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Comparing Benefits and Total Compensation in the Federal Government and the Private Sector

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Comparing Benefits and Total Compensation in the Federal Government and the Private Sector

Abstract

This analysis integrated Current Population Survey data from 2005 through 2010 with data on a wide range of employee benefits to compare the cost of those benefits for federal employees and for workers in the private sector who have certain similar observable characteristics. In that comparison, we found that the average cost of benefits was about 72 percent higher for federal employees than for their private-sector counterparts among workers with no more than a high school education, was about 46 percent higher in the federal sector among workers with a bachelor's degree, and was about the same in the two sectors among workers with a professional degree or Ph.D. Overall, federal benefits were about 48 percent higher, on average, than the benefits received by measurably similar private-sector workers. The most important factor contributing to differences between the two sectors in the costs of benefits is the defined-benefit pension plan that is available to most federal employees. Such plans are becoming less common in the private sector.

Benefits accounted for about 39 percent of total compensation (the sum of wages and benefits) in the federal sector versus 30 percent of total compensation at large firms in the private sector. We found that the average of total compensation was about 36 percent higher for federal employees than for their private-sector counterparts among workers with no more than a high school education, was about 15 percent higher among workers with a bachelor's degree, and was about 18 percent lower among workers with a professional degree or Ph.D. Overall, total compensation for federal employees was about 16 percent higher, on average, than total compensation for measurably similar workers in the private sector.

These estimates do not show precisely what the compensation of federal workers would be if they were employed in the private sector. The difference between federal employees' compensation and what that compensation would be in the private sector could be larger or smaller depending on characteristics that were not included in this analysis because such traits are not easy to measure. These estimates of the costs of benefits are much more uncertain than the estimates of wages, primarily because the cost of defined-benefit pensions that will be paid in the future is more difficult to quantify and because less-detailed data are available about benefits than about wages.

I. Introduction

Employees of the federal government are more likely to receive various fringe benefits, such as health insurance coverage and a pension in retirement, than workers in the private sector are. Lawmakers have asked what the implications would be for the federal budget if federal workers were paid the same amount of total compensation as similar workers in the private sector. If the number of hours worked by federal employees is held constant, the answer to that question depends on differences in the nonwage compensation per hour of workers in the federal and private sectors and on differences in hourly wages.

In this paper, we found that the economic cost to employers of nonwage compensation was 48 percent higher for federal workers than for similar workers in the private sector. In a companion paper (Falk 2012), we found that wages—which make up about 61 percent of total compensation in the federal government—were about 2 percent higher for federal workers than for similar private-sector workers. Looking at both wages and benefits, we found that the total economic cost of compensation was about 16 percent more per hour for federal employees than for similar employees in the private sector.

Those results varied by workers' level of educational attainment. Benefits and total compensation were much higher in the federal sector than in the private sector among workers with less education. Those differences were smaller among workers with more education; for workers with a professional degree or Ph.D., total compensation was greater in the private sector than in the federal sector.

In this analysis, we focused on the economic cost to employers of providing compensation. That economic cost reflects the cost of future obligations, such as retirement benefits, that are not necessarily paid by an employer in the year that an individual works. In particular, for federal employees, those costs are recorded as federal spending after an individual stops working for the federal government.¹ The cost of benefits to the employer may differ from the value that employees place on those benefits, but such valuations are beyond the scope of this analysis.

A current data set that includes comprehensive data on benefits and on the education and work experience of the employees receiving those benefits was not available for this research. With many types of benefits, however, the amount that employees receive is directly related to their wages. For example, for each hour of paid leave, employees are given their wages; employers' matching contributions to defined-contribution pension plans are typically limited to a percentage of workers' salaries; and the annuities that employees receive through defined-benefit pension plans and Social Security are generally a function of their salary history. Other benefits, such as health care coverage, typically do not depend directly on an individual's wages. Even so, on average, employees with higher salaries receive more-valuable benefits because of those higher salaries. To the extent that employees' attributes, such as education and experience, influence their wages, those attributes also influence their benefits.

¹ Also, paid leave is not recognized as a cost in the federal budget. However, we treat paid leave as a cost, because the amount of paid leave given to federal employees can indirectly affect the budget by changing the number of workers the government must employ to perform its duties.

In this analysis, we imputed benefits for workers included in the March Current Population Survey (CPS) using data from the Bureau of Labor Statistics (BLS) for the private sector and from the Office of Personnel Management for the federal government. Specifically, we estimated the relationship in each sector between employees' wages and the benefits they received; those relationships were used to impute benefits for workers included in a CPS sample covering 2005 through 2010. Using those estimates, we compared average benefits in the federal and private sectors for five different levels of educational attainment after adjusting for the other attributes measured in the CPS (employees' occupations, years of labor-market experience, demographic traits, and the size of the firms they work at) so that federal workers were compared with workers in the private sector who have similar attributes. We judged—as have most researchers studying this topic—that the most relevant private-sector group to compare with federal workers is people employed by large private firms, because the work they perform is more akin to that performed by federal employees. If the comparison was made to workers at all private firms, the differences between the two sectors would be larger.

Section II of this paper gives a brief overview of nonwage compensation and the previous literature comparing it in the public and private sectors. Section III describes how we constructed the data on benefits for this analysis. Section IV provides results of our comparison of benefits between sectors. Section V concludes by combining the results about benefits with related work on wages to compare estimates of total compensation in the federal and private sectors.

II. Background

The federal government and most large private employers provide various forms of nonwage compensation, including retirement benefits, health insurance, and paid leave. The federal government provides a defined-benefit pension plan, which was once common in the private sector but is becoming much less widespread. Smaller firms in the private sector frequently offer less generous benefits and may not provide some benefits, such as health insurance or retirement benefits, at all. The federal government and private-sector employers are both required to pay certain payroll taxes to fund employees' Social Security and Medicare benefits. Together with cash wages, benefits are an important factor in people's decisions about whether to work in the federal or the private sector.

A. Composition of Benefits

The composition of benefits varies between the federal and private sectors. Paid leave and retirement obligations account for a larger portion of compensation in the federal sector, whereas contributions to workers' current health insurance premiums account for a larger portion of compensation in the private sector (see Table 1). On average, the cost of paid leave equals 18 percent of wages in the federal sector, compared with 12 percent in the private sector, where workers receive fewer hours of paid leave. Funding for defined-benefit pensions and retirees' health benefits is also greater relative to wages in the federal sector (16 percent and 7 percent, respectively) than in the private sector (4 percent and 2 percent, respectively), where many firms do not offer such benefits to their employees. Conversely, the contributions that employers make to employees' current health insurance premiums are larger relative to wages in the private sector. Although private-sector workers are less likely to have employment-based health

insurance than federal workers are, the average employer contribution to current health insurance premiums is about 6 percent larger in the private sector.² Some employers also offer additional benefits, such as subsidies for their employees' continuing education and transportation, which are not included in the comparisons in this analysis.

B. Previous Research

Five recent studies have compared the sum of wages and benefits (total compensation) for public- and private-sector workers nationwide after adjusting for differences in the composition of those workforces. Studies by Munnell and others (2011), Bender and Heywood (2010), and Keefe (2010) compared the total compensation of private-sector employees and state and local government employees; studies by Biggs and Richwine (2011) and Sherk (2010) compared the total compensation of private-sector and federal employees.

