Causes and Consequences of Navy Civilians' Retirement Behavior

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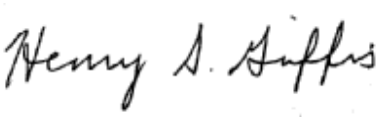

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Executive summary

Civilian employment in the Department of Defense (DOD) fell by over 36 percent between 1988 and 1999. Many policy-makers and analysts have argued that the government's lack of strategic planning during the downsizing has resulted in a "top-heavy" civilian workforce—that is, personnel profiles that have disproportionately high numbers of older workers. As a result, many in the large cohort of older workers are becoming eligible for retirement, leaving the Services at risk of losing much of the human capital embedded in their civilian workforces. CNA initiates some projects on its own to help maintain competency and expertise in support of its research mission. We undertook this study to build expertise that will help the Navy address civilian manning issues: in this case, the magnitude of current and projected manning shortages related to increasing retirements. As part of developing this competency, we also created a database that will facilitate the analysis of other civilian manning issues.

To determine whether the civil service workforce is meeting the government's goals, human resource specialists need to consider many components, such as organizational structures, job design, training and development policies, and ensuring that future leadership roles will be filled. Another important component is workforce-shaping policies, or policies affecting accession and retention. In our paper, we focus on retirement behavior, a subset of retention issues: we identify whether and to what extent retirements are contributing to civilian manning shortages and discuss possible remedies. Manning shortages caused by high rates of retirement are of special concern because losing experienced workers involves a loss of institutional memory.

We conduct our analysis by surveying relevant literature, investigating characteristics of the Navy civilian workforce, and estimating an econometric model of the determinants of retirement behavior. We use a sample of 1.46 million Navy civil service personnel from the

1999-2008 Civilian Personnel Master File collected by the Defense Manpower Data Center to identify workforce characteristics. We then use a statistical model to estimate how a wide variety of worker, job, and economic characteristics affect retirement behavior.

We find that alarms regarding future retirement trends and the potential for employment gaps may be warranted for some occupations but not for others. In identifying communities that are in dire straits, planners need to consider not only the size of the community but also future retirement-eligibility rates and the likelihood that individuals in that community will retire once they are eligible. We use information on a person's retirement plan, age, and years of federal service to estimate future retirement-eligibility rates. Our estimates indicate that, overall, a little more than a third of Navy civil service personnel will be eligible to retire by 2013. The percentage eligible to retire by 2013 varies widely among communities, however, from under 20 percent to over 55 percent.

One factor that underlies fears that high retirement rates will erode human capital is that the workforce is aging. The workforce as a whole, both private sector and civil service, has been aging since the late 1970s, and this trend is expected to continue until at least 2016. Even if the workforce ages and more people become eligible to retire, however, Navy civilians do not all retire immediately after they become eligible. Our data indicate that only 22 percent of the Navy civil servants who became eligible to retire in 1999 actually retired within 2 years. Our analysis reveals several determinants of the behavior of retirement-eligible personnel: whether they had military experience, whether they were covered by the Civil Service Retirement System (CSRS) or Federal Employees Retirement System (FERS) retirement plan, and their demographic characteristics.

Recent policy changes have affected the entry of military retirees into civil service, resulting in a trend toward more Navy civilian accessions being military retirees: the share of new hires who are recent military retirees increased from 8 percent in 1999 to 19 percent in 2008. Since our statistical estimates show that Navy civil servants with military experience are significantly more likely to retire once they become eligible, hiring more military retirees will decrease the average expected interval between becoming eligible to retire and actually retiring.

The change from CSRS to FERS retirement plans in 1987 will also cause changes in the behavior of retirement-eligible personnel. In 2008-2009, FERS covered 76 percent of the entire Navy civilian workforce and 32 percent of those eligible to retire. By 2013, however, FERS will cover the majority of those who are currently eligible for retirement. The CSRS and FERS plans contain a number of differences; notably, FERS includes Social Security benefits that provide an incentive for people to remain employed until they reach Social Security retirement ages. Our empirical results support the hypothesis that Navy civilians who are covered by FERS have a spike in retirements at ages 61 to 63. In addition, we find that demographic characteristics, particularly gender and minority status, influence retirement decisions. Our results indicate that women are more likely to retire, whereas minorities are less likely to retire.

In making recommendations for how policy-makers should respond to changes in retirement behavior, we consider two sources of possible additional employment: personnel from the private sector and recent military retirees. Using data from the Bureau of Labor Statistics, we created a crosswalk between occupations in the private sector and Navy civilian communities. Each community has an abundance of private-sector employees who work in similar occupations. Based on this, community managers could consider turning to the private sector to fill employment gaps.

Although retired military personnel make up a growing share of the Navy civilian inventory, policy-makers will need further research to determine how viable this group might be as a source of new personnel. To do this, one should take into consideration the kind of work that individuals performed in the military relative to which civilian communities have gaps. In addition, since military retirees tend to be older than other new hires, if the Navy brings more military retirees into its civilian workforce, it might lessen employment gaps in the short run but cause larger gaps in the future.

Given our findings, we recommend that communities with the highest risks of employment gaps should be tracked and given priority in mitigation efforts. While tracking communities that may face the largest manning shortages due to high levels of retirements, changes in policies and predicted demographic trends that may affect retirement rates should be monitored. In addition, consideration should

be given to both short- and long-run consequences on the Navy civilian workforce of accessing different sources of personnel to mitigate shortages. Our final recommendation is that additional empirical research be conducted into how private-sector employees and recently retired military personnel should be used and to what extent they might close employment gaps, especially once required workforce capabilities are taken into consideration.

Introduction

The Department of Defense downsized its civil service workforce dramatically in the 1990s; civilian employment fell from 1.1 million in 1988 to about 700,000 in 1999—a decrease of more than 36 percent [1]. Many policy-makers and analysts have questioned whether the government made these cuts with adequate strategic planning.[1] Their concern is that a lack of strategic planning, along with forces outside the government's control, may have resulted in troublesome longevity profiles in critical areas. In particular, while older workers are becoming eligible and deciding to retire, there may be too few younger workers available to replace them.

CNA initiates some projects on its own to help maintain competency and expertise in support of its research mission. We undertook this study to build expertise that will help the Navy address civilian manning issues—in this case, the magnitude of current and projected manning shortages related to increasing retirements. As part of developing this competency, we also created a database that will facilitate the analysis of other civilian manning issues.

In this paper, we examine whether imbalances between older and younger workers are putting the federal civil service in general, and the Navy in particular, at risk of losing the human capital and institutional memory that senior civilian employees provide. Alarms about a "crisis" in civil service manning have been sounded frequently in the past. We will investigate whether, and to what extent, current concerns are warranted. In determining whether the civil service workforce is meeting the government's goals, human resource specialists must consider many components, including organizational structures, job design, training and development

1. We use *civilians* and *civil service workers* interchangeably. The terms do not include contractors who work for government agencies. When we refer to *private-sector workers,* we mean any nonmilitary employed person who is not a government employee.

policies, and ensuring that future leadership roles will be filled. Another important consideration is workforce-shaping policies (i.e., policies affecting accession and retention). In our paper, we focus on retirement behavior, a subset of retention issues: we identify whether and to what extent retirements are contributing to civilian manning shortages and discuss possible remedies. Manning shortages caused by high rates of retirements are of special concern because losing experienced workers involves a loss of institutional memory [2 and 3].

The loss of experienced workers could have more detrimental effects on the Navy and other military Services than on the private sector. Because uniformed personnel rotate frequently among assignments and because of substantial turnover among military contractors, civilian employees provide critical institutional memory for many of the Navy's activities. If the Navy were to see a large exodus of civilian workers, these departures could disrupt the orderly transfer of institutional knowledge to younger employees and could undermine important functions and missions. Commonly cited examples of where problems might occur are with critical shortages of civilian workers in the Navy's depot maintenance facilities and with key personnel who work with the Navy's computer systems.

The combined effect of more people being eligible to retire and changes in retirement behavior might vary by occupation and function. In some areas, and even for the workforce on average, losses of senior personnel may not pose a problem. Even if this is true, however, some occupations or functions may face critical shortages.

In this study, we examine some facts about Navy civil servants and the extent to which increasing retirements will have a critical effect on the supply of employees. In particular, we will address the following questions:

- Has the civil service workforce changed in ways that might affect the number of retirements? If so, what has been the effect of changes in:
  - — Retirement plan coverage?
  - — The distribution of prior military experience?

— Demographic characteristics, especially age and retirement eligibility?

- What does a statistical model reveal about the relative importance of these factors in explaining retirement behavior?
- Which Navy civilian communities are most likely to face shortages?
- How can expected shortages be mitigated?

We first provide context by reviewing relevant literature. We then describe some features of the Navy civil service workforce by analyzing personnel records. Next, we report the results of an econometric model of retirement decisions. Finally, we identify communities that are at greatest risk of having workforce shortages caused by large retirement losses and recommend actions that could mitigate these shortages.

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Background and literature review

In this section, we establish a context for our analysis by discussing elements that underlie the number of retirements and retirement behavior. Focusing on issues that are relevant to possible increases in federal employee retirements, we describe changes in policies, the value of retirement benefits, and characteristics of the pool of employees who are eligible to retire. We review previous examinations of retirement decisions, especially for federal and private-sector workforces. Subsequent sections of this paper will describe the Navy civil service workforce in particular.

The fundamental issue we address here is whether increasing retirements are contributing to civilian workforce shortages and age imbalances. In our literature review, we examine several elements that underlie changes in retirements. Understanding what lies behind changes in retirements will allow us to suggest informed options for policies to mitigate problems caused by changing retirement patterns. Given this, we divide our discussion of retirements into the following subsections:

- The size of the retirement-eligible population
- Policy changes regarding military retirees entering the civil service
- The change from the Civil Service Retirement System to the Federal Employees Retirement System
- The incentives and relative values of civil service and private-sector retirement plans
- The effect of demographic characteristics
- Differences in accession cohorts
- Results of other studies of retirement behavior.

The size of the retirement-eligible population

An obvious cause of age imbalances in the federal workforce is that the proportion of the population eligible to retire has been increasing. The workforce as a whole, both private sector and civil service, has been aging since the late 1970s, and this trend is expected to continue until at least 2016.[2] Early in this period, people remaining employed longer caused the proportion of older workers to grow. Since the first of the Baby Boomers reached retirement age in 2000, however, the workforce will continue to age because of the size of this cohort. Regardless of what is behind the growth in the number of older workers, it is an unequivocal fact that more people are reaching the age at which they are eligible to retire.

In this subsection, we will focus on changes among the retiree population in the private sector and the general civil service. Later, we will analyze the Navy in more detail.

Trends in workforce age

For the private sector, the number of employed people age 65 and over increased by 101 percent between 1977 and 2007. One can compare this increase to a smaller increase of 59 percent for total employment (16 and older). Over this time period, the increasing numbers of older workers cannot be attributed to the aging of Baby Boomers because the first of the Boomers only became retirement eligible around 2000. Instead, higher labor force growth rates for workers over 65 are attributable to people delaying their retirements [2].

The Bureau of Labor Statistics (BLS) also projects that the graying of the workforce will continue from 2006 to 2016. According to its predictions, the total labor force will increase by only 8.5 percent while it expects the number of workers age 55 to 64 to climb by 36.5 percent. In addition, BLS predicts even more dramatic growth for the two oldest groups: 83.4 percent for 65- to 74-year-olds and 84.3 percent for those 75 and older. In contrast to the period ending in

2. Reference [2] provides a complete discussion of the data sources and analysis that supports our discussion of workforce aging.

2007, the large projected growth for older workers is a function of both the large Baby Boomer generation reaching retirement age and later retirement ages.

If the population of older workers increases more rapidly than that of the entire workforce, as we saw for the private sector, the average age among workers must also increase. Between 1985 and 2005, the average age of all federal employees increased from 42 to 47 [4].[3] There was a similar increase for Navy civilians, from a median age of 40 in 1985 to 48 in 2008. A little more than half of the increase occurred between 1993 and 2000, a time that bookends the years of downsizing due to the Federal Workforce Restructuring Act of 1994.

In addition to the number of older workers, the number of retirements is affected by the labor force participation rates of older workers. Reference [2] reports that, in 1996, the labor-force participation rate of people age 55 and older was 30 percent. A decade later, in 2006, the participation rate of this group increased to 38 percent. A strong influence on this increase was higher participation rates for older women. Projecting out to 2015, the labor force participation rate of people age 55 and older is expected to reach 57 percent. Given their data, [2] projects that, between 2004 and 2014, the number of people in the labor force age 55 to 64 will increase by 42.3 percent, and the number of labor force participants age 65 and older will grow by nearly 74 percent.

A consequence of an older workforce is an increase in the percentage of the workforce that is eligible to retire. In DOD, 33 percent of career federal employees will be eligible to retire by 2012 [5]. This does not mean, however, that 33 percent of the workforce will retire since many people do not retire immediately upon becoming eligible. In 2004, the last year for which data are available, excluding involuntary retirements, actual retirements occurred about 3 years after people became eligible to retire.

Reference [5], a 2008 GAO report, also gives more detail on age distributions and retirement eligibility in particular agencies and occupations. The report stresses the importance of assessing

3. This includes full-time, permanent employees and excludes employees of the Postal Service.

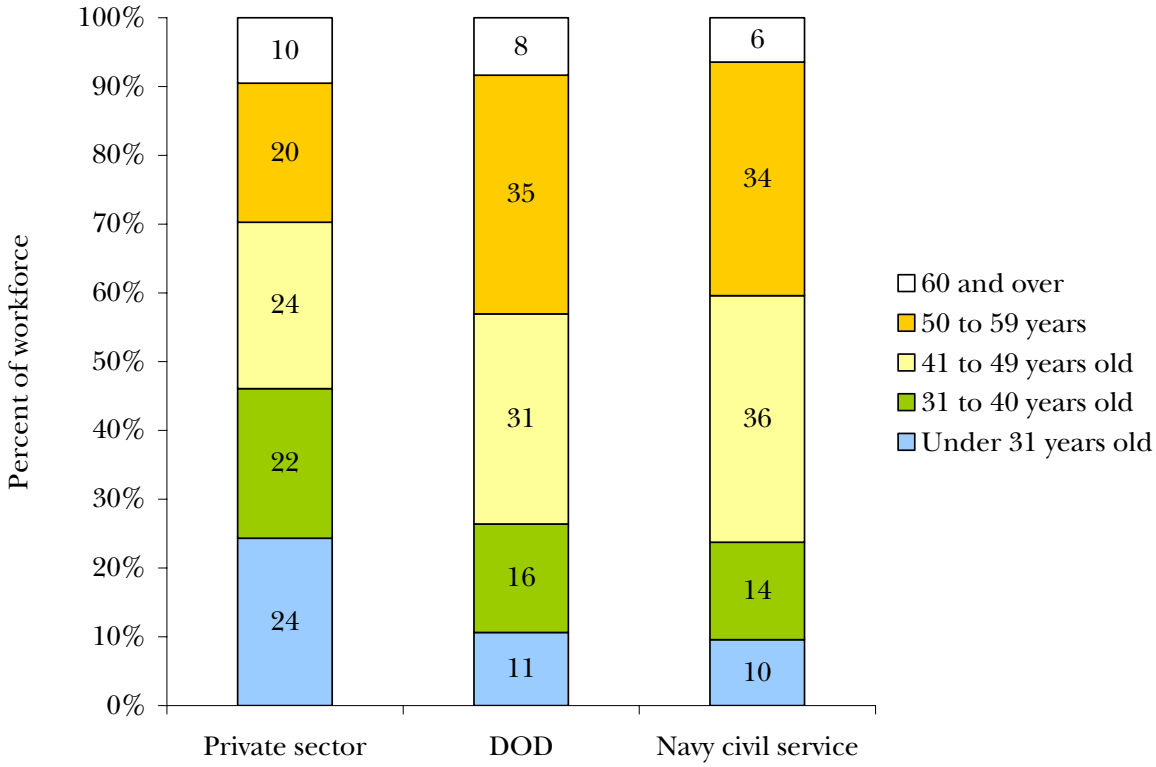
retirement rates and manning shortages by occupation. In many occupations, increasing retirements will not cause manning crises because retirees can be replaced by hiring new employees. The analysts in [5], however, found that, including employees in all branches of the Federal government, over 50 percent of employees in 24 of 315 federal occupations with 500 or more staff would become retirement eligible by 2012. Many of these occupations, such as engineering fields, industrial trades, security and law enforcement, and medical, correspond to the Navy's high-risk communities, which we identify later.

