ The rapid development of computer technology—both more advanced hardware and software and the growth of networks, including the Internet—plus sharply falling computer prices led to the spread of computer use to almost all areas of the economy.

Accountants and auditors grew 13 times as a proportion of total employment between 1910 and 2000, from 0.1 percent to 1.4 percent. (See chart 3, second panel.) Employment grew from 39,000 to 1,795,000.¹⁵ The increasing complexity of business and government operations; more sophisticated management techniques that required more accounting data; greater government regulation regarding financial disclosure, mergers, pensions, and other issues; and the development of complex tax laws all contributed to the growth of this occupation.

College presidents, professors, and instructors grew 12 times as a proportion of total employment between 1910 and 2000, from 0.07 percent to 0.87 percent. (See chart 3, third panel.) The number grew 43 times, from 26,000 to 1,132,000. Over the 9 decades, college enrollments also grew 43 times, from 355,000 to 14,979,000, while the proportion of the population aged 25 and older with 4 or more years of college grew 9.5 times, from 2.7 percent to 25.6 percent.

The more rapid growth from 1960 to 1970 reflects the attendance of the 1946–64 baby-boom generation. From fall 1959 to fall 1969, enrollments in degree-granting institutions more than doubled, from 3.64 million to 8 million. The sharp increase from 1990 to 2000 reflects a sharp rise in enrollments, as well as growth in the proportion of part-time professors and instructors. The latter growth may have spread the teaching load over more teachers.

Engineers increased 9 times as a proportion of total employment between 1910 and 2000, from 0.2 percent to 1.8 percent. (See chart 3, bottom panel.) Their number grew from 74,000 to 2,276,000. Rapid industrialization and growing technological sophistication, which increasingly depended on the work of engineers, fueled the growth. Prior to 1910, much innovation was carried out by self-taught inventors, such as Thomas Edison, but it increasingly began to be carried out by engineers, many in research-and-development laboratories. A rapid growth of manufacturing, including the new motor vehicle and aircraft industries; the development of a vast infrastructure of roads, bridges, and electric power and other utilities; the growth of telephone and broadcast communications and the development of computers; more com-

mercial buildings; and sharp increases in defense spending after 1940 all fueled the growth.¹⁶ Slower growth after 1970 reflects the slower growth of manufacturing, in which engineers are concentrated, and the use of computers in design work, which increased engineers' productivity.¹⁷ The 1990–2000 trend also reflects a drop in defense spending with the end of the Cold War.

Healthcare workers grew 5 times as a proportion of total employment between 1910 and 2000, from 1.2 percent to 7.0 percent. (See chart 4, top panel.) Employment grew from 453,000 to 9,056,000. In 1950, some occupations included in healthcare were not part of professional and technical employment. In order to encompass all healthcare workers within the same category, attendants in hospitals and other institutions and practical nurses, both of which were classified as service occupations in the 1950 census, and attendants in physicians' and dentists' offices, classified as a clerical occupation in 1950, are included among healthcare workers in this article.¹⁸

Growth occurred as improved medical technology permitted many more medical problems to be treated, or to be treated more aggressively, greater wealth and the spread of health insurance made healthcare more affordable, and a more long-lived population increased the need for healthcare. In 1910, most healthcare was provided in the home, with basic tasks performed by family members. Over the century, more and more healthcare began to be provided by healthcare workers in hospitals, nursing homes, and offices of medical practitioners.¹⁹ For example, there was a large increase in the proportion of childbirths in hospitals between 1920 and 1940.²⁰

The expansion of health insurance played a key role in the growth of healthcare after 1940. By shifting the responsibility for payment from the consumer to third-party payers such as insurance companies and the government, health insurance encouraged consumers to use more and costlier healthcare services. Health insurance also encouraged the development of new programs and technologies with little concern for their true cost.²¹ In 1939, only 6 percent of workers had hospital insurance; by 1950, 51 percent of workers were covered.²² Growth was stimulated during World War II, as wage controls encouraged employers to offer benefits, such as hospital insurance, to recruit and retain workers.²³ Gradually, hospital insurance was expanded from simply covering hospital care to covering a wide range of healthcare, whereupon it became health insurance in general. In 1965, with the creation of Medicare and Medicaid, insurance expanded further to cover the elderly and the poor. By 1970, 86 percent of Americans had some form of health insurance,²⁴ and that percentage remained about the same through 2000.²⁵

Despite growth in the proportion of healthcare workers, overall the proportion of physicians and surgeons dropped between 1910 and 1970, from 0.40 percent to 0.36 percent of

total employment. (See chart 4, bottom panel.) The drop was caused by changes in healthcare delivery that increased the productivity of physicians and surgeons and by restrictions on medical school enrollments that limited the supply of those professionals. Physicians' productivity increased because some duties were shifted to other healthcare workers and because doctors stopped making house calls. The expansion of medical schools and the admission of more foreign-trained physicians and surgeons to the Nation helped raise the proportion of physicians and surgeons to 0.55 percent by 2000.²⁶ Employment grew from 155,000 in 1910 to 279,000 in 1970 and 709,000 in 2000.

The expansion of hospitals, nursing homes, and other healthcare services and the increasing specialization in healthcare increased the proportional employment of most other healthcare workers. Professional nurses grew from 0.3 percent to 2.1 percent of total employment, and therapists and healers grew from 0.02 percent to 0.37 percent. (See chart 4, bottom panel.) Attendants in hospitals and other institutions and attendants in physicians' and dentists' offices grew from 0.1 percent to 2.2 percent of total employment from 1920 to 2000 (no data were available for 1910), as they assumed more routine tasks formerly done by physicians, nurses, and other higher paid workers. (See chart 4, bottom panel.) Medical and dental technicians grew from 0.14 percent to 0.99 percent of total employment between 1950 and 2000. (See chart 4, bottom panel; no data were available before 1950.)

Lawyers and judges increased one-and-a-half times as a proportion of total employment between 1910 and 2000, with almost all growth coming since 1970. (See chart 5, top panel.) Between 1910 and 1970, lawyers and judges grew from 0.29 percent to 0.35 percent of employment (reaching a peak of 0.36 percent in 1940), after which they jumped to 0.71 percent by 2000.²⁷ Employment grew from 112,000 in 1910 to 272,000 in 1970 and 927,000 in 2000. Stiff licensing requirements (for both individuals and law schools) and other restrictions on supply limited growth through 1970, but as these restrictions weakened or disappeared, the number of law graduates grew.²⁸ At the same time, demand for lawyers increased, as many more laws were enacted, business activities became more complex, and society became more litigious. Civil rights legislation for minorities, women, and older and disabled persons; laws regarding the environment, employer-employee relations, product safety, and consumer protection; and higher crime and divorce rates all contributed to the growth of lawyers and judges.²⁹ Several Supreme Court decisions expanded the right to a court-appointed counsel for criminal defendants, which in turn led to increased funds for public-defenders' offices and a sharp increase in the number of court-appointed defense attorneys.

Teachers below the college level³⁰ increased 1.4 times as a proportion of total employment between 1910 and 2000, from 1.6 percent to 3.8 percent. (See chart 5, bottom panel.) Their

number rose sevenfold, from 624,000 to 4,972,000. Decreasing class size, as measured by pupil-to-teacher ratios, and greater enrollments drove the growth of schoolteachers. The sharp growth in the number of adults taking self-enrichment classes, in subjects such as cooking, dancing, and creative writing, as well as those taking remedial education, adult literacy, and English as a second language, drove the growth of adult education teachers.

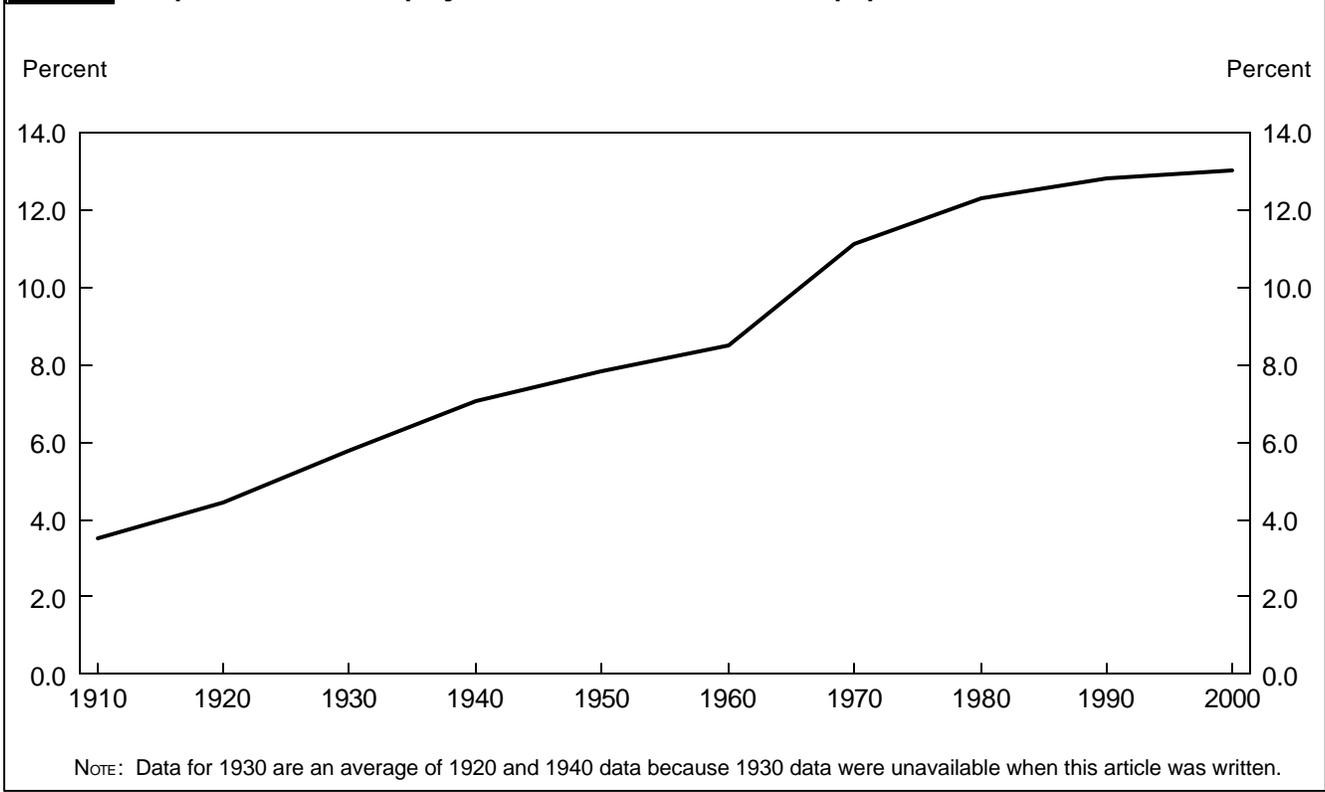
The elementary and secondary school pupil-to-teacher ratio dropped by more than half, from about 35 in 1910 to 16.4 in 2000.³¹ Elementary and secondary school enrollments grew 1.7 times, from 19,372,000 to 52,989,000, between 1910 and 2000, while total U.S. population grew more than twofold, from 92,000,000³² to 281,000,000.³³ The number of 5- to 18-year-olds increased 1.3 times, from 24,361,000 in 1910 to 61,298,000 (5- to 19-year-olds) in 2000.³⁴ Enrollments increased even faster than the 5- to 18-year-old population, because students remained in school for more years, on average, in 2000 than in 1910. Much of the increase in educational attainment occurred during the middle of the century. Between 1940 and 1980, the percentage of 25- to 29-year-olds with a high school diploma increased from 38.1 percent to 85.4 percent. (The percentage of black 25- to 29-year-olds with a high school diploma increased from 12.3 percent to 76.7 percent.) Growth slowed after 1980, but reached 88.1 percent in 2000.³⁵ The increase in the number of teachers below the college level was more pronounced among secondary school teachers than among elementary school teachers.

