Article

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Childcare employment—before, during, and after the COVID-19 pandemic

The employment rate in the United States fell dramatically in many industries during the COVID-19 pandemic—the childcare industry, in particular, was hit hard. In this article, we use data from the U.S. Bureau of Labor Statistics (BLS) Business Response Surveys and other BLS sources to examine employment, wages, telework, benefits, and the inner workings of the critical child daycare services industry before and during the pandemic and most importantly how the industry has managed since. Although the childcare industry's wages are low and it has high labor turnover, our findings show that it is critical in supporting workers across all industries.

Because of the COVID-19 pandemic, childcare centers were subject to mandated closures; increased safety requirements, including limits on capacity; and other disruptions.[1] These disruptions in the childcare services industry rippled across the U.S. economy because workers were unable to access reliable childcare for their families.

The childcare industry fulfills multiple roles in the labor market. First, the childcare industry employs several thousands of workers who earn their living caring for, protecting, and educating large portions of the nation's youth. Second, the childcare industry facilitates efficiencies and equity in the labor market by enabling parents to work outside the home. During the pandemic, mothers of younger children, those most often needing childcare, experienced the steepest declines in employment rates, specifically illustrating the importance of the childcare industry for working mothers.[2] Third, the childcare industry is crucial in educating and socializing the next generation of employees and entrepreneurs. This article covers the first of these facets—employment.

In addition to the functional importance to the labor force, the childcare industry itself comprises hundreds of thousands of employees across tens of thousands of establishments. In the most recent release of data for the first quarter of 2023, the U.S. Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) program reported that the 77,000 childcare services establishments in the United States employ over 942,000 workers and account for $7.2 billion in total quarterly wages.[3] The childcare industry is characterized by small establishments: 58 percent of childcare establishments employed fewer than 10 employees. Furthermore, according to the BLS Business Response Survey (BRS) to the COVID-19 pandemic, establishments in the childcare industry experienced certain effects of the pandemic at a higher level (in some cases much higher) than the national average.

In what follows, we leverage new data from the BLS BRSs and other BLS sources to assess employment, wages, telework, benefits, and dynamics of the critical child daycare services industry before the pandemic, in the early days of the outbreak, and how the industry has coped since.[4]

Data sources and definitions

In 2020, BLS developed a new survey on how U.S. businesses changed their operations since the onset of the COVID-19 pandemic. Data from the first BRS to the COVID-19 pandemic help all data users understand how businesses responded during the pandemic through September 2020.[5] Data were collected from July through September 2020. In 2021, BLS similarly developed a second survey with different questions about how businesses had changed operations through that stage of the pandemic.[6] The 2021 BRS was collected from July through September 2021. Most recently, in 2022, BLS developed a third BRS with questions about telework, hiring, and vacancies.[7] The 2022 BRS was collected from August through September 2022.

In this article, we complement the findings of the BRS with data from the QCEW. The QCEW is a quarterly count of employment and wages that covers about 95 percent of U.S. jobs, made available at the county, metropolitan statistical area, and state and national levels by industry.[8] QCEW includes employment and wages from establishments subject to unemployment insurance (UI). This coverage represents a near census that, in the first quarter of 2023, included information on 11.6 million establishments. Note that some establishments not covered by UI laws are excluded from the QCEW. These noncovered establishments include sole proprietorships, unincorporated self-employed, and unpaid family members.[9] Noncovered establishments are somewhat more prevalent in the childcare industry than most other industries.

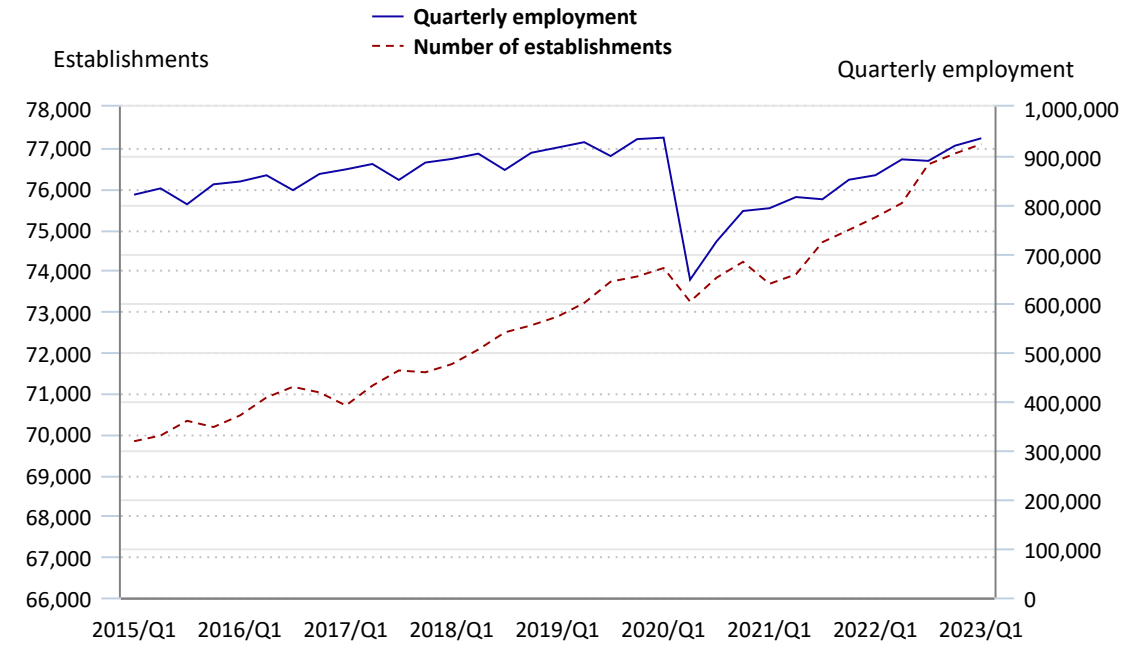
For this analysis, the childcare industry is identified in the North American Industry Classification System (NAICS) as NAICS 6244, child daycare services, in which establishments are subject to UI. According to the NAICS manual, "this industry comprises establishments primarily engaged in providing daycare of infants or children. These establishments generally care for preschool children, but may care for older children when they are not in school and may also offer pre-kindergarten and/or kindergarten educational programs."[10]

The child daycare services industry falls within NAICS sector 62, healthcare and social assistance. As described in the NAICS manual, "the Health Care and Social Assistance sector comprises establishments providing healthcare and social assistance for individuals. The sector includes both healthcare and social assistance because it is sometimes difficult to distinguish between the boundaries of these two activities. The industries in this sector are arranged on a continuum starting with establishments providing medical care exclusively, continuing with those providing healthcare and social assistance, and finally finishing with those providing only social assistance. Establishments in this sector deliver services by trained professionals. All industries in the sector share this commonality of process, namely, labor inputs of health practitioners or social workers with the requisite expertise."[11] In this article, we present national data for comparison from the BRSs for 2020, 2021, and 2022 and from the QCEW that are specifically for healthcare and social assistance (NAICS 62) and for child daycare services (NAICS 6244).[12]

Before the COVID-19 pandemic (2015–19)

According to the QCEW, child daycare services employed 929,000 workers in April 2019.[13] In the 5 years before the onset of the COVID-19 pandemic, the industry added 116,000 jobs and 4,235 establishments. (See chart 1.) The deepest employment loss due to the COVID-19 pandemic was in April 2020. Because QCEW data are not seasonally adjusted, we chose April 2019 as a prepandemic baseline. In terms of wages, child daycare services had one of the lowest levels of average weekly wages nationally. In the second quarter of 2019, child daycare services had an average weekly wage of $461, much lower than the national average of $1,085. Research consistently finds that child daycare workers were among the lowest paid workers before, during, and after the pandemic.[14]

Chart 1. Number of child daycare center establishments and quarterly employment, 2015–23



Click legend items to change data display. Hover over chart to view data.
Note: Q1 = first quarter, Q2 = second quarter, Q3 = third quarter, and Q4 = fourth quarter.
Source: U.S. Bureau of Labor Statistics.

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In the 5 years before the onset of the COVID-19 pandemic, approximately 2,700 child daycare services closed, on average, per quarter. Those closings were counterbalanced with approximately the same number of openings every quarter. On average, child daycare center closings affected around 13,600 employees each quarter. In second-quarter 2019, child daycare services industry was reduced by approximately six jobs per establishment, on average.

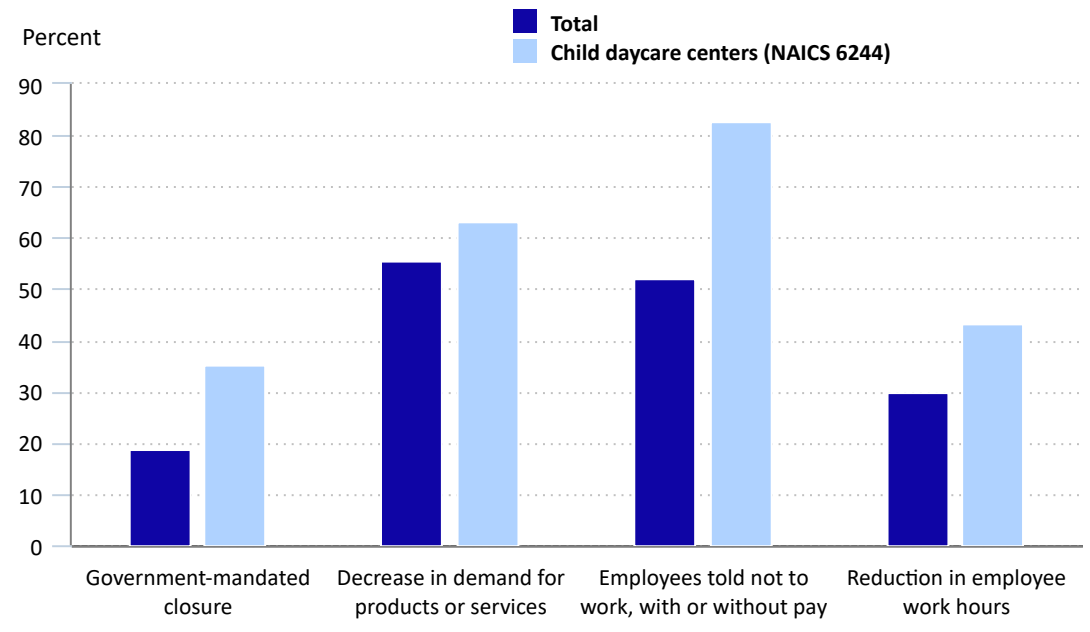
The start of the COVID-19 pandemic

As businesses and the public experienced the fullest economic impact of the COVID-19 pandemic, in April 2020, child daycare services experienced a year-over-year employment decrease that was more than twice the national rate. According to QCEW data, employment at child daycare services decreased 33.9 percent from 928,929 in April 2019 to 613,632 in April 2020.[15] During this same time, employment fell nationally by 15.7 percent and by 9.1 percent in healthcare and social assistance.

The quarterly series on Business Employment Dynamics show that between the first and second quarters of 2020, nearly 13,000 child daycare services establishments closed.[16] Furthermore, 18,000 child daycare services reduced employment in first-quarter 2020. In the following quarter, 35,000 child daycare services reduced employment but remained open.

Looking at 2020 BRS data reveals that 35.2 percent of child daycare services establishments experienced government-mandated closures, compared with 18.7 percent of businesses across all industries.[17] (See chart 2.) In addition to closures, an uncertainty about the safety of group settings swayed some parents to voluntarily hold their children out of schools and child daycare services establishments.[18] The 2020 BRS data show that child daycare services establishments experienced a slightly larger decrease in demand for products or services compared with establishments across all industries—63.1 percent versus 55.6 percent. Child daycare services establishments were also much more likely to tell employees not to work, with or without pay. Almost 83.0 percent of child daycare services establishments told employees not to work, with or without pay, compared with 51.9 percent of all establishments. In addition, 43.3 percent of child daycare services establishments reduced hours for employees who worked at least some hours. This figure was considerably higher than the national average of 29.9 percent.

Chart 2. U.S. business response to the COVID-19 pandemic, in percent, 2020



Click legend items to change data display. Hover over chart to view data.
Note: Employees who worked reduced hours worked at least a few hours. NAICS = North American Industry Classification System.
Source: U.S. Bureau of Labor Statistics.

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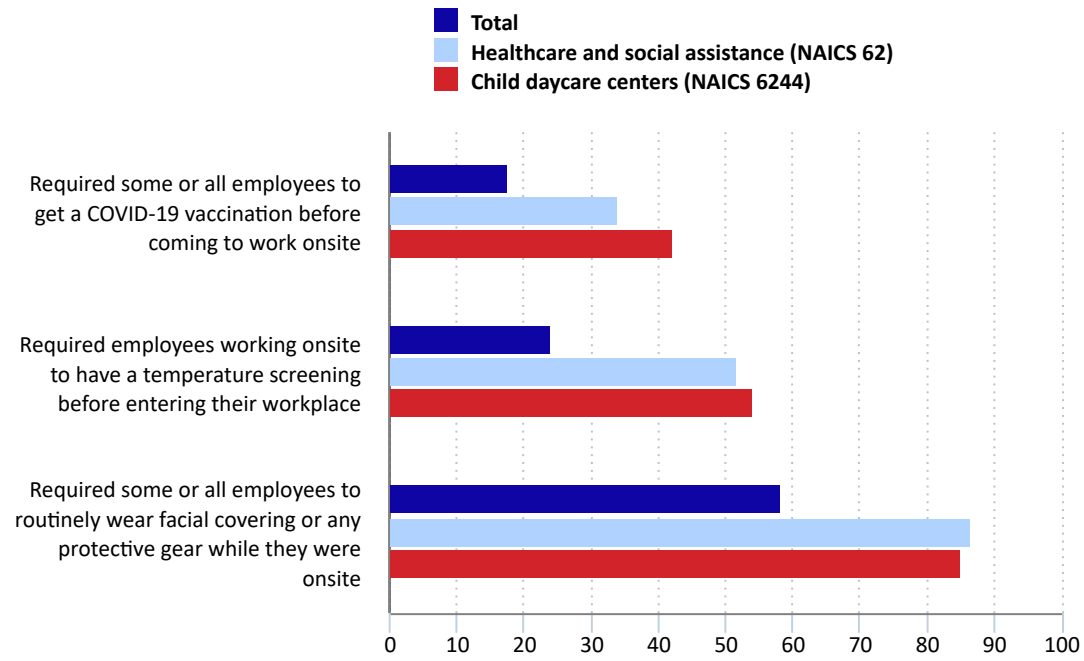
Given that workers in low-wage jobs are much less likely to have emergency savings available to them,[19] these disproportionate disruptions in work hours would have been a substantial hardship on child daycare workers during the already uncertain early stages of the pandemic. Research clearly shows that child daycare workers are made up of a relatively larger share of employees who are women, Black, and Hispanic.[20] Therefore, many hardships faced by child daycare workers during this period were endured disproportionally by those who were women, Black, and Hispanic.[21]

During the COVID-19 pandemic

According to the 2020 BRS, 82.3 percent of businesses changed operations in some way because of the pandemic.[22] As the pandemic continued through 2021, businesses continued to change various operations. Workplace safety changes included requiring facial coverings to work onsite, temperature screenings before working onsite, and COVID-19 vaccinations. For the child daycare industry, these operational changes occurred at higher rates than the national average and, at times, slightly higher than the healthcare and social assistance industry. (See chart 3.)

Chart 3. U.S. business response to the COVID-19 pandemic, in percent, 2021



Click legend items to change data display. Hover over chart to view data.
Note: NAICS = North American Industry Classification System.
Source: U.S. Bureau of Labor Statistics.

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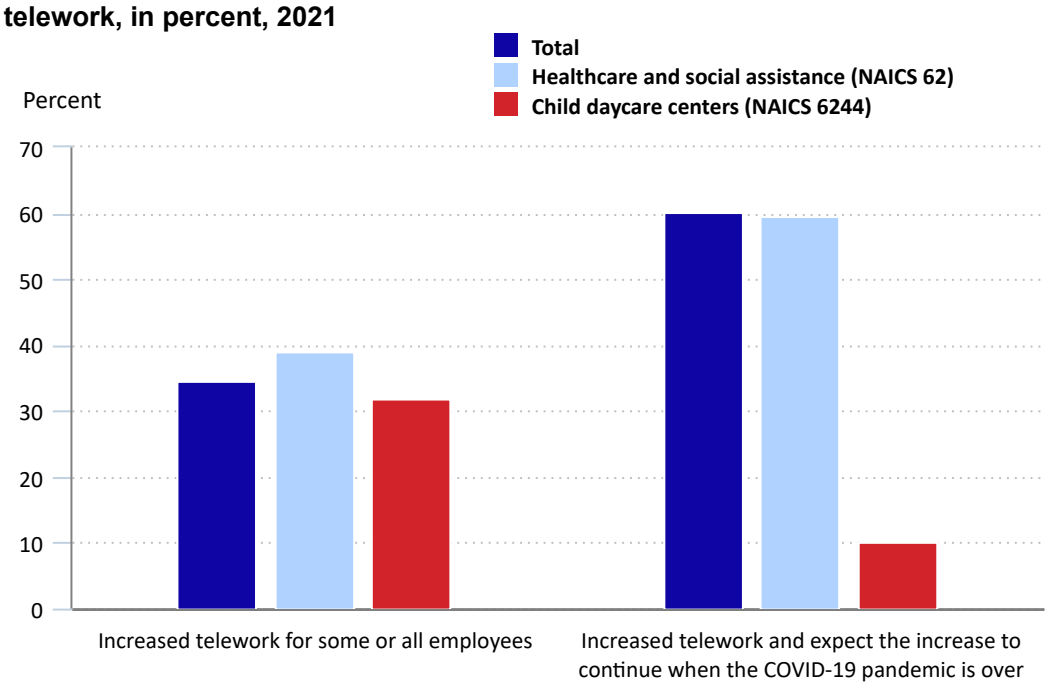
Results from the 2021 BRS show that child daycare services required employees to wear masks (facial coverings), get temperature screenings, and get a COVID-19 vaccine at higher rates than the national average. In fact, child daycare services establishments had similar levels of masking and temperature screenings as did their counterparts across the healthcare and social assistance industry, which were much higher than the national average. Of child daycare services establishments, 42.0 percent required vaccinations for some or all employees. This percentage was higher than the 33.8 percent of establishments in healthcare and social assistance and much higher than the 17.5 percent of establishments with vaccination requirements across all industries.

Telework during the COVID-19 pandemic

The 2020 and 2021 BRS data show that many establishments coped with the COVID-19 pandemic by offering employees telework or work-from-home arrangements.[23] The reduction or elimination of in-person operations reduced the risk of COVID-19 transmission while it also reduced costs and burdens associated with implementing in-person precautions, such as masking, social distancing, or vaccination requirements. The nature of work associated with caring for young children requires that workers be present in person and onsite. While some workers may have been able to increase telework, frontline childcare workers could not generally perform their work remotely. According to the 2020 BRS, 62.6 percent of child daycare services establishments had no telework before or after the pandemic, compared with 52.3 percent of all establishments nationally.[24]

Looking at the 2021 BRS reveals that 34.5 percent of all establishments increased telework for some or all employees because of the pandemic.[25] (See chart 4.) Child daycare services establishments were similar, with 32.0 percent of establishments increasing telework for some or all employees. Note that by the parameters the telework question presented in the 2021 BRS, establishments would report that they had some employees with increased telework even if only one or two employees were permitted to telework while others remained in person.

Chart 4. U.S. business response to the COVID-19 pandemic increase, in telework, in percent, 2021



Click legend items to change data display. Hover over chart to view data.
Note: NAICS = North American Industry Classification System.
Source: U.S. Bureau of Labor Statistics.

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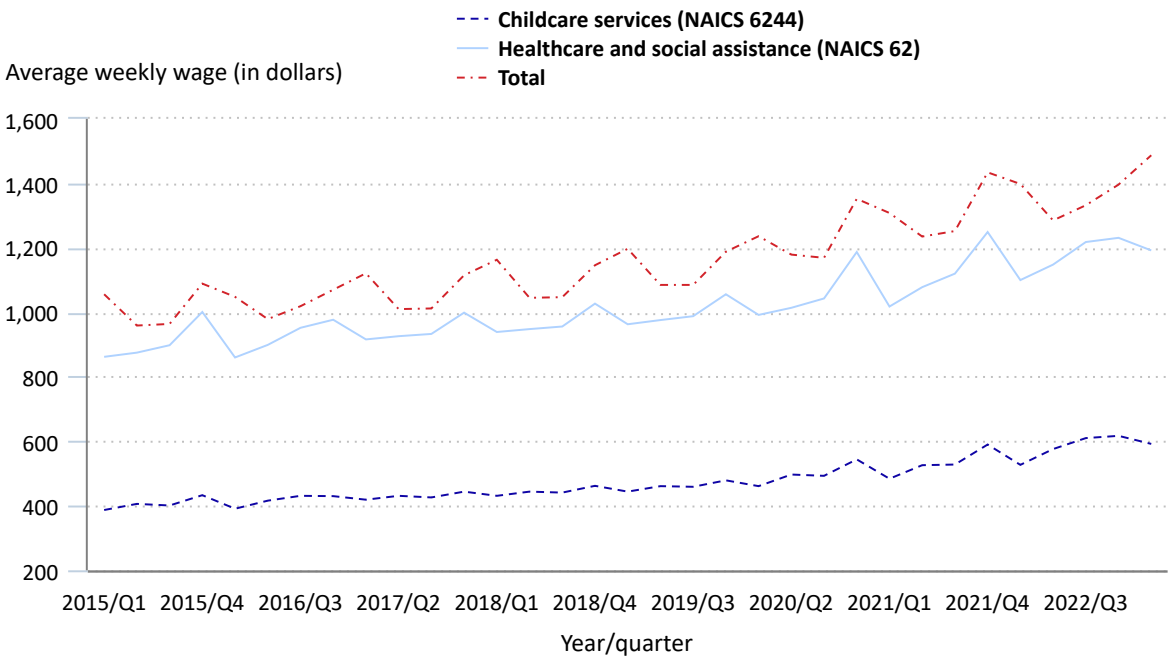
Although child daycare services increased telework for some or all employees during the pandemic, they did not expect these telework increases to continue once the pandemic was over. Only 10.0 percent of child daycare services establishments expected increased telework to continue in their industry after the pandemic, compared with 60.1 percent of establishments across all industries. Whatever shifts to telework were made during the pandemic were largely expected to revert to onsite work in the future.