Comparison of age distributions

Figure 1, based on 2006 data, compares the age distribution of the private-sector workforce with segments of the civil service workforce. The figure shows that, even though the private-sector workforce had aged, its age distribution was still younger than civil service workforces were in 2006. While 30 percent of the private-sector workforce was over 50, at least 40 percent of the DOD and Navy civil service workforces were over 50.

If we compare the segments of the civil service, the proportion of workers over 50 remains constant, but there are differences in age distributions among younger workers. In particular, the percentage of the civil service workforce that is 40 or younger falls from 30 percent in the Executive Branch, to 27 percent in DOD, to 24 percent in the Navy civil service.

Figure 1. Age distribution of workforce, FY 2006



Policy changes regarding military retirees entering the civil service

In a following section, we will show that recent military retirees are forming an increasing share of Navy civil-service accessions. In addition, our statistical model indicates that the retirement behavior of military retirees differs from that of other accession sources. Here we examine recent policy changes that have contributed to increases in the number of military retiree accessions.

In 2001 and 2002, legal and policy changes were adopted that made it more likely that military retirees, especially officers, would enter the DOD civilian workforce. Therefore, recent discussions regarding gaps in civil service workforces have raised the possibility that the increased accessibility of military retirees can help alleviate shortages. A follow-on question would be whether recent military retirees might have different retirement incentives and behavior

than other civilian employees. In this subsection, we will describe the policy changes and then consider how more military retirees among Navy civilians might affect retirement behavior.

Description of policy changes

Two major policy changes have occurred regarding military retirees joining the civil service.[4] First, in 2001, the President declared a state of national emergency, removing the 6-month waiting period between retiring from the military and entering the civil service. Second, in July 2002, Congress effectively removed the cap on combined civil service and military retirement pay.

Waiting period for civil service employment

A long-standing law has restricted the appointment of military retirees to DOD civil service positions during the first 6 months following their retirement.[5] The 180-day waiting period dates back to a 1964 statute that reflected a concern with "revolving door" appointments by which ex-military personnel could assume top civilian decision-making positions and blur the distinction between military and political goals [6].

The waiting-period law contains several circumstances under which the 180-day waiting period can be waived. One option is having the proposed appointment authorized by the appropriate Secretary and then the applicant approved as qualified by the Office of Personnel Management. The law also removes the 180-day waiting period when a state of national emergency exists. After the 9/11 attacks in 2001, President Bush declared a state of national emergency, and that declaration continues to be in effect. Over this 8-year period, military retirees have been able to take civil service jobs immediately upon leaving the military.

Policy-makers and analysts must recall that the law only waives the 180-day waiting period until the President removes the state of

4. Reference [6] contains a complete discussion of changes in senior military officer retirees joining the civil service.

5. U.S. Code, Title 5, Section 3326 (http://uscode.house.gov/).

national emergency. Unless policy-makers adopt other legal changes, when the state of national emergency is lifted, retirees will once again have to wait 6 months before they can take civil service jobs within DOD. In our discussion about mitigating civilian workforce shortages, we consider a strategy of filling Navy civilian jobs with military retirees. We must caveat any conclusions we reach, however, by noting that the law will reinstate the 6-month waiting period if national security conditions change.

Military and civil service dual compensation

Under the Dual Compensation Act of 1964, retired officers taking a civil service position could have their retirement pay reduced to avoid "double dipping" by receiving two forms of federal compensation. In general, under this law, retired officers could keep all of an initial portion of their retirement pay and half of the remainder. The Civil Service Reform Act (CSRA) of 1978 further capped combined civil service and military retirement pay at the equivalent of a mid-grade political appointee.

The Repeal of Dual Compensation Reductions for Military Retirees, which went into effect in July 2002, ended previous restrictions on the pay of military retirees employed by the Federal Government.[6] The repeal of the pay reduction meant that military retirees had the same maximum pay as other civil service employees, regardless of how much retirement pay they were collecting. Before the repeal, the compensation reduction would have been binding for some retirees, especially for senior officers. The repeal, therefore, removed an economic disincentive to join the civil service.

Transfer of years of service from military to civil service employment

In addition to recent policy changes in the accessibility of military retirees and the total compensation they can claim, decisions of

6. Repeal of Dual Compensation Reductions for Military Retirees, Jun 2002. This revision is discussed in the Federal Register, Vol. 67, No. 115. A link to this document can be found at http://www.opm.gov/fedregis/2002/66-0040837-a.pdf.

retirees to join the civil service will depend on the value of civil service retirement benefits. Civil service retirement benefits are a function of years of service (YOS) and earnings. Whether civil service members can transfer military YOS to total years of federal service, then, is a factor in whether people will join the Navy civilian workforce after leaving the military.

In general, veterans may transfer their time in the uniformed service toward total time of federal civil service (a veteran is someone who served in the military but left before retirement). Military retirees, however, are subject to a "fresh start" rule, which limits crediting time spent in the military toward civil service retirement benefits. Retirees receive credit only for service during war, and in a few other cases.[7] Military retirees, however, can elect to waive their military retirement compensation in return for having their military service added to their civilian service tenure when determining civil service pension amounts.

How additional military retirees might affect civil service retirements

Presumably because of changes in waiting periods and compensation, our sample shows that the share of Navy civilian employees hired during the year who are military retirees increased from 15 percent in 1999 to 25 percent in 2008.[8] An obvious result of this increased proportion of military retirees among these new hires is that military retirees will hold an increasing number of civil service jobs. While we find no increase so far in the proportion of the stock of Navy civilians who are military retirees, if the higher rate of flow among new hires continues, the total proportion will eventually increase.

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7. The exceptions are if you were awarded the retired pay because of a service-connected disability either (a) incurred in combat with an enemy of the United States or during a period of war or (b) caused by an instrumentality of war and incurred in the line of duty during a period of war.

8. We present data sources and detail on Navy civilian statistics in a subsequent section.

A possible implication of an increased presence of military retirees in the civil service is a change in the response to retirement incentives among DOD civilians. Like civil servants under FERS, all military retirees qualify for Social Security. However, this is not the case for civil service retirees under CSRS. For this reason, civil service retirement age profiles of military retirees may more closely resemble FERS retirees than CSRS retirees. Researchers have shown that, on one hand, CSRS retirees do not have peaks in retirements corresponding to Social Security retirement age milestones [7]. On the other hand, the results of our econometric model discussed below indicate that FERS retirees do have retirement spikes at Social Security retirement ages. The difference is most likely because FERS retirees are eligible for Social Security benefits, while CSRS retirees are not. With the addition of more military retirees to the civilian workforce, we expect retirements to be more concentrated at the ages of Social Security retirement eligibility. For most current workers, partial-benefit Social Security eligibility occurs at 62 and full-benefit eligibility at 65 or 66.[9] If military retirees exhibit similar retirement behavior to FERS retirees, having more military retirees in the civil service will amplify the changes in retirement behavior due to the gradual shift from CSRS to FERS.

The results of our econometric model provide little support for conjectures of how prior military experience and retirement plan interact. The results do show that everyone covered by the FERS plan has age spikes in retirement rates that correspond with eligibility for Social Security. In addition, our results show that a specific group of people with military experience tends to retire earlier. We were unable, however, to attribute differences in the civil service retirement behavior among military retirees to their differential response to the design and value of civil service pension plans.

We expect the retirement behavior of military retirees in the civil service to differ from that of military veterans, who have left the military before becoming eligible for retirement. By our definition, veterans do not receive military pensions. We must, therefore,

9. Full retirement age was 65 for many years. However, beginning with people born in 1938, that age will gradually increase until it reaches 67 for people born after 1959.

attribute any differences in retirement behavior between veterans and civil service members with no prior military service to one of two factors. First, veterans enter the civil service with the YOS they transfer from their military service. Second, veterans receive a preference in qualifying for civil service jobs, and this might alter the population's characteristics.

The change from CSRS to FERS retirement policies

Most people do not retire immediately after they become eligible to retire. Changes in retirement policies, how people respond to retirement incentives, or relevant population characteristics will also affect the number of retirements. In this section, we investigate the effect of the policy shift from CSRS to FERS. Our econometric model considers how retirement behavior might differ under the two policies. For this reason, we need to know how the features of the two policies differ, drawing on information from other relevant studies.

Policy descriptions

Congress passed legislation that enacted the FERS retirement plan in 1986 and it became effective January 1, 1987. FERS automatically covers almost all new employees hired after December 31, 1983.[10] FERS replaced CSRS (which was established in 1920) and the policies have several differences that might be expected to change retirement behavior.[11]

CSRS is a purely defined-benefit (or "pay out") plan—one in which companies promise to pay workers a specified amount in retirement benefits. Federal employees contribute a percentage of their salaries toward program costs and then receive an annuity after they retire.

10. A small number of civil service employees who were hired between 1984 and 1987 were allowed to join a modified version of CSRS.

11. References [8] and [9] contain thorough descriptions of the two policies. In addition, an Office of Personnel Management (OPM) publication [10] described the two plans as a way to assist employees considering a switch during the 1998 open transfer season.

In contrast, FERS is a three-tiered retirement plan. It includes Social Security, a defined-benefit component, and a defined-contribution component called the Thrift Savings Plan (TSP). In a defined-contribution (or "pay in") plan, companies promise to contribute a certain amount but make no assurances as to the final payout.

Both CSRS and FERS require employee contributions. Employees covered under CSRS generally pay 7 percent of their salaries toward program costs. Employees covered under FERS, however, must make a small contribution to the defined-benefit component (less the 1 percent) and pay Social Security taxes on their earnings (currently 6.2 percent). TSP contributions are voluntary, but, of course, the value of the plan depends on what you contribute. The government matches employee's TSP contributions of up to 5 percent of their salaries. The Federal Tax Code limits the amount of additional, unmatched contributions.

Several differences between the FERS and CSRS plans may influence retirement behavior:

- FERS's defined-contribution component creates different incentives because contributions are voluntary and retirement income is subject to how employees manage their money and to market conditions.

- Federal employees under the FERS plan become fully vested in their retirement plan after 5 YOS. Vesting gives FERS employees greater flexibility in changing employers without losing retirement benefits. Under CSRS, if employees leave the federal service before becoming retirement eligible, they may lose all of the retirement benefits they have accrued.

- FERS includes Social Security benefits. Introducing Social Security into the retirement plan adds another set of financial incentives. For example, people have an incentive to remain employed until they reach the age benchmarks at which they qualify for partial or full Social Security retirement benefits.

- CSRS computes benefits based on earnings in the last year of employment, while FERS uses the average of 3 years in which earnings were the highest. Depending on a person's

earnings profile, this change may make FERS benefits more or less generous than CSRS.

FERS implementation and differences in retirement-eligibility policies

Since our model includes an analysis of how changes in retirement-eligibility rules affect retirement behavior, we must understand what these rules are. In addition, we need to refine our definitions of the FERS and CSRS populations.

Under both retirement plans, employees become eligible for benefits based on age and YOS. In addition, both plans base the age for receiving full retirement on whether employees have met certain YOS milestones.[12] CSRS employees qualify for immediate retirement benefits (an annuity beginning within 30 days after retirement) if they are 55 with 30 YOS, 60 with 20 YOS, or 62 with 5 YOS. If employees leave federal service before meeting the age and service requirements for immediate benefits, they may be eligible in some cases for deferred benefits.

The retirement-eligibility rules for FERS are similar, except the plan includes a Minimum Retirement Age (MRA) that allows employees to retire with reduced benefits when they reach the MRA if they have at least 10 YOS. The MRA gradually increased from 55 to 57 as dates of birth rose from 1947 to 1970. FERS employees receive full, immediate retirement benefits if they are at the MRA with 30 YOS, if they are 60 years old with 20 YOS, or if they are 62 years old with 5 YOS. If employees retire at the MRA with at least 10 but less than 30 YOS, they receive a reduced benefit.[13] Time spent in the active-duty

12. See [8, 9, or 10] for detail on the YOS milestones and the many variations and exceptions to the policy. We limit our discussion to the policy aspects that are most relevant to our analysis.

13. References to "early retirement" from the civil service are generally a misnomer. Strictly speaking, the civil services' early retirement programs are available in certain involuntary separation cases and in cases of voluntary separations during a major reorganization or reduction in force. FERS introduced the possibility of getting reduced retirement benefits for employees at the MRA who have less than 30 YOS.

military sometimes counts toward YOS; we will discuss this in more detail later.

The retirement-eligibility rules may affect FERS employees differently than CSRS employees because they apply only to the defined-benefit portion of their retirement package. In particular, early- to mid-career personnel, who are vested in their defined-contribution benefit and have paid into Social Security, may feel less of a pull to remain in federal employment until they meet one of the YOS milestones.

The shift in the proportion of federal employees covered under the two plans is occurring gradually as people hired since 1984 and people who switched plans become a greater portion of the workforce.[14] Starting in 1984, almost all civil service accessions have been covered by FERS. In addition, federal employees hired before this date could choose to convert to FERS during two different windows in 1987 and 1998, although it appears that the number of conversions was low. According to [11], about 4 percent of CSRS employees chose to convert during the 1987 open season. Given the scarce conjecture and evidence regarding the 1997-98 open period, the switch rate was probably lower than 4 percent then.[15]

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14. We report FERS and CSRS coverage statistics for our Navy civilian sample in a subsequent section.

15. Reference [11] reported that about 4 percent of eligible employees transferred from CSRS to FERS during the first open season—1987. There is less information about how many workers switched plans in 1998. Recognizing the difficulty of predicting the transfer rate, the authors of [11] used hypotheses of 1-, 5-, and 10-percent switch rates in their calculations of the cost of the transfer program. They based the 1-percent rate on a Congressional Budget Office assumption, the 5-percent rate on the results of the 1987 program, and the 10-percent rate on reported speculation that large numbers of eligible employees would switch. The authors of a RAND study [9], however, conclude that fewer people would have a financial incentive to switch in the 1997-1998 period than in 1987. If this conclusion were true, the switch rate in 1997-1998 would have been lower than the 4 percent observed in 1987. The only evidence we were able to locate on actual transfers was from a report by the Postal Service that less than 1.2 percent of their employees chose to change plans (USPS http://www.usps.com/history/anrpt01/financial/note6.htm).

Literature on how the shift to FERS affects retirement behavior

Previous studies have examined how retirement behavior responds to the shift from CSRS to FERS. We also estimate an econometric model of the effect of the plan change on retirements and discuss our results in detail in a following section. In some cases, our results reinforce prior findings; in other cases, we find inconsistent results. Some of these differences may be caused by differences in samples, theoretical models, or estimation technique. In this subsection, we will refer ahead to some of our results and point out salient differences with previous studies.

Policy-makers reformed civil service retirement policy for several reasons, two of which we discuss in detail. First, they wanted to include federal employees in the Social Security system after it underwent substantial changes in the 1980s. If civil service retirees did receive Social Security benefits, however, the policy-makers had to eliminate windfall benefits that would accrue to CSRS retirees who went on to qualify for Social Security benefits. Second, the government adopted FERS to address a perceived problem that economic incentives in CSRS produced undesirable turnover and retirement behavior. In particular, some felt that CSRS produced low turnover in the middle of careers and caused senior personnel to retire as soon as they became eligible [12]. One author claimed that the proposed reform, which eventually became FERS, would "substantially alter the retirement incentives of the current system, completely eliminating the existing incentive to retire as soon as full eligibility is attained" [13].