The drop in teachers as a proportion of the total employed in 1950 reflects lower enrollments as the smaller age cohort of those born during the 1930s moved through the education system. The increases in 1960 and 1970 reflect higher enrollments as the baby-boom generation, born between 1946 and 1964, moved through the system. After 1970, lower enrollments, together with a continued drop in pupil-teacher ratios, led to more modest growth in teachers as a proportion of the total employed.

Clergy (trend not charted), one of the larger professional occupations in 1910, decreased slightly as a proportion of total employment between 1910 and 2000, from 0.32 percent to 0.29 percent. Employment of clergy grew from 125,000 to 379,000.³⁶

Service workers, except private household

Service workers, except private household, increased 2.7 times as a proportion of total employment between 1910 and 2000, from 3.5 percent to 13 percent. (See chart 6.) Employment increased from 1,363,000 to 16,897,000.³⁷ Subgroups analyzed correspond to 2000 soc major group (two-digit) categories: building and grounds cleaning and maintenance service, food

Chart 6. Proportion of total employment of service workers, except private household, 1910–2000

preparation and serving, protective service, and personal care and service occupations. (Health service, a fifth major group within the service occupations, which includes attendants at hospitals and other institutions, as well as practical nurses, was discussed earlier with professional healthcare workers.³⁸)

Building and grounds cleaning and maintenance occupations grew 5.3 times as a proportion of total employment between 1910 and 2000, from 0.4 percent to 2.4 percent.³⁹ (See chart 7, top panel.) Employment grew from 150,000 in 1910 to 2,676,000 in 1980 and 3,158,000 in 2000. Rapid growth in the number of office buildings, hotels, stores, healthcare facilities, apartment buildings, schools, and other structures requiring cleaning and maintenance spurred the increase in employment. It is not clear why the proportion dropped after 1980, but the numbers may reflect problems with the data.

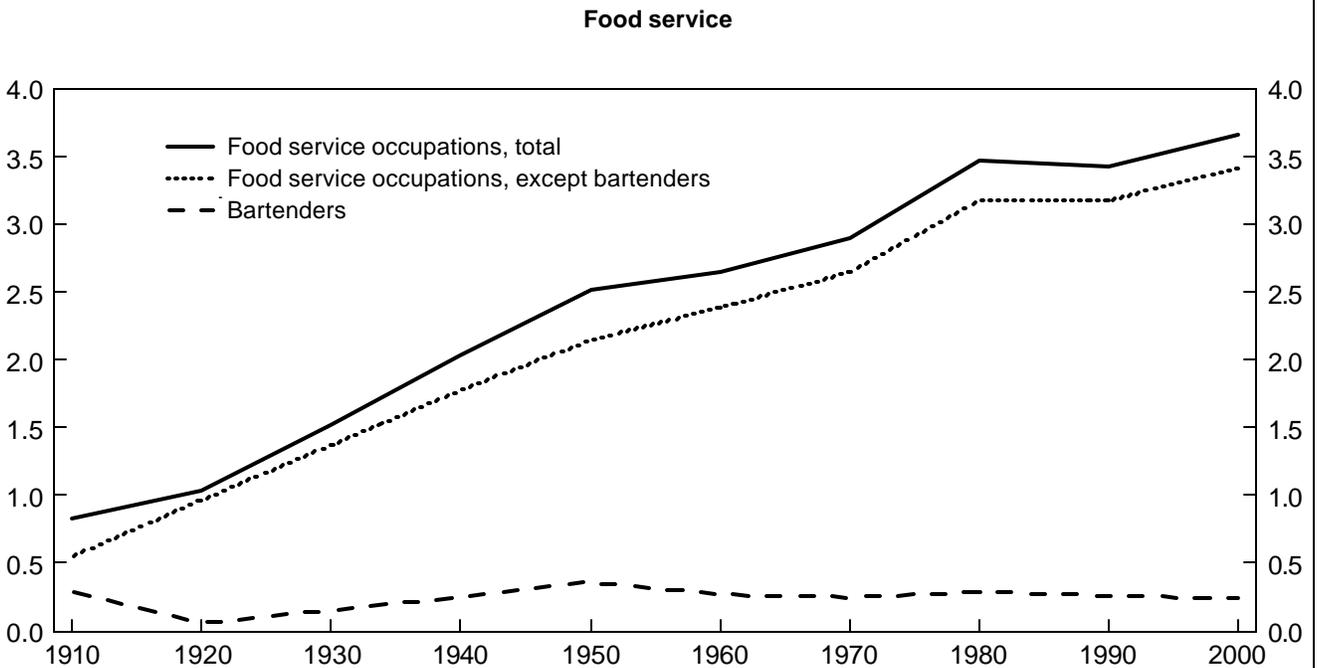
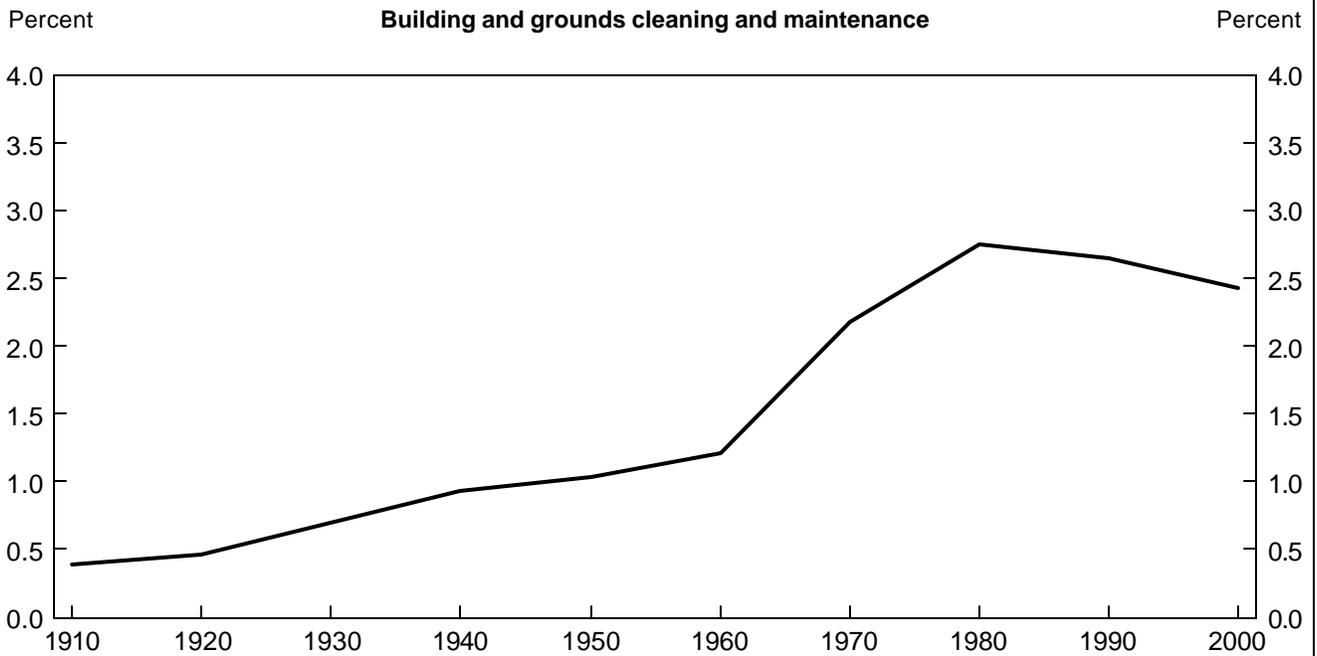
Workers in food preparation and serving related occupations are employed in eating and drinking places, in stores selling food prepared on the premises, and in schools, health care, and other facilities providing prepared meals. Their employment grew 3.4 times as a proportion of total employment between 1910 and 2000, from 0.8 percent to 3.7 percent of total employment. (See chart 7, bottom panel.) In numbers, their employment grew from 323,000 to 4,758,000. Bartenders,

however, declined slightly, from 0.29 percent to 0.24 percent, with a temporary drop to 0.06 percent in 1920 as a result of prohibition.⁴⁰ (See chart 7, bottom panel.)