Indeed, in July 2022, the availability of telework was much lower for child daycare services than for establishments overall: 5.0 percent of child daycare services establishments had employees who teleworked some or all the time, compared with 27.5 percent nationally.

Child daycare center wages

Research clearly shows that child daycare center workers are among the lowest paid workers in the United States.[26] According to the 2020 BRS, 8.8 percent of child daycare services establishments increased salaries and wages for some workers, compared with only 5.6 percent nationally.[27] And 59.6 percent of child daycare services establishments continued paying employees who were told not to work, compared with 51.3 percent nationally. QCEW data show that average weekly wages for child daycare services were about 60 percent less than the national average from 2018 to 2022. From the BRS data, child daycare services and social assistance establishments saw slightly higher rates of increases in base pay attributed to the COVID-19 pandemic when compared with other establishments. In the first quarter of 2020, average wages for child daycare services were 63 percent below the national average. This gap closed slightly to 58 percent below the national average in the second quarter of 2020 but returned to 60 percent below the national average in the first quarter of 2023. (See chart 5.)

Chart 5. Average weekly wages at U.S. child daycare centers, in dollars, 2015–23



Click legend items to change data display. Hover over chart to view data.
Note: NAICS = North American Industry Classification System. Q1 = first quarter, Q2 = second quarter, Q3 = third quarter, and Q4 = fourth quarter.
Source: U.S. Bureau of Labor Statistics.

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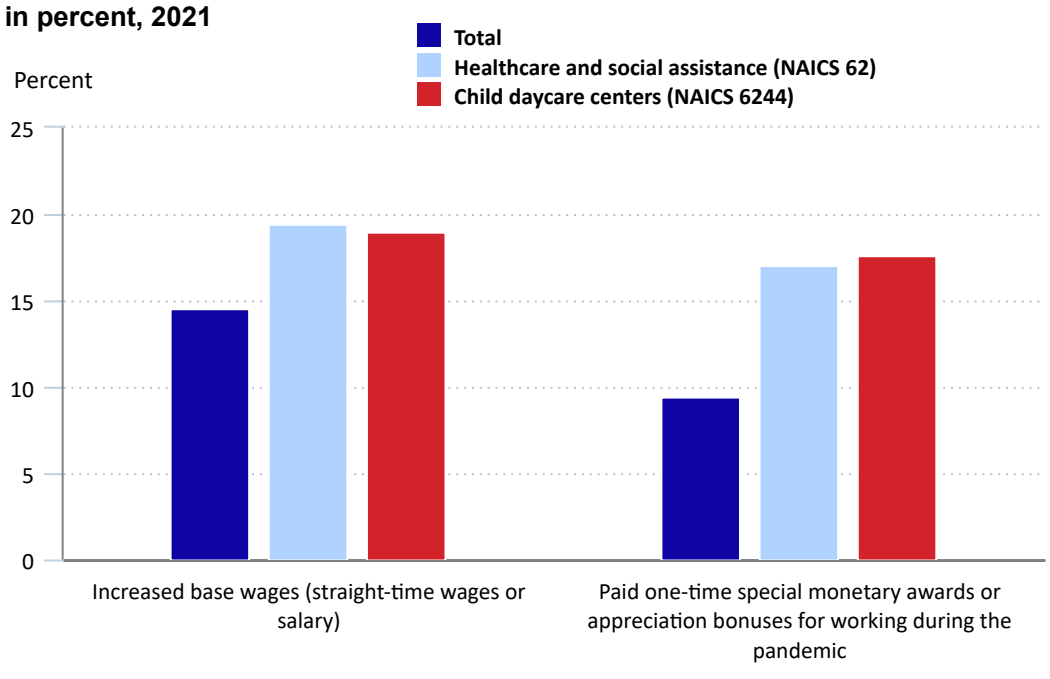
During the COVID-19 pandemic, employers made various changes in the pay of employees. These changes included not only increases in base wages but also one-time monetary awards and other monetary or nonmonetary incentives for working under the extraordinary circumstances of the pandemic. We know that establishments in industries classified as essential by the Centers for Disease Control and Prevention had different experiences from those in industries that were not deemed essential.[28] And in terms of pay, essential workers were often singled out for bonuses or other pay incentives based on the critical functions that they performed during the pandemic.

According to the 2021 BRS data, 19.4 percent of child daycare services establishments increased base wages or salary, which was similar to the rate for the healthcare and social assistance industry.[29] Both were higher than the national average of 14.5 percent of establishments that increased base wages or salary. Child daycare services and the healthcare and social assistance industry also showed higher levels of paying one-time bonuses for work during the pandemic, at 17.6 percent and 17.0 percent, respectively. These rates are much higher than the national average of 9.4 percent. (See chart 6.)

Chart 6. U.S. business response to the COVID-19 pandemic changes, in pay, in percent, 2021



Click legend items to change data display. Hover over chart to view data.
Note: NAICS = North American Industry Classification System.
Source: U.S. Bureau of Labor Statistics.

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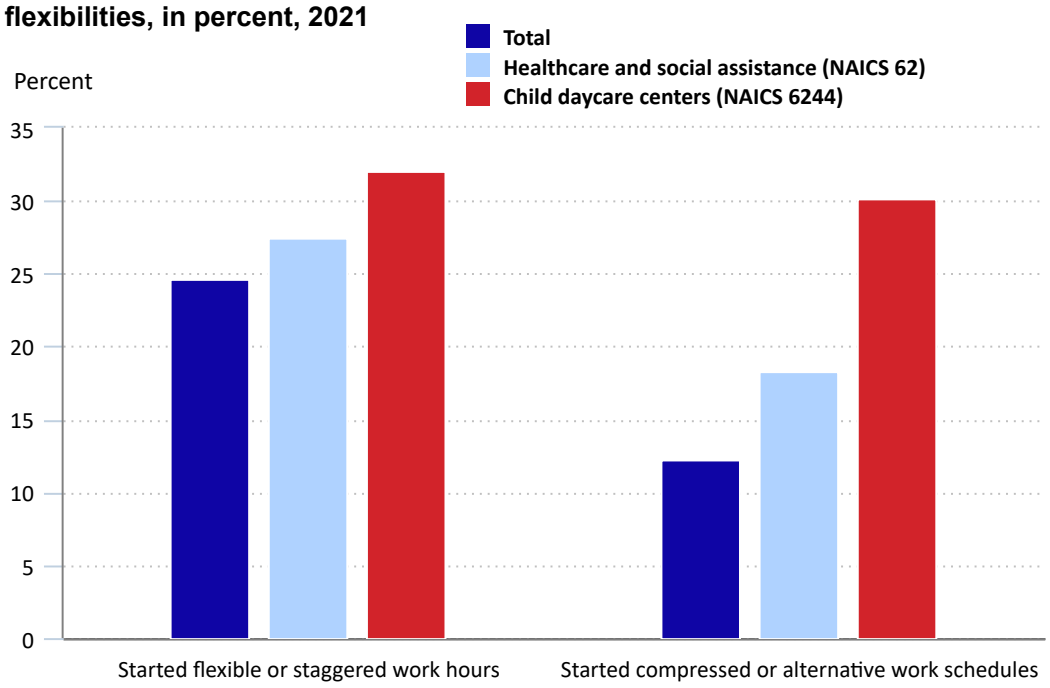
Beyond changes in pay, another option that employers implemented during the pandemic was to offer increased flexibilities for hours of work. Rather than continue to require the more ridged prepandemic schedules, in 2021, 34.5 percent of employers started offering at least one of the following flexibilities to their employees: flexible or staggered work hours, alternative work schedules, voluntary reductions in hours (such as a move from a full- to part-time schedule), job sharing, and/or additional paid leave. Although telework was less of an option for child daycare services to cope with the pandemic, increasing flexibility for hours worked was one strategy that the child daycare industry could implement.

From the 2021 BRS, 32.1 percent of child daycare services started flexible or staggered work hours and 30.1 percent started compressed or alternative work schedules.[30] Both figures were higher than the national and healthcare and social assistance averages. (See chart 7.)

Chart 7. U.S. business response to the COVID-19 pandemic work-hours flexibilities, in percent, 2021



Click legend items to change data display. Hover over chart to view data.
Note: NAICS = North American Industry Classification System.
Source: U.S. Bureau of Labor Statistics.

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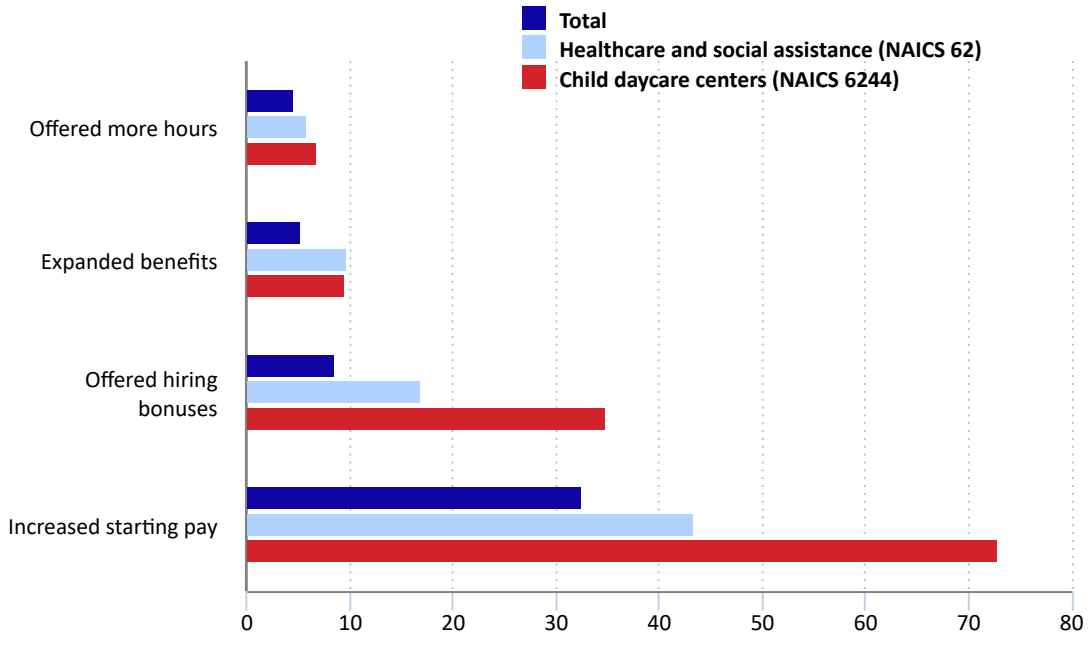
Later stages of the COVID-19 pandemic

Data from the Job Openings and Labor Turnover Survey show that that the number of unemployed people per job opening nationally was at a series low in December 2021 and remained at historically low levels through 2022.[31] The 2022 BRS continued to include questions about telework, similar to the prior two versions. But in response to the tight labor market conditions, the survey added new topics to gain additional insight into businesses' hiring practices, how long vacancies were open, and recruitment practices.[32]

The data introduced in the remaining paragraphs of this section are from the 2022 BRS.[33] In July 2022, 39.7 percent of child daycare services establishments hired employees, compared with 22.4 percent of establishments nationally. Of child daycare services establishments that hired at least one new employee, 72.9 percent increased starting pay to attract more applicants, while nationally, 32.6 percent of establishments did so. Furthermore, 20.1 percent of child daycare services filled positions that were open for more than 30 days, nearly triple the national average of 7.0 percent. To attract more applicants, employers increased compensation, offered hiring bonuses, expanded benefits, and offered more hours (e.g., changed positions from part time to full time). Employers also turned to noncompensation means of attracting applicants, such as advertising, using recruiters, reducing qualifications (e.g., education or experience), and increasing telework or remote work.

To attract additional applicants, in July 2022, child daycare services establishments increased starting pay and offered hiring bonuses at much higher rates than those offered by establishments nationally. However, unlike in 2021, when child daycare services establishments increased flexibilities for hours worked, in July 2022, child daycare services were just slightly more likely (6.9 percent) to offer more hours than establishments in healthcare and social assistance (5.9 percent) and the nation overall (4.5 percent). Remember that childcare workers are and continue to be among the lowest paid workers (see chart 5), so these increases in pay were not substantial enough to elevate wages in this industry to within even half the national average. (See chart 8.)

Chart 8. Compensation methods for attracting new hires by U.S. establishments that hired at least one new employee in July 2022, in percent



Click legend items to change data display. Hover over chart to view data.
Note: NAICS = North American Industry Classification System.
Source: U.S. Bureau of Labor Statistics.

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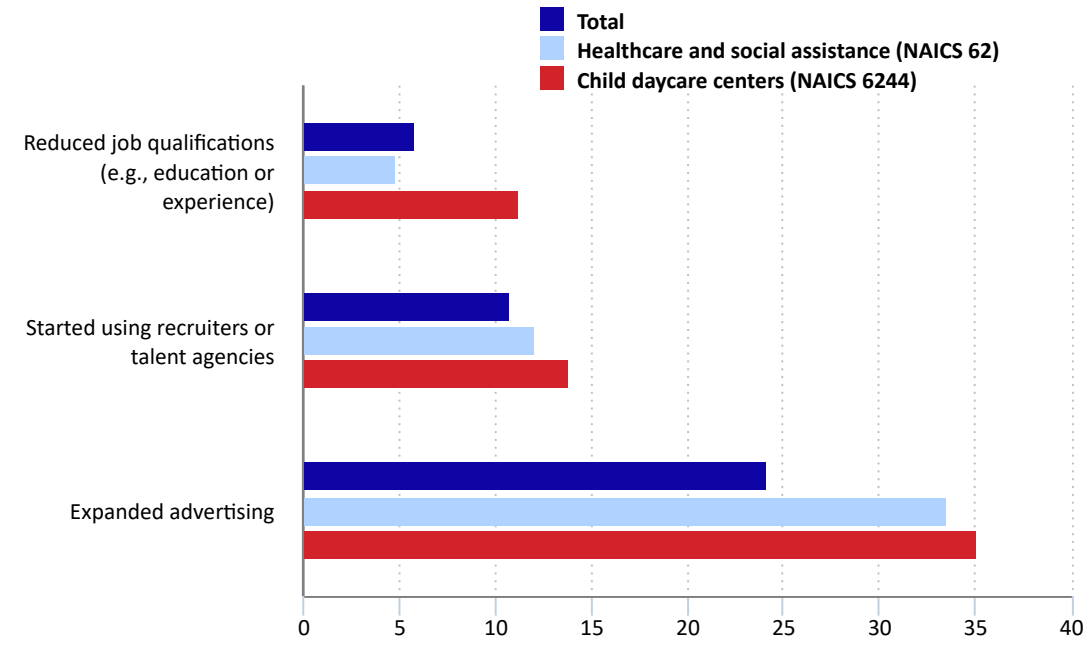
In July 2022, in establishments that hired at least one new employee, 11.3 percent of child daycare services reduced qualifications to attract additional applicants, compared with 5.8 percent nationally and 4.8 percent in healthcare and social assistance. (See chart 9.) Child daycare services were also more likely to expand advertising and start using a recruiter. In keeping with all previous findings on telework, child daycare services were less likely to expand telework, at less than 1.0 percent, compared with 3.1 percent nationally across all industries.

Chart 9. Noncompensation methods for attracting new hires by establishments that hired at least one new employee in July 2022, in percent



Click legend items to change data display. Hover over chart to view data.
Note: NAICS = North American Industry Classification System.
Source: U.S. Bureau of Labor Statistics.

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Child daycare services were more likely than establishments overall to have vacancies both in August and September 2022 and in the 12 months following. From August to September 2022, 38.3 percent of child daycare services had at least one vacancy, compared with 20.9 percent nationally. Furthermore, 65.0 percent of child daycare services had at least one vacancy between August 2021 and September 2022, compared with 40.5 percent nationally.

Conclusion and a look ahead

Most child daycare services employ fewer than 10 employees, have wages below the national average, and are made up of a relatively larger share of employees who are women, Black, and Hispanic. The childcare industry was hit particularly hard by the COVID-19 pandemic. Data gaps limit the ability of data users to fully explain the impacts to this crucial industry. The BLS BRSs for 2020, 2021, and 2022 served as nimble tools that allowed data users to study the impact of the coronavirus pandemic on the labor market and broader economy. Using these data, we filled in a few of the known data gaps to more completely explain the impact of COVID-19 on the childcare industry.

Our results from the 2020 and 2021 BRS data show that some workplace flexibilities, such as telework, were offered at lower rates at child daycare services, while others, such as alternative work schedules, were offered at higher rates.[34] Required safety protocols for COVID-19 were implemented at higher rates at child daycare services.

The COVID-19 pandemic necessitated new, possibly permanent, requirements on child daycare services so that they can operate safely. These requirements included vaccinations, COVID-19 testing, masking, screening tests, cleaning and disinfecting, handwashing and respiratory hygiene, and ventilation improvements.[35] These requirements have associated costs that affect operational costs of child daycare services.[36]

Results from the 2022 BRS data show that child daycare services establishments were more likely to hire and have vacancies than were establishments in the nation overall. This finding is important because, in the childcare industry, continuity of individual workers is necessary to build bonds with young children and families.[37] Costs are also associated with hiring and filling vacancies, such as posting jobs, onboarding, and training new employees.

Looking at March 2023 QCEW data, the most recent datapoint available, we find that child daycare services employed 942,000 workers, surpassing its prepandemic level of 929,000 workers in April 2019.[38] Average weekly wages in first-quarter 2023 were $592, compared with $1,487 nationally. Wages in childcare continue to be among the lowest nationally.

The childcare industry is marked by low wages and high labor turnover, yet it is critical in supporting workers across all industries.[39] Future research on the child daycare services industry and the supporting labor market may be fertile ground to isolate the impact of COVID-19-related requirements on establishments with respect to employment, wages, and labor turnover.

Also worth noting is that in March 2021, the American Rescue Plan (ARP) included $24 billion for the Child Care Stabilization Program.[40] According to the Health and Human Services Office of Child Care, as of December 31, 2022, the ARP Child Care Stabilization Program had served more than 220,000 childcare providers, affecting as many as 9.6 million children. Providers used such awards to help with operational costs such as wages and benefits, rent and utilities, program materials and supplies, and cleaning and sanitation.[41] These federal funds needed to be fully used by states, territories, and tribes as of September 30, 2023.[42] New research points to considerable difficulty across the childcare industry as it continues to operate absent these stabilization funds.[43]

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Notes

1 Lauren Russell and Chuxuan Sun, "The effect of mandatory child care center closures on women's labor market outcomes during the COVID-19 pandemic," *Covid Economics*, no. 62, December 2020, https://bpb-us-w2.wpmucdn.com/web.sas.upenn.edu/dist/0/610/files/2020/12/RussellChuxuan_2020_CovidEconomicsIssue62.pdf.

2 Liana Christin Landivar and Mark deWolf, "Mothers' employment two years later: an assessment of employment loss and recovery during the COVID-19 pandemic" (U.S. Department of Labor, Women's Bureau, May 2022), https://www.dol.gov/sites/dolgov/files/WB/media/Mothers-employment-2%20-years-later-may2022.pdf.

3 "Quarterly census of employment and wages: *overview,*" *BLS Handbook of Methods* (U.S. Bureau of Labor Statistics, last modified February 17, 2023), https://www.bls.gov/opub/hom/cew/.

4 The "child day care services" industry and the terms "child care" and "health care" are referred to as such in other official documents, websites, and databases, but they are referred to as "child daycare services," "childcare," and "healthcare," respectively, in this article to conform to the *Government Publishing Office Style Manual* publication standards. According to the Centers for Disease Control and Prevention (CDC) COVID-19 timeline, on March 11, 2020, the World Health Organization (WHO) declared COVID-19 a pandemic. Around mid-March 2020, schools, childcare centers, restaurants, and other businesses began shutting down in-person operations. By April 13, 2020, most states in the United States reported widespread cases of COVID-19. In December 2020, Americans started to become eligible for the COVID-19 vaccine, and by April 2021, the United States surpassed 200 million vaccinations administered. In June 2021, the COVID-19 Delta variant became the dominate variant in the United States, kicking off a third wave of infections during the summer 2021. In November 2021, the WHO identified Omicron as a variant of concern, leading to another spike around and after the winter holidays. For more information, see "COVID-19 timeline," David J. Sencer CDC Museum: in association with the Smithsonian Institution (U.S. Department of Health and Human Services, CDC, no date), https://www.cdc.gov/museum/timeline/covid19.html.

5 "2020 results of the Business Response Survey," *Business Response Survey* (U.S. Bureau of Labor Statistics), https://www.bls.gov/brs/2020-results.htm.

6 "2021 results of the Business Response Survey," *Business Response Survey* (U.S. Bureau of Labor Statistics), https://www.bls.gov/brs/2021-results.htm.

7 "2022 results of the Business Response Survey," *Business Response Survey* (U.S. Bureau of Labor Statistics), https://www.bls.gov/brs/2022-results.htm. For more information about the Business Response Survey (BRS), see https://www.bls.gov/brs/.

8 For more information about the QCEW program, see https://www.bls.gov/opub/hom/cew/.

9 For more information about QCEW coverage and employment exclusions, see https://www.bls.gov/cew/overview.htm#coverage.

10 *North American Classification System* (U.S. Census Bureau), https://www.census.gov/naics/.

11 *North American Classification System* (U.S. Census Bureau, 2017), p. 523, https://www.census.gov/naics/reference_files_tools/2017_NAICS_Manual.pdf.

12 Data from the 2020 BRS for healthcare were published with a modification in North American Industry Classification System (NAICS) sector 62 to break out subsectors 621 to 623, healthcare, from NAICS 624, social assistance. Healthcare is used as a comparison point in 2020, by using NAICS 621 to 623 compared with NAICS 624. The full sector 62 is used as a comparison for 2020 and 2021 data in alignment with BRS publications.

13 "Quarterly census of employment and wages."