To investigate the hypotheses that FERS would change the resignation and retirement behavior of federal employees, a RAND study simulated and compared expected lifetime wealth under FERS and CSRS at each leaving age for a typical employee [9]. The authors then used the simulation model to compare FERS and CSRS in terms of which was more generous, what retirement age incentives they embedded, and whether FERS had stronger separation incentives for mid-career and senior personnel. The researchers also analyzed the incentives for switching from FERS to CSRS during the open seasons.

Broadly speaking, the RAND study concluded that expected lifetime wealth is higher under FERS than under CSRS under a variety of assumptions.[16] The study also found that the FERS and CSRS embed identical retirement age and YOS incentives. In other words, their simulation showed that people maximize their expected net lifetime wealth at the same age and YOS under both retirement plans. The authors concluded that the only notable change in retirement behavior is caused by the increase in the MRA from age 55 to 57.

The study did find differences, however, in the possible variation of retirement ages around the wealth-maximizing age. In particular, FERS employees who leave before or after the wealth-maximizing age do not suffer as much of a penalty as CSRS employees. The penalty is lower for employees leaving before the wealth-maximizing retirement point because FERS offers better inflation protection and allows partial retirement pay with less tenure. Those who leave after the optimal age suffer a lower penalty because total retirement benefits under FERS increase more with YOS and earnings than do benefits under CSRS. Thus, although the average optimal retirement age is the same for both plans, the authors surmise that there may be more variation in retirement ages for FERS employees.

The analysts found more differences between FERS and CSRS employees in separation behavior than in retirement behavior. In particular, they concluded that, on one hand, FERS employees have a stronger incentive to stay in the civil service in their early- to mid-career years, presumably because they are vested in their pensions. On the other hand, the incentive to stay is weaker for employees who are nearing retirement. The stronger incentive to stay for early- and mid-career personnel is dependent on the assumption that FERS benefits are relatively more generous than CSRS or private-sector retirement plans.

In their empirical results, the authors of [9] do not find evidence that FERS changes the retirement behavior of mid-career and retirement-eligible people. In contrast, as their simulation model

16. Other studies have reached different conclusions about the generosity of FERS, CSRS, and private-sector retirement plans. We discuss these comparisons in a subsequent section.

predicts, younger people covered by FERS have greater probabilities of staying. Their empirical results show that FERS reduces the average separation rate by 2 percentage points, from 4.4 percent to 2.2 percent. This difference is both large and statistically significant. The authors could not test hypotheses regarding separation incentives for later-career personnel, however, because too little time had elapsed for anyone to complete an entire career under FERS.

Comparing our empirical results with the predictions from the simulation model in [9], we find several differences in the retirement behavior of FERS and CSRS employees. We support the hypothesis of their simulation results that personnel under the CSRS plan have little incentive to stay in the civil service once they become eligible for retirement. Unlike their simulations, however, we find that Navy civilians between the ages of 59 through 63 who switched to FERS are less likely to retire than the comparison group. In addition, FERS employees have a spike in retirements at ages 61 to 63—most likely because FERS retirees are eligible for Social Security benefits while CSRS retirees are not.

Relative value of FERS and CSRS retirement benefits

The relative values of FERS and CSRS pensions may also affect retirement behavior. In [9], the authors argue that FERS's benefits exceed CSRS's under a wide variety of conditions and that both exceed the value of most private-sector pensions. Higher expected retirement benefits would increase continuation rates for federal employees and increase average tenure. In addition, we would expect the average tenure to be even higher under FERS if it is more lucrative than CSRS.

Other sources, however, have argued that, while FERS benefits are higher for most people, they do not exceed CSRS benefits for all individuals [11 and 14]. In addition, tools designed to allow employees to make informed decisions about switching into FERS during open enrollment periods incorporate a number of factors that determine the relative value of the plans for each person [10]. Some of the factors that influence differences in the value of FERS and CSRS are age, YOS, salary histories, return on investments, the rate of inflation after retirement, and expected ages of retirement and death.

The incentives and relative values of civil service and private-sector retirement plans

Differences between the structure and benefit levels of civil service and private-sector retirement plans affect retirement rates. Since federal pensions reward higher tenure, we expect lower turnover and more people staying until the retirement point. In addition, more lucrative overall benefits may reinforce a tendency for retirements to be concentrated around retirement eligibility points. Retirement behavior may also be influenced by interactions between civil service and private-sector retirement policies because some civil service retirees go on to jobs in the private sector.

Structures and incentives

Reference [15] argues that civil service pensions, which offer qualification for full retirement benefits to people who have sufficient YOS, will result in different workforce age distributions than Social Security or private pensions. In particular, since civil service pensions are based on YOS, once people have been federal employees for a number of years, they will have an incentive to stay. Social Security and private pensions, however, are not based on years with a single employer, so there is no incentive stay with one employer. As a result, the civil service will tend to retain more employees until they are relatively senior. This pattern is consistent with figure 1, which shows that the civil service workforce has a higher percentage of workers who are 50 or older than does the private sector.

Merely having an older age distribution than the private sector, however, does not indicate that the higher retirement rates associated with an older workforce represent a crisis. Instead, the steady-state outcome of a retirement plan that rewards longer service is a more senior workforce. The only problem would come if there were an increase in the retirement rate among people who are eligible for retirement. This is why our econometric model focuses on the retirement-eligible population.

The long-term effect of the switch from CSRS to FERS on the relative age distributions of civil service and private sector workers is uncertain. In general, differences in retirement incentives between

civil service and private-sector workforces will lessen as more people retire under FERS since FERS includes Social Security and defined-contribution benefits. FERS will still have a defined-benefit component with a YOS reward, but we can expect this to play less of a role in retirement incentives. The authors of [9] simulated that, relative to CSRS, retention incentives would be higher for low- and mid-grade employees and lower for employees later in their careers and those nearing retirement. If this is so, the federal employees' and private-sector workers' age distributions should become more similar over time as higher retirement rates balance higher accession and retention rates among young and mid-career personnel. The effect, however, probably varies greatly by occupation, since some jobs require institutional knowledge and skills that only senior personnel can provide.

Relative value

In addition to the effect of plan designs, retirement decisions are influenced by the value of benefits. In general, the literature contains a consensus that civil service pensions are more generous than private-sector pensions, although the authors all point out the difficulties of making comparisons [15, 16, and 17]. Among the greatest obstacles to making valid comparisons is the diversity in private retirement plans. The studies use surveys of hundreds of employers, mostly large firms, and try to construct some typical plans. The authors also point out that the comparisons only include private-sector workers who have employer-sponsored retirement plans. According to one survey, 40 percent of all employees had no retirement coverage [16].

The Congressional Budget Office (CBO) prepared comparisons for five hypothetical employees with different ages and YOS by making assumptions about employee behavior, rates of inflation, and other factors [15]. They chose assumptions that would produce the highest federal benefit amounts to make it simpler to reject claims that federal benefits are more generous than those in the private sector. Comparing the annual value of retirement benefits, they found that FERS was 30 to 40 percent greater than the private sector. CSRS did not perform as well, generally being of a value comparable to private-sector benefits. There were several reasons for the federal

plan's relative generosity, among which were that only 8 percent of the private plans provided the kind of automatic postretirement cost-of-living adjustments found in FERS and CSRS. In addition, only about 15 percent of the private plans allowed employees to retire with full pensions at age 55 with 30 years of service, as federal employees are able to do.

The CBO study also compared other benefits, such as health insurance, retiree health insurance, and leave policies. Overall, given the limitations of making comparisons, the authors conclude that federal employees' benefits may exceed private-sector employees' benefits by about 7 percent. They go on to point out that, while in some fields these generous benefits may make government employment attractive, in many occupations the benefits may not make up for a pay gap between federal and private-sector employment.

A problem with using generous benefit packages to compensate for pay differentials is that some pays can vary by occupation, while benefits cannot. Limited variation across occupations can then cause shortages in some fields. Especially when retirement plans are designed with specific retirement age incentives, as is the case with federal employees, uniformity across occupations can create problems. This is because the same age or YOS profile is not optimal in all occupations. In the subsequent section on communities that have the highest probability of manning shortages caused by retirements, we will discuss how age distributions and retirement behavior have produced problems in some communities but not in others.

The effect of demographic characteristics

Some researchers have hypothesized that demographic characteristics, such as gender and minority status, may influence retirement decisions. In this subsection, we discuss how the demographics of the civil service workforce have changed and the probable effect of these changes on retirements. Studies of retirement behavior among civil service personnel in DOD, the entire federal government, and the private sector have shown consistent results by

gender and suggestive, but more mixed, results by race and ethnicity.[17] In virtually every study, quit rates and retirement rates are higher for women, with large and statistically significant effects [7 and 9]. The same studies found that nonwhites have lower quit and retirement rates than whites, but the results are not uniform and not always statistically significant. Our empirical results also indicate that women are more likely to retire while minorities are less likely to retire.

There are two broad hypotheses regarding why retirement behavior may differ by demographic group. In general, the first set of arguments has to do with differences in levels of attachment to civil service jobs. Tastes for leisure, the need to perform functions outside the workplace, the desire for job security, and attitudes toward public service may differ based on such demographic characteristics as age, marital status, education, gender, and race or ethnicity. Reference [18] finds that women, minorities, and more educated people were more likely to be government employees than their counterparts, after controlling for other characteristics. If people in these groups are more likely to remain government employees until they reach retirement eligibility, their actual retirement behavior may be different.

The second hypothesis regarding differences in retirement behavior based on demographic characteristics involves pay differences between the public and the private sector. Although women and minorities still earn less than comparably educated and experienced white men in the federal service, the white male pay advantage is smaller in government than in the private sector [19 and 20]. This is likely the result of the governments' older and better enforced bans on discrimination against women and minorities. Consequently, members of "protected" groups (minorities, women, and veterans) may be more likely to work for the government than whites, men, and nonveterans with similar characteristics [21]. As a result, continuation and retirement incentives will differ depending

17. Some of the earliest studies of retirement behavior included white males only. For example, [18] uses a sample of 1,500 salesmen aged 50 and over in Jan 1980.

on the pattern of pay differences and the likelihood of seeking post-retirement employment.

Differences in accession cohorts

Another factor that receives attention in the literature regarding civil service retirements is how the composition of cohorts approaching retirement age may affect retirement behavior. In the private sector, where turnover is higher, people who are retiring from a single employer at a point in time may have joined that employer over a wide range of years. In the civil service, however, turnover is much lower, especially after the mid-career point. Because of the low turnover, a higher percentage of people who retire at the same time will have served their federal employment careers over the same period of time. For this reason, the characteristics of entire cohorts may influence retirement behavior.

Cohorts may differ for a number of reasons:

- Characteristics of accession cohorts may vary over time due to changes in
  - — Attitudes toward civil service or the government
  - — Pay differentials between civil service and private sector jobs
  - — The size of a generational cohort (e.g., Baby Boomers).
- Characteristics of people who remain in civil service until retirement may vary over time due to changes in
  - — The type or number of people the government needs to employ
  - — Economic conditions that influence decisions to remain in civil service.

In particular, the factors affecting accession cohorts that are currently approaching retirement are the "Crisis in Civil Service" that took place during the late 1980s, large pay gaps between government and private-sector jobs around the same time, and the movement of the Baby Boom employment bulge toward retirement [22].

In addition, as these accession cohorts moved through their careers, they were affected by the downsizing of the federal workforce in the 1990s, changes in pay gaps, and changes in private-sector unemployment rates. Several articles discuss decreases in the desire to work for the government jobs in the late 1980s [23, 24, and 25]. The authors attribute the declining inclination to enter the civil service in general, and the DOD civil service in particular, to changing attitudes toward the government. Another cause might have been that civil service pay was especially low at that point, particularly for professional and administrative positions [4 and 28].

Compounding the difficulties with accessions, the federal workforce downsizing changed the size, shape, and characteristics of the civil service [1]. The size of employment cuts was larger in some occupations, and retirement behavior differs across occupations. In addition, some of the downsizing was accomplished through early retirement buyouts, and there were probably differences in the characteristics of people who accepted the buyouts versus those who did not. Taken together, different accession, retention, and retirement conditions and policies may have resulted in the current retirement-eligible population having different characteristics than earlier cohorts. Some of the characteristic differences may, in turn, have caused differences in retirement behavior.

Reference [4] found that, controlling for occupation group, federal employees in 2005 were older, better educated, and more highly paid than in the past.[18] The authors point out that in comparing education levels, it is important to control for the employee's occupation. In 2005, about two-thirds of federal employees were in professional and administrative occupations, and that proportion has increased over time. When the CBO analysts compared new hires with current employees, recent retirees, and people who had resigned, they found that recent hires tend to be more highly educated, on average, than either current employees or recent retirees. Similarly, full-time permanent employees who have resigned from federal service tend to be more highly educated than current em-

18. These statistics are for full-time, permanent employees and exclude employees of the Postal Service.

ployees are, although not as highly educated, on average, as newly hired workers.

Results of other studies of retirement behavior

There have been many econometric studies of retirement behavior using different populations, different theoretical models and different estimation techniques. Some of these studies contribute to our understanding of the issues addressed in this paper—in particular, how increased retirements relate to manning shortages and ways to mitigate shortages. Most of the studies have estimated responses of private-sector employees to Social Security benefits, Medicare, or private pensions.[19] There have been, however, a few studies of the civil service workforce and military retirees.[20]

In a 2005 study, researchers examined how the retirement behavior of federal civil service workers responds to financial incentives [7]. The study was motivated by general concern regarding the solvency of entitlement programs, such as Social Security and Medicare. The authors present evidence that, because the U.S. population is aging, the ratio of people paying into Social Security relative to people receiving benefits has fallen steadily since 1955 and will continue to fall. Their study addresses whether entitlement programs might remain solvent if the financial incentives embedded in retirement plans were changed. To analyze this question, the researchers develop and estimate an econometric model of how retirees' behavior responds to financial incentives and other policies.

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19. Reference [26] was a seminal work on financial incentives and retirement behavior and [27] provides a survey of other studies conducted before 1990. More recent studies include [28, 29, and 30]. In addition, the National Bureau of Economic Research (NBER) has published a series of books, edited by David A. Wise, on the economics of aging and retirement.

20. The authors of [7] analyze the effect of the CSRS. Some studies, such as [31 and 32], consider the effect of military pensions on uniformed personnel. Military pensions have so many distinct features, however, that comparisons of civil service to private-sector personnel may be more appropriate.

The authors used data on DOD civil service workers covered by CSRS to analyze retirement behavior. They focused on this group because it is relatively easy to calculate retirement benefits under CSRS, and DOD keeps a centralized database that facilitated the analysis. One of the researchers' main results suggests that federal employees respond to financial retirement incentives in a manner that is similar to that of private-sector workers. That is, the responsiveness of retirement rates relative to benefit levels is statistically significant and of roughly the same magnitude. This result is useful because it gives researchers more confidence when predicting how federal employee retirement behavior will respond to changes in retirement plans.

In the field of civil service and military exit behavior, there have been many more studies of retention decisions than retirement decisions.[21] Because of similarities between models of retirement and retention decisions, the consistent findings regarding responses to financial incentives are of note. In addition, researchers can benefit from comparing the methodological and estimation techniques used in both retention and retirement studies. A review and analysis of econometric techniques is beyond the scope of this study, however.