Greater income made food prepared away from home more affordable; the advent of automobiles, improved roads, and greater urbanization made food and drink purveyors more accessible; and an increasing percentage of women working outside of the home intensified the need for prepared meals.⁴¹ More nursing home and assisted-living facility residents and an expansion of school lunch programs also stimulated growth. The number of meals that Americans eat away from home has grown from 16 percent in 1977–78 to 29 percent in 1995.⁴²

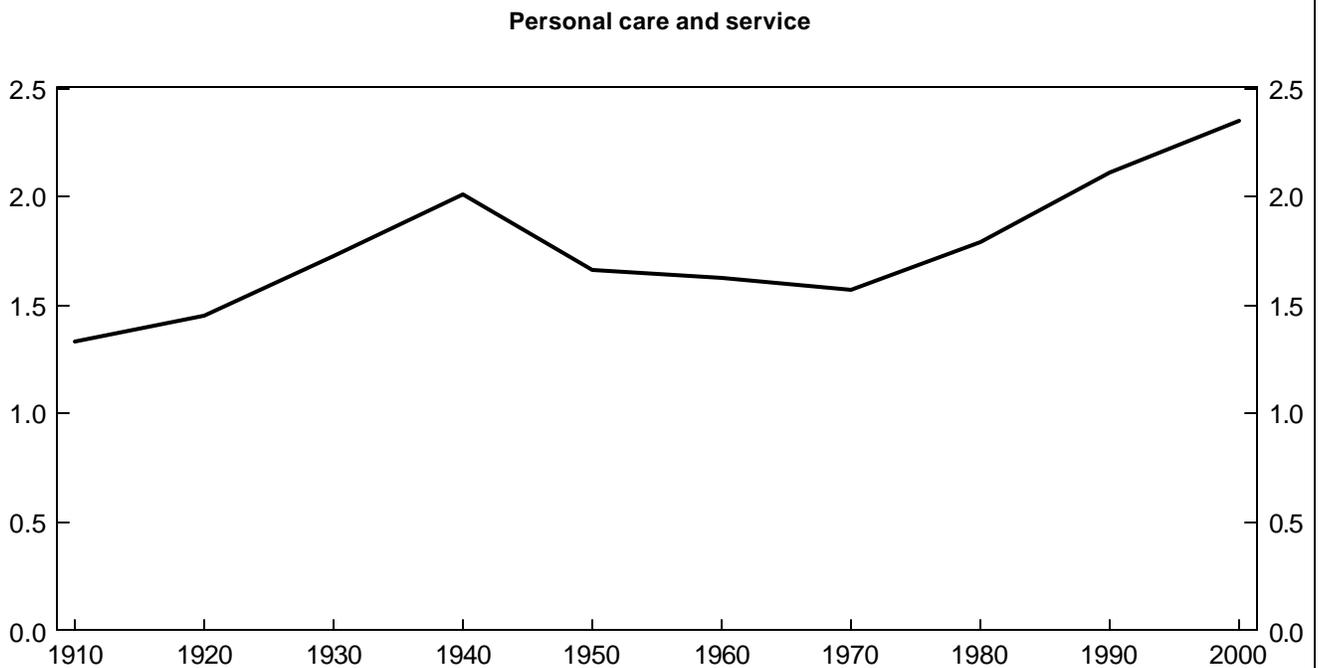
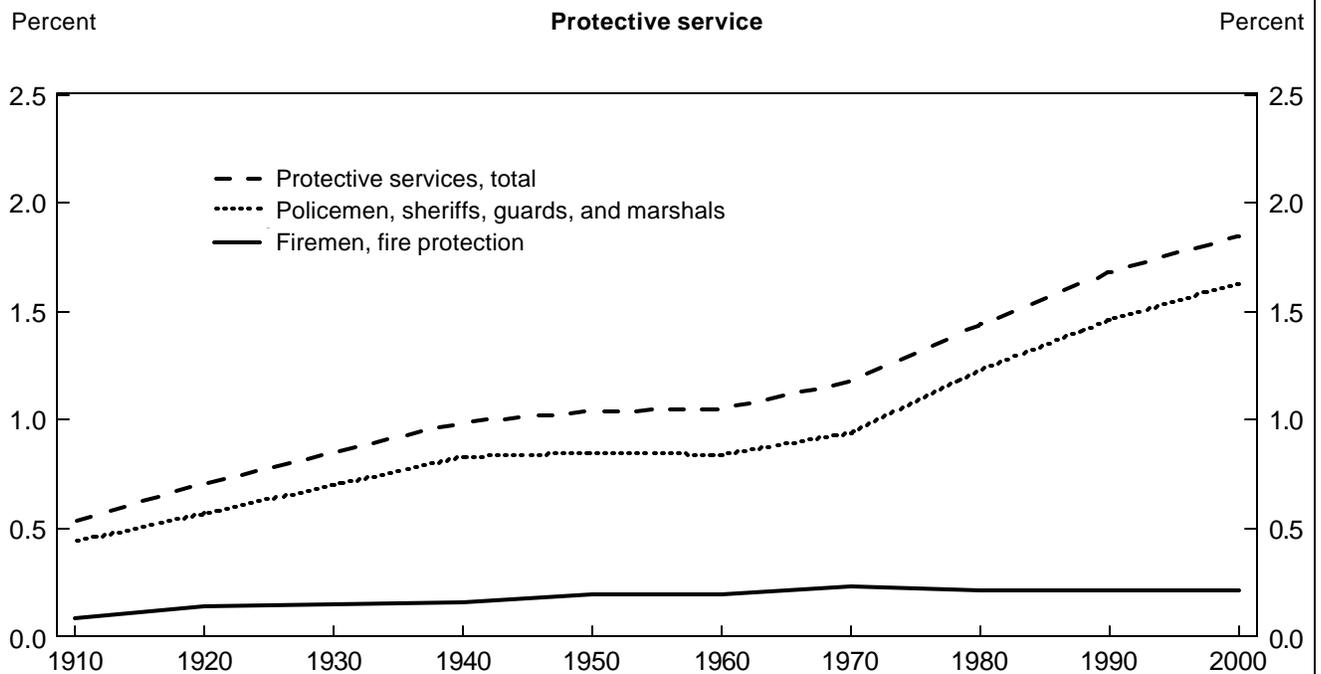
Protective service workers increased 2.5 times as a percent of total employment between 1910 and 2000, from 0.53 percent to 1.85 percent. (See chart 8, top panel.) Their employment grew from 205,000 to 2,395,000. Most growth was in police, sheriffs, guards, and marshals. (See chart 8, top panel.) Increased urbanization, more motor vehicle traffic, higher crime and incarceration rates, more properties and other assets to protect, and more laws to enforce all contributed to the growth. The faster growth since 1960 may reflect, at least in part, a response to the sharp increase in homicide and robbery rates.⁴³ The proportion of firemen doubled between

Chart 7. Proportion of total employment in building and grounds cleaning and maintenance occupations and proportion of total employment in food service occupations, 1910-2000



NOTE: Data for 1930 are an average of 1920 and 1940 data because 1930 data were unavailable when this article was written.

Chart 8. Proportion of total employment in protective service occupations and in personal care and service occupations, 1910–2000



NOTE: Data for 1930 are an average of 1920 and 1940 data because 1930 data were unavailable when this article was written.

1910 and 1950, due to urbanization and the replacement of volunteers with paid firefighters, but remained level thereafter. (See chart 8, top panel.)

Personal care and service occupations grew 77 percent as a proportion of employment between 1910 and 2000, from 1.3 percent to 2.4 percent. (See chart 8, bottom panel.) Employment grew from 515,000 to 3,054,000. Most of the growth took place after 1970 and was among professional and personal services attendants, an occupation that includes teachers' aides and childcare workers. Over the 90-year period, employment of barbers, beauticians, and manicurists showed little growth, while that of porters and elevator operators declined.

Clerical and kindred workers

Clerical and kindred workers grew 2.7 times as a proportion of employment between 1910 and 1980, but by 2000 their proportion had declined to 2.3 times the 1910 level. The proportion went from 5.2 percent in 1910 to 19.3 percent in 1980 and 17.4 percent in 2000. (See chart 9, top panel.) Employment grew from 2,026,000 in 1910 to 18,758,000 in 1980 and 22,591,000 in 2000. The greater number, size, and complexity of business, government, and nonprofit organizations, with more reports, transactions, records, correspondence, and telephone calls to handle and more clients and customers to deal with all contributed to the growth of clerical occupations. In addition, the spread of retail self-service, as opposed to asking a sales worker for goods stored behind a counter and then having the worker ring up the sale, caused cashiers, classified as a clerical occupation in 1950, to grow rapidly, replacing sales workers.⁴⁴

The growing use of computers and other electronic devices, which simplified or eliminated many clerical activities, caused the post-1980 decline. Automated switching and voice messaging affected telephone operators; personal computers, word-processing software, optical scanners, electronic mail, and voice messaging, secretaries and typists; accounting and database software, bookkeepers; ATM's and telephone and online banking, tellers; and computerized checkout terminals, cashiers.⁴⁵ The proportion of telephone operators declined after 1950; stenographers, typists, and secretaries, as well as bookkeepers, after 1970; bank tellers after 1980; and cashiers after 1990. (See chart 9, panel 2.) However, occupations requiring personal contact, such as bill and account collectors; vehicle dispatchers and starters; attendants in physicians' and dentists' offices; and receptionists, increased as a percent of employment through 2000.⁴⁶

Managers, officials, and proprietors

Managers, officials, and proprietors, except farm, grew 1.2 times as a proportion of total employment between 1910 and

2000, from 6.5 percent to 14.2 percent of all employment. (See chart 10.) Their number grew from 2,503,000 to 18,392,000. More and larger bureaucratic organizations, some with many layers of managers, as well as the development of more sophisticated management techniques, spurred growth. The proportional drop between 1950 and 1970 is due to a sharp decline in the number of self-employed managers, as small owner-operated establishments were replaced by larger corporate-owned ones operated by salaried managers. Employment of self-employed managers, officials, and proprietors, n.e.c., declined 22 percent between 1950 and 1960, from 2,528,000 to 1,968,000, and employment of self-employed managers and administrators, n.e.c., declined 49 percent between 1960 and 1970, from 1,764,000 to 902,000.⁴⁷ Most of those employed within the major soc group of managers, officials, and proprietors, except farm, are classified in the census as managers, officials, and proprietors (not elsewhere classified), limiting more detailed analysis.

Sales workers

Sales workers grew 69 percent as a proportion of total employment between 1910 and 1970, but then dropped. In 2000, the occupation was 56 percent above the 1910 level. Sales workers went from 4.4 percent of total employment in 1910 to 7.4 percent in 1970 and 6.8 percent in 2000. (See chart 11.) Employment of sales workers grew from 1,695,000 in 1910 to 5,677,000 in 1970 and 8,855,000 in 2000. A rapid increase in the volume of goods and services sold kindled the growth. The leveling after midcentury occurred as self-service retailing became widespread, reducing the need for sales workers and spurring the growth of cashiers, a clerical occupation in the 1950 census.⁴⁸ Computerized sales terminals, introduced toward the end of the century, also limited growth by raising retail sales workers' productivity.