14 Elise Gould, "Childcare workers aren't paid enough to make ends meet," Issue Brief 405 (Economic Policy Institute, November 5, 2015), https://www.epi.org/publication/child-care-workers-arent-paid-enough-to-make-ends-meet/#:~:text=Child%20care%20workers%20are%20largely,in%20other%20occupations%20are%20women; "Labor force statistics from the Current Population Survey," *Current Population Survey* (U.S. Bureau of Labor Statistics), https://www.bls.gov/cps/; Asha Banerjee, Elise Gould, and Marokey Sawo, "Setting higher wages for child care and home health care workers is long overdue," report (Economic Policy Institute, November 18, 2021), https://www.epi.org/publication/higher-wages-for-child-care-and-home-health-care-workers/; and "Bearing the cost report: how overrepresentation in undervalued jobs disadvantaged women during the pandemic," report (U.S. Department of Labor, March 15, 2022), https://www.dol.gov/sites/dolgov/files/WB/media/BearingTheCostReport.pdf.

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16 "Business Employment Dynamics: *overview*," *BLS Handbook of Methods* (U.S. Bureau of Labor Statistics, last modified December 24, 2015), https://www.bls.gov/opub/hom/bdm/.

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Announcement

January 2024

BLS Technical Advisory Committee is requesting nominations for new members

More information is available online at https://www.federalregister.gov/documents/2023/12/15/2023-27538/technical-advisory-committee-request-for-nominations.

Beyond BLS

Beyond BLS briefly summarizes articles, reports, working papers, and other works published outside BLS on broad topics of interest to MLR readers.

January 2024

Looking into the crystal ball: when should people consider long-term care?

Summary written by: John C. Roach

People in the United States are aging quickly, and much of this growth occurs among the 85 and older age group who rely the most on long-term healthcare. In their working paper, "Long-term care in the United States" (National Bureau of Economic Research, Working Paper 31881, November 2023), authors Jonathan Gruber and Kathleen M. McGarry analyze the long-term healthcare system in the United States.

The authors observe that our older population, who in many cases have the greatest need for long-term care, is often unable to afford this care because of limited resources. For most people, bearing most out-of-pocket costs and living on a fixed or reduced income make a long-term nursing home stay unfeasible. As for formal home care, Gruber and McGarry find that, on average, recipients receive 30 hours of care a week, for $35,000 annually. Alternatively, they find that nursing homes are the recipients' only other option. Although they are less common and usually the least preferred, nursing homes are often essential when one needs 24-hour care.

Other findings reveal that in 2019, the average annual cost of a private nursing home room was $102,000. In 2018, approximately $171 billion was spent on nursing homes and $108 billion on home care costs. These figures do not include costs for informal home care. These informal caregivers are usually family members who provide care to both family and friends, typically without payment. The authors state that informal home care should be factored into the economy's total cost of long-term healthcare.

Even though the cost of long-term healthcare is staggering, especially when the limited financial resources of the older population are considered, Gruber and McGarry determine that the U.S. government shoulders 63 percent of the total cost of healthcare through programs such as Medicaid and Medicare. In addition, out-of-pocket costs account for 19 percent and private insurance for 10 percent, respectively.

The authors conclude by noting that although other countries fund healthcare through dedicated taxes, the United States funds healthcare through government programs. These programs mostly target more general coverage and extend to long-term care only under certain circumstances. Gruber and McGarry speculate that the difficulty in affording long-term healthcare will likely increase as the U.S. population ages and that the need for such care will coincide with the older population's inability to afford the costs.

Article

January 2024

Nonprofits: a look at national trends in establishment size and employment

This article explores trends and highlights of 501(c)(3) organizations at the national level. An examination of total private employment and industry-level employment reveals that nonprofit organizations tend to employ more workers at an establishment than do their for-profit peers. These data also show that nonprofit employment grew at a steady rate from 2007 to 2017, including during the 2007–09 recession.

Nonprofit organizations are an integral part of the U.S. economy. These organizations—from museums and social advocacy groups to healthcare providers and universities—can be found across all segments of the economy. To gauge the impact of this sector, the U.S. Bureau of Labor Statistics (BLS) uses its business register, which relies on data from the Quarterly Census of Employment and Wages (QCEW) program, to produce employment, wage, and establishment estimates for nonprofit organizations on a 5-year cycle.[1]

Although the BLS Business Register contains considerable information about business establishments, it cannot be used to comprehensively identify nonprofit organizations. Thus, to create its nonprofit tabulations, BLS used publicly available data from the Internal Revenue Service (IRS) to identify private-sector nonprofit establishments on the BLS Business Register. Although the IRS lists 29 classifications of tax-exempt entities, BLS restricted its nonprofit tables to the 501(c)(3) category, which identifies charitable and religious organizations.[2]

For the purposes of this article, the phrase "501(c)(3) establishments" is used interchangeably with the phrase "nonprofit organizations." Establishments not identified by this approach are labeled as for-profit establishments. However, these for-profit establishments include a small number of tax-exempt organizations that are classified as 501(c) organizations but not as 501(c)(3)s. Tax-exempt businesses that are not 501(c)(3)s include some types of co-ops, civic leagues and social welfare organizations, and domestic fraternal societies.[3] Annual estimates are available as a spreadsheet for 2007 to 2017 and can be downloaded from the BLS website.[4] Total private and industry data are available at the national, state, metropolitan statistical area, and county levels. Nonprofit statistics for 2018 to 2022 are scheduled to be released in 2024.

This article focuses on employment and establishment tabulations at the national level. This examination of nonprofit data begins by reviewing total private estimates. In 2017, the most recent year of published estimates, 501(c)(3) organizations made up 10 percent of employment and 3 percent of business establishments. An implication of these two statistics is that a nonprofit establishment employs more workers, on average, than does a for-profit establishment.[5]

Both nonprofit employment and the number of nonprofit establishments increased steadily for all 11 years of data. These steady increases occurred despite the 2007–09 recession.[6] By contrast, for-profit companies saw declines in employment and the number of business establishments during this recession.

To understand why this is the case, this article delves beyond the total private level and examines the industry composition of 501(c)(3) organizations. Although nonprofit organizations can be found across all segments of the economy, they tend to be concentrated in four industry sectors: healthcare and social assistance; educational services; other services; and arts, entertainment, and recreation.

After reviewing the industry composition of 501(c)(3) organizations, this article examines the distribution of employment between nonprofits and their for-profit counterparts within each industry. Perhaps not surprisingly, the industries in which nonprofits are most prevalent also possess the highest ratios of nonprofit to for-profit employment. In some industries, for example, the proportion of nonprofit jobs relative to for-profit jobs can be as high as 10 to 1.

These industry features provide insight into why nonprofits tend to be large in terms of employment size. Additionally, these same industry features also explain why 501(c)(3) organizations had a steady expansion in employment when for-profit businesses had a decline in employment during the 2007–09 recession.

Highlights at the total private level

Employment and establishment count tabulations for 501(c)(3) organizations are available from 2007 to 2017. These annual estimates depict important differences between nonprofit organizations and their for-profit counterparts.

In 2017, 501(c)(3) organizations made up 10.2 percent of the nation's private-sector employment (12,488,563 jobs). (See table 1.) In terms of the number of business establishments, however, nonprofits made up only 3.1 percent of the private-sector figure.

Table 1. Annual total employment and average number and size of establishments for nonprofits and for-profits, 2007 and 2017

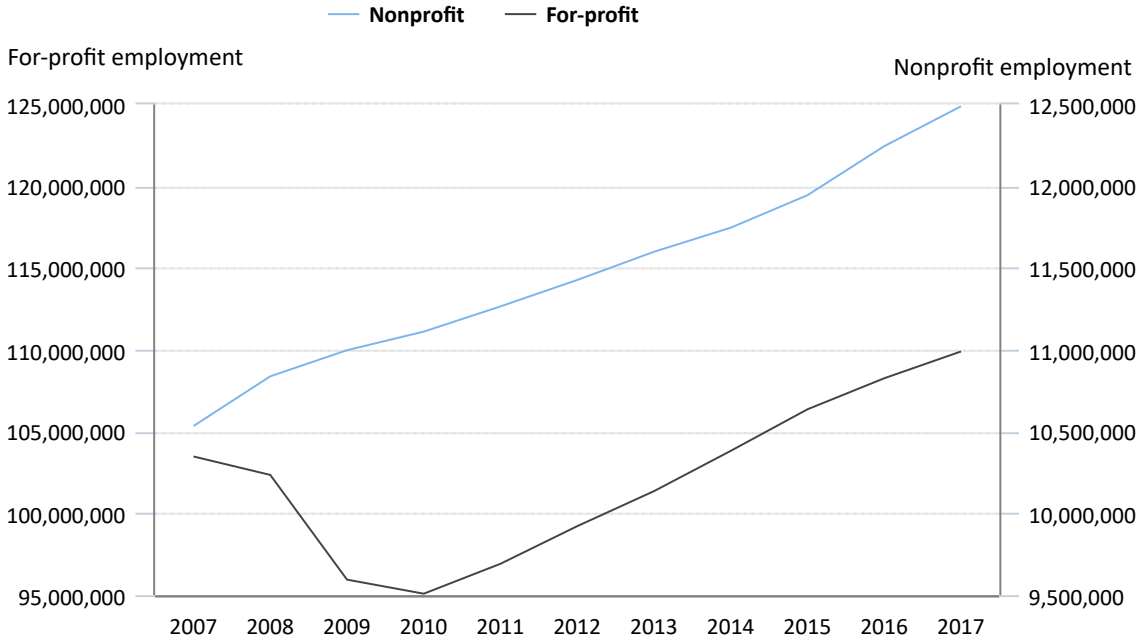
Measure	Nonprofit establishments			For-profit establishments		
	2007	2017	Percent change	2007	2017	Percent change
Employment	10,534,183	12,488,563	18.6	103,478,038	109,898,002	6.2
Average number of establishments	232,396	299,457	28.9	8,448,605	9,237,374	9.3
Average establishment size	47	42	[1]	12	12	[1]

[1] Not applicable.

Source: U.S. Bureau of Labor Statistics.

Annual changes in employment showed lower variability for nonprofit organizations compared with that of the for-profit segment of the economy. Nonprofit employment grew at a steady pace every year for which there are published estimates, including during the 2007–09 recession. For nonprofits, the largest over-the-year change in total private employment occurred in 2008, when employment increased by 2.9 percent. (See appendix table A-1.) The smallest increase was in 2010, when the total number of nonprofit jobs rose by 1.0 percent. From 2007 to 2010 employment among nonprofits increased by 5.5 percent. Employment at nonprofit organizations was 18.6 percent higher in 2017 than in 2007. (See table 1 and chart 1).

Chart 1. Total private employment for nonprofit and for-profit establishments, 2007–17



Click legend items to change data display. Hover over chart to view data.
Source: U.S. Bureau of Labor Statistics.

View Chart Data

In contrast to the stable employment growth shown by nonprofit organizations, employment growth in the for-profit portion of the economy proved to be more sensitive to economic fluctuations. The effects of the 2007–09 recession can be seen in the employment figures. From 2007 to 2010, total private employment for for-profit businesses fell 8.1 percent, with the greatest annual drop occurring in 2009, when employment fell 6.3 percent. (See appendix table A-1.) As the economy expanded coming out of the recession, from 2010 until 2017, employment in for-profit companies grew 15.6 percent. The largest annual increase occurred in 2015, when employment grew by 2.4 percent. For the full 11-year timeframe (from 2007 to 2017), total private employment increased 6.2 percent. (See table 1 and chart 1).

Comparisons between nonprofits and for-profit firms in terms of the number of business establishments are similar to the comparisons involving employment. The number of 501(c)(3) establishments increased every year from 2007 to 2017, with no slowdown during the 2007–09 recession. From 2007 to 2010, the number of nonprofit establishments grew by 9.4 percent. Coming out of the recession, from 2010 to 2017, the number of 501(c)(3) establishments increased by 17.8 percent. The most rapid annual increase occurred in 2008, when this figure rose by 3.4 percent. (See appendix table A-2.) The slowest growth occurred in 2017, when the number of nonprofit establishments increased by 1.8 percent. From 2007 to 2017, the number of establishments expanded by 28.9 percent. (See table 1 and appendix table A-2.)

The steady increase in the number of nonprofit establishments stands in contrast to the greater variability of for-profit companies. As with employment, the number of for-profit business establishments fell during the recession. From 2007 to 2010, the number of for-profit establishments fell by 0.1 percent. Following the recession, the number of for-profit business establishments increased by 9.4 percent from 2010 to 2017. The largest annual increase took place in 2016, when the number of establishments increased by 2.1 percent. (See table A-2.) From 2007 to 2017, the number of for-profit establishments expanded by 9.3 percent. (See table 1.) For every year of available data, the rate of growth of nonprofit establishments exceeded that of for-profit establishments.

On average, nonprofit establishments tend to have more workers than their for-profit counterparts do. In 2017, nonprofit organizations had, on average, 42 employees per worksite. In contrast, the average number of employees at a for-profit establishment in 2017 was 12, a more than threefold difference in establishment size. (See table 1.)

Understanding why nonprofit establishments have more jobs, on average, than do for-profit establishments requires looking beyond estimates at the total private level and taking into consideration an organization's economic activity. The next section explores the industry profile of 501(c)(3) organizations and provides insight into this employment size disparity. This industry examination also provides an explanation as to why nonprofits experienced steady employment growth.

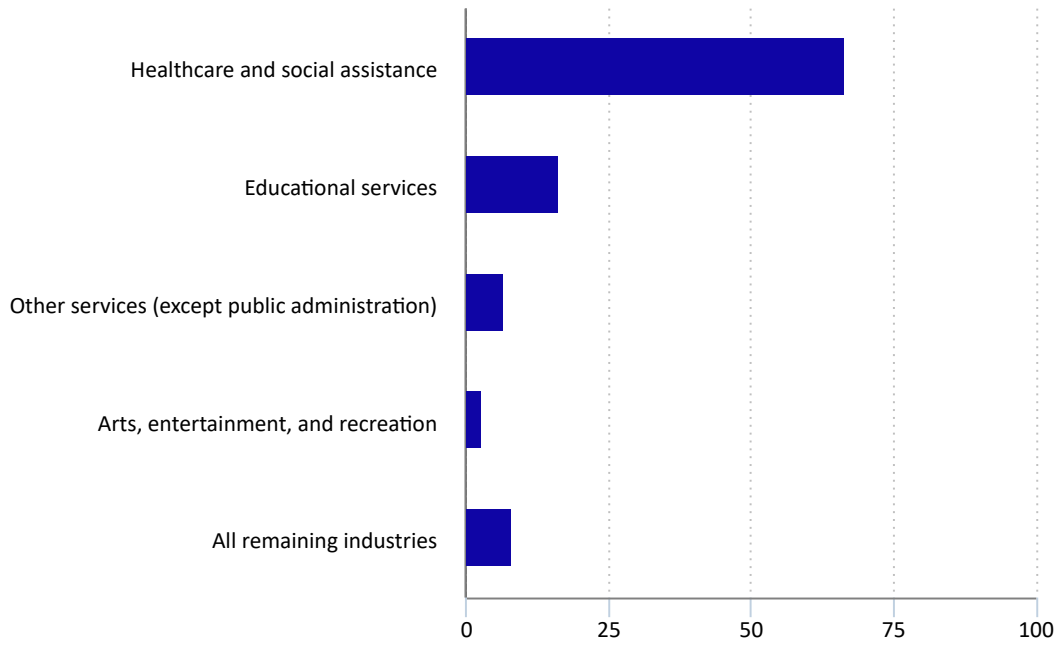
Industry nonprofit employment levels

Nonprofit businesses can be classified into a variety of economic activities. One of the many strengths of the nonprofit data is that users can group them by industry. The remainder of this article focuses on the characteristics of 501(c)(3) organizations and for-profit businesses by industry.

Among the 20 industry sectors specified by the North American Industry Classification System (NAICS), BLS did not produce nonprofit estimates for three of these sectors. One of the 20 sectors included in NAICS, public administration, is outside the scope of this project.[7] Additionally, BLS did not publish data for utilities or for mining, quarrying, and oil and gas extraction because the number of 503(c)(3) establishments in these two sectors was too low. BLS is required by law to safeguard the confidentiality of its respondents and publishing estimates related to these industries could lead to the release of employer identifiable information.[8]

Although 501(c)(3) establishments can be found across all segments of the economy, four industry sectors account for about 92 percent of nonprofit jobs. In 2017, the healthcare and social assistance industry (8,306,650 jobs) represented 67 percent of all nonprofit employment. (See chart 2 and appendix table A-3.) The next two largest industries were educational services (2,003,634 jobs) and other services (837,662 jobs), with employment shares of 16 percent and 7 percent, respectively. After these three sectors, the next largest sector, the arts, entertainment, and recreation industry (355,965 jobs) accounted for 3 percent of nonprofit employment. (See chart 2).

Chart 2. Industry distribution of nonprofit employment, 2017



Hover over chart to view data.
Source: U.S. Bureau of Labor Statistics.

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For all 11 years of published data, nonprofit employment is concentrated in the same four industry sectors. Additionally, the employment share for each of these four sectors shows little change during this period. For example, the healthcare and social assistance's share of total nonprofit employment ranged between a low of 67 percent to a high of 68 percent, while educational services varied from 15 percent to 16 percent. The other two major industry sectors showed similar degrees of stability.

Examining the components of these four major industry sectors provides a more detailed picture of this concentration in nonprofit employment. Subsector data, which are at the NAICS three-digit level, are available from 2007 to 2017. With grant funding from the Charles Stewart Mott Foundation and with support from the Center for Civil Society Studies at Johns Hopkins University, BLS published data by industry group, which are at the NAICS four-digit level.[9] Industry group tabulations are available for 2013 to 2017.

The healthcare and social assistance sector, the largest nonprofit sector, is made up of four major components. In 2017, the hospital subsector (4,206,764 jobs) accounted for 51 percent of the employment in the healthcare and social assistance sector and for 34 percent of overall nonprofit employment.[10] (See table 2 and appendix table A-3.) Within hospitals, most employment was concentrated in the general medical and surgical hospitals industry group (4,031,773 jobs), which includes children's hospitals, osteopathic hospitals, and general pediatric facilities. The two remaining industry groups are specialty hospitals (129,038 jobs) and psychiatric and substance abuse hospitals (45,943 jobs).

Table 2. Employment and employment shares for nonprofit and for-profit establishments, select industries, 2017 annual estimates

Industry title	Nonprofit	For-profit	Percent nonprofit
Total private	12,488,563	109,898,002	10
Healthcare and social assistance	8,306,650	11,015,841	43
Hospitals	4,206,754	811,728	84
Social assistance	1,528,920	2,190,857	41
Ambulatory healthcare services	1,402,007	5,856,868	19
Nursing and residential care facilities	1,168,968	2,156,390	35
Educational services	2,003,634	820,787	71
Colleges, universities, and professional schools	1,137,681	104,447	92
Elementary and secondary schools	684,170	127,242	84
Other services (except public administration)	837,662	3,597,016	19
Religious, grantmaking, civic, professional, and similar organizations	818,562	550,983	60
Arts, entertainment, and recreation	355,965	1,937,907	16
Museums, historical sites, and similar institutions	141,289	21,972	87
Amusement, gambling, and recreation industries	110,595	1,536,818	7
Performing arts, spectator sports, and related industries	104,081	379,118	22

Source: U.S. Bureau of Labor Statistics.

The social assistance industry (1,528,920 million jobs) is the next largest subsector of healthcare and social assistance in terms of nonprofit employment. (See table 2.) This diverse industry consists of organizations that focus on local and community involvement. Sixty-six percent of the employment in social assistance was in individual and family services (829,592 jobs). (See appendix table A-3.) Establishments in this industry include drug and alcohol addiction self-help organizations as well as adoption agencies and disability support groups. The remaining 44 percent of social assistance employment is distributed among vocational rehabilitation services (288,693 jobs), child day care services (256,140 jobs), and community food and housing and emergency and other relief services (154,495 jobs).

The second-largest sector in terms of nonprofit employment is educational services. Within this industry, nonprofit jobs were concentrated in two subsectors in 2017—colleges, universities, and professional schools (1,137,681 million jobs) and elementary and secondary schools (684,170 jobs). (See table 2.) Taken together, these two industries were 91 percent of all nonprofit employment in the educational services sector. (See appendix table A-3.) The remaining 9 percent of employment in educational services was distributed across the remaining five industry subsectors—other schools and instruction (82,918 jobs), educational support services (60,153), technical and trade schools (15,493 jobs), business schools and computer management (12,642 jobs), and junior colleges (10,578 jobs).

The other services sector is the third-largest industry in terms of nonprofit employment. In this sector, 98 percent of nonprofit employment is concentrated in the religious, grantmaking, civic, professional, and similar organizations (818,562 jobs) subsector. (See appendix table A-3.) This subsector comprises organizations that promote religious activities, support and advance a variety of causes through grantmaking, and advocate for social and political goals. Some of the other industries found in the other services sector, such as automotive repair and maintenance, deathcare services, and dry cleaning and laundry services, did not have sufficient nonprofit employment to allow publication.

The smallest of the four sectors included in chart 2 is arts, entertainment, and recreation. Within this sector, two industry groups account for 70 percent of all nonprofit employment—museums, historical sites, and similar institutions (141,289 jobs) and other amusement and recreation industries (107,724 jobs). (See table 2.) The other amusement and recreation industries include a diverse range of business ranging from bowling centers to golf clubs and from archery ranges to sailing clubs with marinas. Within the arts, entertainment, and recreation sector, 501(c)(3) organizations can be found among what initially might seem to be unlikely industries. For example, the gambling industries category, which includes casinos and bingo halls, accounted for 1,991 nonprofit jobs in 2017.[11] (See appendix table A-3.)

Outside of these four sectors, all remaining industries account for only 8 percent of nonprofit employment. In particular, goods-producing industries, a large segment of total employment in the economy, have relatively few nonprofits. This collection of industries includes construction, manufacturing, and agriculture. Although the goods-producing sector amounts to less than 0.2 percent of all nonprofit employment in 2017, 501(c)(3) establishments can be found throughout a wide variety of subindustries within these sectors. Some of these organizations may be engaged in the construction of low-income housing, the manufacture of Christmas ornaments, or the operation of livestock shows and contests.