Those studies used data from the National Compensation Survey (NCS) and the national income and product accounts, which tabulate the costs that employers incur in providing many types of benefits. Because those data sets do not include information on employees' education, age, race, and sex, the researchers could not directly adjust for differences in those characteristics between public- and private-sector workers when calculating differences in total compensation. Instead, most of the studies extrapolated from the size of adjustments made to wage differentials, as estimated using data from the Current Population Survey. For example, Biggs and Richwine estimated the adjusted total-compensation differential by scaling the unadjusted total-compensation differential by the ratio of the adjusted to unadjusted wage differentials. With β_1^T and β_1^W as the coefficients on indicators of public-sector employment in log-linear models for total compensation and wages, \bar{Y}_1^W and \bar{Y}_0^W as the arithmetic averages of wages for the public and private sectors, and \bar{Y}_1^T and \bar{Y}_0^T as the arithmetic averages of total compensation for the public and private sectors, Biggs and Richwine calculated β_1^T (which could not be estimated directly because the microdata were not available) using a formula that is equivalent to equation (1).

$$(1) \exp(\beta_1^T) = \frac{\bar{Y}_1^T \exp(\beta_1^W)}{\bar{Y}_0^T \bar{Y}_1^W / \bar{Y}_0^W}$$

The term $\exp(\beta_1^W)$ is the adjusted percentage difference in the *geometric* averages of wages as it was estimated using the natural logarithm of wages. Consequently, the adjusted total-compensation differential given in equation (1) is a product of geometric and arithmetic averages and thus is difficult to interpret. In Falk (2012), we demonstrate that the adjusted differential between federal and private-sector wages is smaller when measured as the percentage difference in arithmetic means, which suggests that using equation (1) would overstate the difference in the arithmetic averages of total compensation between federal and private-sector workers. The studies by Munnell and others, Bender and Heywood, and Sherk may also have overstated

² For the private sector, the average employer contribution and the share of workers covered by employment-based health insurance come from Department of Health and Human Services, Agency for Healthcare Research and Quality, "Medical Expenditure Panel Survey: Insurance Component National-Level Summary Tables," available at www.meeps.ahrq.gov/meepsweb/data_stats/quick_tables_search.jsp?component=2&subcomponent=1.

differences in total compensation because they too extrapolated from wage differentials estimated using log-linear models.

Keefe's procedure for estimating the total-compensation differential avoided combining geometric and arithmetic means. He calculated total compensation for each worker in the CPS by multiplying the worker's wages by the ratio of average total compensation to average wages for the worker's sector and occupation, based on unpublished tabulations of the NCS. He then used the log-linear model to calculate the adjusted difference in the geometric averages of total compensation between the public and private sectors. In Falk (2012), we demonstrated that such comparisons of geometric averages are less relevant from a budgetary perspective than comparisons of arithmetic averages are. Also, Keefe's approach implies that benefits are a constant percentage of wages within each sector/occupation grouping, although research by Carrington, McCue, and Pierce (2002) suggests that is not the case.

In comparing total compensation, all of the researchers attempted to control for differences in education, experience, and certain demographic traits, but they were divided on whether to control for firm size. Biggs and Richwine (2011), Keefe (2010), and Munnell and others (2011) included indicators of firm size as explanatory variables in their regression analyses and calculated ratios of total compensation to wages based on workers at large establishments. Munnell and others found that their results were very sensitive to that choice: They estimated that total compensation was 6 percent lower in the public sector than in the private sector in their preferred specification, but that total compensation was 5 percent higher in the public sector than in the private sector when the adjustments for firm size were removed. Sherk (2010) and Bender and Heywood (2010) did not control for firm size in their main specifications.

The estimates of total-compensation differentials by Biggs and Richwine (2011) and Sherk (2010) imply that federal employees received far more substantial benefits than their private-sector counterparts. Biggs and Richwine found that total compensation (including benefits) for federal workers exceeded total compensation for private-sector workers by 37 percent, whereas federal wages exceeded private-sector wages by 14 percent. Those results imply a benefit differential of 86 percent. Sherk found a total-compensation differential of 31 percent and a wage differential of 18 percent. He would have estimated a total-compensation differential of 48 percent if he had used equation (1), as Biggs and Richwine did.³

III. Data on Benefits

We imputed data on benefits for each individual in our CPS sample on the basis of the relationship between benefits and wages. For the private sector, that relationship was estimated using unpublished tabulations from the NCS that were provided by the Bureau of Labor Statistics. The NCS is the basis for two widely used data series, which are available publicly through the BLS: the employer cost of employee compensation series and the employment cost index. Because the NCS does not cover federal employees, we estimated the relationship between benefits and wages in the federal sector using the Central Personnel Data File (CPDF),

³ Sherk calculated the total-compensation differential based on $\exp(\beta_1^T) = \ln(\bar{Y}_1^T / \bar{Y}_0^T) \frac{\exp(\beta_1^W)}{\ln(\bar{Y}_1^W / \bar{Y}_0^W)}$, which appears to conflate the log of averages with the average of logs.

which is collected by the Office of Personnel Management.⁴ The benefits measured by those data include paid leave, defined-benefit pensions, defined-contribution pensions, health insurance benefits, and legally required benefits (such as payroll tax contributions for Social Security, Medicare, and unemployment insurance).

The data on benefits were taken from June 2009 cross sections of the NCS and CPDF. The relationship between benefits and wages in those cross sections was assumed to be representative of the entire 2005–2010 period covered by our CPS sample. Publicly available data based on the NCS indicate that the ratio of benefits to wages was roughly constant over that period in the private sector.⁵

A. Private-Sector Imputation

To assess the reasonableness of using wages as a sufficient statistic for imputing benefits, we examined the relationship between benefit receipt and educational attainment of workers—both controlling and not controlling for wages— using CPS data, which contain some information on health insurance and pension benefits. When no other controls were included in the analysis, we found that more-educated workers were much more likely to have received health insurance and pensions through their employer than less-educated workers were (see Table 2). Once we controlled for wages, however, the probability of coverage was quite similar at all five levels of educational attainment. Although there were some small (but statistically significant) differences between the education levels, we interpreted the similarity as evidence that the relationship between benefits and wages could be used to generate a reasonably accurate prediction of benefits for individuals with similar wages who differed by education level.

To construct an estimate of benefits as a function of wages, we used a cross tabulation of benefits from the NCS that the Bureau of Labor Statistics provided for this research. Those data included the averages and standard deviations of benefits and wages for 20 groupings of the private-sector wage distribution—with the first grouping containing the lowest 5 percent of wages, the second grouping containing the next-lowest 5 percent of wages, and so on. We then used a kernel regression procedure to estimate a continuous relationship between the averages of benefits and wages; the same procedure was also used to estimate such a relationship between the variances of benefits and wages.⁶

The average of benefits rises with wages because many benefit programs are designed so that employers' costs to provide benefits are directly related to their workers' salaries. The relationship between the averages of benefits and wages is concave (see Figure 1), with the ratio of benefits to wages falling from 48 percent at a wage of \$20 per hour to 33 percent at a wage of

⁴ For a description of the Central Personnel Data File, see Congressional Budget Office, *Characteristics and Pay of Federal Civilian Employees* (March 2007), p. 2.

⁵ From 2005 through 2010, the ratio of average benefits to average total compensation ranged from 0.313 to 0.318 at private-sector firms with at least 100 employees; see Department of Labor, Bureau of Labor Statistics, “National Compensation Survey Databases,” available at www.bls.gov/ncs/data.htm. That measure of benefits includes supplemental pay, which we categorize as part of wages.

⁶ Specifically, each pair of quantile averages for benefits and wages was treated as a data point in estimating a continuous relationship using the “lowess” command in the software package Stata. The “adjust” suboption was specified in order to impose the average of raw quantile averages on the average of fitted values.

\$100. Assuming the same ratio of benefits to wages at all wage levels, similar to Keefe (2010), would have slightly understated the benefits received by the bulk of the workforce while substantially overstating benefits for workers with wages in the top decile. Thus, assuming a constant ratio would have overstated the average of benefits among the most educated groups of workers, as they tend to have high wages.

We used the continuous relationship that we estimated between the average of benefits and wages to impute benefits for private-sector workers in the March CPS. The sum of mean benefits across the private-sector workers in the CPS equaled 43 percent of their wages, which is similar to the ratio of 44 percent that we calculated from the NCS.

B. Federal-Sector Imputation

To examine the relationship between benefits, wages, and other characteristics of federal employees, we used microdata from the CPDF. Those data include more information on benefits than the CPS data do. (The health insurance and pension coverage measures we used to analyze the private sector are less informative about the relationship between benefits and other characteristics for the federal sector because most federal workers have health and pension benefits.) As with private-sector workers, more-educated federal workers had more benefits (see columns 1, 3, and 5 in Table 3). Controlling for wages, however, more than reversed that relationship, mainly because more-educated federal workers tended to be less experienced and have less tenure in the federal government, and therefore have lower defined-benefit pensions, than less-educated workers earning the same hourly wage—an issue of small importance in the private sector. The average of benefits at a given wage would pool workers of different education levels together, understating the benefits of less-educated workers and overstating the benefits of more-educated workers. We interpreted this evidence as indicating that using a single benefit-wage relationship to impute benefits for federal workers would distort comparisons between workers by educational attainment, so we estimated separate benefit-wage relationships for five education levels using the CPDF data.