Craftsmen, foremen, and kindred workers

Craftsmen, foremen, and kindred workers grew 27 percent as a proportion of total employment between 1910 and 1920, but by 2000 the group was 10 percent below the 1910 level. The occupation grew from 10.9 percent in 1910 to 13.8 percent in 1920, dipped below 12 percent in 1940, recovered to almost 14 percent by 1950, remained above 13 percent through 1970, and then declined to 9.8 percent in 2000. (See chart 12.) The drop in 1940 reflects, at least in part, the Great Depression, which may have affected craftsmen more than other occupation groups.⁴⁹ Employment grew from 4,223,000 in 1910 to 12,769,000 in 2000. The occupation of craftsmen, foremen, and kindred workers is divided into three subgroups for this article, roughly corresponding to the 2000 soc major occupation groups of construction workers, mechanics and repairers, and production and other craftsmen.⁵⁰

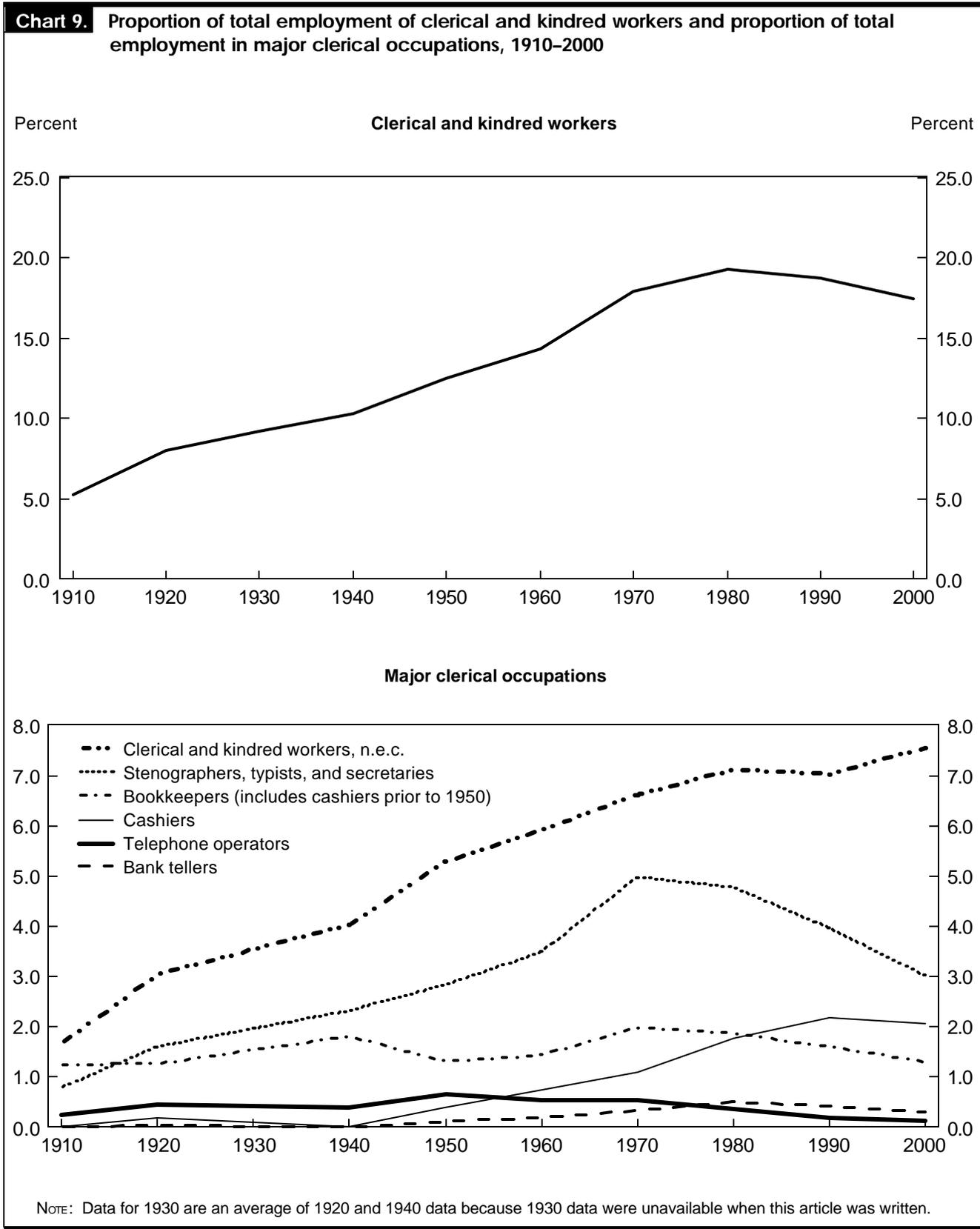
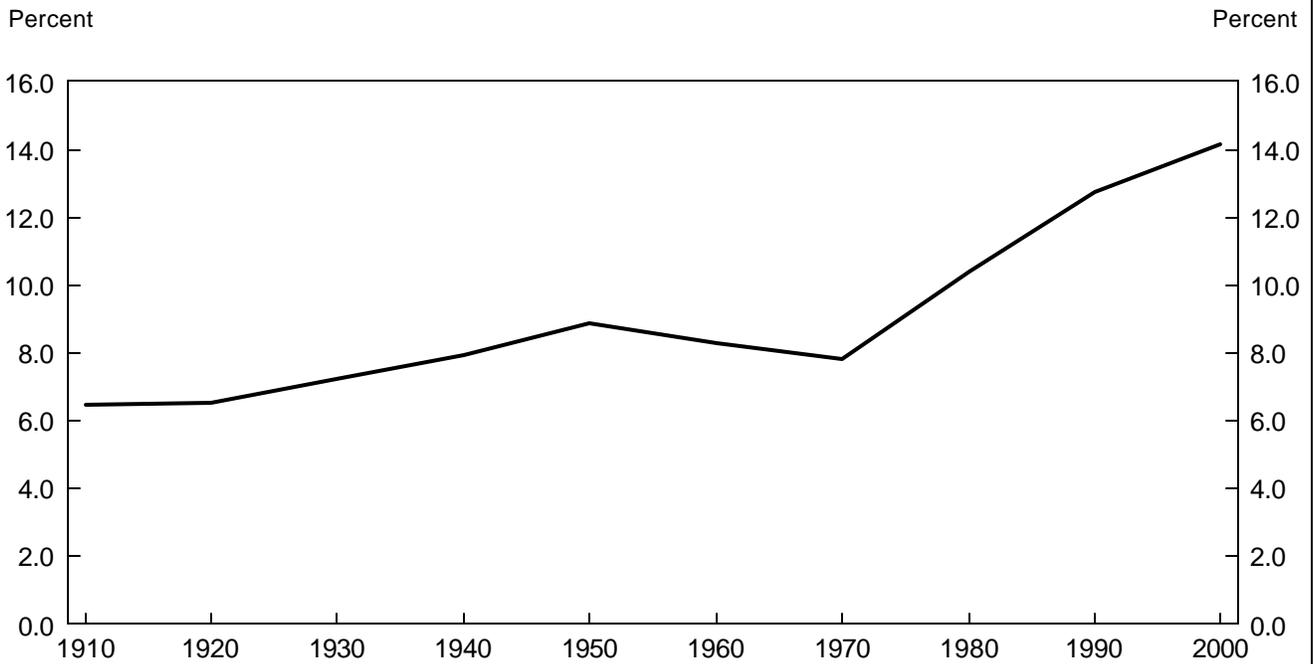
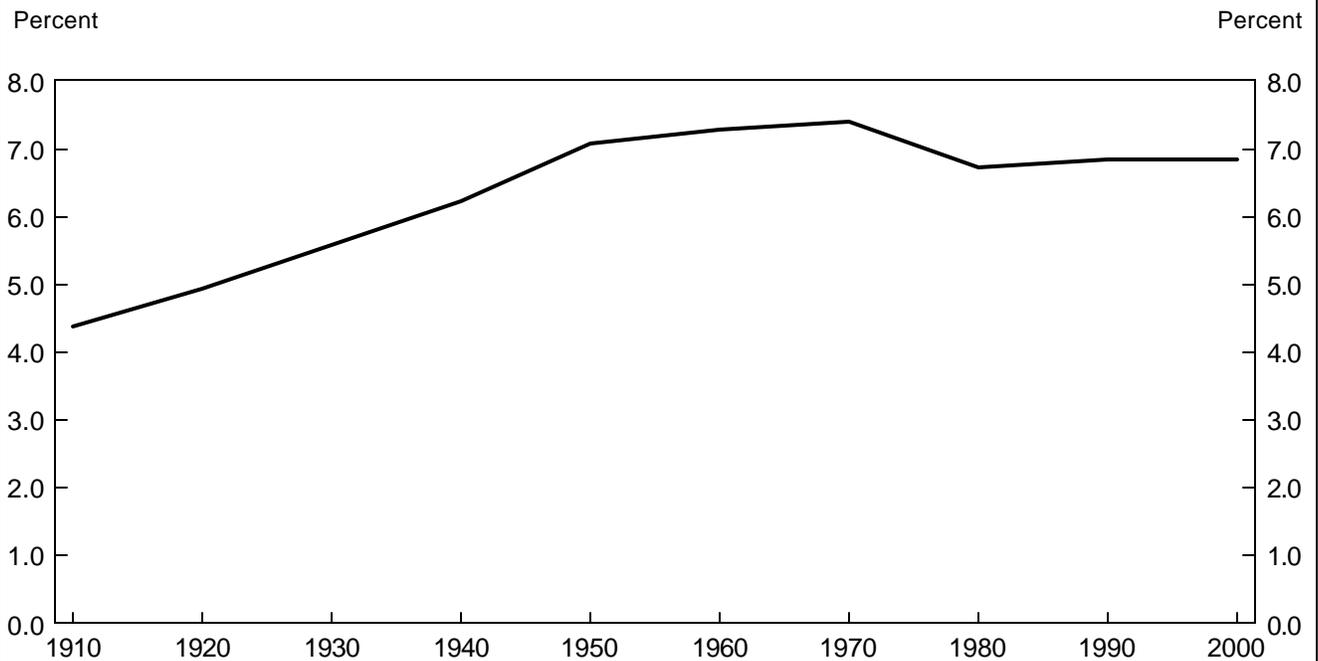


Chart 10. Proportion of total employment of managers, officials, and proprietors, 1910–2000



NOTE: Data for 1930 are an average of 1920 and 1940 data because 1930 data were unavailable when this article was written.