Employment distribution within industries

Not only do table 2 and appendix table A-3 show the industries with high levels of nonprofit employment, but they also detail the proportion of employment in nonprofit organizations by industry.

In 2017, 71 percent of educational services jobs were in nonprofits. (See table 2.) Within colleges, universities, and professional schools, 92 percent of jobs were in 501(c)(3) organizations, the highest share within the sector. In elementary and secondary schools, 84 percent of employment was in nonprofit organizations. The remaining five industries within educational services all had nonprofit employment shares less than 50 percent. (See appendix table 3.) The lowest share was in technical and trade schools, in which nonprofits accounted for 14 percent of employment.

In the healthcare and social assistance sector, 43 percent of jobs were in nonprofit organizations. However, this sector-wide figure hides large variability in 501(c)(3) involvement in the subindustries that make up the sector. (See table 2.) For example, 91 percent of jobs in community food and housing and emergency and other relief services were in nonprofit organizations. (See appendix table 3.) By contrast, none of the components of ambulatory healthcare services had a 501(c)(3) share of employment greater than 50 percent. Companies in this subsector typically provide outpatient care across a broad range of health-related services. Offices of dentists showed the lowest proportion of nonprofit employment, not just within this subsector but also in the entire healthcare and social assistance sector. The 9,825 jobs at 501(c)(3) dental offices represented 1 percent of the overall employment in that industry.

Notably, general medical and surgical hospitals, which accounted for nearly half of all 501(c)(3) jobs in the healthcare and social assistance sector, had a large share of nonprofit employment. Just over 86 percent of employment (4,031,773 jobs) was in nonprofit establishments, with the remaining share at for-profit establishments (638,476 jobs).

Within the other services sector, there was a high share of nonprofit employment in religious, grantmaking, civic, professional, and similar organizations. Employment within the five industry groups that compose this subsector were distributed mostly toward nonprofit organizations. The industry with the largest share of nonprofit employment was grantmaking and giving services, in which 92 percent of employment was in 501(c)(3) establishments. (See appendix table A-3.) Included in this industry are charitable trusts, community foundations and health research funding organizations. Some of these organizations may fund a single institution—such as a university, museum, or hospital—or they may opt to support smaller entities or a range of entities. Other industry groups within this subsector with large nonprofit employment shares were social advocacy organizations (88 percent), religious organizations (85 percent), and civic and social organizations (85 percent).

The only industry group in the religious, grantmaking, civic, professional, and similar organizations subsector that did not have most of its employment in nonprofits was business, professional, labor, political, and similar organizations. In this industry group, 14 percent of employment was in 501(c)(3) organizations. (See appendix table A-3.) This group includes establishments involved in promoting the business interests of their members, such as real estate boards, trade associations, and farmers' unions.

Additionally, sectors with relatively low levels of nonprofit employment also display low shares of nonprofit employment. Outside of the four largest sectors for 501(c)(3) employment, the sector with the highest share of nonprofit employment is management of companies and enterprises. In this sector, nonprofits, which oversee and administer other establishments within their company, accounted for 12 percent of all employment (281,078 jobs) in 2017. (See appendix table A-3.)

Nonprofit employment among goods-producing industries was particularly low. There were no sectors or subsectors with a nonprofit share of employment that exceeded 1 percent. (See appendix table A-3.) Among these industries, the highest share of 501(c)(3) employment was in construction of buildings, an industry in which 0.4 percent of jobs were in nonprofit companies.

Number of establishments and employment size

One of the questions posed at the beginning of this article is why nonprofit organizations tend to have more jobs per establishment on average compared with for-profit companies.[12] An examination of the number of business establishments within each industry, combined with the previous discussion on industry employment and the nonprofit share of this employment, provides some insights.

Table 3 specifies the distribution of establishments among both nonprofits and for-profit companies for the major industries discussed in this article. In addition to these establishment figures, the table includes the average number of jobs per establishment.

Table 3. Establishment counts and average establishment size in select industries for nonprofit and for-profit establishments, 2017 annual estimates

Industry	Number of establishments		Average establishment size	
	Nonprofit	For-profit	Nonprofit	For-profit
Total private	299,457	9,237,374	42	12
Health care and social assistance	138,319	1,393,815	60	8
Hospitals	5,171	4,853	814	167
Social assistance	67,884	784,418	23	3
Ambulatory health care services	36,058	554,580	39	11
Nursing and residential care facilities	29,205	49,965	40	43
Educational services	32,832	84,647	61	10
Elementary and secondary schools	12,879	5,090	53	25
Colleges, universities, and professional schools	5,331	3,603	213	29
Other services (except public administration)	64,730	81,534	13	5
Arts, entertainment, and recreation	15,261	126,241	23	15

Source: U.S. Bureau of Labor Statistics.

Two themes emerge from this table: First, industries in which nonprofits are prevalent have an average establishment size greater than the national average of 12 jobs. For both the healthcare and social assistance sector and the educational services sector, the average number of jobs per establishment is more than five times greater than the average for their for-profit counterparts. Second, when comparisons are restricted to establishments within the same industry, nonprofit establishments often have more jobs on average than their for-profit counterparts. All the industries shown in table 3, except for nursing and residential care facilities, feature an average employment size for a nonprofit establishment higher than that of a for-profit. In many instances, this size differential is considerable, especially in industries with high levels of nonprofit employment.

The subsectors that comprise the healthcare and social assistance sector illustrate these differences. In the hospital subsector, the largest in terms of nonprofit employment, the average number of jobs at nonprofits was nearly five times higher than at for-profit hospitals. An even greater disparity exists among establishments in social assistance: the average employment size of nonprofit establishments was more than seven times larger than their for-profit peers.

As another example, consider the size difference between the two largest industry groups in the educational services sector. In 2017, a for-profit college or university had an average of 29 jobs. In contrast, the average for nonprofit establishments was over seven times larger, at 213 jobs. (See table 3.) Similarly, employment in an average for-profit elementary or secondary school averaged 25 jobs, while their nonprofit peers averaged 53 jobs.

Most industries with high proportions of nonprofit organizations show similar tendencies. Appendix table A-3 lists all published sectors and the subsectors and industry groups for the four sectors that account for most nonprofit employment. Estimates in this table show that within nearly all listed industries the average employment size for a nonprofit establishment exceeded that of its for-profit counterpart.

In addition, as illustrated in chart 2 and table 3, most nonprofit employment is concentrated in industries characterized by large employers. Two-thirds of nonprofit employment was in the healthcare and social assistance sector, in which the average nonprofit establishment had 60 jobs in 2017. Another 16 percent of 501(c)(3) employment occurred in the educational services sector, in which nonprofit establishments averaged 61 jobs.

In contrast, employment among for-profit companies is more dispersed. Consider the two largest sectors in terms of for-profit employment. The retail trade sector constituted 14 percent of total private employment, and the accommodation and food services sector contributed a 12-percent share. (See appendix table A-3.) For-profit establishments in these two sectors averaged 15 jobs and 20 jobs, respectively.

Industries in which the average employment size is generally large, such as hospitals, make up a considerably smaller portion of for-profit employment than is the case for nonprofits. Specifically, the hospitals subsector made up less than 1 percent of for-profit employment. (See appendix table A-3). By contrast, the ambulatory healthcare services subsector was 53 percent of the employment among for-profit establishments in the healthcare and social assistance sector. This industry group, which includes offices of chiropractors, optometrists, and dentists, tends to be characterized by small-scale employers. The average establishment size among these for-profit businesses was 11.

Similarly, universities and elementary schools—which have large average establishment sizes—contributed much less to overall for-profit employment. The colleges, universities, and professional schools industry group and the elementary and secondary schools industry group each constituted less than 1 percent of total private employment among for-profit businesses.

These industry tabulations reveal why nonprofit establishments are large in terms of employment. Within most industries, nonprofit organizations are larger than their for-profit counterparts. These size differences are amplified by the industry concentration found among nonprofits: most 501(c)(3) organizations are in industries where the average employment size of an establishment is large. Conversely, for-profit businesses are more broadly dispersed throughout the economy, including in many industries in which the employment size is quite small. Taken together, these features provide an explanation as to why nonprofit establishments are considerably larger on average than their for-profit peers.

Looking at employment by industry allows us to explain why nonprofit establishments have more jobs on average than their for-profit counterparts. These same industry estimates can also be used to explain the stable employment growth experienced by nonprofit entities both during and after the 2007–09 recession.

Industry employment growth rates

Employment among nonprofit organizations grew steadily from 2007 to 2017, including during the 2007–09 recession. (See appendix table A-1.) Conversely, employment among for-profit businesses declined during the 2007–09 recession, but then grew faster than did nonprofit employment after the recession.

The noticeable difference in employment growth for nonprofits relative to their for-profit peers reflects their differing industry compositions. Although the nonprofit segment of most sectors had positive employment growth from 2007 to 2017, employment growth was driven by the two largest nonprofit industries.

Nonprofit organizations in the healthcare and social assistance sector experienced employment growth for all 11 years for which data are available.[13] The largest over-the-year increase occurred from 2007 to 2008, when the number of jobs in this industry increased by nearly 3 percent. Over the course of the 11 years, nonprofit employment expanded by 16 percent. Like their nonprofit counterparts, for-profit businesses in this sector also experienced employment growth each year from 2007 to 2017, expanding more than their nonprofit counterparts.[14]

Establishments in the educational services sector also experienced steady employment growth from 2007 to 2017. Both nonprofits and their for-profit peers had positive job growth nearly every year. Among nonprofits in this sector, the number of jobs increased by 21 percent from 2007 to 2017. At the same time, however, employment among non-501(c)(3) companies expanded at a faster rate, 29 percent.

The employment growth in these two sectors explains the steady growth in overall 501(c)(3) employment. As noted in the previous section, 67 percent of nonprofit employment is in healthcare and social assistance and 16 percent is in educational services. Growth in these two sectors from 2007 to 2017, combined with the fact that more than 80 percent of nonprofit jobs are found in these two industries, led to the steady growth in total nonprofit employment over the period.

Although employment in for-profit companies grew in these two sectors, this growth did not lead to steady increases in total private employment. Rather, as shown in chart 1, the 2007–09 recession saw a clear contraction in overall employment among for-profit companies. Whereas the healthcare and social assistance sector and the educational services sector made up 83 percent of nonprofit jobs, these same two sectors constituted only 8 percent of total for-profit employment in 2007. This much smaller share of total private employment diluted the effect of these two industries on overall employment growth.

Also noteworthy is that industries that were more sensitive to the economic downturn of 2007 to 2009 played a small role in nonprofit employment but contributed greatly to for-profit employment. Jobs in construction, manufacturing, and retail trade constitute only a small fraction of the employment at 501(c)(3) organizations yet comprise a significant proportion of for-profit jobs. Among for-profit establishments, all three of these industry sectors experienced large job losses during the 2007–09 recession.

In 2007, the construction, manufacturing, and retail trade sectors were nearly 36 percent of employment for for-profit businesses but less than 1 percent of nonprofit employment. (See appendix table A-3.) As table 4 shows, employment among for-profit companies declined by 27 percent in construction, by 17 percent in manufacturing, and by 7 percent in retail trade.

Table 4. Employment change in select industry sectors for nonprofit and for-profit establishments, 2007–10

Sector	Nonprofit establishments			For-profit establishments		
	2007	2010	Percent change	2007	2010	Percent change
Construction	7,621	8,493	11	7,555,111	5,481,006	-27
Manufacturing	6,656	6,732	1	13,826,366	11,480,764	-17
Retail trade	51,926	58,161	12	15,457,091	14,423,163	-7

Source: U.S. Bureau of Labor Statistics.

A listing of employment changes in all industry sectors during the recessionary period from 2007 to 2010 is in appendix table A-4. As the table shows, 15 of the 17 listed sectors had declines in employment for the for-profit segment of each industry. The only two sectors to have positive for-profit employment growth were the healthcare and social assistance industry and the educational services industry.

Appendix table A-4 also shows that the nonprofit component of most sectors had positive employment growth from 2007 to 2010; 13 of the 17 published sectors showed an increase in the number of jobs, while 4 had a decrease. These declining industries were information, finance and insurance, wholesale trade, and real estate and rental and leasing. In 2007, these four sectors accounted for about 1 percent of all nonprofit employment and thus had little effect on the overall nonprofit employment trend.

After the recession, most nonprofit sectors experienced positive job growth. As appendix table A-4 shows, from 2010 to 2017, 501(c)(3) organizations experienced positive employment growth in 16 of the 17 published industry sectors. The only sector to see a decline in employment was the real estate and rental and leasing sector. Between 2010 and 2017, total private nonprofit employment increased by 12 percent. Over the same period, for-profit employment grew at a faster rate (16 percent). All industry sectors saw positive employment growth among for-profit businesses, and seven of these sectors grew at a faster rate than their nonprofit counterparts.

Conclusion

The 501(c)(3) nonprofit tabulations created by BLS provide valuable insight into this diverse segment of the economy. Nonprofit organizations display characteristics that are not present among for-profit firms. One notable finding is that nonprofits are concentrated in only a few industries. The healthcare and social assistance sector and the educational services sector account for 83 percent of nonprofit jobs. Among for-profit firms, however, the healthcare and social assistance sector and the educational services sector make up just 11 percent of jobs. Other industries, such as retail trade and construction, are a small portion of employment among nonprofit organizations yet constitute a large portion of employment among for-profit entities.

This nonprofit concentration has important implications. One notable consequence is that nonprofit organizations tend to be large in terms of employment size. Hospitals and universities—which together account for about 4 of every 10 jobs in nonprofit employment—have a higher number of jobs per establishment, on average, than do retail outlets or construction sites.

Another consequence of this concentration can be found in the changes in employment from 2007 to 2017. The 2007–09 recession led to large employment losses. However, the effects of this economic downturn were not evenly spread throughout the economy. While for-profit firms experienced large job losses, nonprofit organizations—which were concentrated in sectors of the economy that fared relatively well during the recession—exhibited steady employment growth during the downturn.

This article focuses on nonprofit estimates at the national level and highlights only some of the characteristics that can be found in the BLS 501(c)(3) data. These data characteristics also include information at the state and county level as well as information on wages at nonprofit organizations. Future analyses of these data could lead to insights about 501(c)(3) organizations at a more granular level.

Appendix

Table A-1. Total private employment for nonprofit and for-profit establishments, 2007–17

Year	Nonprofit		For-profit	
	Employment	Percent change	Employment	Percent change
2007	10,534,183	[1]	103,478,038	[1]
2008	10,837,928	2.9	102,350,715	-1.1
2009	10,997,668	1.5	95,949,436	-6.3
2010	11,111,096	1.0	95,090,136	-0.9
2011	11,265,233	1.4	96,919,562	1.9
2012	11,426,870	1.4	99,218,999	2.4
2013	11,599,269	1.5	101,359,065	2.2
2014	11,746,589	1.3	103,822,097	2.4
2015	11,945,181	1.7	106,362,536	2.4
2016	12,245,030	2.5	108,259,592	1.8
2017	12,488,563	2.0	109,898,002	1.5

[1] Not applicable.

Source: U.S. Bureau of Labor Statistics.

Table A-2. Total private annual average number of establishments for nonprofit and for-profit establishments, 2007–17

Year	Nonprofit		For-profit	
	Number of establishments	Percent change	Number of establishments	Percent change
2007	232,396	[1]	8,448,605	[1]
2008	240,272	3.4	8,549,088	1.2
2009	247,026	2.8	8,462,089	-1.0
2010	254,236	2.9	8,441,362	-0.2
2011	261,673	2.9	8,513,984	0.9
2012	267,855	2.4	8,558,161	0.5
2013	273,333	2.0	8,638,841	0.9
2014	279,261	2.2	8,787,948	1.7
2015	286,427	2.6	8,937,909	1.7
2016	294,064	2.7	9,123,612	2.1
2017	299,457	1.8	9,237,374	1.2

[1] Not applicable.

Source: U.S. Bureau of Labor Statistics.

Table A-3. Employment levels and average establishment employment size for nonprofits and for-profit establishments, selected industries, 2017 annual estimates

Industry	Total private employment	Nonprofit				For-profit			
		Employment	Percent of employment		Average establishment size	Employment	Percent of employment		Average establishment size
			Total private	Sector			Total private	Sector	
Total private	122,386,565	12,488,563	100.0	[1]	42	109,898,002	100.0	[1]	12
Health care and social assistance	19,322,491	8,306,650	66.5	[1]	60	11,015,841	10.0	[1]	8
Ambulatory healthcare services	7,258,875	1,402,007	11.2	16.9	39	5,856,868	5.3	53.2	11
Offices of physicians	2,572,041	653,456	5.2	7.9	39	1,918,585	1.7	17.4	10
Offices of dentists	933,738	9,825	0.1	0.1	18	923,913	0.8	8.4	7
Offices of other health practitioners	886,112	43,264	0.3	0.5	20	842,848	0.8	7.7	6
Outpatient care centers	889,352	396,544	3.2	4.8	37	492,808	0.4	4.5	20
Medical and diagnostic laboratories	269,282	22,752	0.2	0.3	50	246,530	0.2	2.2	12
Home healthcare services	1,407,028	190,154	1.5	2.3	73	1,216,874	1.1	11.0	38
Other ambulatory healthcare services	301,323	86,012	0.7	1.0	30	215,311	0.2	2.0	21
Hospitals	5,018,482	4,206,754	33.7	50.6	814	811,728	0.7	7.4	167
General medical and surgical hospitals	4,670,249	4,031,773	32.3	48.5	892	638,476	0.6	5.8	241
Psychiatric and substance abuse hospitals	118,991	45,943	0.4	0.6	167	73,048	0.1	0.7	84
Specialty (except psychiatric and substance abuse) hospitals	229,242	129,038	1.0	1.6	341	100,204	0.1	0.9	75
Nursing and residential care facilities	3,325,358	1,168,968	9.4	14.1	40	2,156,390	2.0	19.6	43
Nursing care facilities (skilled nursing facilities)	1,617,065	361,827	2.9	4.4	130	1,255,238	1.1	11.4	84
Residential intellectual and developmental disability, mental health	624,987	415,031	3.3	5.0	22	209,956	0.2	1.9	22
Continuing care retirement communities and assisted living facilities	918,205	280,092	2.2	3.4	81	638,113	0.6	5.8	28
Other residential care facilities	165,101	112,019	0.9	1.3	30	53,082	0.0	0.5	18
Social assistance	3,719,777	1,528,920	12.2	18.4	23	2,190,857	2.0	19.9	3
Individual and family services	2,341,858	829,592	6.6	10.0	24	1,512,266	1.4	13.7	2
Community food and housing, and emergency and other relief services	169,361	154,495	1.2	1.9	16	14,866	0.0	0.1	10
Vocational rehabilitation services	335,404	288,693	2.3	3.5	42	46,711	0.0	0.4	18
Child day care services	873,154	256,140	2.1	3.1	15	617,014	0.6	5.6	11
Educational services	2,824,421	2,003,634	16.0	[1]	61	820,787	0.7	[1]	10
Elementary and secondary schools	811,412	684,170	5.5	34.1	53	127,242	0.1	15.5	25
Junior colleges	27,952	10,578	0.1	0.5	52	17,374	0.0	2.1	26
Colleges, universities, and professional schools	1,242,128	1,137,681	9.1	56.8	213	104,447	0.1	12.7	29
Business schools and computer and management training	67,466	12,642	0.1	0.6	11	54,824	0.0	6.7	6
Technical and trade schools	110,321	15,493	0.1	0.8	13	94,828	0.1	11.6	11
Other schools and instruction	419,343	82,918	0.7	4.1	12	336,425	0.3	41.0	7
Educational support services	145,799	60,153	0.5	3.0	12	85,646	0.1	10.4	7
Other services (except public administration)	4,434,678	837,662	6.7	[1]	13	3,597,016	3.3	[1]	5
Repair and maintenance	1,305,012	1,126	0.0	0.1	6	1,303,886	1.2	36.2	6
Personal and laundry services	1,471,650	17,462	0.1	2.1	11	1,454,188	1.3	40.4	7
Religious, grantmaking, civic, professional, and similar organizations	1,369,545	818,562	6.6	97.7	13	550,983	0.5	15.3	7
Religious organizations	191,664	162,772	1.3	19.4	9	28,892	0.0	0.8	6
Grantmaking and giving services	143,416	131,273	1.1	15.7	9	12,143	0.0	0.3	6
Social advocacy organizations	211,659	185,370	1.5	22.1	10	26,289	0.0	0.7	6
Civic and social organizations	392,218	279,738	2.2	33.4	31	112,480	0.1	3.1	7
Business, professional, labor, political, and similar organizations	430,587	59,409	0.5	7.1	11	371,178	0.3	10.3	7

[1] Not applicable.

Note: Percentages may not sum to totals because of rounding.
Source: U.S. Bureau of Labor Statistics.