At most wage levels, federal workers with advanced degrees receive lower benefits, on average, than their less-educated coworkers do. At an hourly wage of \$50, for example, the average of benefits for federal employees with professional degrees is around 22 percent lower than the averages for employees whose education culminated in a bachelor's degree (see Figure 2). Most of that difference can be explained by the fact that the shorter tenures of the more-educated federal employees result in smaller government obligations for their future defined-benefit pensions and retiree health benefits.

The average of benefits increased more rapidly with wages in the federal sector than in the private sector. When considering wages between \$10 and \$100, the average slopes of the benefit-wage relationships in the federal sector were around \$0.75, whereas the average slope in the private sector was \$0.36. The steeper slope of the federal benefits function results from the prominence of paid leave and defined-benefit pensions in that sector, because those benefits are more closely tied to wages than are health insurance benefits, which account for a larger portion of benefits in the private sector.

As in the private-sector analysis, we used those relationships between wages and benefits to impute benefits for federal workers in the March CPS. The sum of mean benefits across the federal workers in the CPS equaled 62 percent of their wages, which is similar to the ratio of 64 percent that we calculated using the CPDF.

C. Population Covered

The NCS is a survey of employers that is designed to obtain a nationally representative sample of the occupations in most private-sector industries, as well as state and local governments. The survey does not cover the federal government, agricultural industries, and self-employed people. Participating employers report the schedules, salaries, and benefits of their employees in randomly selected occupations. The NCS also includes information about the employer's size and location, but it does not include data on the employees' education or work experience.

Most federal agencies report information on the earnings, education, experience, and demographic traits of their employees for inclusion in the CPDF. That data set does not include information on people who work for government-sponsored enterprises, such as the Postal Service. In addition, the legislative and judicial branches do not report data for the CPDF, nor do some of the smaller agencies in the executive branch. In 2009, the CPDF included data on about 2.0 million of the roughly 2.1 million federal civilian employees.⁷

Firm and Establishment Size. For our comparison with federal workers, we focused on workers at large private-sector establishments. The attributes of the federal workforce are more like those of private-sector workers at large firms than those of workers at small firms, because both large firms and federal agencies require a workforce that is more specialized and educated than small firms do. Many federal employees have expertise in specific roles, as over 95 percent of them work in agencies that divide tasks among more than 100 occupations. That degree of specialization is not possible for small employers. In addition, only 27 percent of workers at small firms have a bachelor's degree; whereas the proportion of workers with that level of education is greater at large firms (37 percent) and in the federal government (51 percent).

Removing workers at small firms from an analysis is similar to including controls for the employer's size in a regression analysis, because almost all federal employees report working for large employers. However, the NCS measures the employer's size on the basis of the number of workers at a particular location, whereas the CPS measures the number of workers the employer has at all locations. In Falk (2012), the comparison of federal and private-sector wages based on the CPS focused on private-sector employers with a total of at least 1,000 employees, which covered about 40 percent of private-sector workers. In order to also cover roughly 40 percent of private-sector workers in the comparison of benefits, the NCS sample was limited to employees of private-sector establishments with at least 250 employees.

Sector, Hours of Work, and Age. Employees of state and local governments were excluded from the comparison because they are not the focus of this analysis, and employees of small

⁷ The total number of federal civilian employees was taken from Table 6.4D of the national income and product accounts, "Full-Time and Part-Time Employees by Industry," available at www.bea.gov/national/nipaweb/SelectTable.asp.

firms were removed to control for differences between the sizes of private-sector and federal employers.

Part-time workers were also removed from the NCS and CPDF samples because of concerns about measurement error in hours of work. The wages used to impute benefits were calculated by dividing earnings by the number of hours worked. Part-time and part-year workers would have smaller denominators in those calculations, exacerbating errors in the reporting of their earnings.

The NCS and CPDF samples include workers of all ages, whereas workers under the age of 16 and over the age of 64 were removed from the CPS sample. Workers could not be excluded from the NCS on the basis of their age because the NCS does not include information about workers' ages. Workers' ages are reported in the CPDF, but workers were not removed from that data set on the basis of age so that the data on federal benefits would be drawn from a similar population as the data on private-sector benefits contained in the NCS. In the CPDF sample, 3 percent of workers are over the age of 64 and almost no workers are under the age of 16.⁸

D. Measurement of Benefits

The comparison of benefits is based on the costs that employers incur in providing paid leave, defined-benefit and defined-contribution retirement plans, current and retirement health insurance benefits, and legally required benefits. In addition to those types of benefits, the NCS includes data on the cost of supplemental pay, life insurance, and disability insurance. Supplemental pay (which includes overtime pay, shift differentials, and bonuses) was excluded from the comparison of benefits; instead, bonuses and overtime pay were included in the calculation of wages.⁹ Life and disability insurance, which were also excluded, account for a small portion of compensation, on average.¹⁰

In the NCS, benefits are measured by dividing the cost that the employer incurred in providing them by the number of hours the employee worked; a comparable measure of benefits is used for federal employees.¹¹ Whereas the NCS directly reports the hourly cost of benefits for private-sector employers, we used information in the CPDF on the age, tenure, salaries, and health plan selections of federal employees to calculate the hourly cost of their benefits. We estimated the

⁸ Among the population of federal workers we wished to cover, 8 percent of observations were dropped because of incomplete data. The vast majority of those observations were missing educational attainment or did not have a sufficient salary history to calculate their defined-benefit pensions.

⁹ When asked to report their "total earnings" from their employers, CPS respondents are specifically asked to "include all tips, bonuses, overtime pay, and commissions."

¹⁰ The NCS data available publicly through the employer cost of employee compensation series indicate that the average cost of life and disability insurance was about 1 percent of the average wage at private-sector firms with at least 100 employees; see Department of Labor, Bureau of Labor Statistics, "National Compensation Survey Databases," www.bls.gov/ncs/data.htm. The federal government does not provide disability insurance for its employees; its average cost to provide life insurance for federal workers was about 0.3 percent of the average wage in 2004. See Office of Personnel Management, *Federal Civilian Workforce Statistics: Work Years and Personnel Costs, Fiscal Year 2005* (October 2008), p. 95.

¹¹ The CPDF does not measure the number of hours that employees work. To get hourly benefit rates for federal employees, we followed two steps. First, the number of hours for which employees were paid was set to the average of that field for federal employees in the CPS with the same educational attainment. Second, hours worked were calculated by subtracting hours of paid leave, which were calculated using the CPDF.

defined-benefit pensions, defined-contribution pensions, and Social Security benefits that workers would receive under the terms of the Federal Employees Retirement System (FERS). The vast majority of federal employees participate in either FERS or the Civil Service Retirement System (CSRS). Workers whose federal employment began after 1984 are only eligible for FERS, which now covers about 82 percent of federal employees. Most employees who are in CSRS receive more-generous defined-benefit annuities, but they do not receive matching contributions for their defined-contribution accounts.

Paid Leave. The comparison of benefits accounts for the cost that employers incur in providing vacation, holiday, sick, and personal leave (that is, general-purpose leave). As individuals work, they typically accrue days of vacation and sick leave that can be used at a future time. The cost of vacation leave is based on hours of leave accrued, reflecting the assumption that all vacation leave will be used or that employees will be compensated for the balance of their vacation leave when they separate from their employers.¹² In contrast, the costs of sick and personal leave are based on the number of hours used, because sick and personal leave are more likely to be forfeited when employees separate. Holiday leave is simply based on the number of paid holidays the employer has scheduled over the course of the year. Thus, over the course of a year, the cost of providing paid leave to employee i is the hours of paid leave that workers receive h^L multiplied by their wages, which are measured as the ratio of annual earnings g to hours paid (that is, hours worked plus hours of paid leave). That annual cost is divided by the number of hours worked h^K in order to get an hourly benefit rate for paid leave b^{PL} , as in equation (2).

$$(2) b_i^{PL} = \left(h_i^L \frac{g_i}{h_i^K + h_i^L} \right) / h_i^K = \frac{g_i}{(h_i^K + h_i^L)} \frac{h_i^L}{h_i^K}$$

The hours of paid leave granted to federal employees are not reported in the CPDF; we calculated those hours on the basis of an employee's length of service. Most people who have worked for the federal government for less than 3 years receive 13 days of vacation leave per year. After 3 years of federal service, employees receive 20 days of vacation leave per year, and after 15 years of federal service, they receive 26 days of vacation leave per year. The amount of holiday and sick leave that federal employees receive does not depend on their length of service. Each year, federal employees receive 10 days of holiday leave and accrue 13 days of sick leave. We assumed that federal workers use 9.4 of those sick days, based on an estimate by the Office of Personnel Management of the average number of sick days that federal employees used in 2005.¹³ Federal employees do not accrue personal days.