One study argued that the force-shaping tools, such as early retirement policies, could induce higher separation rates among mid- to late-career personnel. If moving from CSRS to FERS was not an effective means of increasing turnover in the desired age range, using force-shaping tools would be an alternative. The Voluntary Separation Incentive Pay (VSIP) and other tools give the government authority to pay bonuses to people who agree to leave government employment (or military service) before they reach retirement age. To assist with the federal employee downsizing program, 141,000 civil servants received separation incentive pays between 1993 and 1999 [1]. While the authority for VSIP is still in effect, policy

21. Reference [33] considers the job separation of federal employees. A study of the retention of defense civil service workers adds a dimension of setting reenlistment benefits so that the highest quality employees are retained [34]. Surveys of the literature on econometric models of military retention are given in [35 and 36].

restricted the use of buyouts to 2,000 employees in FY 2002 and to 6,000 in FY 2003. These restrictions are quite small given that the DOD has about 400,000 retirement-eligible employees.

Inducing higher separation rates among mid- to late-career personnel would create openings for more junior personnel and help recruitment by increasing advancement opportunities. Several data sources confirm that turnover rates are much lower among federal employees than among private-sector workers. For example, BLS data for September 2005 to August 2006 show that the turnover rate for federal employees was 9.3 percent, compared with 23.4 percent for all U.S. workers. This turnover rate is for employees of all ages; once federal employees reach 41, their annual separation rate is only 2 to 3 percent [1]. Reference [13] documents the persistence of lower turnover rates among federal employees and discusses causes of the discrepancy.

Reference [1] examined the predicted effect of retention allowances, buyouts, and early retirement benefits on CSRS retirement behavior. The authors found that retirement decisions responded greatly to financial incentives. During the drawdown, the maximum retention allowance reduced the estimated incentive to retire by 60 percent while the retirement rate among those eligible for optional retirement increased by 20 percent.

The authors of [37] found that uniformed personnel also respond strongly to the same early separation incentives. Military personnel, like federal employees, have pensions that induce low turnover rates as YOS approach retirement eligibility milestones (20 years in the military). Evidence of the effectiveness of force-shaping tools for military personnel, then, reinforces the conclusion that incentive pays could increase turnover among mid- to late-career Navy civilians.

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Characteristics of the Navy civil service workforce

In this section, we discuss our investigation into characteristics of the Navy civil service workforce that are relevant to retirement behavior. After describing our data set, we present statistics describing demographics, education, age, retirement eligibility, and plan coverage. We pay particular attention to changes over time.

Data

Our sample of Navy civil service personnel comes from the 1999-2008 Civilian Personnel Master File collected by the Defense Manpower Data Center (DMDC). These annual snapshots provide information on demographics, military experience, employment, earnings, and education among civilian personnel. The original sample contained 1.7 million observations on 280,000 Navy civilian personnel. For our analysis, we made some sample restrictions, as seen in table 1, that reduced the number of observations and individuals in our sample by 12 and 14 percent, respectively.

First, we excluded part-time employees, seasonal employees, and those who work less than 12 months per year since these groups are likely to have low labor force attachment and therefore different retirement behavior compared with the rest of the Navy civil service workforce. These personnel represent roughly 5 percent of Navy civil service personnel in the sample. Second, we exclude employees who are not covered by either the CSRS or FERS retirement program since these personnel will face different retirement incentives than personnel covered under CSRS or FERS. This represents 3 percent of individuals in the sample. Finally, we drop employees who have invalid YOS since we need information on YOS to predict retirement eligibility. This group represents 6 percent of individuals in the sample. After making these sample restrictions, we retain 86 percent of individuals and 88 percent of observations from the

sample. Our sample is evenly distributed across fiscal years 1999 through 2008, as shown in table 2. The decrease in our sample size from FY 1999 through FY 2007 is consistent with the overall DOD downsizing, as we discussed earlier.

Table 1. Sample size after sample exclusions, FY 1999-2008

	Observations	Individuals
DMDC raw data	1,662,679	279,449
Part-time employees	-17,104	-3,815
New sample size	1,645,575	275,634
% of raw data	99%	99%
Seasonal employees	-14,817	-2,517
New sample size	1,630,758	273,117
% of raw data	98%	98%
Employees who work less than 12 months per year	-50,689	-8,859
New sample size	1,580,069	264,258
% of raw data	95%	95%
Employees not covered by CSRS or FERS	-15,590	-6,364
New sample size	1,564,479	257,894
% of raw data	94%	92%
Employees with invalid YOS	-104,680	-17,089
New sample size	1,459,799	240,805
% of raw data	88%	86%

Table 2. Sample size by fiscal year

Fiscal year	Sample size
1999	156,674
2000	151,704
2001	148,977
2002	149,886
2003	148,170
2004	144,592
2005	140,757
2006	138,554
2007	137,865
2008	142,620
Total	1,459,799

Characteristics of Navy civilian retirees

In this subsection, we use the dataset just described to examine differences over time in the characteristics of Navy civilians. Where there was little change over time, or a more detailed examination of a particular group is warranted, we also look at data from FY2008, the most recent year of data in the sample.

Military experience

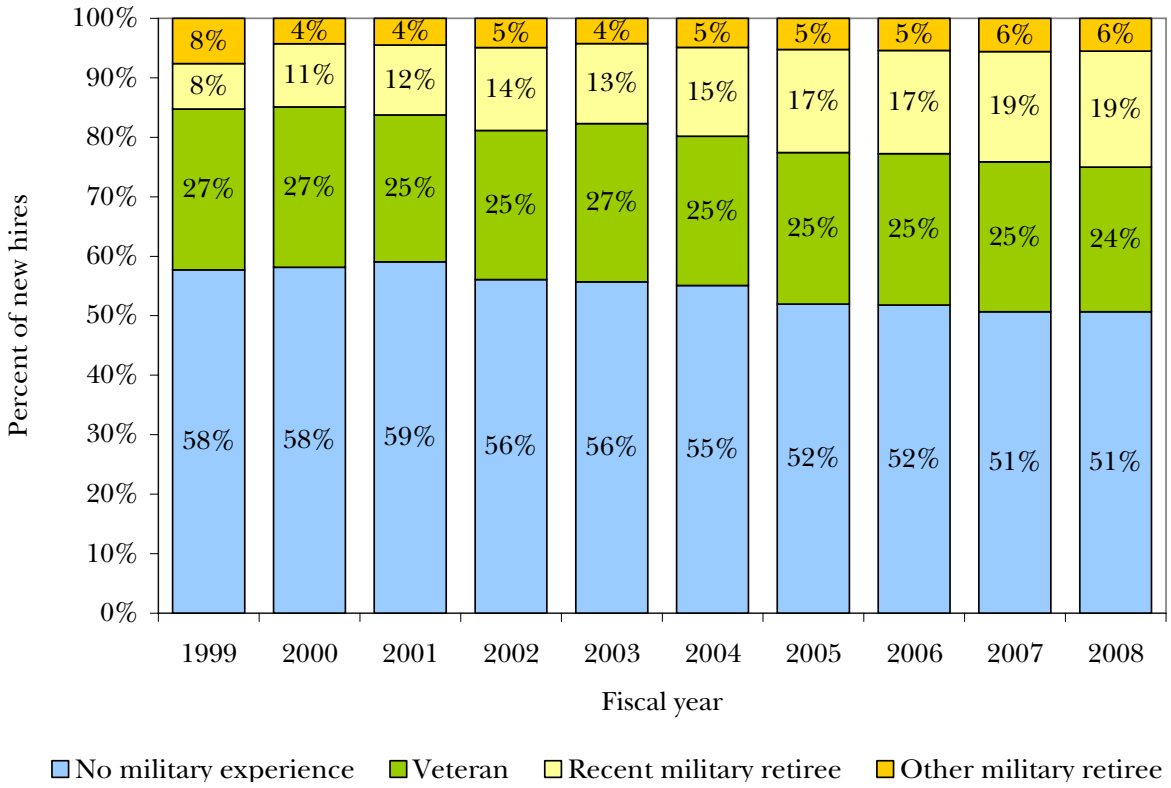
As we discussed in the background section, policies affecting the civil service employment of Navy retirees have changed. Given this, we examine whether there has been a change in the share of Navy civil service personnel that are military retirees. We also examine whether there has been in change in the share of Navy civil service personnel that have military experience but left the military before they retired—a group we refer to as veterans.

For our analysis, we group Navy civil service personnel into four mutually exclusive categories based on military experience. The first category consists of personnel with no military experience, and these personnel represent about one-half of our sample. The remaining inventory is divided into three categories: veterans, recent military retirees (those who retired from the military within the past 5 years), and other military retirees. In 2008, among the 49 percent of Navy civil service personnel that have military experience, 66 percent were veterans, 14 percent were recent military retirees, and 20 percent were other (not recent) military retirees.

The distribution of military experience among personnel in the Navy civil service workforce has remained relatively stable during 1999 through 2008, but our data suggest that this may change in the future. Since 1999, the beginning of our sample, personnel who enter the Navy civil service during a year represent roughly 6 percent of the overall Navy civil service workforce in that year. Among these new hires, the share that is recent military retirees has increased substantially since 1999, while the share that has no military experience has declined. As shown in figure 2, the share of new hires that has no military experience dropped by 7 percentage points over the

sample period—from 58 in 1999 to 51 in 2008. The share of new hires that are recent military retirees, however, increased by 11 percentage points, from 8 percent in 1999 to 19 percent in 2008. Over the same period, the shares of new hires who are veterans and other military retirees remained relatively constant.

Figure 2. Military experience among Navy civilian new hires, FY 1999-2008



Demographic characteristics

The demographic characteristics of Navy civil service personnel differ considerably over time and by military experience. These differences are relevant to our analysis if demographic characteristics turn out to be significant determinants of retirement propensity in our statistical model. For example, if women are more likely to retire and the workforce is becoming increasingly female, one would expect retirement rates to increase, all else constant.

Gender

The percentage of the Navy civil service workforce that is male varies considerably by military experience and over time. For example, veterans and military retirees are more likely to be male relative to personnel with no military experience. Indeed, in 2008 no less than 90 percent of Navy civilian personnel who were veterans or military retirees were male, compared with only 60 percent of Navy civilian personnel with no military experience. The same is not true, however, among new hires. While the male percentage remains at or above 90 percent for military-retiree new hires and at 60 percent for new hires with no military experience, the percentage among new hires who are veterans is only 80 percent.

It is unclear what will happen to the male percentage in the overall Navy civilian personnel inventory over time. On one hand, Navy civilian hiring is shifting away from personnel with no military experience (who are relatively less likely to be male) and toward personnel who are recent military retirees (who are relatively more likely to be male). On the other hand, while veterans have made up an unchanging share of new hires over the sample period, newly hired veterans are considerably less likely to be male relative to the veterans who are already a part of the Navy civilian workforce. Therefore, we cannot predict whether the percentage of the Navy civilian workforce that is male will rise or fall in the coming years.

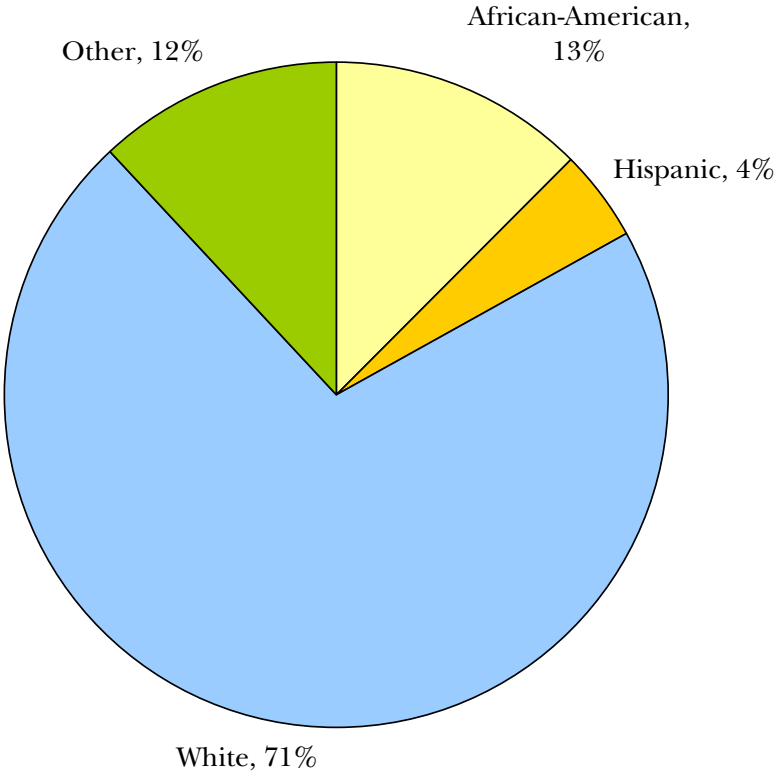
Race and ethnicity

The racial and ethnic makeup of the Navy civil service (and of new hires) has remained relatively constant over the sample period. Figure 3 shows the distribution of race and ethnicity among Navy civilian personnel in 2008. The vast majority of the inventory is white (71 percent), while 13 percent is African-American, 4 percent is Hispanic, and 12 percent is from other racial or ethnic backgrounds.[22] When we narrow our focus to new hires and look by military experience, however, we find that new hires who are veterans and recent military retirees are more likely to be of minority descent

22. This includes Asian/Pacific Islanders, Native Americans, and people who report more than one race.

than other new hires. If the pattern toward hiring personnel who recently retired from the military instead of personnel with no military experience persists, these data suggest that the Navy civil service is likely to become increasingly nonwhite in the future.

Figure 3. Race and ethnicity among all Navy civilian personnel, FY 2008



Earnings and education

Figure 4 shows average annual earnings for all Navy civilian personnel and for new hires, from FY 1999 through 2008, in constant 2008 dollars. As we would expect, new hires have, on average, lower annual earnings relative to the entire inventory, regardless of military experience. Among personnel in the entire Navy civil service, those who have no military experience or who are veterans have the highest average annual earnings, which is consistent with these groups having the greatest average years of federal service experience. However, average annual earnings have risen over time for both recent and other (not recent) military retirees, while average earnings

have remained relatively flat for veterans. In fact, by FY 2008, average annual earnings grew enough for Navy civil service personnel who were military retirees to close the gap with earnings among Navy civil service personnel who were veterans. Among new hires, military retirees earn more on average than other new hires. This could be because, recently, an increasing proportion of civil service accessions who are recent military retirees have been officers rather than enlisted and officers would join the civil service at higher grades.