Chart 11. Proportion of total employment of sales workers, 1910–2000



NOTE: Data for 1930 are an average of 1920 and 1940 data because 1930 data were unavailable when this article was written.

Chart 12. Proportion of total employment of craftsmen, foremen, and kindred workers, 1910–2000

Mechanics and repairers grew 10.9 times as a proportion of total employment between 1910 and 1950, but by 2000 the occupation had dropped to 9.9 times the 1910 proportion. It grew from 0.32 percent to 3.91 percent in 1960 and then slipped to 3.58 percent in 2000. (See chart 13, top panel.) Employment of mechanics and repairers grew from 140,000 in 1910 to 2,520,000 in 1960 and 4,642,000 in 2000. A vast increase in the amount of machinery, all requiring maintenance and repair, drove the growth. There was greater mechanization of factories, farms, offices, mines, service industries, and homes, all made possible by the spread of a network of electric power lines and generating facilities. The number of motor vehicles and aircraft in use grew exponentially, as did machinery related to central heating and air-conditioning, telephone and broadcast communications, computers, and many other technologies. The proportion of mechanics and repairers declined slightly after 1960 as the pace of mechanization slowed and as machinery and equipment became more reliable and easier to repair.

Construction workers declined 31 percent as a proportion of total employment between 1910 and 2000, from 4.3 percent to 3.0 percent. (see chart 13, middle panel.) Employment grew from 1,663,000 in 1910 to 3,837,000 in 2000. Most of the relative decline in construction workers' share of employment was

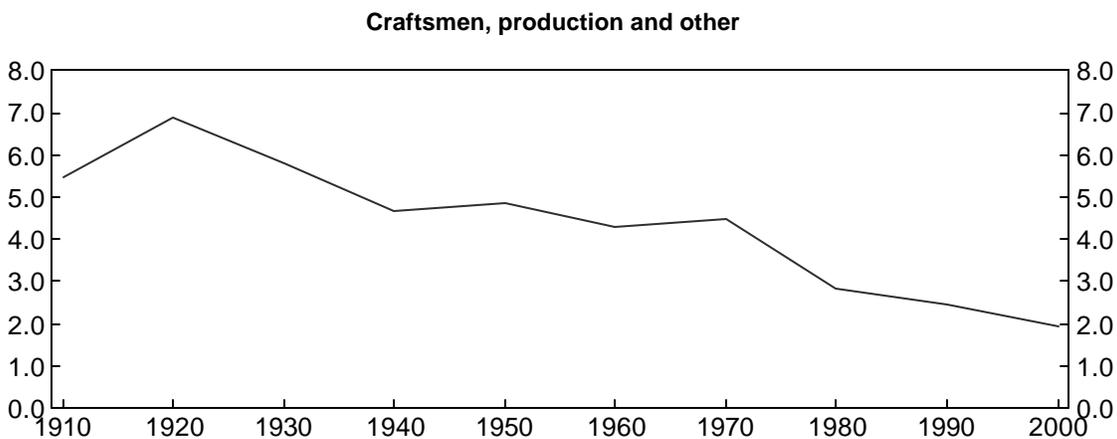
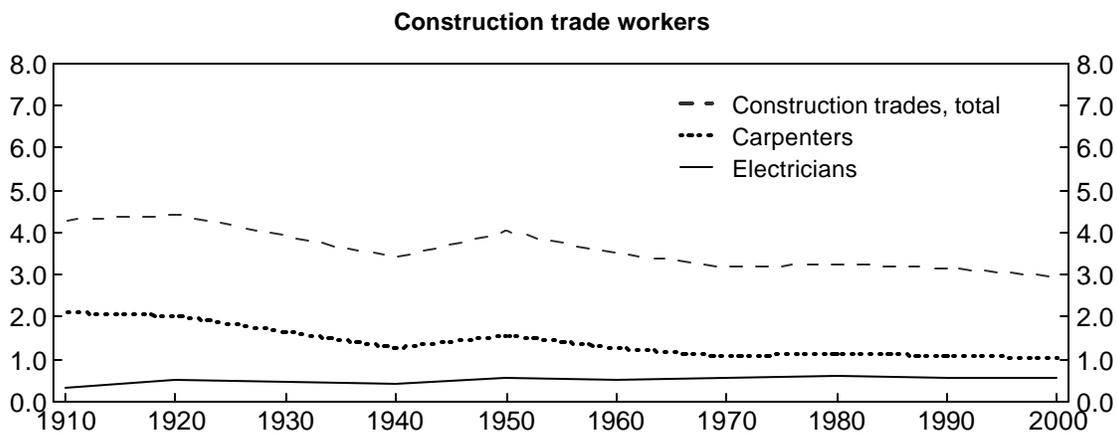
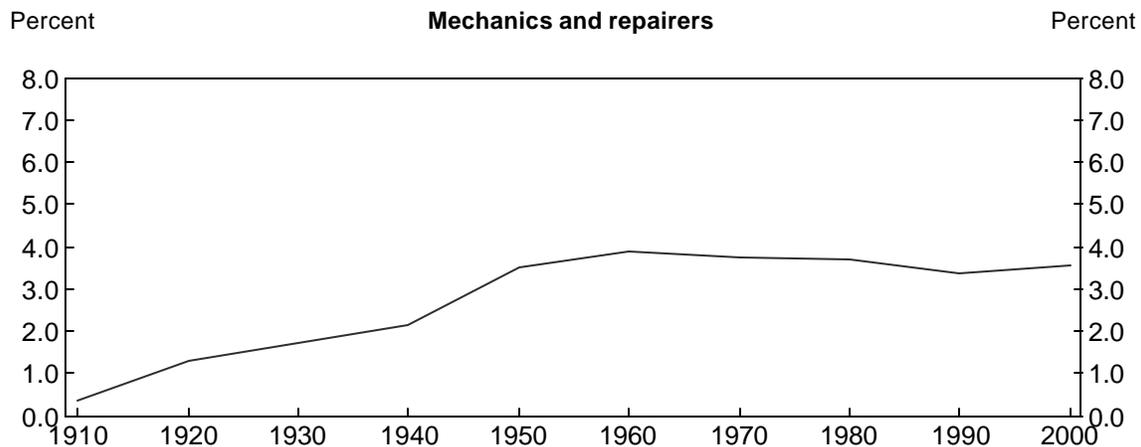
among carpenters. Electricians, the second-largest construction occupation after carpenters in 2000, grew from 0.34 percent of total employment in 1910 to 0.57 percent in 2000, with most growth between 1910 and 1920. (See chart 13, middle panel.)

Production and other craftsmen grew 26 percent as a proportion of total employment from 1910 to 1920, but then declined, dropping to 65 percent below the 1910 level. The category grew from 5.5 percent in 1910 to 6.9 percent in 1920, but fell to 1.9 percent by 2000. (See chart 13, bottom panel.) Employment grew from 2,125,000 in 1910 to 3,435,000 in 1970, but slipped to 2,515,000 by 2000. Mechanization and automation in the manufacturing and railroad industries, as well as in other industries; more efficient management; and, in the later decades, greater imports caused the decline.

Operatives

Operatives and kindred workers include operators of motor vehicles and fixed machinery; assemblers, inspectors, packers, and related workers; and apprentices to craft workers. In the early years of the 20th century, the occupation also included many operators of horse-drawn vehicles. Operatives grew 28 percent as a proportion of total employment

Chart 13. Proportion of total employment of mechanics and repairers, construction trade workers, and production and other craftsmen, 1910-2000



NOTE: Data for 1930 are an average of 1920 and 1940 data because 1930 data were unavailable when this article was written.

between 1910 and 1950, but by 2000 their proportion had fallen to 33 percent below the 1910 level. Operatives grew from 15.7 percent of total employment in 1910 to 20.1 percent in 1950, but then declined to 10.4 percent in 2000. (See chart 14.) Employment grew from 6,079,000 in 1910 to 11,518,000 in 1950, peaked at 14,346,000 in 1980, and declined to 13,544,000 by 2000. The group is divided into three components for analysis: road (motor and horse-drawn) vehicle operators, mine operatives and laborers, and production and other operatives.

Road vehicle operators grew 88 percent as a proportion of total employment between 1910 and 1960, but by 2000 the category was only 59 percent above the 1910 level.⁵¹ Road vehicle operators grew from 1.9 percent of total employment in 1910 to 3.6 percent in 1960, but then settled at about 3.0 percent for the rest of the century. (See chart 14.) Employment grew from 735,000 in 1910 to 3,917,000 by 2000. The increase was due to growth in the volume of goods moved by road and in the distances the goods were shipped.

The employment drop to 641,000 and 1.5 percent of total employment in 1920 reflects the shift from horse-drawn to motorized vehicles, which greatly increased driver productivity.⁵² (The 1910 and 1920 censuses did not distinguish clearly between operators of horse-drawn and

motorized vehicles.) The growth of truck registrations from 10,000 in 1910 to 1.1 million in 1920 indicates the magnitude of the shift. So does the drop in employment of livery stable keepers and managers from 35,000 to 11,000 over the same period.⁵³

Mine operatives and laborers declined 95 percent as a proportion of total employment between 1910 and 2000, from 2.4 percent in the former year to 0.1 in the latter (see chart 14), while employment fell from 917,000 to 158,000. The sharp decline was due to advances in mining technology and mechanization and to the slower-than-average growth of mining industry output.