Industry	Total private employment	Nonprofit				For-profit			
		Employment	Percent of employment		Average establishment size	Employment	Percent of employment		Average establishment size
			Total private	Sector			Total private	Sector	
Private households	288471	511	0.0	0.1	2	287960	0.3	8.0	1
Arts, entertainment, and recreation	2,293,872	355,965	2.9	[1]	23	1,937,907	1.8	[1]	15
Performing arts, spectator sports, and related industries	483,199	104,081	0.8	29.2	18	379,118	0.3	19.6	8
Performing arts companies	122,891	70,103	0.6	19.7	20	52,788	0.0	2.7	8
Spectator sports	141,877	3,509	0.0	1.0	12	138,368	0.1	7.1	23
Promoters of performing arts, sports, and similar events	141,120	28,692	0.2	8.1	17	112,428	0.1	5.8	18
Agents and managers for artists, athletes, entertainers, and public figures	26699	229	0.0	0.1	5	26470	0.0	1.4	6
Independent artists, writers, and performers	50,611	1,548	0.0	0.4	4	49,063	0.0	2.5	2
Museums, historical sites, and similar institutions	163,261	141,289	1.1	39.7	28	21,972	0.0	1.1	15
Museums, historical sites, and similar institutions	163,261	141,289	1.1	39.7	28	21,972	0.0	1.1	15
Amusement, gambling, and recreation industries	1,647,413	110,595	0.9	31.1	25	1,536,818	1.4	79.3	20
Amusement parks and arcades	211474	879	0.0	0.2	31	210595	0.2	10.9	68
Gambling industries	122,414	1,991	0.0	0.6	11	120,423	0.1	6.2	39
Other amusement and recreation industries	1,313,524	107,724	0.9	30.3	26	1,205,800	1.1	62.2	17
Management of companies and enterprises	2,278,042	281,078	2.3	[1]	61	1,996,964	1.8	[1]	33
Professional, scientific, and technical services	8,996,430	270,133	2.2	[1]	23	8,726,297	7.9	[1]	7
Administrative and support and waste management and remediation services	9,064,811	100,918	0.8	[1]	20	8,963,893	8.2	[1]	17
Retail trade	15,854,454	93,484	0.7	[1]	16	15,760,970	14.3	[1]	15
Information	2,793,429	68,057	0.5	[1]	14	2,725,372	2.5	[1]	17
Finance and insurance	5,908,709	43,734	0.4	[1]	34	5,864,975	5.3	[1]	12
Accommodation and food services	13,606,761	38,065	0.3	[1]	20	13,568,696	12.3	[1]	20
Real estate and rental and leasing	2,179,696	36,433	0.3	[1]	9	2,143,263	2.0	[1]	6
Transportation and warehousing	4,947,369	21,229	0.2	[1]	24	4,926,140	4.5	[1]	20
Construction	6,919,107	9,270	0.1	[1]	10	6,909,837	6.3	[1]	9
Manufacturing	12,406,757	7,464	0.1	[1]	28	12,399,293	11.3	[1]	36
Wholesale trade	5,898,637	3,985	0.0	[1]	5	5,894,652	5.4	[1]	10
Agriculture, forestry, fishing, and hunting	1,261,312	2,976	0.0	[1]	9	1,258,336	1.1	[1]	12

[1] Not applicable.

Note: Percentages may not sum to totals because of rounding.
Source: U.S. Bureau of Labor Statistics.

Table A-4. Change in industry sector employment for nonprofit and for-profit establishments, 2007–17 (in percent)

Industry	2007–2010		2010–17		2007–17	
	Nonprofit	For-profit	Nonprofit	For-profit	Nonprofit	For-profit
Total private	5	-8	12	16	19	6
Healthcare and social assistance	6	8	10	28	16	37
Hospitals	5	0	6	24	10	24
Social assistance	7	10	10	103	18	124
Nursing and residential care facilities	3	8	-1	11	3	20
Ambulatory healthcare services	15	8	37	18	58	28
Educational services	4	17	17	10	21	29
Other services (except public administration)	1	-3	9	0	11	-2
Religious, grantmaking, civic, professional, and similar organizations	1	-5	9	-2	10	-6
Arts, entertainment, and recreation	8	-4	29	19	39	14
Museums, historical sites, and similar institutions	1	0	27	34	28	33
Performing arts, spectator sports, and related industries	-1	-3	18	24	16	19
Amusement, gambling, and recreation industries	35	-4	45	18	96	13
Professional, scientific, and technical services	7	-3	7	21	15	18
Management of companies and enterprises	16	-1	44	20	67	19
Administrative and support and waste management and remediation services	3	-12	32	22	36	8
Information	-2	-11	7	3	5	-8
Retail trade	12	-7	61	9	80	2
Finance and insurance	-35	-8	72	7	12	-1
Real estate and rental and leasing	-3	-11	-2	14	-5	1
Accommodation and food Services	10	-2	20	23	32	20
Transportation and warehousing	16	-8	24	25	44	15
Construction	11	-27	9	26	22	-9
Manufacturing	1	-17	11	8	12	-10
Wholesale trade	-3	-9	0	8	-3	-1
Agriculture, forestry, fishing and hunting	19	-2	71	10	104	8

Source: U.S. Bureau of Labor Statistics.

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Notes

[1] Many nonprofit organizations rely heavily or entirely on volunteer workers. However, only paid employment is included in the tabulations discussed in this article. The U.S. Bureau of Labor Statistics (BLS) Business Register is based on unemployment insurance reports filed by employers, and only paid employees are included in these reports.

[2] For more information about publicly available Internal Revenue Service (IRS) data, see “Exempt Organizations Business Master File extract” (Internal Revenue Service, last modified October 15, 2023), https://www.irs.gov/charities-non-profits/exempt-organizations-business-master-file-extract-eo-bmf. For a detailed discussion of the methodology and data sources used to create these estimates, see Erik Friesenhahn, “Nonprofit organizations using the BLS Business Register to measure employment, wages, and establishment size,” *Monthly Labor Review*, November 2023, https://doi.org/10.21916/mlr.2023.27.

[3] For more information, see “Other Tax-Exempt Organizations” (Internal Revenue Service, last modified March 7, 2023), https://www.irs.gov/charities-non-profits/other-tax-exempt-organizations.

[4] For more information on nonprofits and how BLS classifies them, see “Research Data on the Nonprofit Sector,” Business Employment Dynamics (U.S. Bureau of Labor Statistics, last modified May 14, 2020), https://www.bls.gov/bdm/nonprofits/nonprofits.htm.

[5] There are administrative reasons that cause BLS tabulations for nonprofit organizations to have a larger employment size than for-profit establishments. Some states do not require nonprofit organizations with fewer than 5employees to file unemployment insurance reports. Because the BLS Business Register is based on unemployment insurance reports, BLS estimates of nonprofit establishment size are overstated in states that do not require small nonprofits to file. However, BLS analyses indicate that the effect is small. The estimated undercount of the total number of nonprofit establishments is somewhat larger and leads to an increased average establishment size for nonprofits. An examination of these issues is presented in Friesenhahn, “Nonprofit organizations.”

[6] For more information, see “U.S. business cycle expansions and contractions” (National Bureau of Economic Research, last updated March 14, 2023), https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions.

[7] BLS, like other federal statistical agencies, uses the North American Industrial Classification System (NAICS) to categorize business establishments into industry groupings. In doing so this classification method provides a uniform process by which to identify and tabulate business activity across the economy. NAICS is a hierarchical system in which each successive layer of detail provides greater insight into an establishment’s business activity. A benefit of this approach is that it allows data users to partition each industry into its component parts and analyze data at a more granular level. In NAICS codes, two digits denotes sector, three digits subsector, four digits industry group, five digits industry, and six digits denotes country of origin. Data users interested in learning more about this classification system can find in-depth information at “North American Industry Classification System” (U.S. Census Bureau, last modified October 24, 2023), https://www.census.gov/naics/.

[8] For more information about the confidentiality requirements of BLS, see “Confidentiality pledge and laws” (U.S. Bureau of Labor Statistics, last modified April 3, 2020), https://www.bls.gov/bls/confidentiality.htm.

[9] For more information on these data, see “Research Data on the Nonprofit Sector,” Business Employment Dynamics (U.S. Bureau of Labor Statistics, last modified May 14, 2020), https://www.bls.gov/bdm/nonprofits/nonprofits.htm.

[10] Note that the nonprofit data include only private-sector hospitals.

[11] The IRS permits gambling and other gaming activities by nonprofits under certain circumstances. For a detailed discussion of permissible gaming and gambling activities that a 501(c)(3) nonprofit may engage in, see “Gaming and Gambling Rules for 501(c)(3) Nonprofit Fundraising” Form1023 (website), last updated November 6, 2023, https://form1023.org/gaming-gambling-rules-for-501c3-nonprofit-fundraising.

[12] Differing reporting requirements among states lead to an undercount of small nonprofit establishments. Because some small nonprofit establishments are excluded from the BLS Business Register, the average establishment size is somewhat higher than if these establishments had been included. This effect is most pronounced in industries in which establishment sizes tend to be small, most notably the religious, grantmaking, civic, professional, and similar organizations subsector. However, even when taking the reporting difference into account, the average establishment size for nonprofits is generally considerably higher than for for-profit organizations. For more information, see Friesenhahn, “Nonprofit organizations.”

[13] For a thorough discussion of employment growth in the healthcare industry , see Catherine A. Wood, “Employment in health care: a crutch for the ailing economy during the 2007–09 recession,” *Monthly Labor Review*, April 2011, pp. 13–18, https://www.bls.gov/opub/mlr/2011/04/art2full.pdf.

[14] From 2007 to 2017, measured employment among for-profit companies in the healthcare and social assistance industry expanded by 37 percent. However, the large increase in 2013 can mostly be attributed to an administrative change in the way certain records were processed. This change affected data tabulations for business establishments classified in the services for the elderly and persons with disabilities industry (NAICS 624120) and the private households industry (NAICS 814110). A review of administrative records revealed that certain establishments that provide nonmedical, home-based services for the elderly and persons with disabilities had been misclassified into the private households industry. To correct this matter, these records were reclassified into the services for the elderly and persons with disabilities industry. This correction led to a large employment increase in the 2013 estimates for services for the elderly and persons with disabilities and a decrease in employment for private households. This administrative change does not account for all the employment growth in the healthcare and social assistance sector in 2013 and does not change the overall strong upward trend in employment for this sector from 2007 to 2017. Furthermore, the over-the-year growth rate of employment for for-profit establishments was greater than that of their nonprofit counterparts for all years of data.

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Beyond BLS

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January 2024

Demographic change is a resource challenge, not a financial challenge

Summary written by: Justin Holt

Current demographic forecasts project a decline in the worker-to-retiree ratio during the 21st century because of increasing longevity and decreasing births. Some social science researchers argue that providing for an aging population may become financially unsustainable because of these demographic changes. For example, a 2023 report by S&P Global forecasts that net governmental debt will reach 102 percent of gross domestic product in advanced economies by midcentury. If governments do not begin to decrease their debt ratios, then the report finds that these nations may have their credit ratings reduced to BB+ or lower. Commonly recommended solutions to this financial shortfall are a combination of increases in the minimum retirement age, increases in taxation, and decreases in public pension payments.

Yeva Nersisyan, Xinhua Liu, and L. Randall Wray in "The unbearable weight of aging: how to deal with the 'demographic time bomb'"(Levy Economics Institute of Bard College, Working Paper 1018, April 2023) argue that the challenge of changing demographics is a real-resource problem and not a financial problem. Real resources are worker productivity and materials. Nersisyan, Liu, and Wray show the importance of worker productivity with a thought experiment. Suppose that a retirement plan is fully funded; that is, all retirees receive the payments they are supposed to receive. Nevertheless, if workers are not productive enough to produce all the desired goods and services, then spending will bid up the price of these goods and services with inflation as the likely result. Taxes could be effective in this hypothetical example to limit demand and reduce inflation. But demand-limiting taxation will not produce more goods and services. Therefore, the actual challenge of demographic change is not a financial problem but a problem of real-resource availability.

Nersisyan, Liu, and Wray argue that if changing demographics are a real-resource problem, then the total dependency ratio is the relevant metric for economic feasibility. The total dependency ratio is the proportion of the population that includes both those age 65 and over and those under age 20 to the population ages 20 to 64. In the United States, the authors project that the total dependency ratio will increase from 0.72 today to 0.89 in 2075. But this percentage is lower than the past peak of 0.95 in 1965. Also, since the end of the 20th century, worker productivity in the United States has increased 60 percent. If this rate of productivity continues, then 2.2 workers in 2050 will produce the same amount of goods and services as 3.5 workers today.

Nersisyan, Liu, and Wray recommend that, today, nations should prepare for a demographic shift to include training and educating people, building physical infrastructure, pursuing scientific research, improving labor force participation, encouraging childcare activities by men, and maintaining full employment. In short, saving in financial terms to meet the needs of future young people and retirees will not necessarily produce the real resources needed for the care of people in the future.

Beyond BLS

Beyond BLS briefly summarizes articles, reports, working papers, and other works published outside BLS on broad topics of interest to MLR readers.

January 2024

Physicians in peer groups prescribe fewer opioids than physicians in solo practice

Summary written by: Jonathan Yoe

The opioid crisis has been described as a national health crisis; the Congressional Budget Office reported over 500,000 opioid-involved deaths in the United States since 2000. The volume of opioids prescribed tripled from 1999 to 2015, and patients treated by physicians who prescribe high amounts of opioids are more likely to use opioids longer and to develop an opioid-use disorder.

In their paper titled "The effect of organizations on physician prescribing: the case of opioids" (National Bureau of Economic Research, Working Paper 31785, October 2023), M. Kate Bundorf, Daniel Kessler, and Sahil Lalwani examine how peer effects influenced opioid-prescribing behavior among physicians. They use data of Medicare recipients in 2014 and 2018. First, they look at whether a physician worked solo or belonged to a physician group. Next, the authors look at the size of the group (large, medium, or small). They then examine the effects that membership to these groups had on opioid-prescribing behaviors, looking at not only the different opioid-prescribing behaviors (measured in how many days of opioids a prescription is allotted for a patient) of solo physicians and physicians belonging to a group but also those behaviors of physicians who practiced solo in 2014 and then became integrated into a group practice in 2018. And finally, the authors investigate how the average age of the other physicians in the group affects the opioid-prescribing behaviors of physicians in that group.

The authors find that group physicians prescribed fewer opioids than did physicians in solo practice. They also learn that solo physicians prescribed opioids more intensively and less appropriately than group physicians. To measure appropriateness of prescribing, Bundorf, Kessler, and Lalwani overlapped the prescriptions of different opioids. When comparing all physicians in solo practice in the study's sample, the authors learn that the average length of an opioid prescription was 25.11 days. Physicians who switched from a solo practice in 2014 to a group practice of any size in 2018 reduced opioid prescriptions by 3.35 to 4.63 days (13.3 to 18.4 percent). However, the authors find that 14.4 percent of physicians in their sample did not prescribe opioids at all. Of the 85.6 percent that prescribed an opioid, the average length of an opioid prescription by a solo physician in 2014 was 27.44 days. Of these physicians, those who switched from solo practice in 2014 to an integrated group of any size in 2018 reduced their prescribing by 3.36 to 5.24 days per prescription (12.2 to 19.1 percent).

The authors show, too, that physicians who switched from solo to a group practice of any size not only reduced prescription days but also prescribed fewer overlapping prescriptions by 2.7 to 3.8 percentage points (14.3 to 20.1 percent) than did physicians who continued in a solo practice. In contrast, physicians who switched from a group of any size in 2014 to solo practice in 2018 increased their overlapping prescribing by 1.8 to 2.7 percentage points more than physicians who remained in a solo practice.

In addition to looking at physicians who belonged to peer groups, the authors look at groups of physicians who were integrated under a hospital or hospital system. The authors find that although hospital-employed group physicians prescribed fewer opioids than solo physicians, the authors determine that this reduced prescribing may be related to factors other than peer effects.

Another key finding that the authors note is regarding the average age of physician group members. Older physicians prescribed more opioids than did younger physicians. Physician groups with an average age of between 30 and 39 years old prescribed 3.66 fewer days of opioids than physicians in groups with an average age of 65 or older.

The authors point out that before they completed their paper, not much research had been done on the effects of peer pressure on opioid-prescribing behavior. These results present an "opportunity to reduce opioid prescribing in general and inappropriate opioid prescribing in particular."

Beyond BLS

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January 2024

Sleep and its effects on employees' health in the workplace

Summary written by: Charlotte M. Irby

During sleep, the human brain actively restores itself and repairs the body. So, with little or no sleep and therefore little or no restoration of the brain, the human body cannot function properly. Every day, we face events that can affect our sleep quality, not only at home but also at work. In "The interplay between poor sleep and work-related health" (*Frontiers in Public Health*, Occupational Health and Safety, July 7, 2022), Ingo Fietze, Lisa Rosenblum, Matthew Salanitro, Alexey Danilovich Ibatov, Marina Vladimirovna Eliseeva, Thomas Penzel, Désirée Brand, and Gerhard Westermayer explore work conditions that may affect not only our health but also our perceived sleep difficulties.

To conduct their analysis, Fietze and his colleagues use secondary data analysis of a survey dataset, gathered from 2003 to 2020, of 97 companies in Germany. Employees from these 97 companies were asked about different hazards within their work environment and whether they thought these conditions affected their health. Each survey contained 137 questions altogether, and 19,504 questionnaires were returned that included a response to the one question (and the topic of the article's study) related to sleep problems. Of the employees surveyed, about 60 percent from each company completed the questionnaires.

Fietze and his coauthors look at four specific health indicators—joy of work, confidence, psychological impairments, and physical impairments—and compare them with the employees' self-reported sleep difficulties. Of the employees who responded to the sleep question, about half reported some level of sleep problems, with the authors classifying about 50 percent of workers as "good sleepers" and about 25 percent as "poor sleepers." In addition, the authors note that those who more often reported sleep problems at the moderate-to-severe levels were women age 50 or older. They also find that the employees who reported higher levels of sleeplessness worked mostly in the health and manufacturing industries. When comparing good sleepers with poor sleepers, the authors observe several differences. For example, the good sleepers were happy and confident and had higher levels of positive work health than those of poor sleepers. The poor sleepers, on the other hand, reported poorer work health because they had more impairments physically and mentally. The authors noted, too, that work demands could also affect sleep problems or conversely sleep problems could affect work.

The authors' findings generally reveal that poor sleepers rated their health potential negatively and saw higher possibilities of work hazards (pressures of deadlines, physical strains, technology overload) than good sleepers did. Fietze and his colleagues contend that industries and different occupations could use these findings to improve work conditions and thereby improve the health of poor sleepers.

Beyond BLS

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January 2024

Community colleges: the anchors of rural communities

Summary written by: Maya B. Brandon

Community colleges serve as anchors of rural communities. These institutions present opportunities for training, education, and community and economic development. In "Community colleges as anchor institutions in rural areas" (Federal Reserve Bank of Richmond, *Econ Focus*, third quarter 2023), authors Stephanie Norris, Laura Ullrich, and Sonya Ravindranath Waddell examine the roles that community colleges play in rural areas and the resources provided to these institutions. The authors focus on 66 public 2-year institutions located in rural communities in the Fifth Federal Reserve District.

The authors state that anchor institutions play a large role in their communities. They train and hire employees, purchase from local vendors, act as resource hubs, provide essential services, and help develop real estate for housing and commerce. Larger institutions, such as universities and hospitals, are understood to be anchors and drivers of economic activity, but community colleges function in the same way for rural communities.

Community colleges are more common in more populated areas, which are often also home to 4-year colleges and universities. The article notes that in rural communities, community colleges are often the only source of higher education or technical development. While providing opportunities for professional and educational advancement, these institutions also provide opportunities for employment and can be one of the top employers in their area.

Norris and company find that community colleges are often highly embedded in the region and counties that they serve. The colleges use this influence to bring projects to areas that may otherwise be forgotten. They invest in the communities that they serve, partner with local businesses, and tailor their offerings to the needs of the surrounding area. By establishing a large presence in their communities, these institutions create the visibility needed to drive enrollment, which in turn serves as a driver of revenue and funding.

Most of the community colleges in the Fifth District see tuition and funding from the state as their main revenue sources. State funding varies from college to college. The college's location and programs offered are factors in the amount of funding from the state but, ultimately, full-time enrollment is the main driver. The authors see that, compared with 4-year universities, rural community colleges have higher levels of part-time enrollment and are often located in areas with more tax-exempt properties and declining populations. These factors contribute to the great divide in funding between community colleges and 4-year institutions.

Norris, Ullrich, and Waddell conclude that community colleges play a substantial role in rural communities. They say that given the magnitude of the role of community colleges in the regions they serve, opportunities may be being missed to support these institutions at the state and federal levels. Overall, they find that these institutions are an undervalued asset of rural communities.

Book Review

January 2024

Trade as a mover of world history

A Splendid Exchange: How Trade Shaped the World. By William J. Bernstein. Grove Press, 2009, 496 pp., $11.59 paperback.

If we look at our work laptop, we recognize it as a tool of the job. We do not see the various raw materials that were mined in different global locations and then used in the laptop's production, nor do we consider the many different countries where its various parts were made. To us, this process is normal, everyday commerce. In *A Splendid Exchange: How Trade Shaped the World*, William Bernstein explains that trade was not always this fluid. The author divides the book into four parts, moving from the often-troubled origins of world trade to modern-day trade. Political stability, a precondition for profitable and viable trade, is a recurring theme in the book.

Bernstein begins with the birth of the arms race in 3000 B.C. in ancient Sumer. He tells the story of nomadic herders, who wore copper helmets, attacking Sumerian farmers. Upon learning of copper, Sumerians sought out ways to make their defensive weapons more lethal, while herders made their helmets thicker. These developments began the trade in exotic metals that still fuels the present-day arms race. From here, the author gives a detailed account of the history of trade from the Stone Age to the 21st century, informing the reader of the most important commodities that were traded; the geopolitical environment, costs, and transportation methods involved in that trade; and the technological advances associated with it.

Bernstein explains that, during the Stone Age, advanced farmers would trade grain and animals to hunter-gatherers for their animal skins and other goods. Besides telling readers what happened, the author also provides evidence that it did, indeed, happen. Looking back to 3000 B.C., he points to the remains of prehistoric trade markets on river islands and to Mesopotamian written records with information on the copper-grain trade of the time. The book is filled with many interesting facts: silver became a medium of exchange around 2000 B.C.; the earliest ancestors of camels and horses originated in North America; and, by 2000 B.C., trade was privatized in Sumer and shipment seals guaranteed that transported goods were untampered.

Waterborne commerce is a huge part of the history of trade. Explorers were always looking for more efficient travel routes and seeking to assert their dominance in the sea. From the Phoenicians (the first to engage in long-distance trade) to the ancient Greeks, trade powers looked to control sea lanes and critical chokepoints, an objective of all cultures that historically controlled world trade to some extent. Bernstein identifies and tells the story of different bodies of water and chokepoints that have been strategically important for thousands of years, including the Turkish straits (the Dardanelles and the Bosphorus), Bab el-Mandeb (a strait between Yemen and Africa), the Suez Canal, the Panama Canal, and more. The author then writes about Pax Romana, a period of relative political stability that started under Octavian, Rome's first emperor. During this period, which lasted from 27 B.C. to 180 C.E., long-range trade flourished, allowing the West to "meet" and learn about other cultures.