Defined-Benefit Pensions. In hiring workers or retaining them for an additional year, employers with defined-benefit plans often become obligated to provide the employees with larger annuities during their retirement. The nominal dollar value of those obligations is not directly comparable to the payments that employers make toward their employees' salaries or current benefits, because the pension obligations are not due immediately. For comparability, the present value of

¹² In reality, the federal government and some private-sector employers place upper limits on the amount of vacation leave that can be carried over to the following pay period. When employees exceed that limit, some of their vacation leave is forfeited; thus, their employers do not incur a cost for it.

¹³ Office of Personnel Management, *Federal Civilian Workforce Statistics: Work Years and Personnel Costs, Fiscal Year 2005* (October 2008), p. 95. More-recent data were not found.

the pension obligations should be used. But finding an appropriate discount rate to use in calculating that present value is difficult, because pension obligations are not traded in financial markets. One option is to base the discount rate for pension obligations on an asset that has similar characteristics and is regularly traded. Such an asset should have little default risk, because pension obligations are insured and have typically been paid.¹⁴

For this analysis, the cost of both private-sector and federal defined-benefit plans is based on the change in the accumulated benefits obligation (ABO), which is calculated using a discount rate derived from the rate of return on Treasury securities. In the NCS, the reported cost of defined benefits is typically the contribution that the employer makes to fund the employee's future annuity. Those employer contributions are largely based on the change in the ABO—that is, in the present value of the annuity payments that an employee would receive on the basis of his or her current years of service and salary history. Thus, the change in the ABO from an additional year of employment will reflect the additional year of service with which the worker is credited as well as changes in salary (and, for workers who were already eligible for an immediate annuity, the forgone annuity payments). The cost of the defined benefits earned by federal employees is also based on the change in the ABO. We calculated the ABO using a discount rate of 5 percent, which is about a percentage point higher than the rate of return on 20-year nominal Treasury securities in 2009. Novy-Marx and Rauh (2009) used the rate of return on Treasury securities to discount states' pension obligations, because many state constitutions prohibit default on those obligations. We chose a slightly higher discount rate because federal pension obligations are not protected by the constitution, and the pension obligations of private-sector employers are only partially covered by the Pension Benefits Guarantee Corporation. Private-sector employers calculate the ABO using an interest rate for corporate bonds as the discount rate, so the cost reported in the NCS was adjusted to reflect the lower discount rate of 5 percent.

Private Sector. The employer contributions reported in the NCS include the change in the ABO less any employee contributions, but they can also include other payments or credits, which were assumed to average to zero for this analysis. The Internal Revenue Service's (IRS's) rules for the funding of defined-benefit plans specify the minimum contributions that private-sector employers can make to those plans. For plans that are fully funded, the minimum employer contribution is the change in the ABO for the employee in question less any contributions made by the employee. For plans that are over- or underfunded, the minimum contribution also includes the amortized value of the deficit or surplus, which is the difference between the present values of the plan's liabilities and assets.¹⁵ In equilibrium, the sum of those gaps would be zero, and the average employer contribution would be the average change in the ABO less the average employee contribution. The time series for the defined-benefit costs of private employers indicates that the average of contributions has been roughly constant since the beginning of

¹⁴ The Pension Benefits Guarantee Corporation (PBGC) provides benefits to private-sector workers in the event that their employer is unable to meet those obligations. However, the PBGC sets a limit on the size of the pension it will provide an employee in such an event.

¹⁵ The rules for pension funding are discussed in more detail in American Academy of Actuaries, *Fundamentals of Current Pension Funding and Accounting for Private Sector Pension Plans* (July 2004). Some of those rules were changed by the Pension Protection Act of 2006; the changes are summarized in Teja Ranade-Gadhoke, "Funding Regulations in U.S.A.—The Pension Protection Act 2006" (blog entry, September 12, 2009), http://indianactuary.com/2009/09/funding-regulations-in-usa-pension_12.html.

2007, which suggests that contributions have not been substantially affected by recent trends in stock values.¹⁶

The defined-benefit costs reported in the NCS were adjusted to reflect the same discount rate we used to value the pension obligations of the federal government. Recall that the NCS's measure of defined benefits for private firms is typically based on the contributions that those firms make to fund employees' future annuities. Under the IRS's rules for funding defined-benefit plans, the pension obligations of private firms are discounted at the rates of return on high-grade corporate bonds. Because corporate bonds carry more default risk than pension obligations, which are insured, the rates of return on those assets probably overstate the riskiness of pension obligations. We adjusted the defined benefits reported in the NCS to reflect a discount rate of 5 percent using the formula suggested by Lenze (2009, p. 21), which increased the figures reported in the NCS by about 29 percent.

Federal Sector. The government's cost for the defined benefits it provides to employee i is calculated as the change c^{DB} in the ABO less the contributions that employees make toward their annuities, which equal a percentage a (which is a function based on years of service k) of their salary g , as in equation (3).^{17, 18}

$$(3) h_i^W * b_i^{DB} = (c_{i,2009}^{DB} - c_{i,2008}^{DB}) - a(k_{i,2008}) * g_{i,2008}$$

Because the annuity cost is modeled on an annual basis, it is divided by the number of hours h^W that employees work during the year to calculate an hourly benefit rate b^{DB} . The change in the cost of benefits was estimated using the June cross sections of the CPDF.

In order to receive an annuity, employees must separate from federal employment as well as meet age and tenure requirements. For most federal employees, those requirements are:

- At least 56 years of age if they have at least 30 years of federal employment
- At least 60 years of age if they have at least 20 years of federal employment
- At least 62 years of age if they have at least 5 years of federal employment

We denote the year in which one of those requirements is met as R . Employees who meet at least one of those requirements are eligible to receive annuities that are proportional to the highest average pay \bar{g} they received over three consecutive years of federal employment. The portion of the high-three salary that retirees receive is the product of their years of federal service k and the

¹⁶ The time series for the cost of defined benefits in the private sector is available at Department of Labor, Bureau of Labor Statistics, "National Compensation Survey Databases," <http://www.bls.gov/ncs/data.htm>. From the first quarter of 2007 through the first quarter of 2011, the standard deviation for the series was \$0.03 per hour. Employer contributions could be fairly unresponsive to short-term fluctuations in asset values because deficits and surpluses are amortized over seven years and based on the three-year running averages of the asset values.

¹⁷ We based the analysis on the terms that apply to most federal employees in FERS. The terms of FERS differ for Members of Congress, Congressional employees, law enforcement officers, firefighters, and air traffic controllers.

¹⁸ That contribution is 0.8 percent of the employee's salary. However, employees who leave before five years of service can withdraw those contributions, so we treat the contribution rate as 0 percent before five years of service, 4 percent at five years of service, and 0.8 percent after five years of service

accrual rate h , which is a function of years of service and age. The accrual rate is 1 percent, except for individuals who are age 62 or greater with 20 years or more of service for whom it is 1.1 percent. Once retirees start receiving an annuity and reach age 62, its nominal value is adjusted annually for changes in the cost of living r^{CPI} as in equation (4).

$$(4) p_{i,j}^{DB} = \bar{g}_{i,t} * k_{i,t} * h(k_{i,t}, Age_{i,t}) \prod_{m=R+1}^j (1 + r_m^{CPI})^{1[Age_{i,m} \geq 62]}$$

The ABO in year t is the expected value of future annuity payments, which depends on the year R that the employee becomes eligible to receive the annuity, the discount rate $r^{Discount}$, the nominal payment p^{DB} , and the distribution of survival rates f (which is a function of age and sex), as in equation (5).

$$(5) c_{i,t}^{DB} = \sum_{j=R}^{\infty} \frac{p_{i,j}^{DB}}{(1+r^{Discount})^{j-t}} * f(Age_{i,j}, Sex_i)$$