Figure 4. Average annual earnings among all Navy civilian personnel and new hires, FY 1999-2008 (constant 2008 dollars)

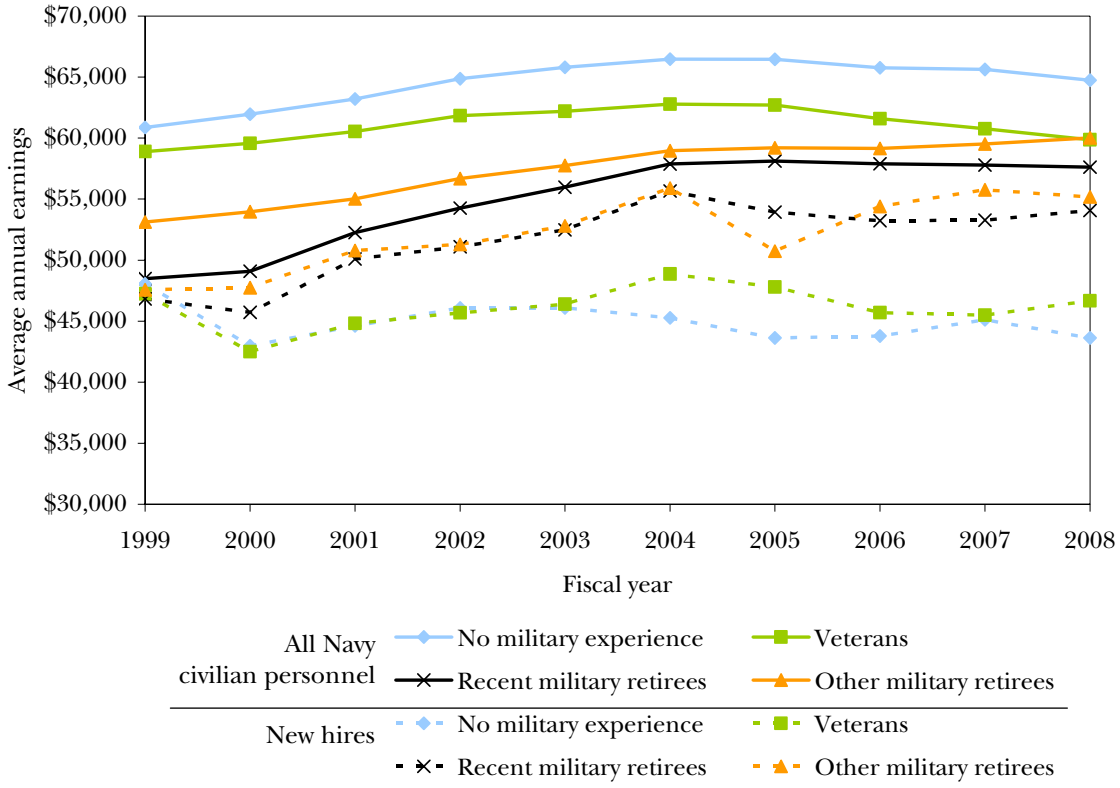
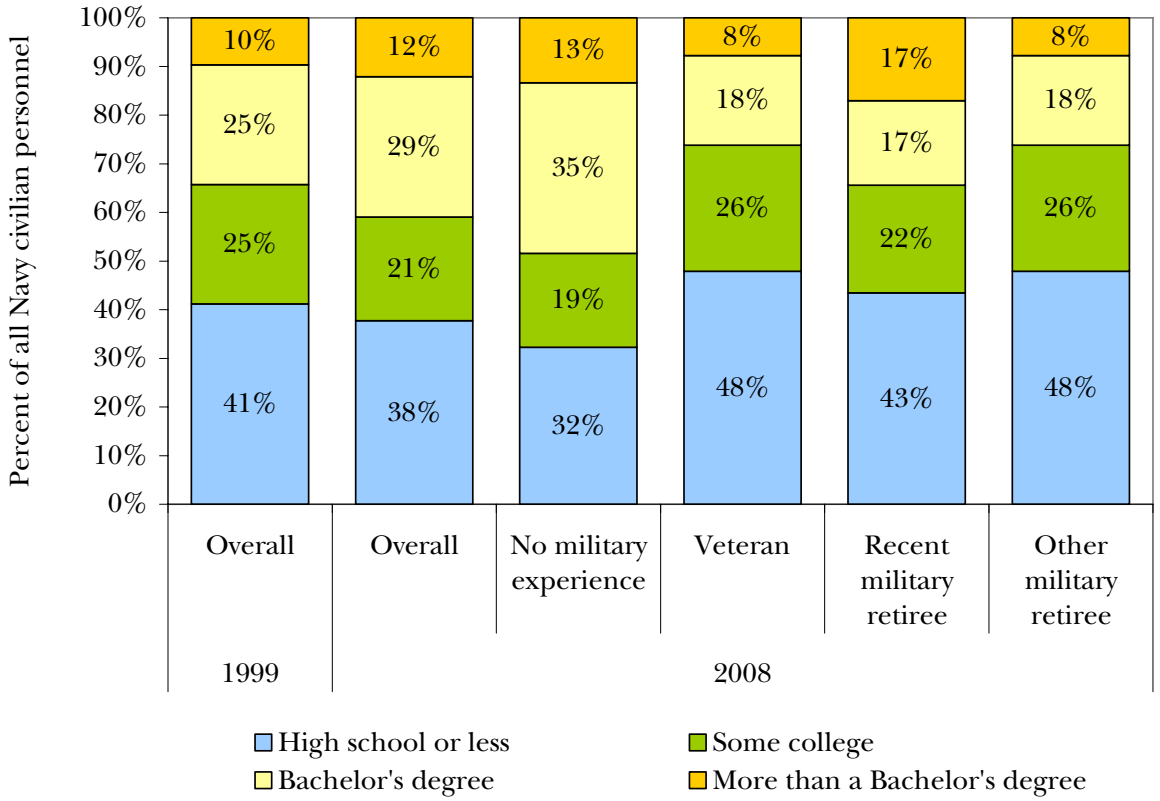


Figure 5 compares initial education levels among Navy civilians in FY 1999 and FY 2008. Here, "initial education levels" indicates that the education levels in our data correspond to the level of education of personnel when entering the Navy civil service.[23] As the figure shows, initial education levels among Navy civilian personnel have increased over time. Relative to FY 1999, a smaller share of the personnel who entered the Navy civil service in FY 2008 did so with a high school degree or less, while a larger share of the personnel who entered the Navy civil service in FY 2008 did so with a Bachelor's degree or more. Since we cannot observe final education levels, we can only surmise that personnel who entered the Navy civil service in FY 1999 did so with less education than did personnel who entered the Navy civil service in FY 2008. However, we remain agnostic on whether this gap persisted over time, since our data do not reflect increases in education over a Navy civil servant's career.

Figure 5. Education among all Navy civilian personnel, FYs 1999 and 2008



23. Since the education variable is not reliably updated over time in the DMDC data, we cannot analyze differences in final education levels.

We also find that initial education levels vary dramatically by military experience (figure 5). In FY 2008, personnel who entered the Navy civil service with no military experience did so with the most education; two-thirds had more than a high school degree, and one-half had a Bachelor's degree or more. This is consistent with our finding that personnel with no military experience have the highest average earnings (figure 4). Recent military retirees had the next highest initial levels of education, with 57 percent of the group holding more than a high school degree. Personnel who were veterans or other (not recent) military retirees had the lowest initial education levels, with only 52 percent of the group holding more than a high school degree. In results not shown here, we find that this pattern of initial education levels by military experience holds among new hires as well.

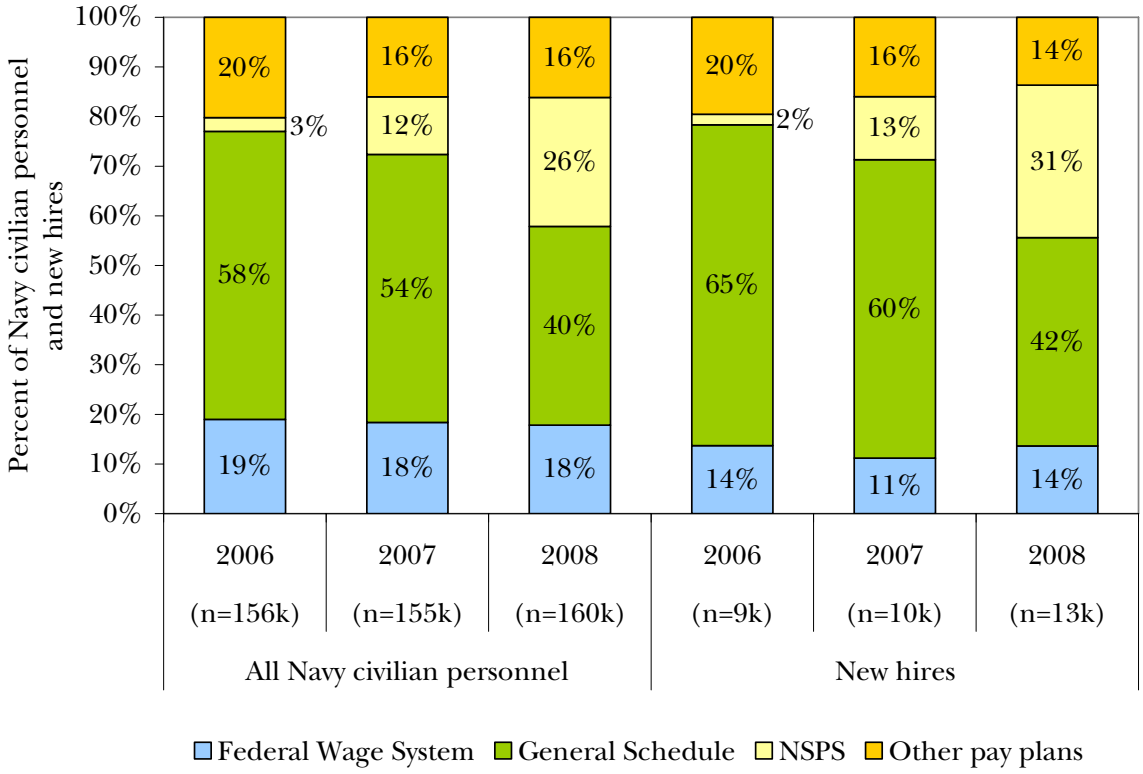
Pay plan, paygrade, and YOS

Over time, the distribution of the Navy civil service (and its new hires) across the various pay plans has changed substantially. As shown in figure 6, among the overall inventory and among new hires, in FY 2006 more than half of personnel were under the General Schedule (GS) pay plan, while less than 20 percent were under the Federal Wage System (FWS) and negligible shares were under the newest pay plan, National Security Personnel System (NSPS). By 2008, however, the shares of the overall inventory and of new hires that were under the GS pay plan had plummeted to 40 percent, while the shares that were under the NSPS pay plan had climbed to 26 percent, corresponding to the expansion of NSPS.

When we combine personnel across the FWS, GS, and NSPS pay plans, we find that newly hired Navy civil servants with no military experience are disproportionately hired into lower paygrades, relative to other new hires (figure 7).[24] Indeed, 37 percent of new hires with no military experience enter at the lowest paygrades, compared with 15 percent or less of veterans and military retirees.

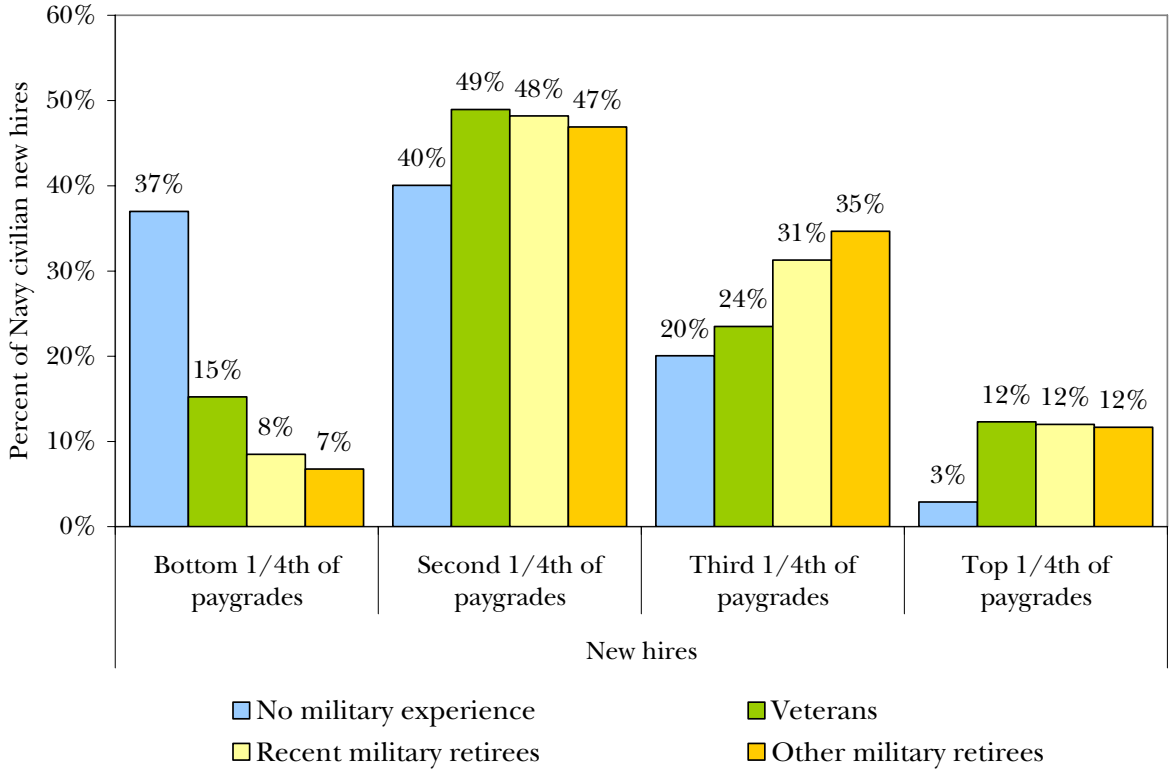
24. For the FWS and GS pay plans, the bottom 1/4th of paygrades are paygrades 1 through 4, the second 1/4th of paygrades are paygrades 5 through 8, the third 1/4th of paygrades are paygrades 9 through 12, and the top 1/4th of paygrades are paygrades 12 through 15. For the NSPS pay plan, there are only four paygrades, 1 through 4, so each 1/4th corresponds to just one paygrade.

Figure 6. Pay plans among Navy civilian personnel and new hires, FY 2006-2008



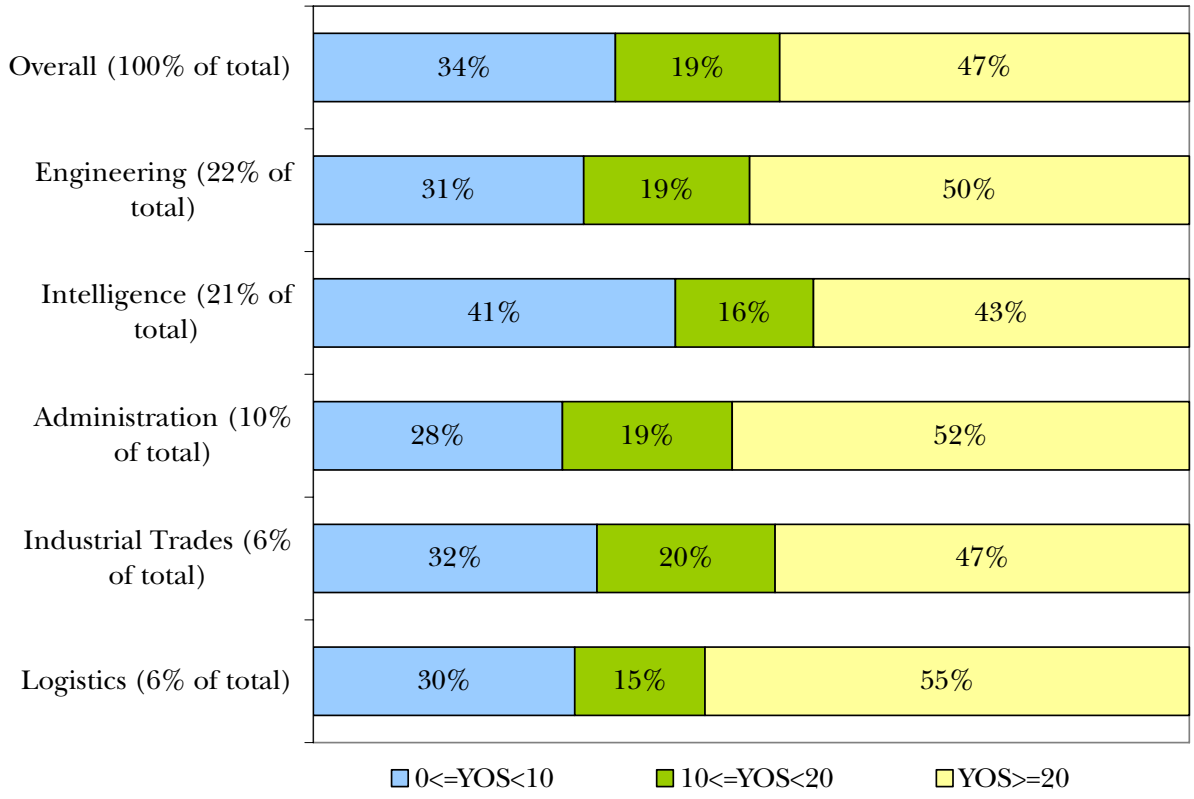
One possible explanation for new hires with no military experience entering the civil service at lower paygrades is that they have fewer YOS. However, we find that new hires with no military experience have on average 2 YOS, while new hires who have recently retired from the military have on average 1 YOS. Recall, though, that new hires who have recently retired from the military are hired in substantially higher paygrades than are new hires with no military experience (figure 7). This suggests that military experience, even in the absence of federal service experience, is rewarded with higher paygrades.