After the fall of Rome, Indian Ocean trade gained prominence, becoming synonymous with Dar al-Islam (the world of Islam). The Muslims gained control of the eastern Mediterranean and banned Europe from the Indian Ocean until 1497. Of course, not all commerce was waterborne. The Silk Road was an alternative overland route, although geopolitical instability often made it costly and dangerous. During the 13th and 14th centuries, the Mongols provided relative stability to this route, making it more viable. This, unfortunately, gave way to the Black Death, the bubonic plague that accompanied trade with the West and killed 75–200 million people from 1347 to 1351. Egypt, whose city of Alexandria had once been the base of world trade, never recovered from the plague.

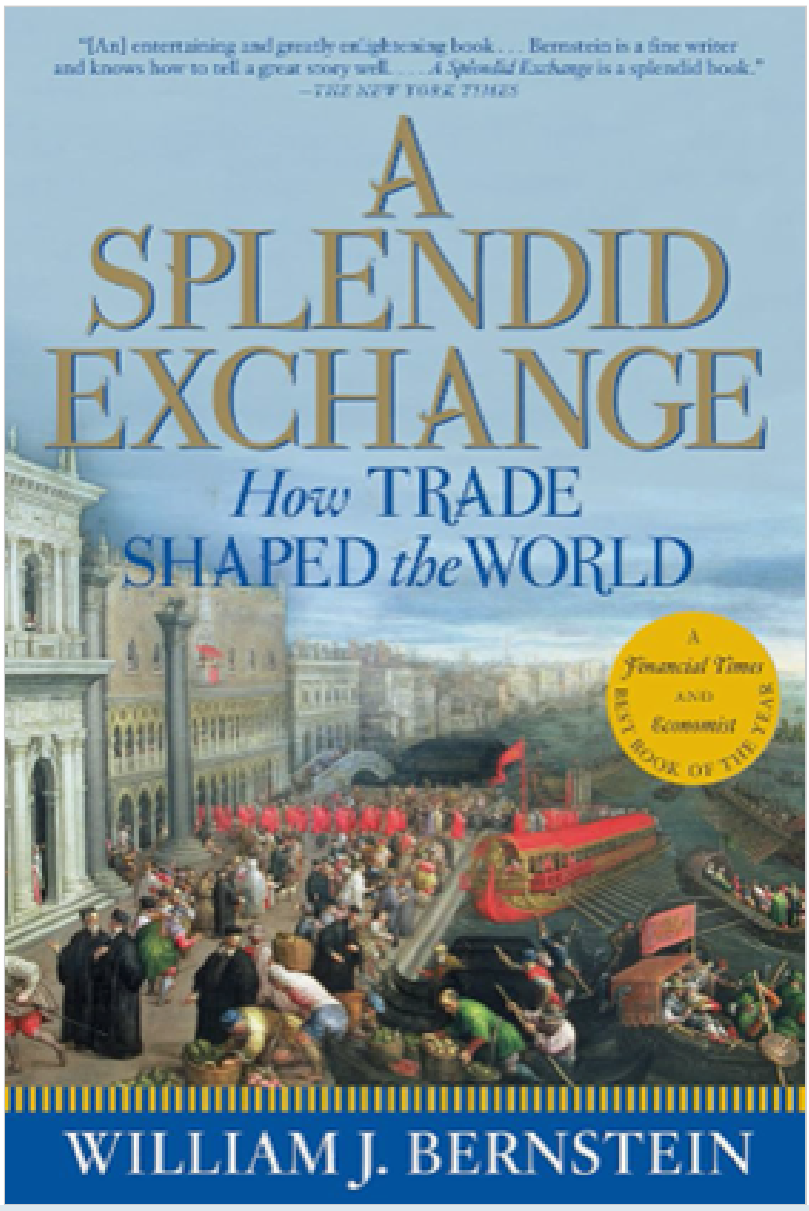
Bernstein details each century as the story moves along. In the late 15th century, Bartholomew Diaz rounded the Cape of Good Hope, giving Europe access to the Indian Ocean and India. Vasco da Gama entered the Indian Ocean and, before long, the Portuguese and Spanish ruled the world, and trade with it. In the 16th century, agricultural and labor markets changed forever as crops began to make their way around the world. Bernstein writes about how publicly held joint-stock corporations were introduced into trade in the 17th century, when the Netherlands founded the Dutch West India Company and the more successful Dutch East India Company. These are some of the many events that the author offers as evidence that globalization is not a new phenomenon; rather, it is a 5,000-year-old process.

Then, Bernstein starts the story down the homestretch with the rise of England. It is interesting to read the author's description of 16th-century England as a "poor, weak, backward state that could not afford to not be pirates…." The English could not compete with the Dutch in the 17th century because they were hobbled by a monarchy that did not inspire confidence in their financial system. However, this changed when the Catholic monarchy of King James II was overthrown during the Glorious Revolution in 1688. The new king, William of Orange, made Parliament the decision-making power in England, which meant a much stronger rule of law. Parliament also instituted excise taxes that helped lower interest rates and promote commerce.

The English East India Company became involved in the cotton trade, and the company manipulated consumer preferences by making sure that royalty wore their cotton from India, which would inspire others to follow suit. Bernstein writes that this was the advent of "the fashion industry and consumer society as we know them today." The author details the protectionist arguments made by domestic textile workers and the arguments made by mercantilists concerned with the trade balance. Bernstein says that many of the protectionist arguments made in the past are the same as those made today.

The author gives a front-row seat to innovation throughout the book. For example, after the English Parliament gave in to protectionist demands and banned the importation of plain Indian cloth in the early 18th century, innovators created new machines that eventually made cotton cheap and plentiful. At this point, Bernstein shifts to the history of economic thought, stating that Adam Smith, David Ricardo, and others argued against monopolies like the English East India Company and made free trade the preferred policy of the future. The author tells the story of the 19th-century trade revolution (the advent of the steamship, the railroad, the telegraph, systems of artificial and natural refrigeration, and a new process to produce cheap, high-quality steel) that "made the world richer during a time of crippling tariff barriers that should have choked off global commerce." He then moves on to discussing the fight for free trade in the 20th century, detailing the removal of protectionist laws and the emergence of a new Pax Americana.

In the last part of the book, Bernstein asks about what we have learned from the history of world trade and how this knowledge can be applied to today's debate about globalization. Some of this discussion concerns the future and seems more conjecture than fact. While Bernstein acknowledges that free trade creates both winners and losers, he does observe that the United States never would have flourished without free trade. He concludes that there is no better alternative to free trade. Given all the evidence he presents, this conclusion seems warranted, and I would absolutely recommend this book for those who want to take a detailed look at how trade has evolved over time and influenced the way countries trade today. However, the book was written in 2008, and the author's predictions about the future may or may not hold up under current geopolitical conditions.



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Beyond BLS

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January 2024

Union power and worker welfare

Summary written by: Yavor Ivanchev

Union membership in the U.S. private sector has declined considerably over time, dropping from about 35 percent in the mid-1950s to about 7 percent in the mid-2010s. Typically, the labor market impacts of this decline, which implies waning union power, have been studied in the context of wages and employment. As a result, comparatively less is known about how suppressed unionization may affect nonpecuniary working conditions. In a recent article titled "The impact of right-to-work laws on long hours and work schedules" (National Bureau of Economic Research, Working Paper 31867, November 2023), Rania Gihleb, Osea Giuntella, and Jian Qi Tan seek to fill this gap by examining the effects of shifts in union bargaining power on two factors affecting worker welfare: long working hours and nontraditional work schedules.

To estimate changes in union strength, the authors take advantage of the varying adoption of right-to-work (RTW) laws across U.S. states. These laws, now enacted by 27 states, eliminate agency-shop protections (arrangements in which workers must pay union dues as a condition of employment), thus reducing union power. Using data from the American Community Survey for the 2005–19 period, the authors compare welfare outcomes within pairs of adjacent counties located in states with differential adoption of RTW laws, while also ensuring that these outcomes trended similarly in each pair before the adoption. Long work hours are estimated with various measures, the main one being a binary variable capturing work exceeding 45 hours per week. Nonstandard work schedules are identified by examining the times at which employees arrive at work (for example, arrival between 5 p.m. and 8 a.m. would indicate a nonstandard shift).

The authors' central finding is that the adoption of RTW laws increases the share of employees working long hours (as measured by the binary variable) by about 6 percent relative to the mean, suggesting that reduced union power weakens worker protections along this welfare dimension. This effect is stronger among male and Black workers, as well as in industry sectors with high unionization, such as construction, manufacturing, and transportation. An alternative continuous measure of working hours also suggests that the enactment of RTW laws is associated with a 0.5-percent increase in the average number of hours worked, although this effect is statistically significant only in manufacturing and transportation. Economically sizable increases on the continuous measure are also observed for blue-collar and Black workers, as well as those ages 25 to 44.

While RTW laws significantly affect the odds of people working long hours, they appear to have a weak impact on nonstandard work schedules. The authors report that, in the main sample, the rollout of RTW laws slightly increases the incidence of starting work between 5 p.m. and 8 a.m., although the strength of this effect is sensitive to data quality and method of analysis. However, some model results show notable differences by industry and worker demographics. For example, in counties adopting RTW laws, the share of people working nonstandard schedules rises sharply in the sectors of education and public administration, both of which are highly unionized. In addition, significant increases occur for Black, Hispanic, and younger workers.

The authors also offer some evidence on the effect of RTW laws on hourly wages and union coverage, topics covered in previous research. They find that, after the adoption of RTW laws, wages generally decline, especially in the manufacturing sector, as does union coverage. However, the wage estimates obtained for the main sample are imprecise and vary by period studied.

Article

January 2024

A consumption measure for automobiles

In this article, we estimate consumption of automobiles by using a user-cost approach and data from the Consumer Expenditure Surveys Interview Survey (CE). The user-cost approach is a method for valuing the flow of services from long-lived goods. A key input into user cost is the depreciation of the good, which we estimate by using purchase data from the CE.

Consumption measures of long-lived items are an important part of measuring the economic well-being of households. These long-lived items include owned housing and durable goods. Measures of expenditure sometimes are used to approximate consumption, but the expenditure on goods and the consumption of goods differ for items that are purchased infrequently and used for several years. Other than housing, automobiles are the most expensive durable good that households purchase. The economic literature assumes that automobiles depreciate slowly over a long period; this assumption implies that the consumption of automobiles is spread over multiple years. Thus, consumption and expenditures on automobiles take place at different times and may exhibit different patterns over time. We calculate the consumption of automobiles by measuring their depreciation, opportunity cost, and the recurring costs of ownership. We follow a user-cost approach to sum these three amounts. This sum is the consumption value for the flow of services from an automobile. Data from the Consumer Expenditure Surveys Interview Survey (CE) are used in our analysis.

The three amounts that produce a consumption value for automobiles are individually derived. First, we estimate depreciation by comparing the purchase price of similar automobiles of different ages across time periods with CE data.[1] Our preferred depreciation specification is an estimate of nonparametric depreciation; that is, the depreciation rate can vary by automobile age. We also estimate constant geometric depreciation as a comparison with nonparametric depreciation. The nonparametric approach is preferred because automobiles of different ages depreciate at different rates, as documented in the literature. Second, the opportunity cost is derived from estimated current market values and interest rates. Third, we use CE data on vehicle maintenance and related costs to produce ownership-cost values. Thus, the two estimated values and the ownership-cost values are summed to create a consumption value for automobiles.

Expenditures on automobiles fluctuate much more than the consumption of automobiles. Our research suggests that consumers buy automobiles when the economy is growing, and expenditures on automobiles decline during recessions as consumers postpone purchases. Consumption follows a similar pattern because new automobiles depreciate more quickly than older automobiles, but the decline in the consumption of automobiles is substantially smaller than the decline in expenditures during recessions.

Our approach allows us to measure consumption for individual consumer units (CUs).[2] We combine information on automobile ownership with estimates of depreciation rates for automobiles (both datasets are from the CE). Real (inflation adjusted) 10-year treasury yields are used to calculate opportunity costs. Other components of user cost (the recurring costs, which include maintenance and repairs, insurance, licensing, etc.) cannot be uniquely matched to CE data. However, we accommodate this matching problem by adjusting the recurring costs for other vehicles by the number of automobiles and other vehicles owned by CUs. For example, if a CU owns a car, a truck, and a boat with a motor, and if the average recurring costs for CUs with two automobiles is only 80 percent of the average recurring costs for CUs with two automobiles and one other vehicle in the same year, then we assume that the recurring costs for the car and truck equal 80 percent of total recurring costs for the CU. Using these data, we estimate automobile consumption individually for all CUs. These consumption estimates are positive in each period for all CUs that own automobiles. In contrast, expenditure estimates for the purchase of automobiles are $0 for most CUs in each period.[3]

Our work is similar to approaches used to measure the consumption of owned housing and other durable goods. There are two main approaches to valuing the consumption of durable goods. One is the acquisition approach, which assigns the full value of the good to the period it which the good was acquired. A limitation of the acquisition approach is that it ignores that durable goods provide value over an extended period. An alternative to the acquisition approach is to value the flow of services received over the lifetime of the durable good. The flow-of-services approach is generally recommended for measuring the consumption value of durable goods.[4] There are two options to value the flow of services from durables. The first is called rental equivalence; it uses the rental price for a similar good to value the flow of services. The other is to estimate the user cost. While rental equivalence is the most common method used to value the flow of services from owned housing, it is not feasible for valuing motor vehicles because vehicles are rarely leased past the first few years of their life. Thus, the user-cost approach is the only approach used to value the flow of services from vehicles.

There has been substantial prior work estimating consumption from owned vehicles that uses a user-cost approach.[5] Also, research has been conducted on estimating the depreciation rate of automobiles. Bruce Meyer and James Sullivan use a constant depreciation rate estimated by comparing the purchase prices of similar vehicles, and Jonathan D. Fisher and David S. Johnson use an estimated constant depreciation rate of 10 percent for all automobiles.[6] In this paper, we use the basic methods developed by Meyer and Sullivan, but we allow the depreciation rate of automobiles to vary by age.

The issue of how to value durable goods also arises in the context of price indexes. Currently, the U.S. Bureau of Labor Statistics (BLS) uses different methods to value different types of goods and services in the construction of price indexes. The acquisition approach is used for most goods and services, including automobiles and other durable goods. However, rental equivalence is used for owner-occupied housing. Introducing the user-cost approach to value the flow of services from automobiles is in line with the Committee on National Statistics (CNSTAT) recommendation for measuring the prices of durable goods: “The prices of durable goods should be converted to user cost before being aggregated into a price index, whether a basket price index or a COLI [cost-of-living index].”[7] Additionally, CNSTAT has recommended that the number

of owned automobiles be used as the quantity weight associated with automobiles in a cost-of-living-based price index. The value of the stock of owned automobiles is an immediate outcome of our approach and can be used to construct the quantity weight. However, a major limitation for implementing a user-cost approach in the production of price indexes is the lack of user-cost data in real time. Our estimates of depreciation rates are average values over a long period of time, but current values would be needed for a timely price index.

In this article, we review how automobile consumption and expenditure can be estimated. To show this, we first discuss how the value of automobile consumption can be measured with a flow-of-services approach. Second, we describe the data available on automobiles in the CE and our methods. Third, we estimate the depreciation rates of automobiles listed in the CE. Fourth, we show how the current market value of automobiles can be imputed with CE data. Fifth, we present a national series of average automobile consumption based on the two depreciation methods and compare them with expenditure on automobiles. Sixth, we estimate the consumption value of automobiles at the level of the CU. Finally, after we summarize our findings, we discuss data sources and the calculation steps for the consumption value of automobiles in a data appendix.

Measuring automobile consumption

We measure the value of automobile consumption by using a flow-of-services approach that combines automobile depreciation with the other costs of owning an automobile. We estimate depreciation by using the difference in the purchase prices (as reported in the CE data) of similar automobiles of different ages. Purchasing an automobile is similar to an investment in which an opportunity cost is incurred as a forgone return to investment. We estimate the opportunity cost of owning an automobile by using an inflation-adjusted market yield on 10-year U.S. Treasuries as a proxy for the real interest rate. As noted earlier, we also use CE data on recurring costs, such as automobile repairs and maintenance, insurance, and registration costs. The sum of depreciation, opportunity cost, and recurring costs equals the user cost, which approximates the flow of services from owned automobiles.

We restrict our analysis to cars, sport utility vehicles (SUVs), and trucks because of the lack of detailed information about other types of vehicles. Throughout the remainder of this article, we refer to cars, SUVs, and trucks as automobiles, and we do not include in our analysis other motorized vehicles, such as aircraft, boats, and motorcycles.

We estimate two measures of depreciation. One measure assumes a fixed depreciation rate over the life of each automobile, and the other measure allows the depreciation rate to vary nonparametrically. A nonparametric measure estimates separate depreciation rates for each age of an automobile. Varying depreciation rates are calculated and used because several sources suggest that automobiles depreciate at different rates throughout their life cycle.[8] As we noted earlier, Meyer and Sullivan use a constant depreciation rate estimated by comparing the purchase prices of similar vehicles, while Fisher and Johnson assume a constant depreciation rate of 10 percent.[9] In this paper, we essentially use Meyer and Sullivan's method, but we allow the depreciation rate of automobiles to vary by age.

We consider three sets of recurring costs. Maintenance and repair costs include spending on service and parts, oil and other fluids, and auto service policies. Insurance costs include all spending on insurance payments. Registration costs include all expenditures needed to obtain and maintain license plates on the automobile. The recurring costs are adjusted for business use because our primary focus is the consumption of households. We do not include fuel purchases in this measure because they are not considered part of user cost in the literature.

We produce a service-flow value of an automobile by combining the estimated depreciation rate of an automobile, the estimated current market value of the automobile, an interest rate representing the opportunity cost of capital, and the recurring costs of automobile ownership. The service flow of an automobile i of age a at time t ($SF_{i,t}$) is calculated with the following formula:

$$(1) \qquad SF_{i,t} = (r_t + \delta_a) \times \Pi_{j=0}^{a-1}(1 - \delta_j) \times P_{i,0} + RC_{i,t} \ ,$$

where r_t refers to the interest rate at time t, δ_a refers to the estimated depreciation rate for an automobile of age a, $P_{i,0}$ refers to the purchase price of automobile i at 0 years of age, and $RC_{i,t}$ is the incurred recurring costs of the automobile i at time t. We use the all-item series of the Consumer Price Index for All Urban Consumers (CPI-U) to adjust the purchase prices of automobiles into constant dollars (1982–84 dollars) in all intermediate steps. Next, we adjust the purchase prices back to the reference-period-dollar level for final measures. Total depreciation over the life of the automobile is equal to its purchase price in constant dollars. In our model, if the interest rate is 0 percent, then the automobile service flow without recurring costs is equal to the original purchase price or acquisition cost. The only difference between the acquisition approach and the sum of the user cost over the vehicle lifetime would be the timing of when costs are recognized. That is, current total expenditure should equal the sum of the depreciation over the life of the vehicle.

Because our primary goal is to measure the automobile consumption of households, we also adjust all three components of depreciation, opportunity cost, and recurring costs for business use. In addition, not all automobile purchases are made through dealers. Nondealer purchase prices may not accurately represent current market prices because of personal relationships, such as those of family members or friends. If the constant dollar purchase price of an automobile is less than $2,000, then we disregard it as an invalid price; instead, we use an imputed price based on the characteristics of a similar automobile.[10]

Data description and method

Our primary data sources are information on household ownership of automobiles from the CE. In our study, we use data collected from the second quarter of 1996 (Q2 1996) to the first quarter of 2022 (Q1 2022). The availability of relevant data is limited for the years prior to 1996 (in particular, maintenance and repair variables are absent from the series). We observe the makes and models of owned automobiles through vehicle descriptions or vehicle codes. These data are internal to BLS. While Public Use Microdata (PUMD) are available for the stock of automobiles owned, details on automobile make and model needed for our estimations are not available for all years of PUMD. As noted earlier, we restrict our analysis to cars, SUVs, and trucks; thus, we do not include observations of other types of vehicles, such as recreational vehicles (RVs), boats, and aircraft. Also, based on purchase information reported in CE vehicle data, we exclude automobiles purchased as a gift for someone outside the CU. We exclude these gift purchases because these automobiles do not generate a service flow for the purchaser. About 0.7 percent of all owned automobiles in the weighted sample are gifts for someone outside the CU. These criteria leave us with more than 1 million automobiles reported in CE interviews from all quarters and all years. If we assume that quarterly data are independent, then the total number of vehicles is a simple sum of automobiles reported in CE data across quarterly surveys. For example, an automobile surveyed in Q1 2021 is treated as a different automobile in Q2 2021. This assumption of the independence of data is necessary because our goal is to produce a value for the flow of services from automobiles for each quarter.

To estimate automobile depreciation, we need information about the original purchase price paid by the consumer of the automobile, whether the automobile was purchased new or used, and the automobile's characteristics (make and model). Among all automobiles that are listed in the stock of owned automobiles, only 24 percent include a valid purchase price in the CE.[11] This means that we can only produce depreciation rates for this subset of all automobiles. For those automobiles with no original purchase prices reported, we impute their current market values based on the average values of automobiles with reported purchase prices and similar characteristics (such as make, model, year, age, and condition). Using CE reporting, we find that approximately 39 percent of all owned automobiles were purchased new and 61 percent were purchased

used. The reported purchase prices are converted into constant dollars by using the CPI-U for all items. We estimate depreciation in constant-dollar terms to remove the effect of varying inflation rates on changes in the nominal value of the vehicle. After estimating depreciation and current market values, we convert all consumption measures in constant-dollar terms back to reference-period dollars by using the CPI-U for all items. Also, we convert all consumption measures into prices from 2 months before the interview month to represent consumption for the current period (this is defined as the quarterly reference period). For example, if the interview took place in February 2021 (Q1 2021 in the CE), then the flow of services was assigned to the period Q4 2020. Next, we use the CPI-U for all items from the middle of the quarter as a deflator for the quarterly consumption measure.

We estimate constant-geometric-depreciation rates separately for new and used automobiles. Additionally, we also allow for nonconstant depreciation of automobiles 0 to 10 years of age. A new automobile depreciates substantially in its first years of life before the estimated depreciation rate stabilizes.