Under current law, the adjustment equals the change in the CPI-W when that change is 2 percent or less, equals 2 percent when the increase in the CPI-W is between 2 and 3 percent, and equals the change in the CPI-W less one percentage point when the CPI-W increases by more than 3 percent. We assumed that the CPI-W would measure an inflation rate of 1.5 percent in 2011, climb to 2.5 percent by 2024, and then remain at that rate.¹⁹ Those nominal pension costs are discounted at a rate of 5 percent. Once the employee dies, the obligations are assumed to cease. The distributions of survival rates are the same ones that private-sector firms use in calculating their ABOs.²⁰

Defined-Contribution Pensions. The 401(k) plans available to private-sector employers and the federal government's Thrift Savings Plan (TSP) allow workers to defer tax payments on income they put aside for their retirement. In addition, employers can make contributions to their employees' accounts. For federal workers, the amount of employer contributions they receive depends on how much of their salary they choose to contribute to their TSP account. Federal agencies automatically contribute an amount equal to 1 percent of an employee's salary to his or her TSP account, match the first 3 percent of the worker's voluntary contributions dollar for dollar, and match the next 2 percent of contributions at 50 cents on the dollar. Some private-sector employers also base their contributions on the contributions made by their employees, but the details of those arrangements vary among firms. The contributions that employers make to their employees' defined-contribution accounts are the primary cost they incur in providing defined-contribution plans.²¹

¹⁹ Those inflation projections are based on the assumptions used for Congressional Budget Office, [CBO's 2011 Long-Term Budget Outlook](#) (June 2011). For 2010, the CPI-W measured an inflation rate of 1.7 percent.

²⁰ Private-sector employers use mortality assumptions specified in Internal Revenue Service, *Internal Revenue Bulletin 2008-42* (October 20, 2008), www.irs.gov/pub/irs-irbs/irb08-42.pdf, to calculate their minimum required contribution to their defined-benefit plan.

²¹ The NCS measure for the cost of defined-contribution plans can also include fees paid to the firms that manage the investment of the account balances. However, those fees are typically taken from the balances of the employees' accounts and thus do not represent an additional costs to employers.

Data provided to us by the administrators of the TSP indicate that the average matching contribution made to federal employees' TSP accounts was \$2,598 in 2007, which equaled about 4 percent of the average federal salary in that year. Because no data were available on how the amount of matching contributions varied with the income of the employees, we assumed that all employees contributed the same percentage of their salary to their TSP accounts (about 3 percent) and thus that all received matching contributions equal to about 4 percent of their salary.

Health Insurance Benefits. Workers may receive health benefits from their employers to help cover their current health care expenses as well as the health care expenses they will incur during retirement. Those health benefits typically take the form of the employers' paying a portion of the employees' health insurance premiums; they can also include employer contributions to health savings accounts (HSAs), which employees can use to cover the out-of-pocket costs of their health care.

In the NCS, employees' health benefits are typically measured as the sum of employers' payments toward their employees' current health insurance premiums and contributions that the employers made to their employees' HSAs. Likewise, the health benefits received by federal employees are measured as the government's payments toward the employees' current health premiums, including HSA contributions.²²

The NCS does not measure the health benefits that employees accrue for their retirement, so we extrapolated those costs from the costs incurred for federal employees and estimates of the percentage of private-sector establishments providing retiree health benefits. The present values of those obligations in the federal sector are estimated on the basis of the terms of the Federal Employees Health Benefits (FEHB) program.

As with the cost of defined-benefit plans, the cost of health benefits accrued for federal employees' retirement is calculated as the change c^{HI} in the ABO as in equation (6).

$$(6) h_i^W * b_i^{HI} = c_{i,2009}^{HI} - c_{i,2008}^{HI}$$

The nominal contributions that the government is obligated to make toward an employee's future insurance premiums (p) are estimated as the contribution that the government made toward the employee's health insurance coverage in 2009, escalated by assumptions for the growth in FEHB premiums, as in equation (7).²³

$$(7) p_{i,j}^{HI} = p_{i,2009}^{HI} \prod_{m=2010}^j (1 + r_m^{FEHB})$$

All eligible federal employees are assumed to participate in the FEHB program during their retirement. To be eligible for that benefit, employees must be eligible for an immediate annuity

²² In the Federal Employees Health Benefits program, HSA contributions are made by the insurer, and the cost of those contributions is passed on to the government and employees through higher premiums.

²³ FEHB premiums are assumed to grow by about 7 percent a year through 2021, after which that growth rate declines linearly to 5.3 percent by 2085.

upon retirement and have continuously participated in the FEHB program during their last five years of federal service. Once the employee dies, the obligations are assumed to cease.

The ABO for health insurance in year t is measured as the expected value of future insurance premiums that the federal government is obligated to pay, discounted at 5 percent, as in equation (8).

$$(8) c_{i,t}^{HI} = \sum_{j=R}^{\infty} \frac{p_{i,j}^{HI}}{(1+r^{Discount})^{j-t}} * f(Age_{i,j}, Sex_i)$$

The cost of retiree health benefits for private-sector workers was extrapolated from the cost incurred for federal employees, adjusted to account for the lower availability of retiree health benefits in the private sector and differences in employers' contributions. Analysis of the Medical Expenditure Panel Survey by the Agency for Healthcare Research and Quality indicates that about one-third of large private-sector firms offer health insurance to retirees. Those data also indicate that the average annual premium in the private sector was \$9,423 in 2009; employers were assumed to contribute 59 percent of that cost for retirees.²⁴ Thus, we estimated that a private-sector employer would, on average, contribute \$5,560 toward the premium of an eligible retiree, whereas the government would contribute \$6,776 (based on the CPDF).²⁵

Legally Required Benefits. Employers incur payroll taxes to fund the government's provision of Social Security, Medicare, unemployment, and workers' compensation benefits for their employees. In 2009, the payroll tax for Social Security was equal to 6.2 percent of salary for workers who earned \$106,800 or less. Employers do not incur additional Social Security taxes for the portion of a worker's salary that exceeds \$106,800. The payroll tax for Medicare is equal to 1.45 percent of a worker's entire salary. The NCS tabulates the costs that employers incur for unemployment insurance and workers' compensation, but those costs could not be estimated for federal employees using the CPDF. Instead, the costs of unemployment insurance and workers' compensation for federal employees were assumed to be the same as those in the private sector.²⁶

IV. Comparing Average Benefits

Having created a data set with imputed benefits using the procedures described in sections IIIA and IIIB, we estimated the percentage difference in the arithmetic averages of benefits between the federal and private sectors in four main steps, following the approach developed in Falk (2012). We reported overall estimates for all education groups combined and separate estimates for each of five levels of educational attainment.

²⁴ The analysis by the Agency for Healthcare Research and Quality did not include estimates of the portion of retiree health insurance premiums covered by employers. However, analysis by the Kaiser Family Foundation and Aon Hewitt found that employers covered 59 percent of premiums for employees in the largest plan.

²⁵ To extrapolate private-sector retirement benefits from those of federal employees, the cost of those benefits was changed to zero for two-thirds of federal employees. The resulting data were then escalated by the ratio of average private-sector to average federal contributions.

²⁶ The NCS data available publicly through the employer cost of employee compensation database indicate that the average cost of worker's compensation and unemployment insurance was about \$0.63 per hour at private-sector firms with at least 100 employees; see Department of Labor, Bureau of Labor Statistics, "National Compensation Survey Databases," www.bls.gov/ncs/data.htm.

A. Methods

Our approach compared federal benefits with the predicted value of private-sector benefits for a worker with the same observable characteristics. That approach estimated a full interaction between sector of employment and worker characteristics—that is, the differences between sectors were allowed to vary for each characteristic. Because we used a nonlinear model, we then integrated over the distribution of worker characteristics to obtain our estimates.

First, we directly modeled the conditional mean function within each major education category s . In equation (9), let Y , D , and X be benefits, sector, and worker characteristics, respectively, and let $\tilde{X} = X - E[X|D = 1]$.²⁷

$$(9) E[Y|D, X] = \exp(\gamma_0^s + D\gamma_1^s + D\tilde{X}\gamma_2^s + \tilde{X}\gamma_3^s)$$

In equation (9), the joint null hypothesis that $\gamma_2^s = 0$ is a test of whether worker characteristics have a different association with benefits in the federal and private sectors beyond the federal-sector main effect (γ_1^s) for a worker with average characteristics for the federal sector. We estimated the parameters of equation (9) using quasi-maximum likelihood estimation (QMLE) methods that provide consistent parameter estimates when the underlying distribution of the data differs from that assumed in the estimation (Gourieroux, Monfort, and Trojan, 1984). Specifically, for our main specification, we used Poisson QMLE, which Silva and Tenreiro (2006) found had a lower mean squared error than several other QMLE methods in simulations.