Figure 7. Paygrade distribution among Navy civilian new hires, FY 2008



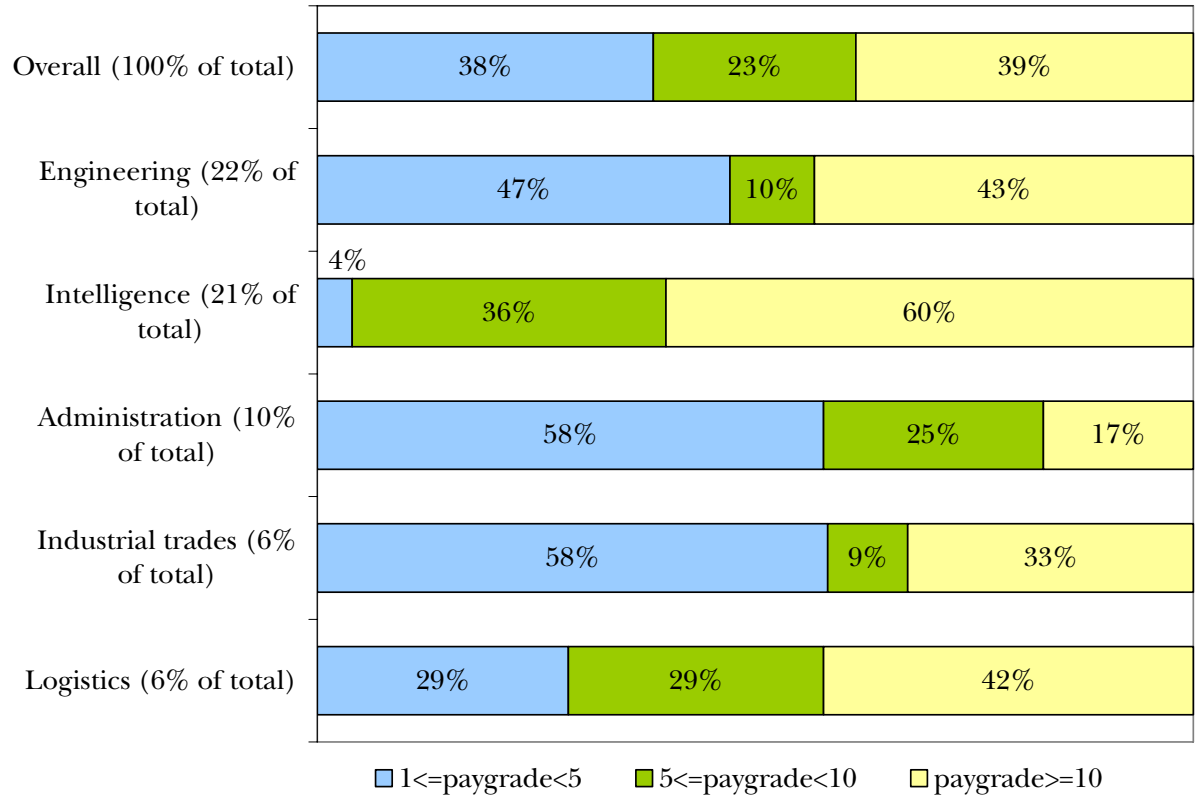
We also examine the distribution of YOS and paygrades by Navy community (figures 8 and 9). A community is a group of personnel that perform similar job functions and are overseen by a community manager. The communities included in figures 8 and 9 are those that make up more than 5 percent of the FY 2008 Navy civil service. As figure 8 shows, for each of these communities as well as for the overall workforce, the majority of FY 2008 Navy civilian personnel have at least 20 YOS, while only a small share have more than 10 but less than 20 YOS. This may pose a problem when the personnel with more than 20 YOS retire because there are relatively few Navy civilians in who can fill the vacancies, suggesting that the Navy will have to hire new employees or consider other workforce planning strategies to meet the manpower requirements in these communities. As the process continues of replacing retirees with younger workers, or mid-career workers from other industries, there will be a loss of the institutional memory embedded in the more senior workforce.

Figure 8. YOS distribution by Navy community, FY 2008



It is interesting to note, however, that the paygrade distribution across these communities varies widely (figure 9). For instance, the Intelligence community has a relatively senior paygrade profile, while the Administration and Industrial Trades communities have relatively junior paygrade profiles. Therefore, new hires into the Intelligence community to replace those who retire will be entering at much higher paygrades than new hires into the Administration and the Industrial Trades communities.

Figure 9. Paygrade distribution by Navy community, FY 2008



Force aging, retirement plans, and retirement eligibility

In the introduction, we discussed the potential for increasing retirements and experience gaps in the Navy civil service. In this subsection, we quantify the underlying changes in the age distribution, the prevalence of the various retirement plans, and retirement eligibility among Navy civil servants.

Age

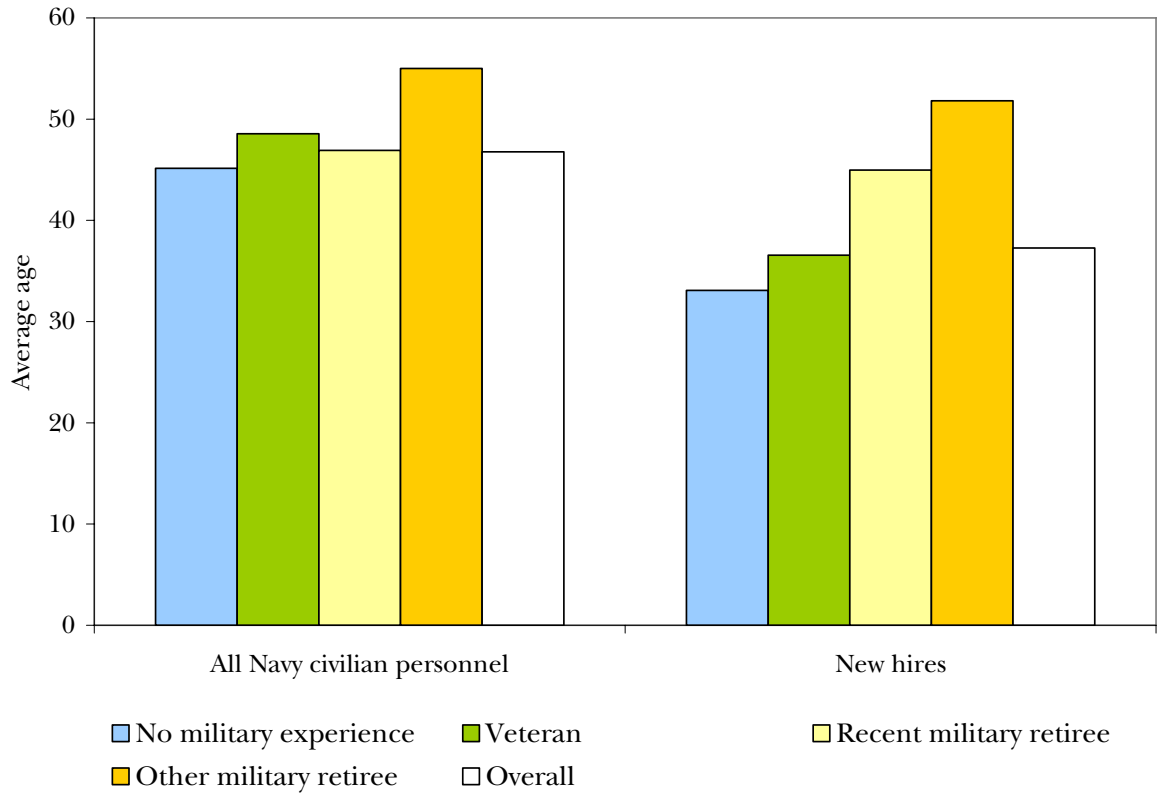
As was the case with race and ethnicity, the average age of Navy civil servants has remained relatively constant from FY 1999 through FY 2008. There are, however, substantial differences in age by military experience category. In addition, ages differ between new hires and the overall inventory. Figure 10 shows the following salient differences:

- The average age of all Navy civil servants is 47, compared with 37 for new hires.

- Other (not recent) military retirees are the oldest among Navy civil servants.
- Personnel with no military experience are the youngest among Navy civil servants.
- In the overall Navy civilian personnel inventory, veterans and recent military retirees have the same average age, whereas among new hires, veterans are substantially younger than recent military retirees are.

Given the shift away from hiring personnel with no military experience (who tend to be relatively young) and the shift toward hiring recent military retirees (who tend to be older), one might expect to see a rise in the average age of Navy civilian personnel in the future.

Figure 10. Average age among all Navy civilian personnel and new hires, FY 2008

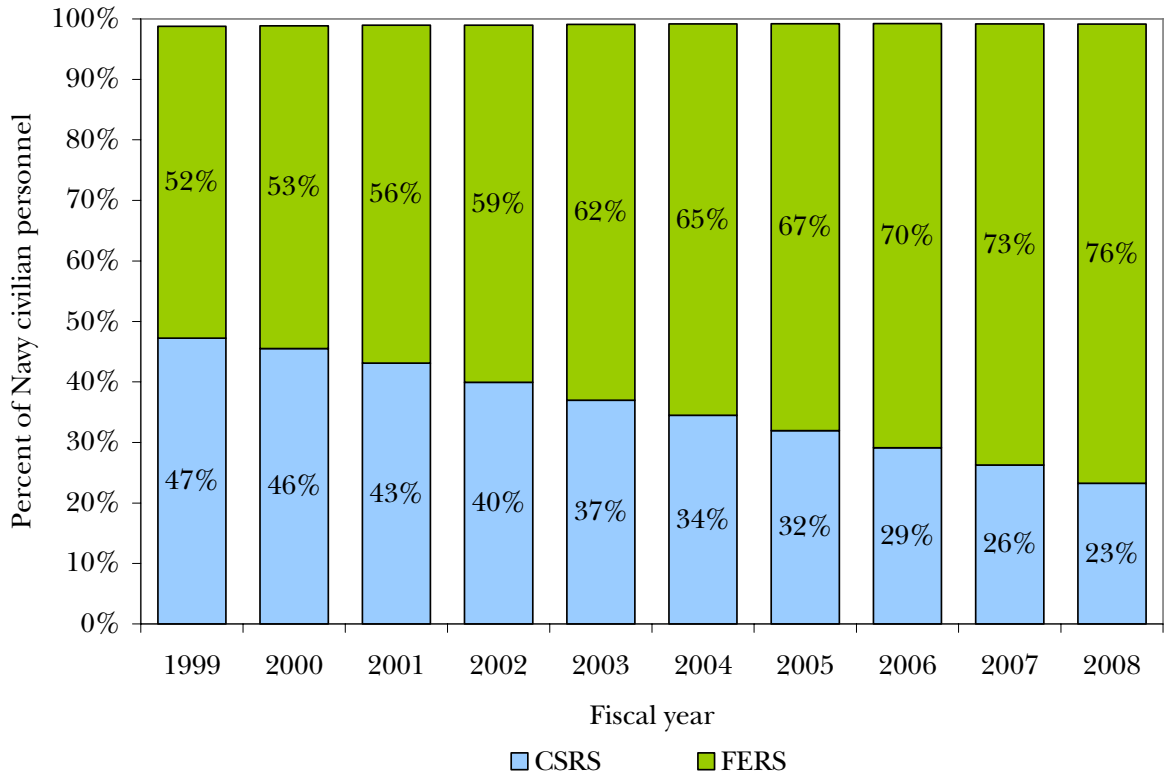


Retirement plan

In the background section, we discussed differences between the CSRS and FERS retirement plans, and how these differences might affect retirement behavior. Here we show how the distribution of retirement plan coverage has changed over time.

As one would expect, there has been a shift over time in the distribution of the workforce covered by FERS and CSRS (see figure 11). In 1999, CSRS covered 47 percent of the workforce, while FERS covered 52 percent.[25] As those covered by CSRS have retired (and been replaced with workers covered by FERS), there has been a shift towards FERS. In 2008, 76 percent of the workforce was covered by FERS compared with only 23 percent covered by CSRS.

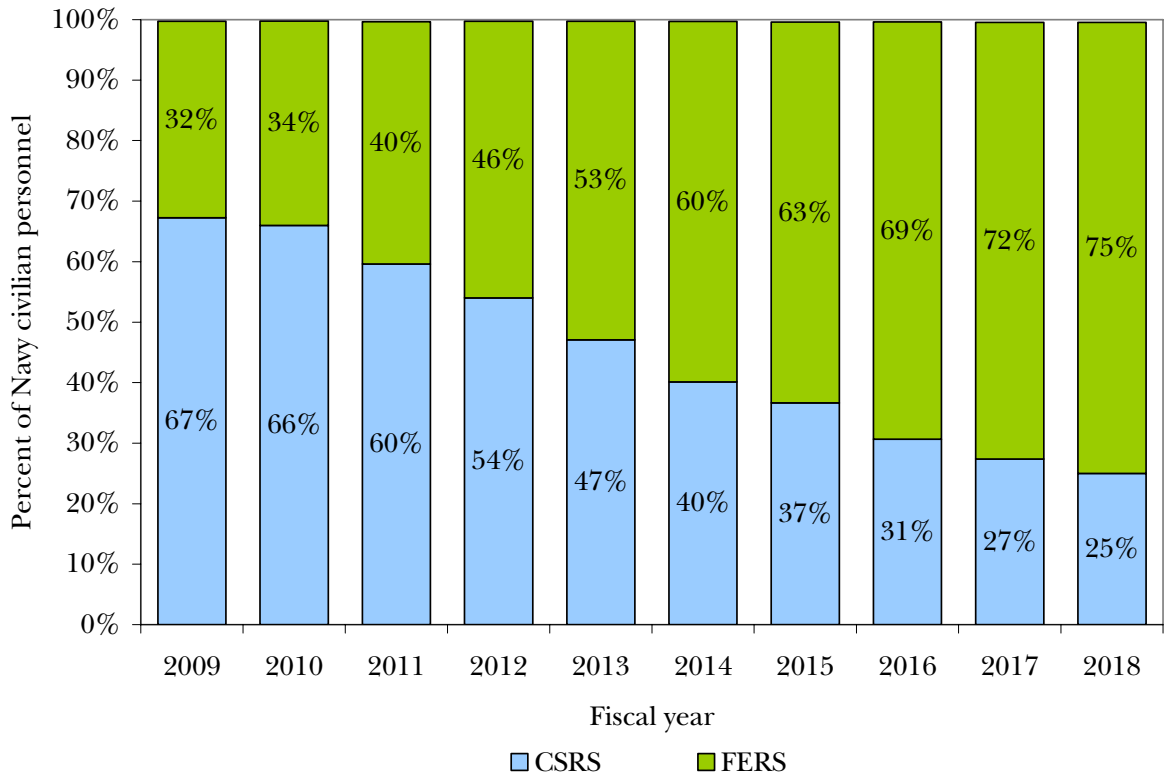
Figure 11. Retirement plans for Navy civilians



25. In our data, a small share (1 percent or less) of Navy civilian personnel was not covered by either CSRS or FERS in each year.