To estimate the age-specific depreciation rates for automobiles, we regress the log of the real purchase price of an automobile on an age indicator. Also, we control for make, model, and model year in our regression. The regression equation for automobiles of age a is as follows:

(2) $$\ln(P_{i,a}) = \beta_0 + \beta_a \text{age}_{i,a} + f_{\text{make}} + f_{\text{model}} + f_{\text{year}} + \epsilon_i \ ,$$

where the coefficient β_α can be interpreted as an annual average geometric-depreciation rate for automobiles of age a. To be exact, we calculate the depreciation rate as $\delta_a = 1 - \exp(\beta_a)$, where β_a is the coefficient of age in the regression for the subgroup of automobiles of age a and age $a + 1$. We estimate the constant-geometric-depreciation rate for all automobiles at different ages by using this equation. Also, we estimate age-specific depreciation rates by using this equation 11 times for automobiles 0 to 10 years of age. These estimates include only automobiles of age a and age $a + 1$ in each regression for the nonparametric estimates. There are few transactions of older automobiles. Accordingly, the sample size of older automobiles is not large enough to reliably estimate age-specific depreciation rates for these older automobiles. So, we estimate a constant-geometric-depreciation rate for automobiles 11 years of age and over.

Next, we calculate the current market values of automobiles in the CE with two different treatments that are described below. One treatment has a purchase price, and the other treatment does not have a purchase price. For automobiles with a reported purchase price, we calculate the current market value of an automobile at time t as follows:

(3) $$\text{CMV}_t = P_0 \times \Pi_{j=0}^{a-1}(1 - \delta_j) \ ,$$

where P_0 denotes the real purchase price (in constant 1982–84 dollars) of an automobile at the time of acquisition, and a is the age of the automobile. About 24 percent of all owned automobiles with a valid purchase price reported in the CE from 1996 to 2021 have a current market value derived from the depreciation approach, and the remaining 76 percent of the automobiles (which have no reported purchase price) are mapped to an imputed market value based on the similar characteristics of the automobiles.

These estimated current market values are adjusted for survival rate and business use. Our depreciation-rate estimates from equation (3) represent the expected loss in market value of an automobile of a given age conditional on the continuing operation of the automobile. Automobiles may cease to be operable for a number of reasons, including damage and mechanical failures. A portion of the yearly service-flow value of an automobile is the expected depreciation. The calculation of expected depreciation is conditional on the probability that the automobile survives the year. This probability that an automobile survives in a specific year is called the survival rate. We estimate the survival rate by using the age distribution of automobiles in the CE. For example, the ratio of the weighted total number of automobiles of age a to the number of automobiles of age $a + 1$ in the CE data is the survival rate for automobiles of age a.

The estimated current market values and recurring operational costs are also adjusted for business use to generate the depreciation and opportunity-cost components for CUs. Next, they are combined with the recurring-costs component to construct a complete series of user cost. Rewriting equation (1), we have the following equation:

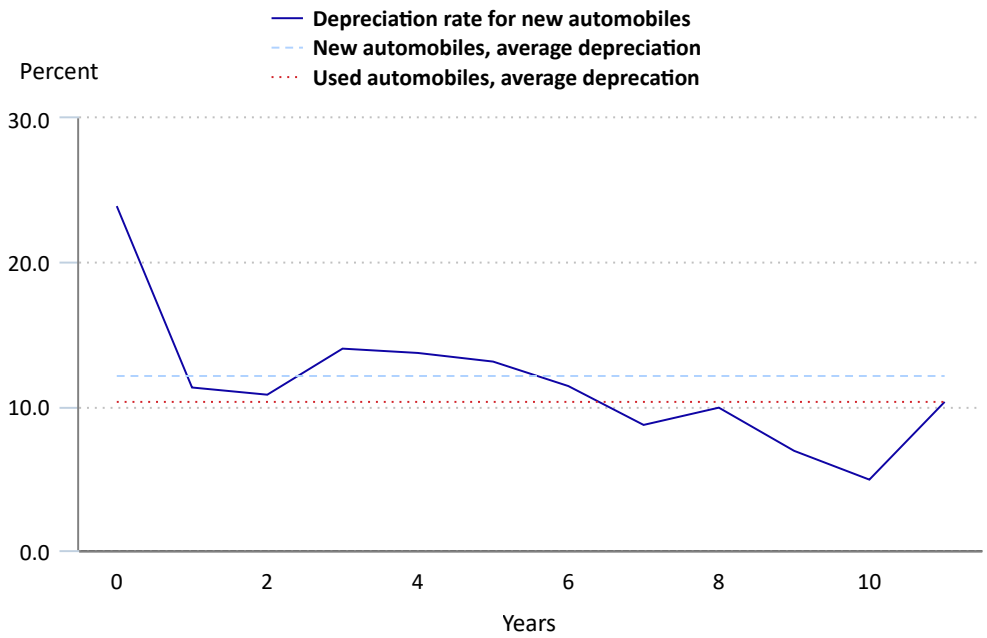
(4) $$\text{SF}_t = (r_t + \delta_a) \times \text{adj\_CMV}_t + \text{adj\_RC}_t \ ,$$

where SF_t refers to the service flow at time t, r_t refers to the interest rate at time t, δ_a refers to the estimated depreciation rate for an automobile of age a, adj_CMV_t refers to the estimated current market value adjusted for business use and the survival rate of an automobile, and adj_RC_t refers to the combined recurring costs of the automobile adjusted for business use at time t.

Depreciation-rate estimates

Chart 1 shows estimated depreciation rates as annual percentages by automobile age from the owned-automobiles data series of the CE. We present rates based on the age of the automobile and constant geometric depreciation. Automobiles purchased as new depreciate faster on average than automobiles purchased used. The depreciation rate of new automobiles is 12.1 percent, and the depreciation rate of used automobiles is 10.3 percent. Not surprisingly, automobiles depreciate much faster in the earliest years of their useful life. If they are purchased as new, automobiles lose almost 40 percent of their original value over the first 3 years. After 5 years, the depreciation rate declines to 5 percent by 10 years of age. This finding is consistent with estimates from Edmunds and Hardesty.[12] These sources state that a new automobile can lose more than 20 percent of its initial value in its first year and may lose almost one-third of its initial value within 3 years of purchase. The estimated depreciation rate for used automobiles is on average close to the fixed depreciation rate (10 percent) used by Fisher and Johnson.[13]

Chart 1. Annual depreciation rates by automobile age



Click legend items to change data display. Hover over chart to view data.
Note: The date range for this dataset is from the second quarter of 1996 to the first quarter of 2022.
Source: U.S. Bureau of Labor Statistics.

View Chart Data

Imputed current market values of automobiles

Similar to Meyer and Sullivan, we impute the current market values of automobiles in the CE either by applying the depreciation rates demonstrated above to the reported purchase price of an automobile or by mapping those automobiles with no reported purchase price to similar automobiles with reported prices in the CE.[14] As noted earlier, we find that about one-quarter of automobiles in the CE data have reported purchase prices. We calculate the current market values in real terms by directly applying annual depreciation rates to the reported real purchase prices. Those current market values are converted back to the current-period-dollar level by using the all-item CPI-U. For example, if an automobile was reported as purchased in January 2010 during a CE interview in the second quarter of May 2020, then the original purchase price is first converted into a price of constant dollars. Next, the current market price in constant-dollar terms is calculated after applying the annual depreciation rate by age (as explained in the previous section). Finally, we use the all-item CPI-U to convert the current market price of the automobile in 1982–84 dollars into March 2020 dollars to reflect the first quarter of 2020 consumption measure.

For the three-quarters of the automobiles in the CE with no reported purchase price, we first impute their current market values in constant dollars by averaging similar automobiles in the pooled data by either full or partial match. The summary statistics of these imputation results are reported in table 1.

Table 1. Imputation results of the current market values of automobiles in the Consumer Expenditure Surveys, 1996–2022

Data condition	Imputation method	Number of automobiles	Percent share of automobiles	Comments
Purchase price is reported.	Depreciation adjusted purchase price	256,741	24	Nonconstant depreciation is used for new automobiles; constant depreciation is used for used automobiles.
Purchase price is not reported.	Average market value of same automobiles	280,420	26	All five variables (make, model, year, age, and condition of new or used automobile) are matched.
Purchase price is not reported.	Average market value of similar automobiles	550,062	50	Partial matches are made based on available characteristics.
Total	[1]	1,087,223	100	[1]

[1] Not applicable.

Note: Calculations use data from the Consumer Expenditure Surveys.
Source: U.S. Bureau of Labor Statistics.

To validate our imputation procedure, we compare data from the 2018 National Automobile Dealers Association (NADA) used-car guides (the only data available for research purposes) with the estimated current market values of the stock of owned automobiles in the 2018 CE.[15] We were able to map a total of 8,596 CE automobiles with the same make, model, and year as a NADA automobile. The correlation is 0.74 between NADA prices and the estimated current market values from the CE for both methods of depreciation. Also, we ran a simple regression (without an intercept) of NADA prices on the estimated current market values from CE data. The coefficients of the CE price from this regression are 0.91 for nonparametric depreciation and 0.85 for constant geometric depreciation. Discrepancies between the two measures are at least partially attributable to differences in body type (this information is not available in the CE) and the condition of the automobile (NADA retail prices are adjusted for mileage). Overall, the NADA prices validate our estimates of CE current market values.

Example: expenditure versus consumption for households

We estimate the consumption of automobiles by spreading expenditures on them (a sum of estimated depreciation and the additional costs of ownership) over many years. If a household buys a new automobile, then the net present value of consumption (excluding additional costs of ownership) is equal to the expenditure on that purchase. We show this result with an example of a new automobile purchased for $30,000 in table 2. We compare consumption values based on constant geometric depreciation (DEP_cg), nonparametric depreciation (DEP_np), and expenditure measures over the operating life of this automobile. We calculate both current market values (CMV_cg, CMV_np) and depreciation by using our estimation of δ from CE data. In table 2, we show that the total values of the three measures differ, but not by substantial margins, from one another because of the age restriction on owned automobiles in the CE. We estimate that automobiles that are over 25 years of age in the CE would have the same

current market value as those that are 25 years of age. Automobiles are assumed to generate a flow of service until they are completely totaled. A totaled automobile is one for which the cost to repair exceeds the current market value of the automobile. Thus, the combined consumption value over the entire lifespan of the automobile would be closer to $30,000 as the automobile operates beyond 25 years of age.

Table 2. Simulation of current market value and depreciation over the life of an automobile

Age, in years	Depreciation rate (percent)	Current market values		Consumption values		Expenditure
		Constant geometric depreciation	Nonparametric depreciation	Constant geometric depreciation	Nonparametric depreciation	
0	23.9	$30,000	$30,000	$3,633	$7,178	$30,000
1	11.3	26,367	22,822	3,193	2,590	0
2	10.8	23,174	20,232	2,807	2,194	0
3	14.0	20,367	18,038	2,467	2,517	0
4	13.7	17,900	15,520	2,168	2,130	0
5	13.1	15,732	13,391	1,905	1,754	0
6	11.4	13,827	11,637	1,675	1,325	0
7	8.7	12,153	10,312	1,472	897	0
8	9.9	10,681	9,415	1,294	930	0
9	6.9	9,387	8,484	1,137	583	0
10	4.9	8,250	7,901	999	390	0
11	10.3	7,251	7,511	878	775	0
12	10.3	6,373	6,736	772	695	0
13	10.3	5,601	6,041	678	623	0
14	10.3	4,923	5,418	596	559	0
15	10.3	4,327	4,859	524	501	0
16	10.3	3,803	4,358	461	450	0
17	10.3	3,342	3,908	405	403	0
18	10.3	2,937	3,505	356	362	0
19	10.3	2,582	3,143	313	324	0
20	10.3	2,269	2,819	275	291	0
21	10.3	1,994	2,528	242	261	0
22	10.3	1,753	2,267	212	234	0
23	10.3	1,540	2,033	187	210	0
24	10.3	1,354	1,824	164	188	0
25	10.3	1,190	1,636	144	169	0
Total	[1]	[1]	[1]	28,954	28,533	30,000

[1] Not applicable.

Source: U.S. Bureau of Labor Statistics.

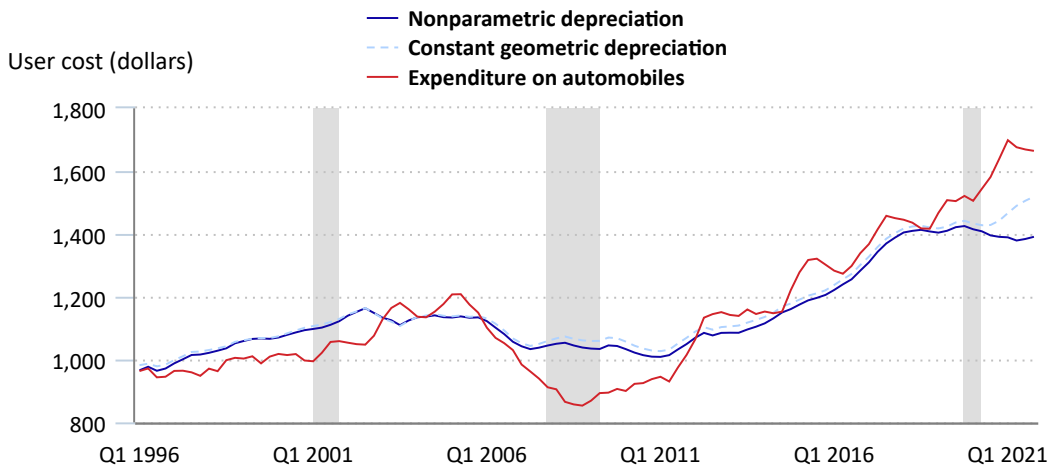
Average automobile consumption at the national level

In this section, we present a national series of quarterly average automobile consumption based on the two depreciation methods and compare them with automobile expenditures. Averages are based on population-weighted quarterly aggregate consumption, population-weighted quarterly aggregate expenditure, and the total number of CUs owning or purchasing automobiles during the reference period. Results are presented by adjusting consumption or expenditure for business use. This is in accordance with the BLS publication of average automobile expenditures that are adjusted to reflect only nonbusiness use.[16] One difference between the consumption-based averages and BLS-published average automobile expenditures is that consumption accounts for not just the previous purchase of automobiles but also the receipt of these as gifts or other transfer and without payment. In contrast, CE-published average expenditures reflect what is purchased in the reference period; this is the case whether or not the purchase is for the consumption of the CU or for someone living outside the CU. The latter are referred to as “gifts given” in CE data files. A discrepancy can arise in the two measures as the total number of vehicles purchased as gifts may not equal the total number of vehicles received as gifts in the sample in a given period.

To compute averages, we first estimate the value of consumption for each CU with an automobile. Next, we average those values across all CUs (including those CUs that do not own automobiles) to obtain a national average series. For comparison, we construct a series with actual net purchase expenditures (this is the amount paid for a vehicle after subtracting any trade-in allowance and any costs paid by an employer) in the CE interview reference period of the previous 3 months. We also construct a time series based on the average expenditures for all vehicles purchased within the interview reference period. The total expenditure series includes the purchase price and the recurring costs, but the opportunity cost (interest component) is not included (the opportunity cost is included in the flow-of-services approaches).

Chart 2 compares consumption estimates of the three methods. Both the nonparametric-depreciation series and the constant-geometric-depreciation series include depreciation, interest (opportunity cost), and recurring expenditures. The two series that use depreciation to measure consumption have relatively smooth quarter-to-quarter changes, while the expenditure series is more variable. Consumption estimated with nonparametric depreciation tends to track consumption estimated with constant depreciation closely, but the two series diverged during the pandemic. It is likely that this divergence between the two series is due to the decline in new automobile production. This production decline led to an increase in the average age of automobiles and an increase in the purchase of used automobiles. Also, the results of the nonparametric-depreciation approach show higher consumption of automobiles in the first years of their lives.

Chart 2. Household consumption and expenditure on automobile purchases, quarterly averages, 1996–2022



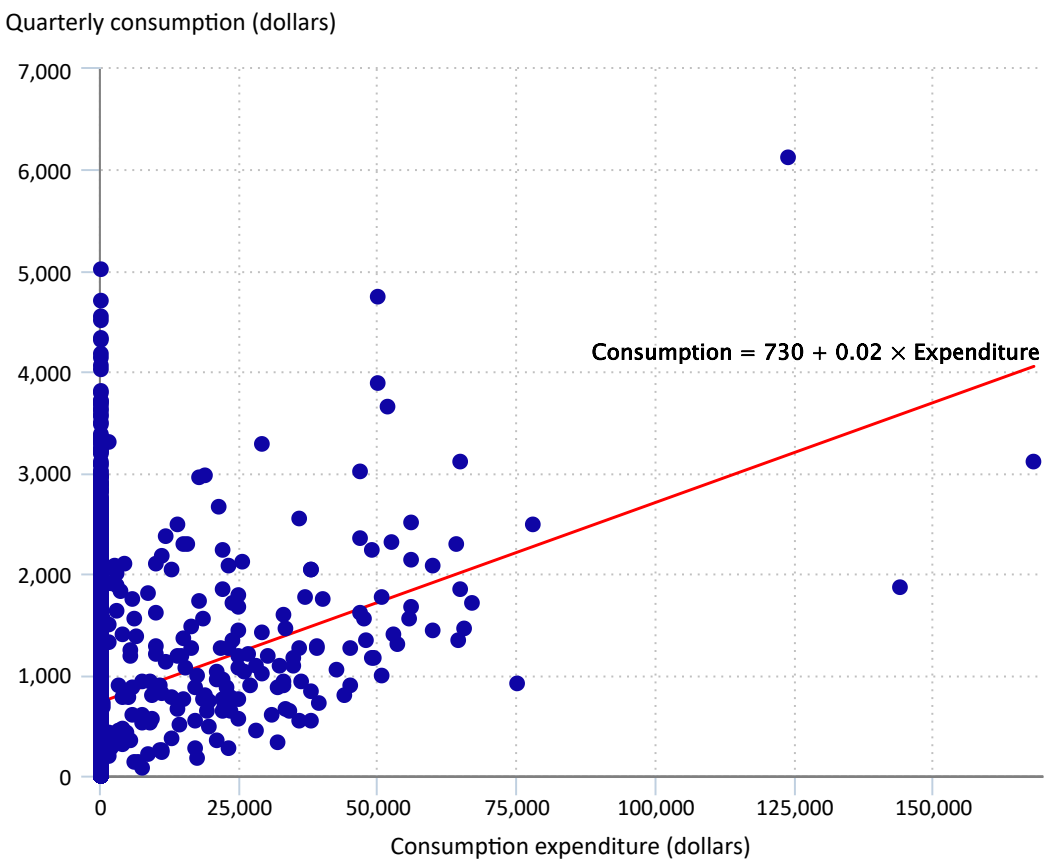
Click legend items to change data display. Hover over chart to view data. Shaded areas represent recessions as determined by the National Bureau of Economic Research. Note: All national average series are based on authors' calculations using data from the Consumer Expenditure Surveys. Both the nonparametric-depreciation series (nonlinear) and the constant-geometric-depreciation series (linear) include depreciation, interest components (opportunity cost), and recurring expenditures, such as maintenance and repair, vehicle insurance, and other operating costs spent on inspection, registration, and property tax. The expenditure series includes automobile net purchase prices and recurring costs, but the interest component is not included for comparison purposes. These data sets are seasonally adjusted and adjusted for business use.
Source: U.S. Bureau of Labor Statistics.

View Chart Data

Consumer-unit consumption

Despite the similarities between average automobile consumption and expenditure, the picture at the CU level is quite different. Most CUs that own automobiles have $0 in expenditures on automobile purchases in any quarter, although expenditures for recurring costs would be positive. Chart 3 plots the estimated parts of consumption, depreciation and opportunity cost, and expenditures that represent the purchase of automobiles for all CUs participating in a CE interview in October, November, or December 2021 (this is referred to as collection period Q4). Because both the consumption and expenditure series include the same recurring costs at the CU level, these are excluded from chart 3. The depreciation and opportunity cost of consumption are calculated on the basis of the stock of vehicles reported as owned during the interview reference period. Automobile purchase expenditures refer to those made in the same reference period (the 3 months prior to the interview month). Adjustments to reflect nonbusiness use are only made in the calculations of consumption and expenditure. Unlike in our automobile consumption measure, here we include purchases of automobiles given to someone outside the CU in the expenditures measure.

Chart 3. Consumption versus expenditure without recurring costs, fourth quarter 2021



Note: Consumption is the sum of depreciation and opportunity cost without recurring costs added at the consumer unit level. Expenditure is the net purchase price after subtracting the trade-in allowance of new and used automobiles reported in data from the Consumer Expenditure Surveys at the consumer unit level.
Source: U.S. Bureau of Labor Statistics.

View Chart Data

Some CUs have purchase expenditures over $50,000, and no CU has estimated automobile consumption above $10,000 that excludes the recurring costs. The positive correlation between expenditure and consumption is limited to the sum of depreciation and opportunity-cost components because automobiles depreciate the most in the period in which they are purchased.

Approximately 4 percent of automobiles are either purchased as a gift to someone outside the CU (0.7 percent) or received as a gift (3.2 percent). When an automobile is given to someone outside of the CU, the consumption value for the purchaser of the automobile is $0. However, expenditures are positive if a gift is purchased. Automobiles purchased for someone outside the CU are excluded in the consumption series, but these purchases are included in the expenditure series that uses purchase information reported in CE vehicle data.

Summary

In this article, we use a user-cost approach to compare estimates of the consumption of owned automobiles at the national level and the CU level, but each comparison uses different depreciation assumptions. Over time, consumption in the average series is less volatile than in the expenditure series, although the levels of consumption and expenditure are similar. But there are a few exceptions between the series. For example, at the national level, average expenditure was relatively lower than consumption during the recessionary period just before and after 2008 and relatively higher during the COVID-19 pandemic period. At the CU level, consumption was positive in each period for all households that owned automobiles, although in each period there were CUs with no expenditures.

Currently, economists at BLS are using automobile consumption values to construct a comprehensive consumption measure. Although additional research is needed, a flow-of-services estimate of automotive consumption could replace the acquisition approach for the pricing of vehicles in the CPI.

Appendix

In this appendix, we discuss data sources and the steps to calculate the consumption value of automobiles.