Second, let the average benefits of workers in the private sector with characteristics similar to those of federal workers be denoted as ω_0^s in equation (10). We estimated ω_0^s by integrating our conditional mean function over the distribution of federal worker characteristics, denoted as $E_{X|D=1}[\cdot]$.

$$(10) \omega_0^s = E_{X|D=1}[E[Y|D = 0, X]] = E_{X|D=1}[\exp(\gamma_0^s + \tilde{X}\gamma_3^s)]$$

Third, let the average benefits of workers in the federal sector be denoted as ω_1^s in equation (11). We estimated ω_1^s in a manner analogous to that used in equation (10).

$$(11) \omega_1^s = E_{X|D=1}[E[Y|D = 1, X]] = E_{X|D=1}[\exp(\gamma_0^s + \gamma_1^s + \tilde{X}(\gamma_2^s + \gamma_3^s))]$$

²⁷ The worker characteristics included here were a fourth-order polynomial in potential experience and indicators for more-detailed levels of educational attainment: 9th grade or less, 10th grade, 11th grade, 12th grade, high school diploma, vocational associate's degree, academic associate's degree, professional degree, and doctorate. In addition, a set of 12 interactions of indicators for being Hispanic, black, female, and married were included (black and Hispanic were modeled as mutually exclusive categories). Other characteristics were indicators for being an immigrant; being a noncitizen; living outside a metropolitan area; 6 categories for firm size, by number of employees (1–9, 10–24, 25–99, 100–499, 500–999, 1,000+); 24 occupational categories; 5 regions; and 5 calendar years.

Fourth, for our overall estimate of benefits in the private sector, we used a weighted average of the estimates for each major education category for both the federal and private sectors ($d = 1$ and $d = 0$). The weights were the share of federal workers in each major education category, $\Pr(S|D = 1)$, as in equation (12).

$$(12) \omega_d = \sum_s \Pr(S|D = 1) \omega_d^s$$

The standard errors for the main estimates based on equations (10), (11), and (12) and for the percentage difference between federal benefits and the benefits of workers in the private sector with similar characteristics were calculated using the method described by Puma and others (2009, pp. 24–27) for multiple stochastic regression imputation, which adds the between-imputation variance and the within-imputation variance. That method entails repeating the four steps described above for 40 sets of benefits imputations. In each iteration, private-sector benefits b_{0i} were drawn from log-normal distributions $LogN$, with means μ_0 and variances σ_0^2 that are functions of the wages the workers reported in the CPS, based on equation (13).²⁸

$$(13) b_{0i} \sim LogN[\mu_0(w_i), \sigma_0^2(w_i)]$$

The construction of those mean and variance functions was discussed in section IIIA on private-sector imputations. Federal benefits were drawn from log-normal distributions as well, but the mean and variance functions are specific to the workers' level of education as in equation (14).

$$(14) b_{1si} \sim LogN[\mu_{1s}(w_i), \sigma_{1s}^2(w_i)]$$

The between-imputation standard errors are the standard deviation between the point estimates based on the 40 draws of benefits.

To calculate the within-imputation variance, we used replicate weights to account for stratification and cluster sampling variability in the calculation of post-stratification weights used to make the CPS more representative of the U.S. population, using the method described by Rao (1994). For each imputed data set, we calculated each estimate 160 times using each of the 160 weights provided by the Census Bureau; the within-imputation standard errors are proportional to the standard deviation of those estimates relative to the estimate based on the post-stratification weights.

B. Results

For all levels of education, we estimated that the benefits of federal employees cost \$20 per hour worked, on average (see Table 4). For employees with similar characteristics in the private sector, we estimated the cost of benefits at \$14. In other words, federal benefits cost 48 percent more than benefits for similar private-sector workers. Those results are based on relationships

²⁸ Let W be the wage, $E[B|W]$ be the mapping from wage to the mean of benefits, and $Var[B|W]$ be the mapping from wage to the variance of benefits. To equalize the arithmetic means of the source data and the imputed data, we used the following functions relating the wage to the moments of the log-normal distribution:

$$\sigma^2(W) = \ln\left(1 + \frac{Var[B|W]}{[E[B|W]]^2}\right); \mu(W) = \ln(E[B|W]) - \frac{1}{2}\sigma^2(W).$$

between wages and benefits for federal workers that differed by education level. When data on all federal workers were pooled and a single benefit-wage relationship was used to impute benefits, federal benefits were estimated to have cost 51 percent more than benefits for private-sector workers—indicating that the overall estimates were not very sensitive to that aspect of the modeling.

Estimates of the cost of benefits were \$6 to \$8 per hour higher for federal workers with a master’s degree or less education than for similar private-sector workers. Because the estimated costs were lower for people with less education, the similar dollar amounts resulted in larger percentage differences for workers with less education. In particular, benefit costs were about 70 percent higher for federal workers with no more than a high school diploma or with some college education than for similar workers in the private sector. Those differences were 46 percent for people with a bachelor’s degree and 36 percent for people with a master’s degree. In contrast, the cost of benefits for federal employees with a professional degree or Ph.D was similar to that of their private-sector counterparts.

The differences in benefits were slightly smaller for almost all education categories when data on benefits from private-sector workers at larger establishments were used (see Table A1). Based on the benefit-wage relationship from private-sector establishments with at least 500 workers, the difference between federal and private-sector benefits was 45 percent.²⁹

V. Comparing Total Compensation

To conclude, we drew together the analysis in this paper on nonwage compensation with related work on wages to assess differences between the federal and private sectors in total compensation of workers with similar attributes.

A. Methods

To calculate total compensation for each individual in the CPS, we added the nonwage compensation measured in this paper to measures of wages. The details of those wage measures are discussed in Falk (2012). We then used the same four steps for estimating total compensation that were used for benefits in section IV.

Benefits in this paper were measured per hour worked. Wages in the NCS, CPDF, and CPS were measured per hour for which individuals were paid—that is, wages as calculated by dividing earnings g by the number of hours worked h^K plus hours of paid leave h^L . Thus, the measure of benefits has a smaller denominator than the measure of wages. In that respect, simple comparisons between wage and benefit rates will tend to overstate the relative magnitude of benefits. The measure of paid leave in equation (2) was constructed so that it could be added to the measure of wages to result in the earnings per hour worked, as in equation (14).

$$(14) \quad w_i + b_i^{PL} = \frac{g_i}{h_i^K + h_i^L} + \frac{g_i}{h_i^K + h_i^L} \frac{h_i^L}{h_i^K} = \frac{g_i}{h_i^K} \left(\frac{h_i^K + h_i^L}{h_i^K + h_i^L} \right) = \frac{g_i}{h_i^K}$$

²⁹ Arguably, the more relevant question is the sensitivity of our findings to the use of data on the benefits and wages of private-sector workers at firms of all sizes, but we did not have such data.

B. Results

We estimated that the average total compensation for federal employees was about \$52 per hour worked, compared with about \$45 per hour worked for similar employees in the private sector (see Table 5). Thus, total compensation was about 16 percent higher for federal workers than for similar private-sector workers.³⁰

Total compensation costs for federal employees with a high school diploma or less education were 36 percent higher than for similar private-sector workers. That difference was 32 percent for people with some college education, 15 percent for people with a bachelor's degree, and 8 percent for people with a master's degree. For people with a professional degree or Ph.D., however, total compensation costs were 18 percent lower for federal employees than for workers with similar attributes in the private sector.

³⁰ The estimates of average total compensation are not equal to the sums of average benefits in section IV and of wages in Table 3 of Falk (2012) because employees at small firms were excluded from the analyses of benefits and total compensation, whereas firm size was controlled for using additional explanatory variables in the comparison of wages. The average wages underlying the results in column 5 in Table A1 of Falk (2012) do exclude employees at small firms. Those averages added to the averages for benefits in this paper do equal the averages for total compensation. Among federal employees, those average wages are \$23.50 (high school or less), \$27.20 (some college), \$35.40 (bachelor's), \$41.30 (master's), \$48.50 (professional or Ph.D.), and \$32.40 (all levels). Among their the private-sector counterparts, average wages are \$19.70 (high school or less), \$23.90 (some college), \$34.80 (bachelor's), \$42.80 (master's), \$65.50 (professional or Ph.D.), and \$31.80 (all levels).