Although the majority of Navy civilians are now covered by FERS, the majority of those who are currently eligible for retirement, or will be in the near future, are covered by CSRS, as figure 12 shows. Since retirement incentives differ under each plan, we consider this information when we model retirement behavior.

Figure 12. Retirement plans for Navy civilians by year of projected retirement eligibility

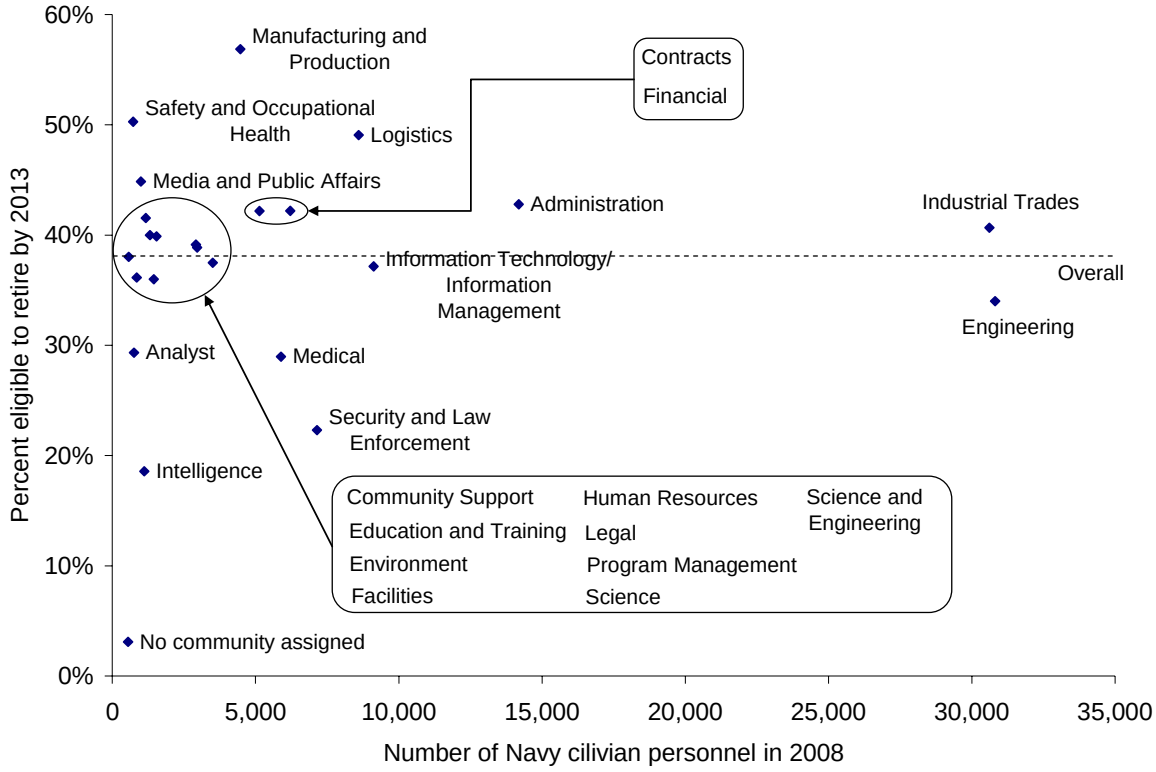


Retirement eligibility

Using information on a person's retirement plan, age, and YOS, we estimate future retirement-eligibility rates. Figure 13 shows that overall a little more than a third of Navy civil service personnel will be eligible to retire by 2013; some communities face even higher retirement-eligibility rates. Of particular concern are the Administration and Industrial Trades communities, which have higher than average retirement-eligibility rates and account for large shares of the overall Navy civilian inventory. The Manufacturing and Production and the Logistics communities have among the highest retirement-eligibility rates, but they are relatively small. Other communities, such as Engineering, Medical, and Security and Law

Enforcement, may have an easier time replacing future retirees since they have lower than average retirement-eligibility rates.

Figure 13. Percentage eligible to retire by 2013, by community



In a later section of this paper, we will identify "red line" communities, or communities that we think face especially high risks of employment gaps due to retirements. This exercise takes into consideration retirement eligibility, as shown in figure 13, as well as the likelihood that people in that community will retire once they become eligible, which we derive from estimates based on the estimation of a statistical model.

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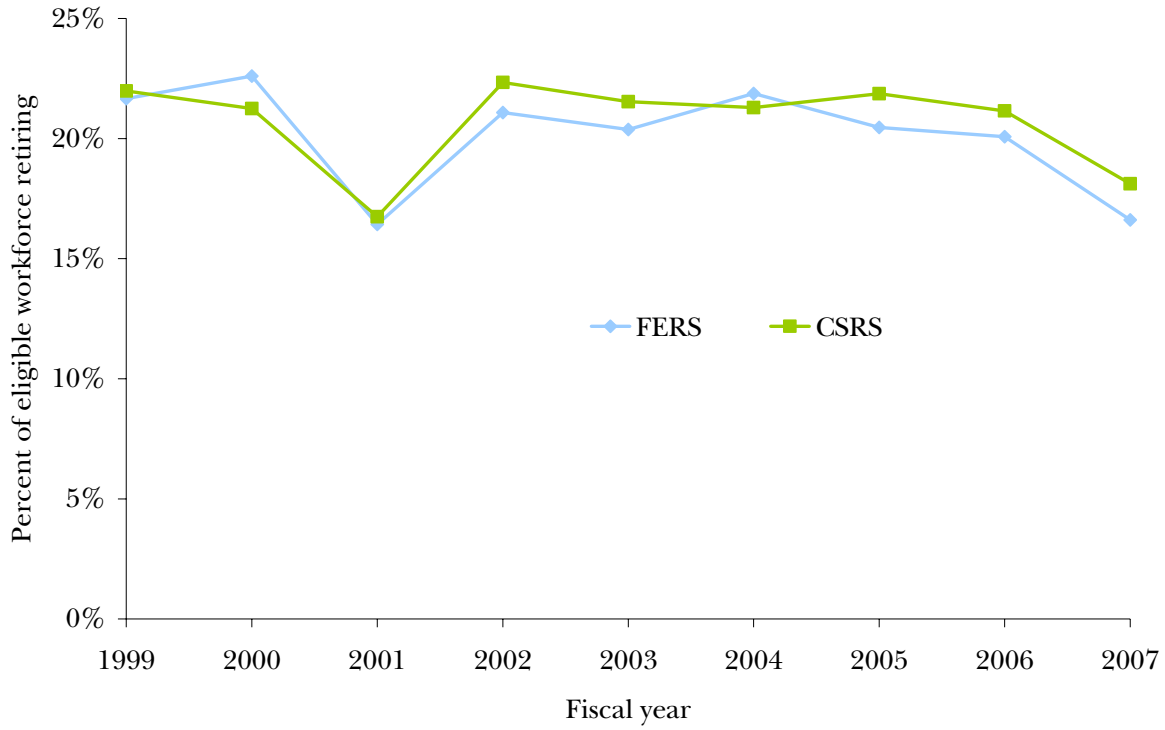
Model of retirement behavior

Navy civilians do not necessarily retire immediately after they become eligible. In our data, of the Navy civil servants who became eligible for regular retirement in 1999, 22 percent had retired within 2 years of becoming eligible, 39 percent had retired between 2 and 5 years of becoming eligible, and the remaining 39 percent retired more than 5 years after becoming eligible.

In addition, retirement rates have changed over time. Figure 14 shows that the retirement rate among those who are eligible was much lower in FY 2001 and FY 2007 relative to other years. In FY 2001, the retirement rate dropped by about 5 percentage points from the year prior, corresponding to a 25-percent decrease for those on FERS and a 20-percent decrease for those on CSRS. In FY 2007, the retirement rate dropped by about 3 percentage points from the year prior, corresponding to a 15-percent decrease for those on either retirement plan.

In the following subsections, we first examine descriptive statistics for personnel who retired within 2 years of becoming eligible. Second, we report the results of our econometric model of retirement behavior.

Figure 14. Percentage of regular retirement-eligible workforce retiring: FY 1999 through FY 2007



Descriptive statistics among personnel who retired within 2 years of becoming eligible

We provide the following descriptive statistics as a backdrop for the results of our econometric model. As we will discuss, descriptive statistics are not as conclusive as are results from econometric modeling because descriptive statistics do not control for other factors, but they nonetheless give us a broad characterization of the retirement behavior for the group we are studying.

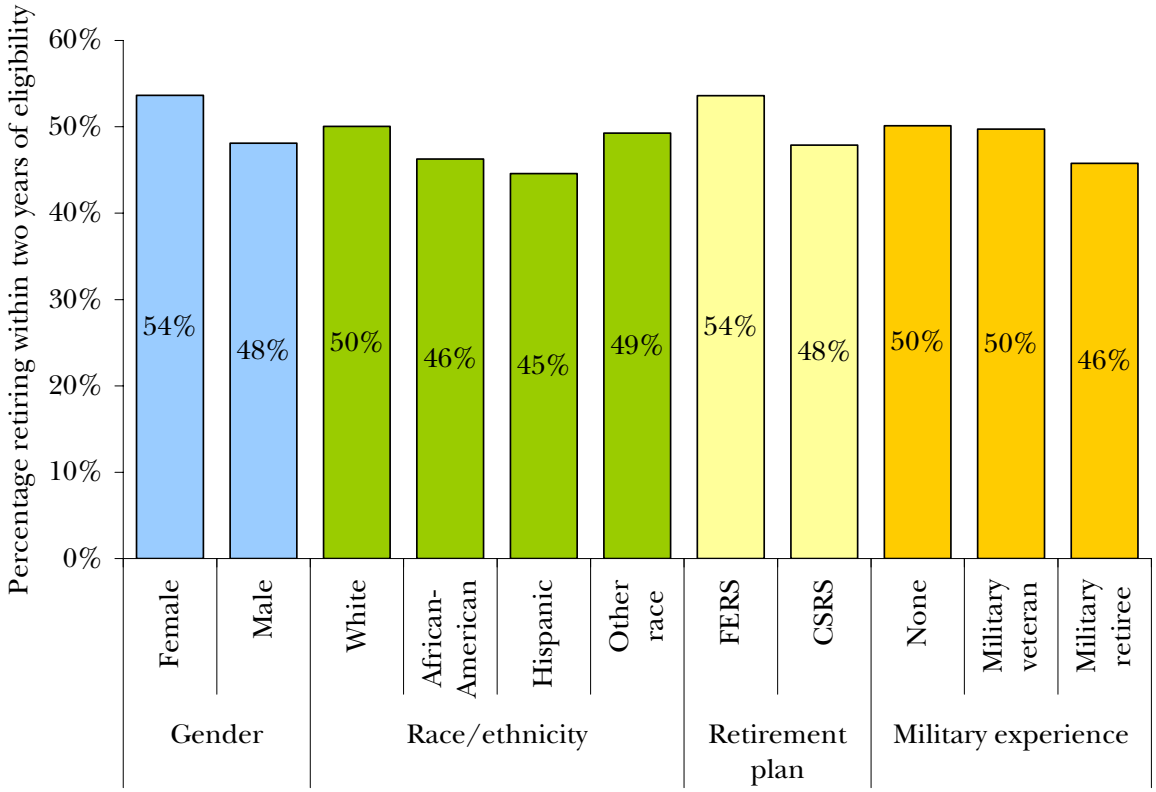
In figure 15, we show that rates of retirement within the first 2 years of eligibility differ for Navy civilians grouped by the following characteristics:

- Gender
- Race/ethnicity

- Retirement plan
- Prior military experience.

Figure 15 shows marked differences in retirement behavior based on these characteristics. In the first 2 years after becoming retirement eligible, female Navy civil servants are more likely than male Navy civil servants to retire. Likewise, Navy civil servants who are white or of "other" racial and ethnic backgrounds are more likely to retire within 2 years of becoming eligible than are Navy civil servants who are African-American or Hispanic. We also find differences by retirement plan and military experience. Those under the FERS plan are more likely to retire within 2 years of becoming eligible than those under the CSRS plan. Finally, Navy civil servants without any military experience and those who are veterans are more likely to retire within 2 years of becoming eligible than Navy civil servants who are military retirees.

Figure 15. Percentages of Navy civil servants who retire within the first 2 years of eligibility



Econometric model of retirement behavior

While descriptive statistics may shed some light on retirement behavior, the statistics we have just presented do not give sufficient information to understand this behavior fully for two reasons.

First, the statistics in figure 15 confound the effects of different characteristics on retirement behavior. From the figure, one can see that women are more likely than men, and whites are more likely than nonwhites, to retire within 2 years of becoming retirement eligible. In figure 15, however, we cannot separate the gender and race/ethnicity effects from one another. In our sample, 32 percent of nonwhites are female compared with 23 percent of whites. Thus, the difference in the retirement rate between races is probably either understated or overstated in figure 15 since it is muddied by the effect of gender. To isolate the effect of race on retirement behavior, we need to remove the gender effect. Statistical modeling allows us to do just that.

The second reason why the descriptive statistics in figure 15 are an incomplete depiction of retirement behavior is that they capture differences only within a very specific type of retirement behavior—retirement that occurs within 2 years of retirement eligibility. We are interested in how different characteristics affect retirement behavior more generally. This calls for a particular type of statistical model—namely, a hazard model. A hazard model captures several things about retirement behavior in our dataset:

- Navy civil servants first must become eligible for retirement before they can retire.
- Characteristics that affect the decision to retire (such as earnings) are not constant across time.
- Our dataset is censored (i.e., we are more likely to see Navy civilians in our dataset who do not retire immediately upon eligibility).

All these characteristics of the retirement process make a hazard model more appropriate than standard regression techniques for modeling retirement behavior.

We estimate our hazard model using a wide variety of worker, job, and economic characteristics. Our estimation produces relative differences in retirement behavior by these characteristics. For instance, in the subsections that follow, we report the differences in retirement behavior among women relative to men, among personnel under FERS relative to personnel under CSRS, among whites relative to nonwhites, and so on. (See the appendix for definitions of the variables used in our analysis and the full estimation results.)

For modeling retirement behavior, we distinguish personnel hired before January 1, 1984 (the first date personnel could be covered by FERS), from those hired on or after that date. For those under the FERS plan, this method distinguishes people who have spent their entire careers covered by FERS from those who switched from CSRS to FERS. For personnel under the CSRS plan, this method will pick up personnel that we call "CSRS late" civil servants, or those who were:[26]

- Hired under the period of transition from CSRS to FERS who elected to stay with CSRS
- In the civil service before 1984, then left and returned after 1984 and remained under CSRS.