Production and other operatives grew 32 percent as a proportion of total employment from 1910 to 1950, but by 2000 was 53 percent below the 1910 level. (See chart 14.) Employment grew from 4,265,000 in 1910 to 8,829,000 in 1950, peaked at 11,010,000 in 1980, and dropped to 9,412,000 by 2000. The trend largely reflects developments in mass production in manufacturing. In the early decades of the 20th century, mass production, which relied on considerable mechanization and the splitting of complex tasks into simple ones, required large numbers of operatives.⁵⁴ Operatives tended the machines used in rapidly growing continuous-process industries such as steel, paper, and chemicals; oper-

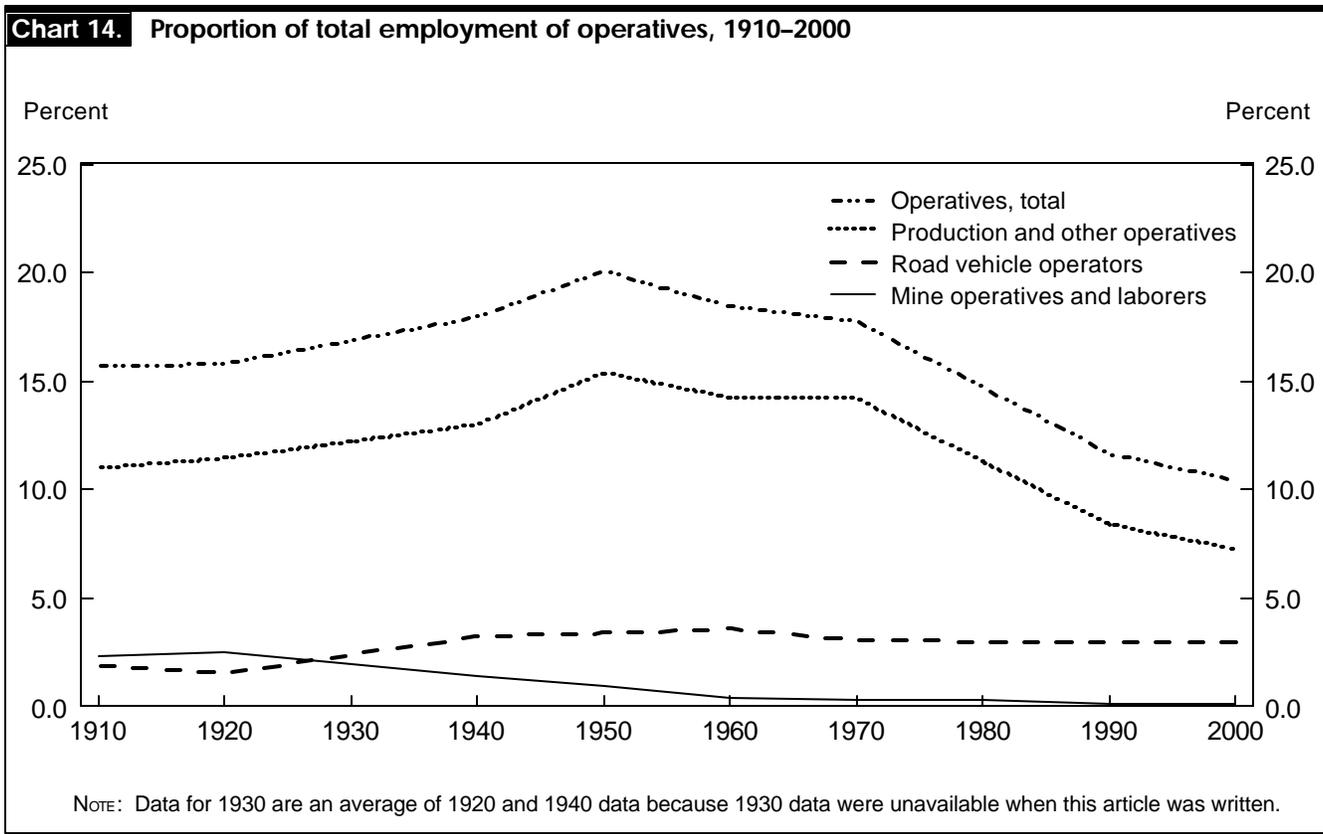
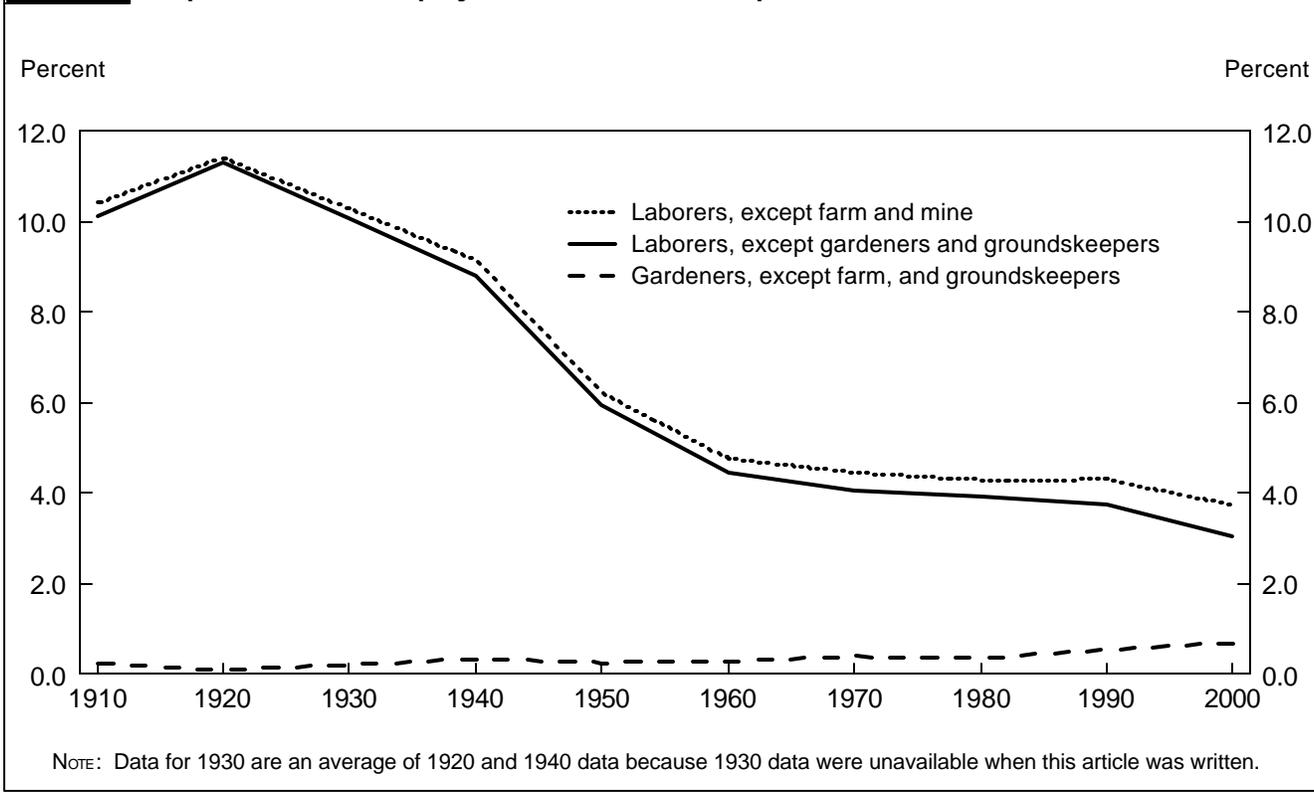


Chart 15. Proportion of total employment of laborers, except farm and mine, 1910–2000



ated metal-fabricating, sewing, printing, textile, and other machinery; and assembled and inspected motor vehicles and, later, refrigerators, radios, televisions, and many other products.⁵⁵ In nonmanufacturing industries, they operated laundry and drycleaning machinery and railroad switches and brakes, made and altered dresses and suits, and parked cars. The proportional decline of operatives after 1950 reflects automation in manufacturing, laundries, railroads, and other industries; more efficient management; and, in the later decades of the 20th century, greater imports.