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Table 1. Average Benefits by Type and Sector

(Percentage of Average Wages)		
	Federal Government	Private Sector
Retirement Income:		
Defined Benefits	16.2	4.2
Defined Contributions	4.5	3.6
Health Insurance:		
Current Coverage	8.3	11.4
Coverage in Retirement	6.5	2.2
Paid Leave	17.8	12.3
Legally Mandated	10.5	10.2
Total Benefits:	63.9	43.9

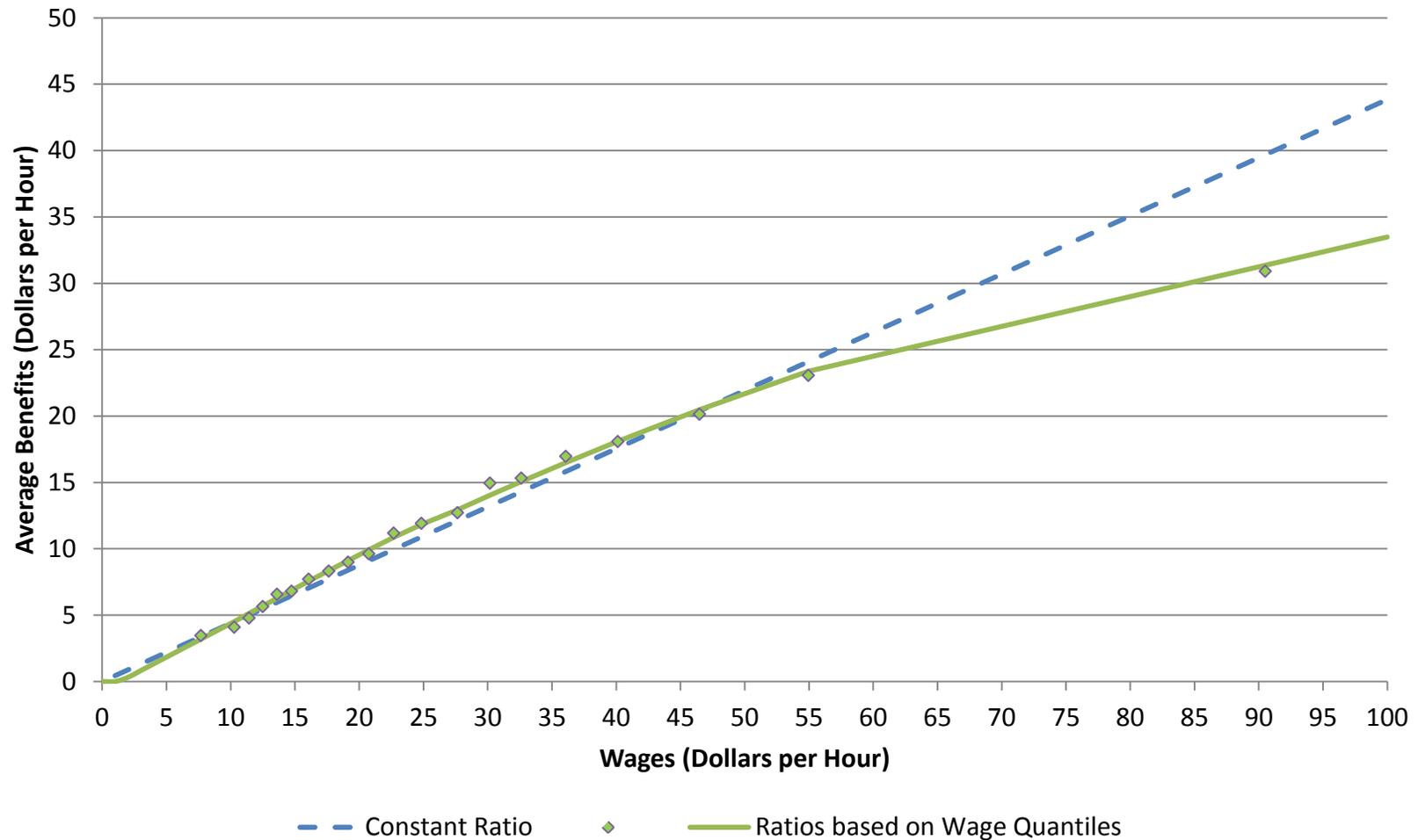
Notes: Benefits were measured per hour worked in terms of the cost that the employer incurred in providing them. Wages were measured per hour paid (the sum of hours worked and hours of paid leave). Average wages were \$33.85 in the federal sector and \$27.50 in the private sector.

Table 2. Predicted Probability of Private-Sector Benefits, by Educational Attainment

(Probability of Coverage Through Employer)				
Educational Attainment	Health Insurance		Pension	
	(1)	(2)	(3)	(4)
High School Diploma or Less	0.713	0.785	0.566	0.664
Some College	0.789	0.803	0.669	0.694
Bachelor's Degree	0.847	0.793	0.753	0.679
Master's Degree	0.870	0.785	0.779	0.650
Professional/Doctorate	0.870	0.790	0.777	0.646
Coefficient of Variation	0.075	0.010	0.122	0.023
Controls	None	Wage	None	Wage

Notes: All columns show predicted probabilities from a logit model using data for 2005 through 2010 from the Current Population Survey on the benefits received by private-sector workers at large firms (1,000+ employees). In columns (2) and (4), the logit model includes a fourth-order polynomial in wages. In the first row of all columns, the values are the predicted probabilities of receiving the benefit, calculated by integrating over the full distribution of private-sector wages but assuming that educational attainment was a high school diploma or less. The values for other rows were calculated analogously, assuming different education levels.

Figure 1. The Relationship Between Benefits and Wages in the Private Sector



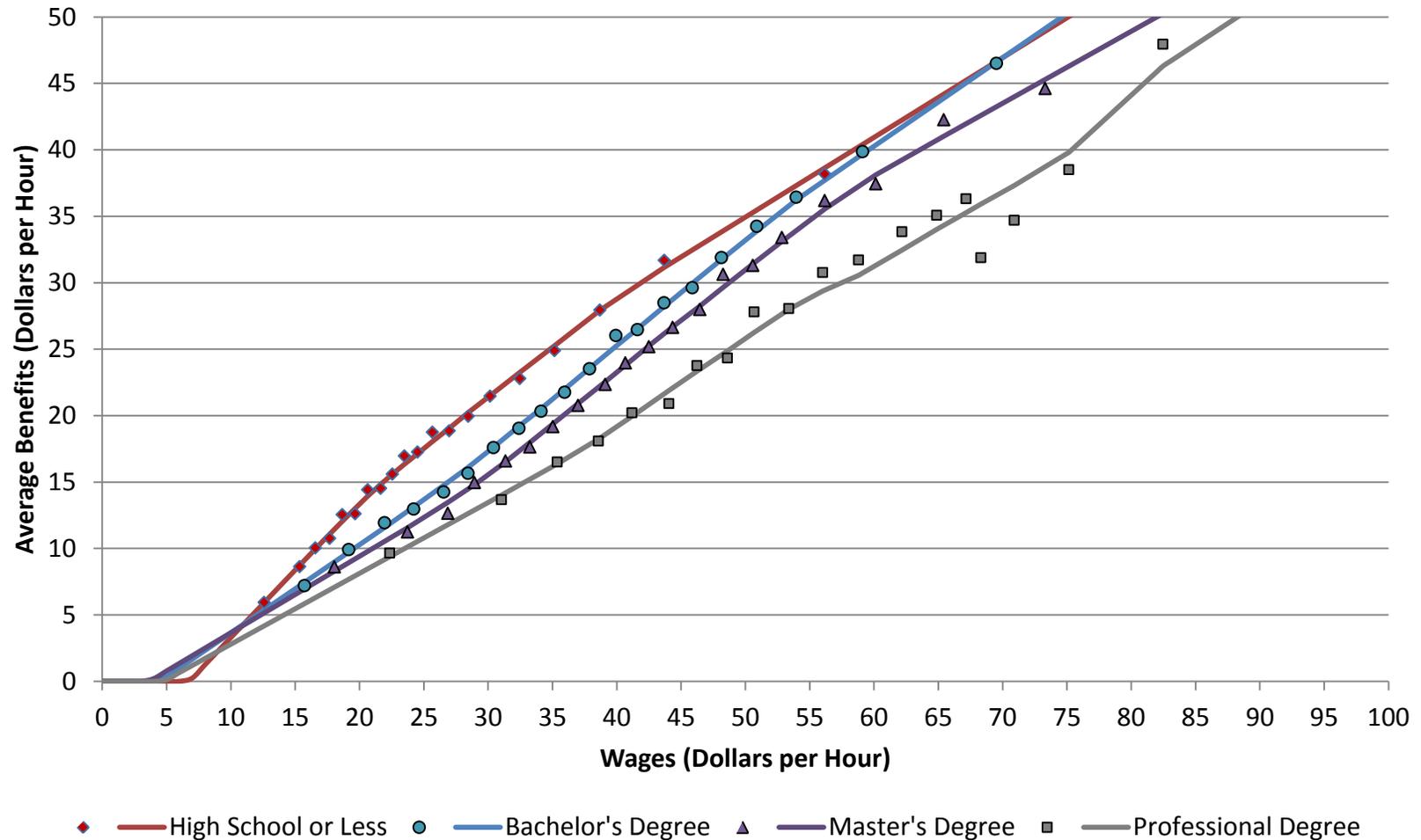
Notes: Benefits were measured per hour worked in terms of the cost the employer incurred in providing them. Wages were measured per hour paid (the sum of hours worked and hours of paid leave). The dashed line measures benefits as 44 percent of wages, which is the ratio of total benefits to total wages in the National Compensation Survey (NCS). The markers represent the averages of benefits and wages in 20 quantile categories of the private-sector wage distributions, also from the NCS. The solid line was fitted to those averages using a kernel regression technique that preserved the average across quantile categories. That approach implied negative averages of benefits at very low wages, which were truncated just above zero.