Data sources

We use CE data from Q2 1996 to Q1 2022 to estimate consumption values from 1996 to 2021. Unlike other consumer products, automobiles are not expected to be consumed immediately. The stock of automobiles is measured by asking a CU if they have any vehicle during the interview time period. Because there is no clear determination of the month in the last 3 months the CU owned the vehicle, we use CE data in the following quarter to measure the consumption value of the stock of automobiles for any reference quarter. For example, consumption values for the first quarter of 1996 are calculated from Q2 1996, for the second quarter from Q3 1996, for the third quarter from Q4 1996, and for the last quarter from Q1 1997.

The quarterly estimated-average consumption series for CUs is again seasonally adjusted by taking a rolling average of measures from the two previous quarters, the current quarter, and the following quarter. The rolling-average equation is as follows:

$$\text{Consumption}_t = (\text{Consumption}_{t-2} + \text{Consumption}_{t-1} + \text{Consumption}_t + \text{Consumption}_{t+1})/4 \ ,$$

where t denotes the reference quarter of a year. Seasonal adjustments are made to smooth out large fluctuations across quarters.

It would have been ideal to use PUMD so outside researchers could reproduce our results, but not all relevant characteristics of an automobile, such as vehicle make, model, and fuel type, are available in PUMD. Instead, we use CE data that are internal to BLS. We assume that each quarterly survey is independent and that CUs are unique across surveys. We count a total of 1,281,071 motor vehicles from 689,811 CUs that are surveyed in the data. In any period, a CU owns an average of 1.86 vehicles, which includes 1.58 cars, SUVs, or trucks. We only include cars, SUVs, and trucks in our current calculation, and we exclude other types of vehicles, such as aircraft, boats, RVs, trailers, and kayaks, because not enough information about these other types of vehicles is available for depreciation-rate estimation. Many other types of vehicles, such as aircraft and boats, have no purchase prices reported, and it is difficult to impute a current market value from limited information. For example, a CU reported that it has a boat without other specific details. A boat can have a market value ranging from $1,000 to over $1 million. Although we can apply some fixed depreciation rate, such as 5 or 10 percent, imputing a current market price is challenging in the first place.

The following tables provide more detail on the exact number of vehicles and CUs by type. We also list all variables used in this article, along with a brief explanation of each. Table A-1 shows the total number of vehicles surveyed in the CE data; we assume that quarterly data are independent of one another. About 85 percent of all types of vehicles are automobiles (cars account for 47 percent, and SUVs and trucks account for 38 percent).

Table A-1. Surveyed automobiles in the Consumer Expenditure Surveys, assuming quarterly reports are independent, second quarter 1996 to first quarter 2022

Vehicle category	Total number of vehicles in the Consumer Expenditure Surveys	Percent share
All vehicles	1,281,071	100
Cars and trucks	1,087,223	85
Cars	605,906	47
Trucks	481,317	38

Source: U.S. Bureau of Labor Statistics.

Table A-2 presents vehicle ownership at the CU level. About 86 percent of CUs have any type of vehicle (including boats, aircraft, and RVs), and 83 percent of all CUs have automobiles. Thus, 3 percent of CUs have no cars or trucks but only other types of vehicles. CUs without any vehicles account for 14 percent of the unweighted pooled sample.

Table A-2. Surveyed consumer units in the Consumer Expenditure Surveys, assuming quarterly reports are independent, second quarter 1996 to first quarter 2022

Consumer unit (CU) category	Total number in the survey data	Percent share
All CUs	689,811	100
Total CUs with any vehicle	593,339	86
CUs with automobiles	575,641	83
CUs with cars	431,670	63
CUs with trucks	339,973	49
CUs with other vehicles but no automobiles	17,698	3
CUs with no vehicle at all	96,472	14

Source: U.S. Bureau of Labor Statistics.

Table A-3 lists all the variables we use in our computation of consumption, expenditure, and recurring costs. Some variables are directly extracted from the CE data, and others are intentionally constructed during the estimation process.

Table A-3. Variables included in the internal data file from the Consumer Expenditure Surveys and used in calculations

Source	Category	Variable name	Description	Comment
Variables from CE				
CE interview data	CU characteristics	FAMID	CU identifier up to Q1 2015	[1]
CE interview data	CU characteristics	NEWID	CU identifier since Q2 2015	[1]
CE interview data	CU characteristics	SEQNO	Sequence number for vehicles owned by a CU	[1]
CE interview data	CU characteristics	QINTRVYR	Interview year	[1]
CE interview data	CU characteristics	QINTRVMO	Interview month	[1]
CE interview data	CU characteristics	FINLWT21	Calibration final weight for CU	[1]
CE interview data	Vehicle characteristics	VEHBSNZ	Percentage of the vehicle used for business	To be used for nonbusiness-use adjustment
CE interview data	Vehicle characteristics	VEHICYB	Vehicle type: "100" for cars and "110" for trucks	[1]
CE interview data	Vehicle characteristics	VEHICYR	Vehicle model year	[1]
CE interview data	Vehicle characteristics	VEHPURYR	Vehicle purchase year	[1]
CE interview data	Vehicle characteristics	VEHPURMO	Vehicle purchase month	[1]
CE interview data	Vehicle characteristics	NETPURX	Net purchase price after discount, trade-in, or rebate including destination fee	[1]
CE interview data	Vehicle characteristics	QTRADEX	Amount paid for vehicle after trade-in allowance (NETPURX) minus amount of cost paid by employer	To be used to construct acquisition series based on expenditure in comparison with the user-cost series
CE interview data	Vehicle characteristics	TRADEX	Amount of trade-in allowance	[1]
CE interview data	Vehicle characteristics	MKMDLY	Vehicle make and model code (four-digit number)	[1]
CE interview data	Vehicle characteristics	MKMODEL	Vehicle make and model	[1]
CE interview data	Vehicle characteristics	MKMDESC	Vehicle make and model description	[1]
CE interview data	Vehicle characteristics	VEHBSNS	Where vehicle is used for business	[1]
CE interview data	Vehicle characteristics	VEHBSNZ	Percentage of vehicle mileage for business use	To be used to adjust current market value of automobiles for business use
CE interview data	Vehicle characteristics	VEHGFTC	Vehicle gift code	Automobiles purchased as a gift for someone outside the CU are excluded from consumption
CE interview data	Vehicle characteristics	VEHNEWU	Was it new or used when acquired?	[1]
CE interview data	Maintenance and repair	QVOPEQPX	Quarterly amount paid for vehicle service and parts less reimbursements	[1]
CE interview data	Maintenance and repair	VOPFLUDX	Quarterly amount spent on the following: motor coolant, antifreeze, brake fluid, transmission fluid, gasoline additives, oil additives, radiator cooling system protectors (excluding tune-up), excluding current month	[1]
CE interview data	Maintenance and repair	VOPPLCYX	Quarterly expense for auto service policies, excluding current month	[1]
CE interview data	Insurance	QADINS3X	Quarterly amount paid for vehicle insurance (adjusted for business), reference period	[1]
CE interview data	Property tax, licensing, registration, and inspection of vehicles	VOPREGX	Quarterly expenditure on vehicle licensing, registration, and inspection	[1]
Variables from other sources				
CPI for all urban consumers (CPI-U)	Price level of all items	INDEX	The national level price index for all urban consumers	To be used for converting nominal values in real terms and vice versa
Federal Reserve Bank of St. Louis	Opportunity cost	INTEREST	Market yield on U.S. Treasury securities at 10-year constant maturity, inflation-indexed, percent, quarterly, not seasonally adjusted	To be used to calculate opportunity cost of owning vehicles
Constructed variables				

[1] No comment. Note: CE = Consumer Expenditure Surveys; CU = consumer unit.

Source: U.S. Bureau of Labor Statistics.

Source	Category	Variable name	Description	Comment
Constructed as intermediate variable	Vehicle characteristics	VEHAGE	Vehicle's age when surveyed	= QINTRVYR – VEHICYR; replaced by 25 if over 25 years
Constructed as intermediate variable	Vehicle characteristics	PURAGE	Vehicle's age when purchased	= VEHPURYR – VEHICYR; replaced by 25 if over 25 years
Constructed as intermediate variable	Vehicle characteristics	VINTAGE	Years owned since purchased	= QINTRVYR – VEHPURYR; replaced by 25 if over 25 years
Constructed as intermediate variable	Vehicle characteristics	PRICE	Vehicle's purchase price	= NETPURX + TRADEX
Constructed as intermediate variable	Vehicle characteristics	RPRICE	Vehicle's purchase price in 1982–84 dollars	[1]
Constructed as intermediate variable	Vehicle characteristics	MAKE	Vehicle make	Extracted from MKMODEL/MKMDESC
Constructed as intermediate variable	Vehicle characteristics	MODEL	Vehicle model without body type	Extracted from MKMODEL/MKMDESC
Constructed as intermediate variable	Vehicle characteristics	YEAR	Vehicle model year	= VEHICYR
Constructed as intermediate variable	Identification	IMPUTE	Current market value imputation identifier	0: not imputed; 1: Imputed using purchase price; 2: imputed using same characteristics of automobile; 3: imputed using similar characteristics of automobile
Constructed as intermediate variable	Identification	VEH	Vehicle identifier	0: no vehicle; 1: has a vehicle
Constructed as intermediate variable	Identification	AUTO	Automobile identifier	0: other vehicle; 1: automobile
Constructed as intermediate variable	Vehicle characteristics	ACQ	Acquisition identifier	0: not acquired during the last 3 months; 1: acquired during the last 3 months
Constructed as intermediate variable	Depreciation	DEP_RATE	Annual depreciation rate of automobile at specific ages	Estimated from regressions of automobile purchase prices on automobile ages
Constructed as intermediate variable	Depreciation	RMV	Current market value of automobile in 1982–84 dollars	= RPRICE × $(1 - \text{DEP\_RATE})^{\text{VINTAGE}}$
Constructed as intermediate variable	Depreciation	SURRATE	Survival rate at a specific age	[1]
Constructed as intermediate variable	Depreciation	CMV	Current market value of automobile	= RMV × INDEX/100
Constructed as intermediate variable	Depreciation	ADJ_CMV	Current market value of automobile adjusted for business-use, survival rate and gift code	[1]
Constructed as intermediate variable	Recurring cost	MREXP	Quarterly expense on vehicle service and parts for owning vehicle	QVOPEQPX adjusted for owning purpose
Constructed as final variable	CU identifier in the pooled data	COMID	CU identifier in the pool data	Either FAMID or NEWID
Constructed as final variable	CU characteristics	CUWT	Quarterly CU final weight	= FINLWT21/4
Constructed as final variable	Reference period	QTR	Calendar quarter	= interview quarter – 1
Constructed as final variable	Reference period	CYEAR	Calendar year	= QINTRVYR if QTR > 1; = (QINTRVYR – 1) otherwise
Constructed as final variable	Identification	N_VEH	Number of all types of vehicles owned by CU	[1]
Constructed as final variable	Identification	N_AUTO	Number of automobiles owned by CU	= N_VEH – number of other vehicles
Constructed as final variable	Expenditure	EXPQ	Quarterly expenditure on automobile purchase	= QTRADEX if purchased in the last 3 months
Constructed as final variable	Expenditure	EXPY	Annual expenditure on automobile purchase	= 4 × EXPQ
Constructed as final variable	Depreciation	DEP	Quarterly depreciation value of all cars and trucks owned by CU	= adj_CMV × DEP_RATE/4

[1] No comment. Note: CE = Consumer Expenditure Surveys; CU = consumer unit.

Source: U.S. Bureau of Labor Statistics.

Source	Category	Variable name	Description	Comment
Constructed as final variable	Opportunity cost	INT	Quarterly opportunity cost (forgone interest revenue in flow of service value) of all cars and trucks	= adj_CMV × interest/4
Constructed as final variable	Depreciation	YDEP	Annual depreciation value of all cars and trucks owned by CU	= adj_CMV × DEP_RATE
Constructed as final variable	Opportunity cost	YINT	Annual opportunity cost (forgone interest revenue in flow of service value) of all cars	= adj_CMV × interest
Constructed as final variable	Maintenance & repair	MR	Quarterly maintenance and repair expense	= MREXP + VOPFLUDX + VOPPLCYX
Constructed as final variable	Property tax, licensing, registration, and inspection of automobiles	REG	Quarterly operating expense	= VOPREGX
Constructed as final variable	Insurance	INS	Quarterly automobile insurance payments	= QADINS3X
Constructed as final variable	Recurring cost	RC	Quarterly combined recurring costs of owning automobile	= MR + REG + INS
Constructed as final variable	Maintenance & repair	YMR	Annual maintenance and repair expense	= 4 × (QVOPEQPX + VOPFLUDX + VOPPLCYX)
Constructed as final variable	Property tax, licensing, registration, and inspection of automobiles	YREG	Annual operating expense	= 4 × VOPREGX
Constructed as final variable	Insurance	YINS	Annual automobile insurance payments	= 4 × QADINS3X
Constructed as final variable	Recurring cost	YRC	Annual combined recurring costs of owning automobile	= 4 × (MR + REG + INS)

[1] No comment. Note: CE = Consumer Expenditure Surveys; CU = consumer unit.

Source: U.S. Bureau of Labor Statistics.

Calculation steps for the consumption value of automobiles

The constant-geometric-depreciation rate (δ_a) is estimated by comparing the purchase prices of the same model automobiles at different ages in the pooled sample data. The regression model for constant geometric depreciation is as follows:

$$\ln(P_{i,a}) = \beta_0 + \beta_a \text{age}_{i,a} + f_{\text{make}} + f_{\text{model}} + f_{\text{year}} + \epsilon_{i,t} \ ,$$

where age denotes an automobile's purchase age. The variable age can take a value from 0 to 25 years. We set a limit for automobile age at 25 years because in many states (including the District of Columbia, Virginia, and Maryland) automobiles over 25 years of age are considered antique or vintage, and these older automobiles may not have a specific pattern of depreciation. The coefficient β_a indicates how much an automobile's value depreciates each year on average as a constant share of its current value. To be precise, we calculate δ_a as $1 - \exp(\beta_a)$.

Similarly, the nonparametric-depreciation rate (δ_v) is estimated by comparing an automobile's purchase price with the purchase price of the same model automobile of age v and age $v + 1$. We assume that an automobile follows age-specific depreciation up to 10 years. After 10 years of age, we assume the automobile follows constant geometric depreciation because of the limited sample size of old automobiles. We estimate δ_v by using age-specific depreciation rates for automobiles 0 to 10 years of age. This is done with a subsample of automobiles of age v and age $v + 1$, in which v takes a value between 0 and 10 years. A total of 11 regressions are run separately on the 11 age-group subsamples. In our estimations, we hold δ_a as constant no matter the age of the automobile (v), and we vary δ_v depending on the age of the automobile (v). The variable v can take a value between 0 and 10 years.

We then calculate the current market values of automobiles after depreciation by separately using the estimated δ_a and δ_v. We calculate the current market value (CMV_t) of an automobile at time t with the constant-geometric-depreciation method as follows:

$$\text{CMV}_t = \text{PRICE}_y \times (1 - \delta_a)^{(x-y)} \ ,$$

where x denotes the current age of the automobile, and y denotes the age of the automobile when it was purchased.

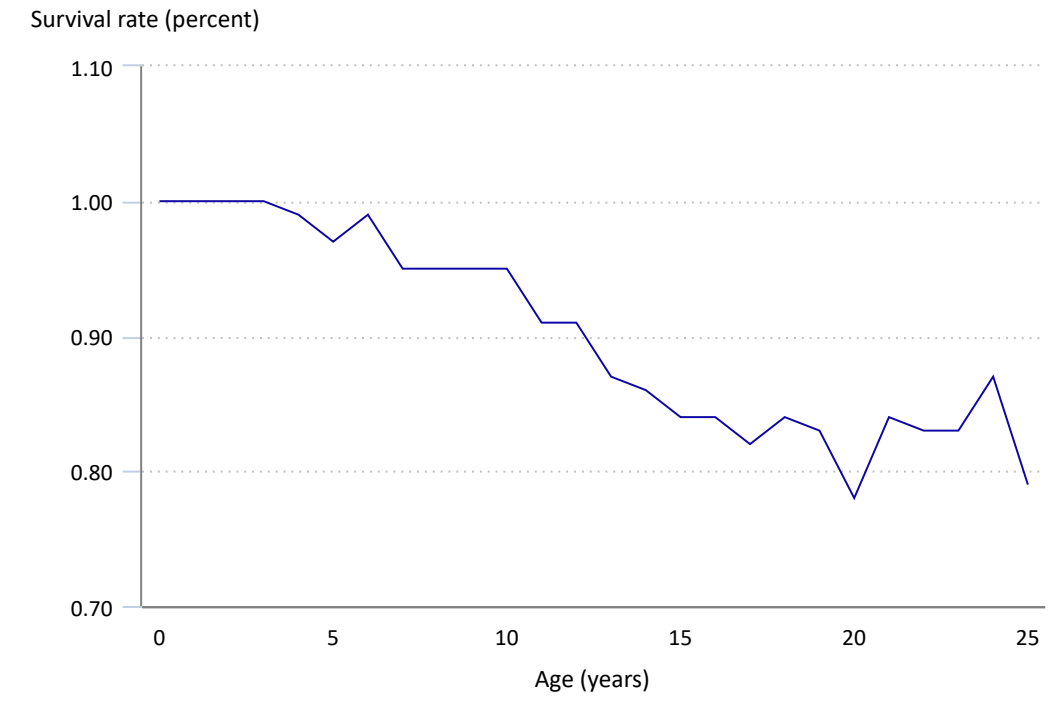
On the other hand, we calculate the CMV_t of the same automobile with the nonparametric-depreciation method as follows:

$$\text{CMV}_t = \text{PRICE}_y \times \Pi_{v=y}^{x-1} (1 - \delta_v) \ ,$$

where δ_v denotes the marginal depreciation rate of an automobile of age v.

Because not all automobiles, old automobiles in particular, are expected to survive to generate a flow of services until the next reference period, CMV_t is age adjusted for survival probability (SURRATE). We aggregate the total number of automobiles of age v and age $v + 1$ by using pooled CE data, and then we divide the two numbers to calculate the survival rate for an automobile of age v. The calculated survival rates are shown in chart A-1.

Chart A-1. Survival rate of automobiles



Hover over chart to view data.
Source: U.S. Bureau of Labor Statistics.

View Chart Data

Our goal is to estimate the consumption value of owning an automobile for nonbusiness use. Therefore, we adjust the estimated current market value of automobiles for business use by using the percentage of the automobiles used for business use as reported in the CE (VEHBSNZ). The formula for survival and business-use adjustment is as follows:

$$\text{Adj\_ CMV}_t = (\text{SURRATE} \times \text{CMV}_t + (1 - \text{SURRATE}) \times (\text{CMV}_t/2)) \times (1 - \text{VEHBSNZ}) .$$

In the equation above, we assume that even if an automobile did not survive until the end of the next period, then the automobile is on average expected to survive halfway through the reference period.

Not all CUs report a purchase price for each owned automobile in the survey. We use the average current market value of a similar automobile in the imputation of the current market value and depreciation of an automobile without relevant information, such as purchase price, automobile purchase age, and model year. When the parties of a vehicle purchase transaction are known or related to each other, such as friends or family members, it is possible that a reported purchase price might not accurately reflect the fair market value. Several sources suggest that there is a minimum price that a consumer has to pay a dealer for a used automobile in working condition.[17] If the purchase price of an automobile is less than $2,000 in 1982–84 dollars, then we assume the transaction was between related parties and use an imputed price based on similar characteristics. The imputation results are shown in table 1.

Next, we impute depreciation (DEP_t) and opportunity cost (INT_t) (forgone investment revenue) of an automobile of age a at time t as follows:

$$\text{DEP}_t = \text{adj\_CMV}_t \times \delta_a ,$$

and

$$\text{INT}_t = \text{adj\_CMV}_t \times r_t ,$$

where r_t denotes the real interest rate at time t. We approximate the real interest rate by using the inflation-adjusted market yield on U.S. Treasury securities at 10-year constant maturity.

Finally, we add together the other recurring costs (RC) associated with operating an automobile to calculate the full user cost of owning an automobile, such as maintenance and repairs (MR); automobile insurance (INS); and registration, property tax, licensing, and inspection (REG). Thereby, the equation for the consumption value of a CU (u) who owns k automobiles at time t ($\text{Cons}_{u,t}$) is as follows:

$$\text{Cons}_{u,t} = \sum_{j=1}^{k} (\text{DEP}_{j,t} + \text{INT}_{j,t} + \text{RC}_{j,t}) ,$$

and

$$\text{RC}_{j,t} = \text{MR}_{j,t} + \text{INS}_{j,t} + \text{REG}_{j,t} ,$$

where $\text{RC}_{j,t}$ denotes the combined recurring costs, MR denotes maintenance and repair cost, INS denotes automobile insurance cost, and REG denotes other registration and licensing expenses for automobile j at time t.

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Notes

[1] For a recent reference on the estimation of such depreciation methods in the production of consumption measures, see Giulia Mancini and Giovanni Vecchi, *On the Construction of a Consumption Aggregate for Inequality and Poverty Analysis* (Washington, DC: World Bank Group, 2022), https://documents1.worldbank.org/curated/en/099225003092220001/pdf/P1694340e80f9a00a09b20042de5a9cd47e.pdf.

[2] The U.S. Bureau of Labor Statistics defines a consumer unit as follows: “A consumer unit is defined as either (1) all members of a particular household who are related by blood, marriage, adoption, or other legal arrangements; (2) a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially independent; or (3) two or more persons living together who pool their income to make joint expenditure decisions. Financial independence is determined by the three major expense categories: housing, food, and other living expenses. To be considered financially independent, a respondent must provide at least two of the three major expense categories.” See *Glossary* (U.S. Bureau of Labor Statistics), https://www.bls.gov/bls/glossary.htm.

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[9] Meyer and Sullivan, “Winning the war: poverty from the Great Society to the Great Recession;” and Fisher and Johnson, “Consumption mobility in the United States: evidence from two panel data sets.”

[10] This lower bound shows cases in which vehicles are purchased for low prices because of related party transactions.

[11] The stock of automobiles owned during a reference period may not necessarily be purchased during the previous 3 months but may also include those purchased prior to the reference period.

[12] Hardesty, “How to beat car depreciation;” and “Depreciation infographic: how fast does my new car lose value?,” *Edmunds*.

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