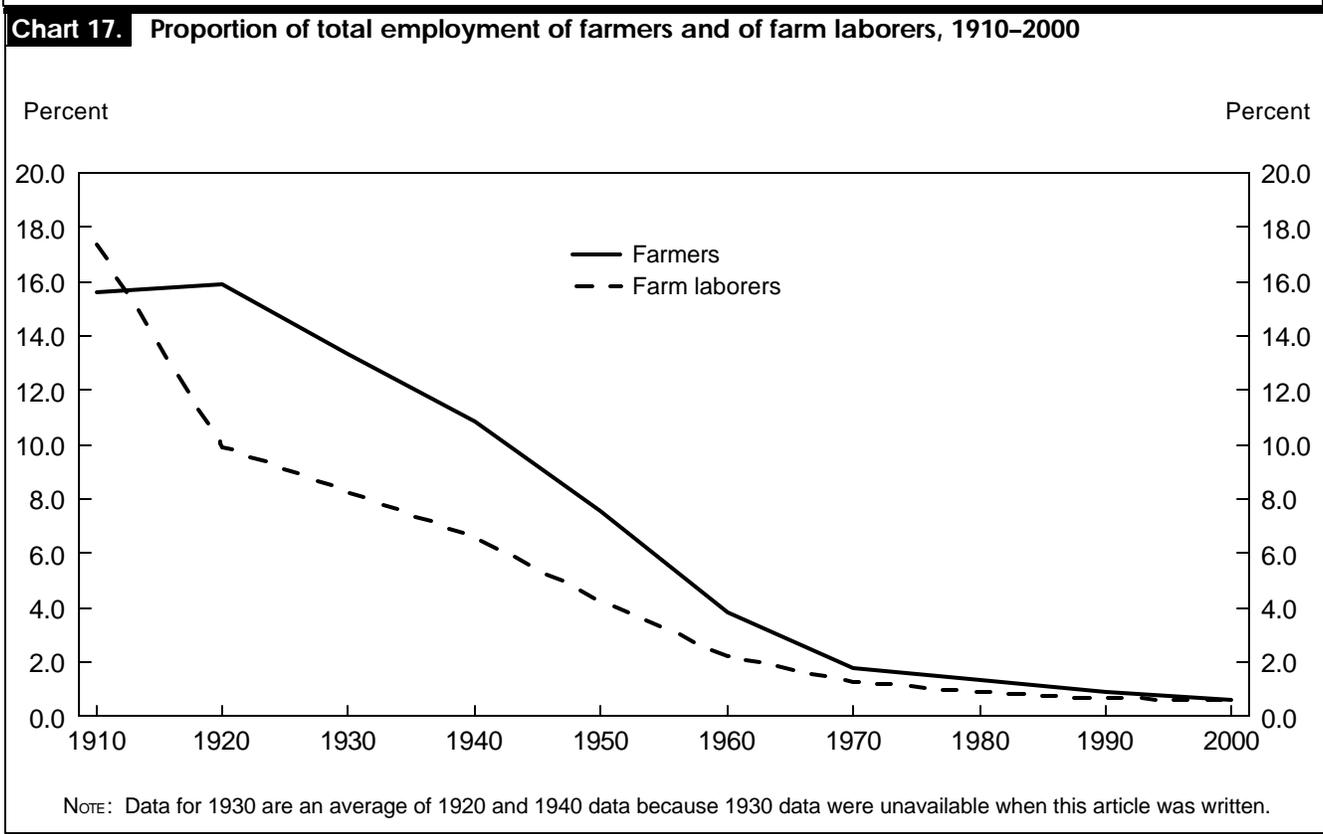
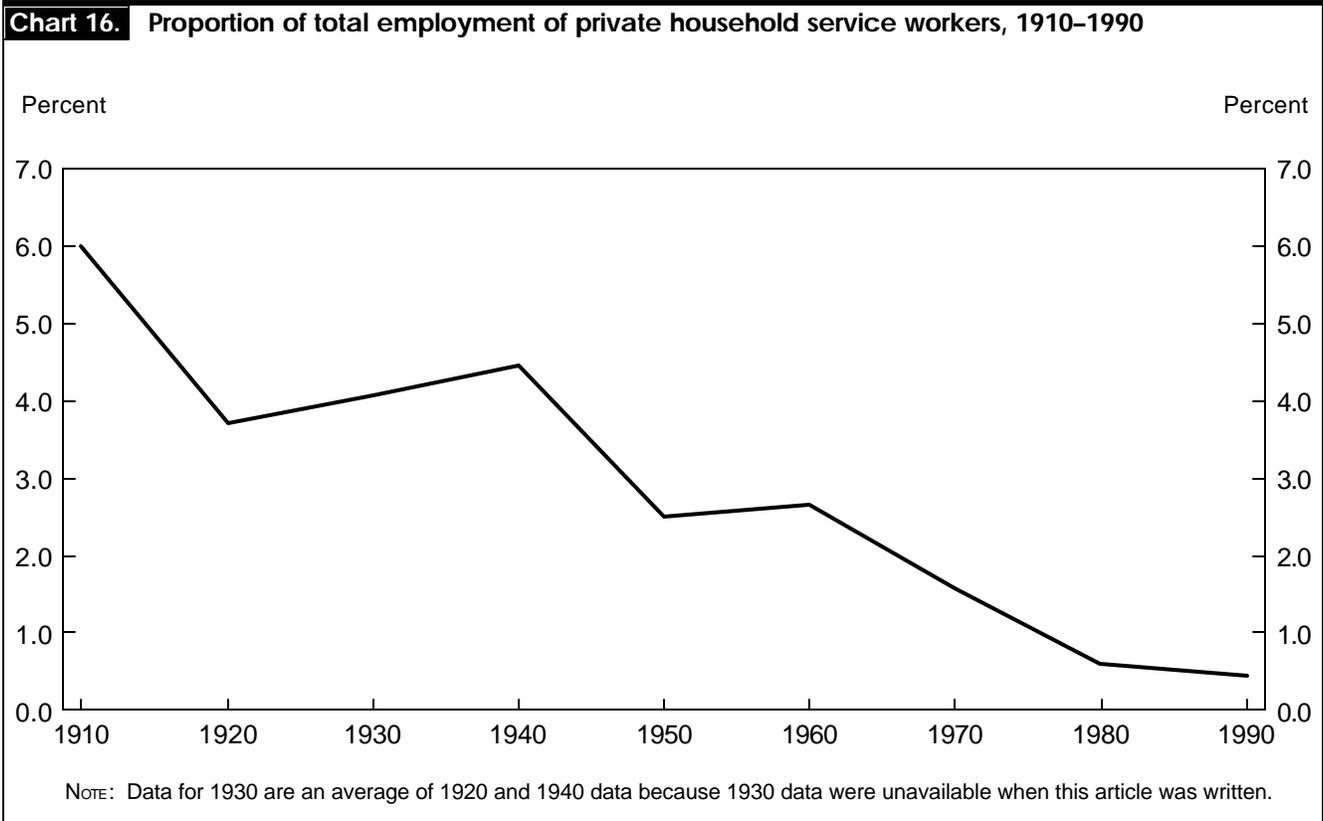
Laborers, except farm and mine

Laborers other than farm and mine laborers declined by 64 percent as a proportion of total employment between 1910 and 2000. During that span, these laborers' share of employment went from 10.4 percent to 3.7 percent, although the proportion peaked at 11.4 percent in 1920. (See chart 15.) Employment of the group grew from 4,035,000 in 1910 to 4,972,000 in 1990, but dropped to 4,851,000 in 2000. Both more efficient management and the mechanization of production, construction, and material-handling activities led to the decline. However, the proportion of gardeners, except farm, and groundskeepers nearly tripled, from 0.26 percent to 0.7

percent, with most growth occurring after 1980. (See chart 15.) Employment grew from 100,000 to 903,000. More public and commercial buildings, highways, and recreation facilities requiring gardening services, plus more extensive landscaping, stimulated the growth. Rising incomes also permitted homeowners to do more extensive landscaping and lawn care and to hire workers for tasks formerly done by household members. Employment of laborers, excluding gardeners, was 3,900,000 in 2000, the same level as in 1910.

Private household workers

Private household workers fell 92 percent as a proportion of total employment, from 6.0 percent in 1910 to 0.45 percent in 1990. (See chart 16.) Employment of these workers declined from 2,319,000 to 523,000. (Due to changes in the occupational classification system used in the 2000 census, data for 2000 are not available.⁵⁶) The decline reflects changes in both demand and supply. The need for private household workers decreased over the period as home production of goods and services shifted to manufacturing and service industries and as housework became more mechanized. A greater proportion of food was prepared in food-processing plants, grocery stores, and restaurants; clothing increasingly was produced in



manufacturing industries and cleaned in service industries; and more and more children were cared for in daycare centers. At the same time, labor-saving technologies such as hot and cold running water, central heating, gas and electric stoves, refrigerators and freezers, clothes washers and dryers, vacuum cleaners, dishwashers, and wash-and-wear clothing made housekeeping easier to perform.⁵⁷ The supply of workers to this occupation also became more limited, particularly in the early part of the century, as outside employment opportunities for women—most of these workers were women—broadened, chiefly in clerical and service occupations.⁵⁸

Farmers and farm laborers

The two occupation groups of farmers (including farm managers) and farm laborers (including foremen) combined declined 96 percent as a proportion of total employment between 1910 and 2000, from 33 percent to 1.2 percent. (See chart 17.) Employment declined from 12,809,000 to 1,598,000 between the 2 years.⁵⁹ Sharply rising farm productivity, together with limited appetites for farm products, caused the decline. In addition, rapid growth in demand for workers in other occupations, as well as higher earnings, encouraged the shift out of farming.

Farm mechanization, most notably the replacement of horses and mules with gasoline-powered tractors of growing power and efficiency, greatly increased farm workers' productivity. So did improved fertilizers and pesticides, higher yield varieties of plants and breeds of animals, improved irrigation practices, more efficient farm management, and farm consolidation. Near the end of the century, genetically modified crops increased yields, reduced pesticide usage, and increased resistance to many pests and fungi. The proportion of farm laborers dropped especially sharply from 1910 to 1920, as

people left for military service or factory work during World War I and did not return. In addition, the 1920 census was conducted on January 1; had it been conducted on April 15, a time of greater farm activity, a greater number of seasonal farm laborers would have been reported.⁶⁰

Despite declining farm employment over the 1910–2000 period, agricultural output grew. Wheat production increased 2.6 times, from 625 million bushels to 2,228 million bushels, and yield per acre tripled, from 13.7 bushels to 42.0 bushels. Corn production grew 2.5 times, from 2,852 million bushels to 9,915 million bushels, with yield per acre growing 4 times, from 27.9 bushels to 136.9 bushels.⁶¹ However, these increases in output, while substantial, were much more modest than increases in output in other sectors, such as manufacturing and services. Still, from 1900 to 1997, the time required to cultivate an acre of wheat decreased from more than 2 weeks to about 2 hours, while for an acre of corn, it declined from 38 hours to 2 hours.

EVERY 2 YEARS, THE BUREAU ANALYZES historic employment trends as part of its program of 10-year occupation and industry employment projections. The Bureau projects that many of the long-term trends described in this article will continue into the 21st century.⁶² Professional and related occupations and health service workers are projected to increase their share of total employment between 2004 and 2014. Construction occupations and installation, maintenance, and repair occupations are expected to remain about the same proportion of total employment, while production occupations (roughly equivalent to production craftsmen and production-related operatives), office and administrative support occupations (roughly equivalent to clerical occupations), and agricultural managers and agricultural workers are projected to decline. □

Notes

¹ See the November 2005 *Review*.

² In the Bureau's biennial projections, an industry-occupation matrix is used to analyze occupations as a percentage of total employment in each industry. (See *Occupational Outlook Handbook, 2004–05*, Bulletin 2570 (Bureau of Labor Statistics, March 2004), pp. 663–64; and *Occupational Projections and Training Data, 2004–05*, Bulletin 2572 (Bureau of Labor Statistics, March 2004), pp. 42–43; on the Internet at <http://www.bls.gov/emp>.)

³ Those with a numeric decline in employment have a staffing pattern decline of 70 percent or more.

⁴ On the Internet at <http://www.ipums.org/>. (See Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander, *Integrated Public Use Microdata Series: Version 3.0* (Minneapolis, Minnesota

Population Center, 2004.)) IPUMS provides Census Bureau microdata dating back to 1850. The size of the microdata sample is either 1 percent or 5 percent, depending upon the year.

⁵ In addition, the original Census Bureau data have both sampling and nonsampling errors.

⁶ An occupation category consists of a homogeneous group of occupation titles. (See *Alphabetical index of occupations and industries, 1950 Census of Population*, rev. ed. (U.S. Bureau of the Census, 1950), p. vi.)

⁷ The 1950 census did include three subgroups: engineers, natural scientists, and mechanics and repairers.

⁸ See *Standard Occupational Classification Manual, 2000* (Executive Office of the President, Office of Management and Budget, 2000).

⁹ Data in chart 1 on private household workers are for 1990, rather than 2000. In the 2000 census, the employment of private household workers cannot be determined, because those workers are included with workers having similar duties in cleaning, childcare, food preparation, or other service worker occupations. Therefore, the change in private household workers' employment over the 90-year period cannot be calculated.

¹⁰ Of course, these shifts began well before 1910. For example, employment in the agricultural sector, roughly equivalent to farm occupation employment, declined from 64.5 percent in 1850 to 32.1 percent in 1910. Over the same period, employment in the goods-producing sector increased from 17.7 percent to 32.1 percent, and that in the service-producing sector increased from 17.8 percent to 35.9 percent. (See Michael Urquhart, "The employment shift to services: where did it come from?" *Monthly Labor Review*, April 1984, pp. 15–22, especially table 1, p. 16.)