Table 3. Predicted Value of Federal Benefits, by Educational Attainment

(Average, Dollars per Hour)						
Educational Attainment	Health Insurance		Defined-Benefit		Other Benefits	
	(1)	(2)	(3)	(4)	(5)	(6)
High School Diploma or Less	2.7	3.0	4.3	6.5	11.2	14.2
Some College	2.7	2.9	5.3	6.6	12.3	14.2
Bachelor's Degree	3.0	2.8	6.1	4.9	14.6	12.7
Master's Degree	2.8	2.4	6.7	4.0	15.7	12.0
Professional/Doctorate	3.1	2.4	7.9	1.1	18.4	10.2
Coefficient of Variation	0.042	0.075	0.191	0.259	0.156	0.084
Controls	None	Wage	None	Wage	None	Wage

Notes: All columns show predicted hourly benefits from a least squares regression model using data from the Central Personnel Data File. In columns (2), (4), and (6), the model includes a fourth-order polynomial in wages. In the first row of all columns, the values are the predicted hourly benefits, calculated by integrating over the full distribution of federal-sector wages but assuming that educational attainment was a high school diploma or less. The values for other rows were calculated analogously, assuming different education levels.

Figure 2. The Relationship Between Benefits and Wages in the Federal Sector, by Educational Attainment



Notes: Benefits were measured per hour worked in terms of the cost that the employer incurred in providing them. Wages were measured per hour paid (the sum of hours worked and hours of paid leave). The markers represent the averages of benefits and wages in 20 quantile categories for each of the education groupings. Continuous functions were fitted to those averages using a kernel regression technique that preserved the average across quantile categories. That approach implied negative averages of benefits at very low wages, which were truncated just above zero. The relationship between wages and benefits is not shown for people with some college education because the plot of that relationship is very similar to the plot for people with a high school diploma or less.

Table 4. Predicted Benefits for Federal and Similar Private-Sector Workers,
by Educational Attainment

Educational Attainment	Average Benefits (Dollars per Hour)			Sample Size (Federal; Private)
	Federal Government (1)	Private-Sector Projections (2)	Percentage Difference in Averages (3)	
High School Diploma or Less	15.5 * (0.8)	9.0 * (0.1)	72.1 * (9.3)	1,597; 28,411
Some College	18.5 * (0.7)	10.9 * (0.2)	70.6 * (7.0)	2,315; 24,688
Bachelor's Degree	21.8 * (0.7)	14.9 * (0.3)	46.2 * (5.5)	2,479; 20,560
Master's Degree	24.1 * (1.2)	17.7 * (0.6)	35.9 * (7.9)	1,197; 6,812
Professional/Doctorate	24.7 * (1.6)	24.1 * (1.7)	2.4 (9.6)	644; 2,373
All Levels of Education	20.1 * (0.4)	13.6 * (0.2)	48.2 * (3.4)	8,228; 82,844

Notes: Benefits were measured per hour worked in terms of the cost that the employer incurred in providing them. In column (1), estimates in rows 1–5 are based on equation (10) and estimates in row 6 are based on equation (12). In column (2), estimates in rows 1–5 are based on equation (11) and estimates in row 6 are based on equation (12). Column (3) is $\{[\text{column (1)} / \text{column (2)}] - 1\} * 100$. Standard errors are in parentheses, calculated as described in the text. * = p-value < 0.05.

Table 5. Predicted Total Compensation for Federal and Similar Private-Sector Workers, by Educational Attainment

Educational Attainment	Average Total Compensation (Dollars per Hour)		Percentage Difference in Averages (3)	Sample Size (Federal; Private) (4)
	Federal (1)	Private-Sector Projections (2)		
High School Diploma or Less	39.1 * (1.0)	28.7 * (0.3)	36.0 * (3.3)	1,597; 28,411
Some College	45.7 * (0.9)	34.7 * (0.4)	31.6 * (2.7)	2,315; 24,688
Bachelor's Degree	57.2 * (0.9)	49.7 * (0.7)	15.1 * (2.1)	2,479; 20,560
Master's Degree	65.3 * (1.6)	60.5 * (1.3)	8.0 * (3.0)	1,197; 6,812
Professional/Doctorate	73.2 * (2.3)	89.6 * (3.6)	-18.3 * (3.7)	644; 2,373
All Levels of Education	52.5 * (0.6)	45.4 * (0.5)	15.7 * (1.4)	8,228; 82,844

Notes: Total compensation was measured per hour worked and equals the sum of wages and benefits. In column (1), estimates in rows 1–5 are based on equation (10) and estimates in row 6 are based on equation (12). In column (2), estimates in rows 1–5 are based on equation (11) and estimates in row 6 are based on equation (12). Column (3) is $\{[\text{column (1)} / \text{column (2)}] - 1\} * 100$. Standard errors are in parentheses, calculated as described in the text. * = p-value < 0.05.

Table A1. Predicted Benefits for Federal and Similar Private-Sector Workers, by Educational Attainment (Private-Sector Establishments with 500 or More Workers)

Educational Attainment	Average Benefits (Dollars per Hour)			Sample Size (Federal; Private)
	Federal (1)	Private Sector Projections (2)	Percentage Difference in Averages (3)	
High School Diploma or Less	15.5 * (0.9)	9.2 * (0.1)	68.5 * (9.6)	1,597; 28,411
Some College	18.5 * (0.8)	11.1 * (0.1)	67.3 * (7.7)	2,315; 24,688
Bachelor's Degree	21.8 * (0.7)	15.2 * (0.3)	43.0 * (5.5)	2,479; 20,560
Master's Degree	24.1 * (1.1)	18.1 * (0.7)	32.7 * (6.8)	1,197; 6,812
Professional/Doctorate	24.7 * (2.2)	25.1 * (1.8)	-1.9 (11.9)	644; 2,373
All Levels of Education:	20.1 * (0.5)	13.9 * (0.2)	44.7 * (3.7)	8,228; 82,844

Notes: The calculations for this table are the same used for Table 4 except that the benefit-wage relationship for the private sector is based on establishments with at least 500 workers. As in the analysis underlying Table 4, that relationship was used to impute values of benefits for individuals in the Current Population Survey (CPS) who reported working at large firms. The sample sizes reflect the number of observations in that CPS sample. Standard errors are in parentheses, calculated as described in the text. * = p-value < 0.05.