¹¹ That is, their growth appears as a straight line in the charts that are presented. Obviously, growth rates over the period need not be steady.

¹² The group included soc numbers 15–29–0000 in 2000. (See *Standard Occupational Classification Manual, 2000*, p. xvi.) Accountants and auditors, however, a category classified as a business and financial operations occupation in the 2000 soc, also is discussed here because it was classified as a professional, technical, and kindred occupation in 1950.

¹³ See *Greatest Engineering Achievements of the 20th Century* (Washington, DC, National Academy of Engineering, 2006), on the Internet at <http://www.greatachievements.org/>.

¹⁴ Data are from the 1960–90 censuses and the 2000 Current Population Survey (cps). Computer programmers; computer systems analysts; and computer specialists, not elsewhere classified (n.e.c.), first appeared as titles of occupations in the 1960 census, within professional, technical, and kindred workers, n.e.c., and as Bureau of the Census occupations (with employment data) in 1970. Special tabulations provide employment data for 1960. (See Constance Bogh DiCesare, "Changes in the occupational structure of U.S. jobs," *Monthly Labor Review*, March 1975, pp. 24–34, especially Table 2, p. 26; and John A. Priebe, Joan Heinkel, and Stanley Greene, *1970 Occupation and Industry Classification Systems in Terms of Their 1960 Occupation and Industry Elements*, Technical Paper 26 (U.S. Department of Commerce, Bureau of the Census, 1972), especially table 1, p. 19.)

¹⁵ Data on accountants for the 1910–40 period are from *Historical Statistics of the United States, Colonial Times to 1970*, Bicentennial Edition, part 1 (U.S. Department of Commerce, Bureau of the Census, 1975). Accountants and auditors are classified with business and financial operations occupations in 2000.

¹⁶ *Greatest Engineering Achievements*.

¹⁷ William C. Goodman, "The software and engineering industries: threatened by technological change?" *Monthly Labor Review*, August 1996, pp. 37–45.

¹⁸ Healthcare workers, excluding attendants and practical nurses, increased 4.6 times, from 0.8 percent to 4.4 percent.

¹⁹ In the latter part of the century, home healthcare provided by healthcare workers also grew rapidly.

²⁰ David E. Kyvig, *Daily Life in the United States, 1920–1940* (Chicago, Ivan R. Dee, 2002).

²¹ See Anne Kahl and Donald Clark, "Employment in health services: long term trends and projections," *Monthly Labor Review*,

August 1986, pp. 17–36; and David Hiles, "Health services: the real jobs machine," *Monthly Labor Review*, November 1992, pp. 3–16.

²² Theodore Caplow, Louis Hicks, and Ben J. Wattenberg, *The First Measured Century: An Illustrated Guide to Trends in America, 1900–2000* (Washington, DC, AEI Press, 2001).

²³ Personal interview with Dale C. Smith, Ph. D., chairman, Department of Medical History, U.S. University of the Health Services, Dec. 8, 2004.

²⁴ Caplow, Hicks, and Wattenberg, *The First Measured Century*.

²⁵ *Statistical Abstract of the United States: 2003* (U.S. Census Bureau, 2003). Data are based on the cps.

²⁶ At 9.1 percent, physicians and surgeons were the second-largest professional and technical occupation in 1910, but by 2000 they had dropped to 2.4 percent of all professional workers. Dentists and pharmacists remained a fairly steady proportion of total employment throughout the century.

²⁷ The higher 1940 ratio may reflect the smaller-than-average impact of the Great Depression on the employment levels of lawyers. In 1940, the overall unemployment rate was 14.6 percent (*Statistical Abstract of the United States, 1961* (U.S. Census Bureau, 1961).)

²⁸ Richard L. Abel, *American Lawyers* (New York, Oxford University Press, 1989); see especially pp. 123–26.

²⁹ Federal laws include the Civil Rights Act of 1964, the Age Discrimination in Employment Act of 1967, the National Environmental Policy Act of 1969, and the Occupational Safety and Health Act of 1970.

³⁰ In the census, teachers, n.e.c. The only other category of teachers is college presidents, professors, and instructors. Teachers, n.e.c., made up by far the largest professional occupation in 1910, at 36.4 percent of all professional workers. By 2000, it was still the largest, but was only 16.4 percent of professional workers.

³¹ Thomas D. Snyder, ed., *120 Years of American Education: A Statistical Portrait* (Washington, DC, National Center for Education Statistics, 1993); see also ES/NCES, "Youth Indicators, 2005: Trends in the Well-being of American Youth, Indicator 11: Pupil/Teacher Ratios and Expenditures per Student," table 11, on the Internet at <http://nces.ed.gov/programs/youthindicators/asp?PubPageNumber=11&ShowTablePage=TablesHTML/11.asp>.

³² *United States Summary: Population and Housing Unit Counts* (U.S. Census Bureau, August 1993), table 2, on the Internet at <http://www.census.gov/population/censusdata/table-2.pdf>.

³³ *National and State Population Estimates: Annual Population Estimates 2000–2005* (U.S. Census Bureau, Dec. 21, 2005), on the Internet at <http://www.census.gov/popest/states/NST-ann-est.html>.

³⁴ The percent change here is based on data for 5- to 19-year-olds, prorated for 5- to 18-year-olds.

³⁵ *Digest of Education Statistics Tables and Figures* (National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education, 2001), table 8, on the Internet at <http://nces.ed.gov/programs/digest/d01/dt008.asp>. Between 1910 and 1940, the proportion of people aged 25 years and older with a high school diploma increased from 13.5 percent to 24.5 percent.

³⁶ Clergy declined from 7.3 percent to 1.3 percent of professionals over the period.

³⁷ The 2000 data include some workers classified as private household workers in earlier years.

³⁸ Health service workers grew 4 times as a percent of total employment, from 0.39 percent to 1.95 percent. Their numbers grew from 97,000 to 3,513,000. Practical nurses are classified with service workers in the 1950 census, but with healthcare practitioners and technical occupations in the soc. Data for service workers, n.e.c., are not included in the components.

³⁹ Gardeners, except farm, and groundskeepers are included within laborers, just as they are in the 1950 census classification.

⁴⁰ Nationwide prohibition began on January 16, 1920, with the 18th amendment to the Constitution, but State and local laws had already significantly affected the drinking of alcoholic beverages. The amendment was repealed in 1934. (See Kyvig, *Daily Life in the United States*, pp. 3, 24, and 25.)

⁴¹ John A. Jakle and Keith A. Sculle, *Fast food: roadside restaurants in the automobile age* (Baltimore, Johns Hopkins University Press, 1999).

⁴² <http://www.fns.usda.gov/cga/PressReleases/1999/PR-0060.htm>.

⁴³ Caplow, Hicks, and Wattenberg, *The First Measured Century*, pp. 214–17.

⁴⁴ In the 2000 soc, cashiers are classified as sales workers.

⁴⁵ See Teresa L. Morisi, “Commercial banking transformed by computer technology,” *Monthly Labor Review*, August 1996, pp. 30–36; and Michael J. Pilot, “Occupational Outlook Handbook: a review of 50 years of change,” *Monthly Labor Review*, May 1999, pp. 8–26.

⁴⁶ Data on attendants in physicians’ and dentists’ offices also are included in data on healthcare workers.

⁴⁷ John Priebe, *Changes between the 1950 and 1960 Occupational and Industry Classifications* (U.S. Bureau of the Census, July 1969). DiCesare, “Occupational structure of U.S. jobs,” cautions that part of the 1960–70 decline could be attributed to definitional changes.

⁴⁸ See note 44.

⁴⁹ See, for example, note 27.

⁵⁰ Data for these three categories do not include foremen, n.e.c. The Census Bureau aggregated data for all foremen, so there was no way to allocate their employment to each of the categories. Craftsmen and kindred workers, n.e.c., also were not allocated. The occupation

of mechanics and repairers is a 1950 census group, roughly equivalent to installation, maintenance, and repair occupations in the 2000 soc.

⁵¹ This group corresponds to motor vehicle operators in the 2000 soc.

⁵² *Fourteenth Census of the United States taken in the Year 1920, Volume IV, Population 1920, Occupations* (U.S. Bureau of the Census), p. 16.

⁵³ *Ibid.*, p. 39.

⁵⁴ See Harold F. Williamson, *The Growth of the American Economy* (New York: Prentice-Hall, Inc., 1944), especially pp. 499–519.

⁵⁵ See Kyvig, *Daily Life in the United States*, pp. 35–37, for a discussion of Henry Ford’s role in developing mass production.

⁵⁶ See *Standard Occupational Classification Manual, 2000*.

⁵⁷ *The First Measured Century*, pp. 36–37, 98–99. The greater labor force participation rate of women in the latter part of the century did not appear to affect the decline in the number and proportion of private household service workers.

⁵⁸ Between 1910 and 1950, the number of women employed in clerical occupations increased 5.5 times (by 3.8 million), while male clerical workers increased 1.1 times. (See *Historical Statistics of the United States*, pp. 139, 140).

⁵⁹ Employment of farmers declined from 15.6 percent of all employment to 0.6 percent, from a level of 6,048,000 to 775,000. Employment of farm laborers declined from 17.4 percent to 0.6 percent, or, numerically, from 6,761,000 to 823,000.

⁶⁰ See *Fourteenth Census*, pp. 12, 13, 22–24. The 1910 census was conducted on April 15. The *Fourteenth Census* also discusses the possible overcount in the 1910 census of children aged 10–15 years reported as farm laborers. In the early years of the 20th century, a large proportion of farm laborers were unpaid family workers.

⁶¹ See *Track Records: United States Crop Production* (U.S. Department of Agriculture, National Agricultural Statistics Service, April 2003), on the Internet at <http://usda.mannlib.cornell.edu/data-sets/crops/96120/track03c.htm#all>; and 2002 Census of Agriculture—State Data: New York (U.S. Department of Agriculture, National Agricultural Statistics Service, no date), table 33, on the Internet at http://www.nass.usda.gov/census/census02/volume1/ny/st36_1_033_033.pdf.

⁶² Daniel E. Hecker, “Occupational employment projections to 2014,” *Monthly Labor Review*, November 2005, pp. 70–101.