Differences in retirement behavior by retirement plan and age

Figure 16 shows our estimates of the effect of retirement plan and age on retirement behavior.[27] Navy civil servants who have always been covered by CSRS are represented by the blue bars, those who switched from CSRS to FERS are represented by the green bars, and those who have always been covered by FERS are represented by the yellow bars.[28] The comparison group in this figure is composed of

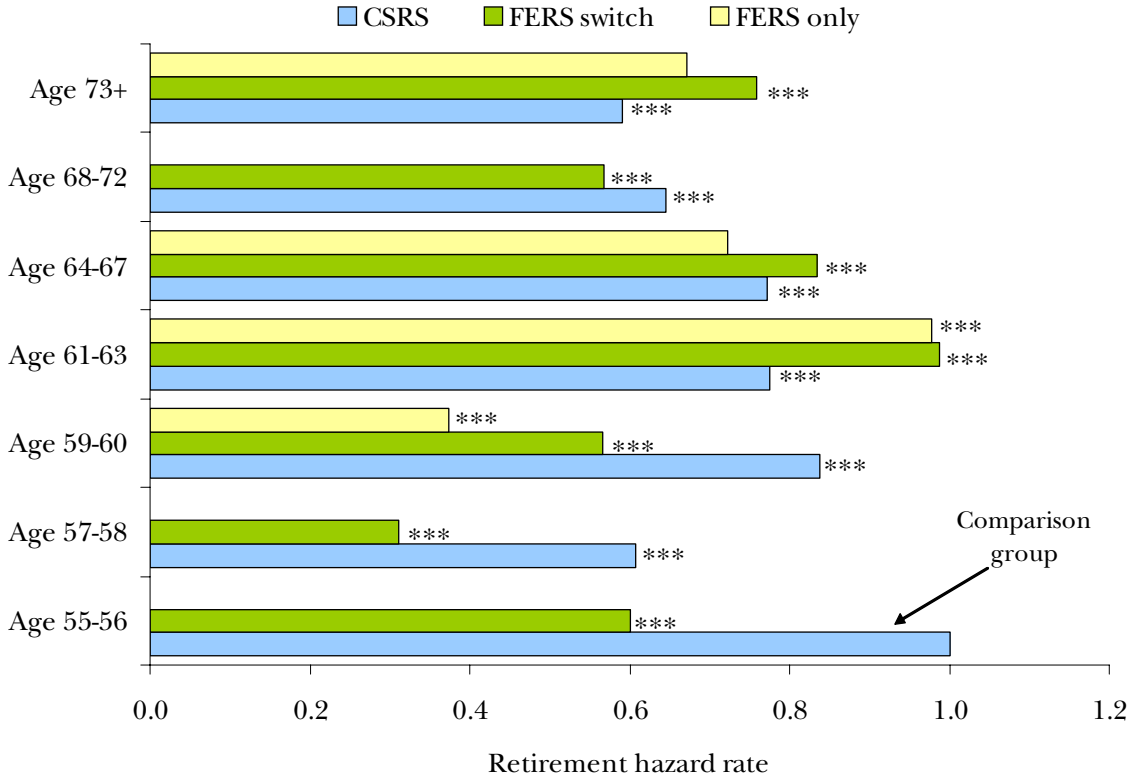
26. This group is referred to as CSRS late in the appendix tables.

27. In this figure and the three that follow, *, **, and *** represent statistically significant differences from the comparison group at the 10-, 5-, and 1-percent levels, respectively.

28. We exclude CSRS late Navy civil servants from this figure because this is a small group and, therefore, none of the results by age is statistically significant.

Navy civil servants under the CSRS plan that are age 55 to 56. This group is more likely to retire than Navy civil servants under CSRS who are age 57 or older. These results support the notion that personnel under the CSRS plan have little incentive to stay in the civil service once they become eligible for retirement at age 55 [9].

Figure 16. Relative retirement probabilities by retirement plan and age



Personnel under the FERS plan (both those who switched from CSRS and those who spent their entire career under it) exhibit different retirement behavior than those under the CSRS plan. Regardless of age, Navy civil servants who switched to FERS are less likely to retire than the comparison group, though the difference is small for personnel age 61 to 63. For both those who switched to FERS and those who were under FERS for their entire careers, there is a spike in retirements at age 61 to 63 under FERS—most likely due to eligibility for Social Security benefits.

We specified other models that allowed retirement behavior to differ by retirement plan, age, and military status. For the most part,

the results were the same as for the full sample. However, Navy civil servants with no military experience who switched to FERS are most likely to retire at age 64 to 67, while the results from the full sample suggest that personnel who switched to FERS are most likely to retire at age 61 to 63. We also specified a model that allowed retirement behavior to differ by retirement plan, age, and gender. Again, most of the results were the same as for the full sample, except that women who switched to FERS are most likely to retire at age 73 and above.

We tested these models that interacted civil service retirement rates with prior military status to test conjectures that military retirees may have financial incentives that differ in a way that influences retirement behavior. The argument—advanced in our background and literature section—is that, since military retirees have qualified for Social Security over the span of both CSRS and FERS plans, they may have had spikes in retirements at the ages of Social Security eligibility all along. While our results show that a specific segment of people with no military experience tend to retire later, we were unable to confirm any of the other hypotheses regarding differences in the retirement behavior of military retirees.

Differences in retirement behavior by community

There are statistically significant differences in the probability of retiring in any given year across communities, even after controlling for a variety of demographic and job characteristics (see figure 17).[29] The communities in the DMDC data correspond to occupations, such as engineers. Since people in almost all occupations work in many different functions, we are unable to define functions, such as acquisitions, using this variable. Here, our comparison group is personnel in the legal community. Figure 17 shows that people in the following communities are statistically just as likely to retire as people in the legal community:

- Science

29. We refer to Department of the Navy's (DON's) Communities of Interest (COIs) as simply *communities*.

- Education and Training
- Intelligence
- Media and Public Affairs.

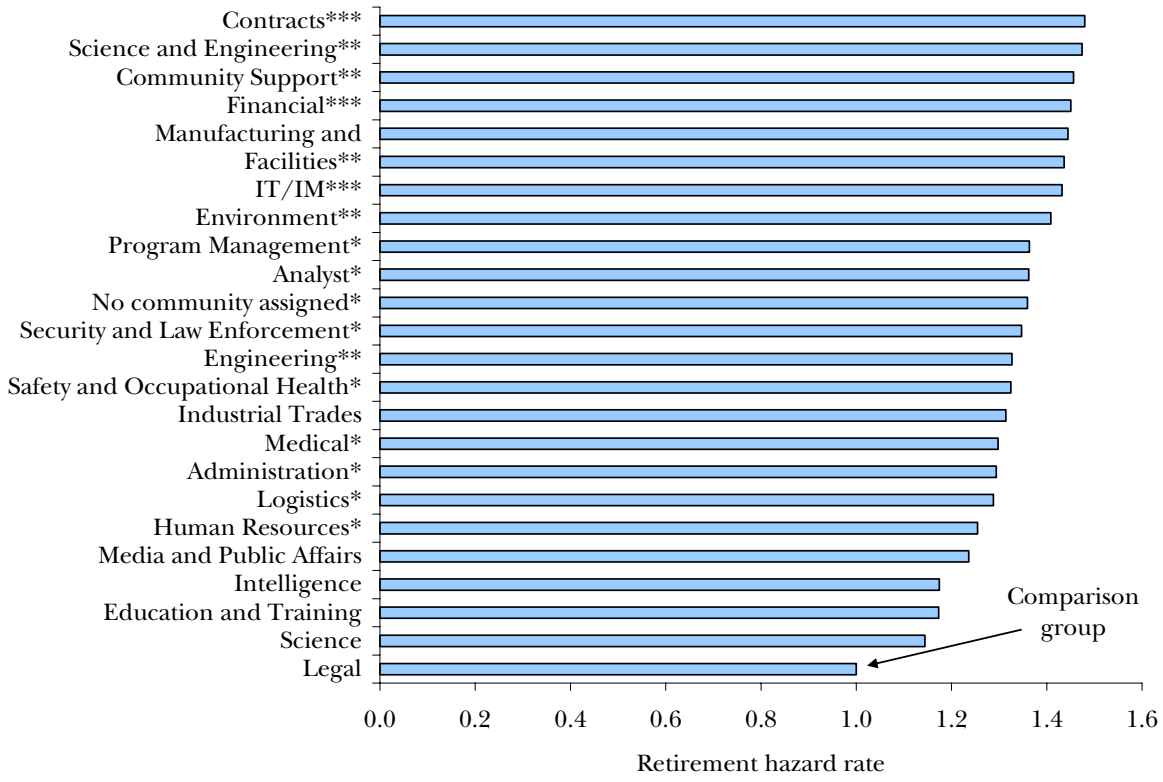
This suggests that personnel employed in these communities on average wait longer to retire after becoming eligible than personnel in other communities, even after controlling for a variety of other factors.

At the other extreme, personnel in the following communities are more than 1.4 times as likely to retire compared with personnel in the legal community:

- Contracts
- Science and Engineering
- Community Support
- Financial
- Manufacturing and Production
- Facilities
- Information Technology/Information Management (IT/IM)
- Environment.

In other words, personnel employed in these communities on average retire much sooner after they become eligible compared with personnel employed in other communities. To determine fully which communities face the greatest risk of employment gaps due to excess retirements, however, we need to take more than retirement propensities into account. In what follows, we will identify so-called red-line communities by combining figure 17's retirement probabilities with the percentage of the community that is eligible to retire and the size of the community, as shown in figure 13.

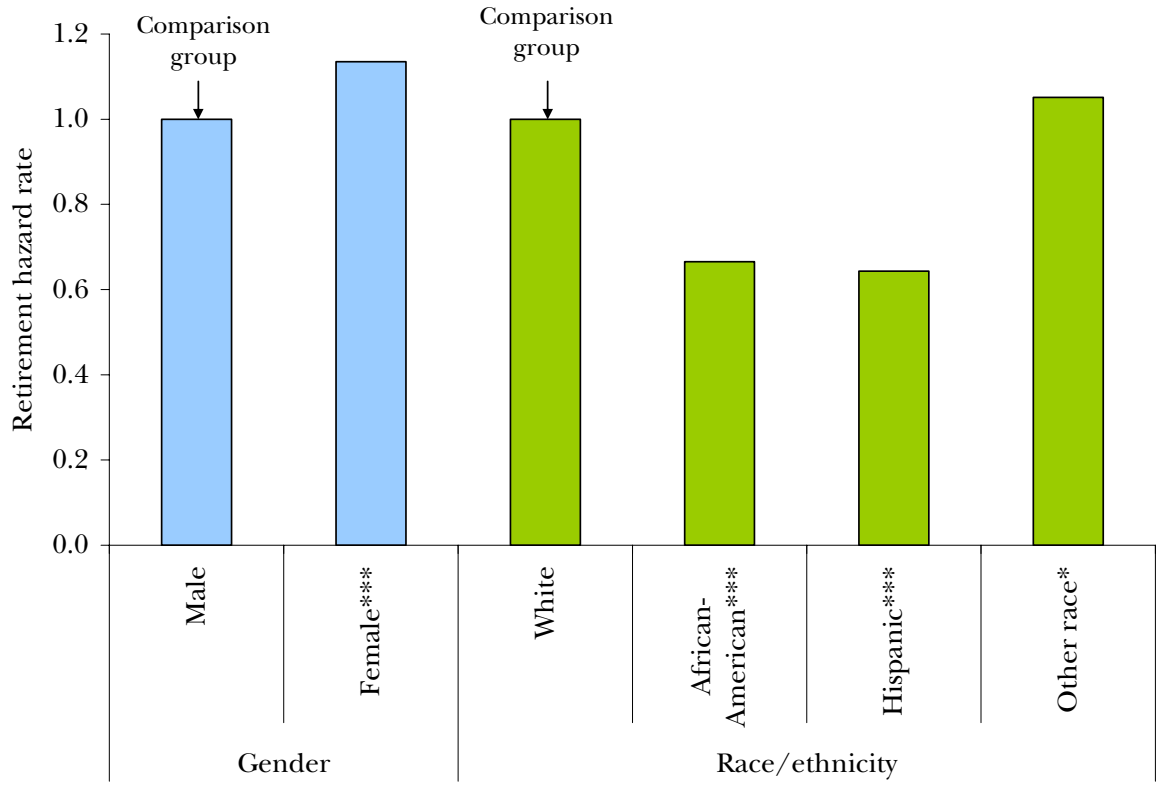
Figure 17. Relative retirement probability by community



Differences in retirement behavior by gender and race/ethnicity

Figure 18 shows differences in retirement behavior by gender and by race and ethnicity. As we found in the descriptive statistics, the model results show that women are slightly more likely than men to retire and that nonwhites are less likely than whites to retire. Specifically, a woman is 13 percent more likely than a man to retire, while African-Americans and Hispanics are 35 percent less likely than whites to retire. Both of these differences are statistically significant at the 1-percent level. Navy civilian personnel of other races are slightly more likely to retire than whites, but this difference is only significant at the 10-percent level.

Figure 18. Relative retirement probability by demographic group



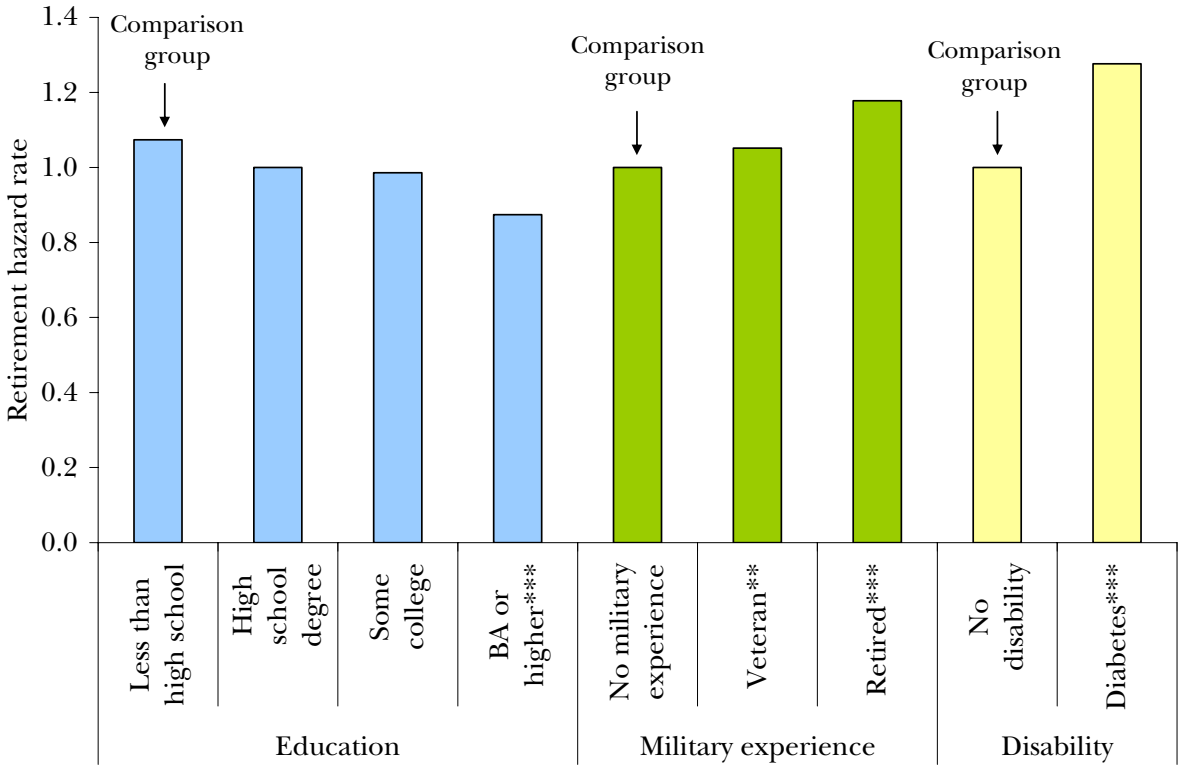
Differences in retirement behavior by other characteristics

Figure 19 shows differences in retirement behavior by education, military experience, and disability. Those at the Bachelor's degree (BA) level or higher are significantly less likely to retire than those with high school degrees. All other educational groups are as likely to retire as those with high school degrees. As discussed in an earlier section and noted in other research [9], education levels may not be updated in the data, so education levels should be interpreted as initial, not final, education.

Figure 19 also shows that Navy civil servants with military experience are significantly more likely to retire once they become eligible than are those without any military experience. Indeed, Navy civil servants who retired from the military or who are veterans are 18 and 5 percent more likely to retire, respectively, once they become retirement eligible compared with Navy civil servants with no military experience.

Finally, we find that those with a disability due to diabetes are 30 percent more likely to retire once they are eligible than are those without any disability. This difference is statistically significant. We examined other disabilities but found no significant differences.

Figure 19. Relative retirement probability by other characteristics



Differences in retirement behavior by job-related characteristics

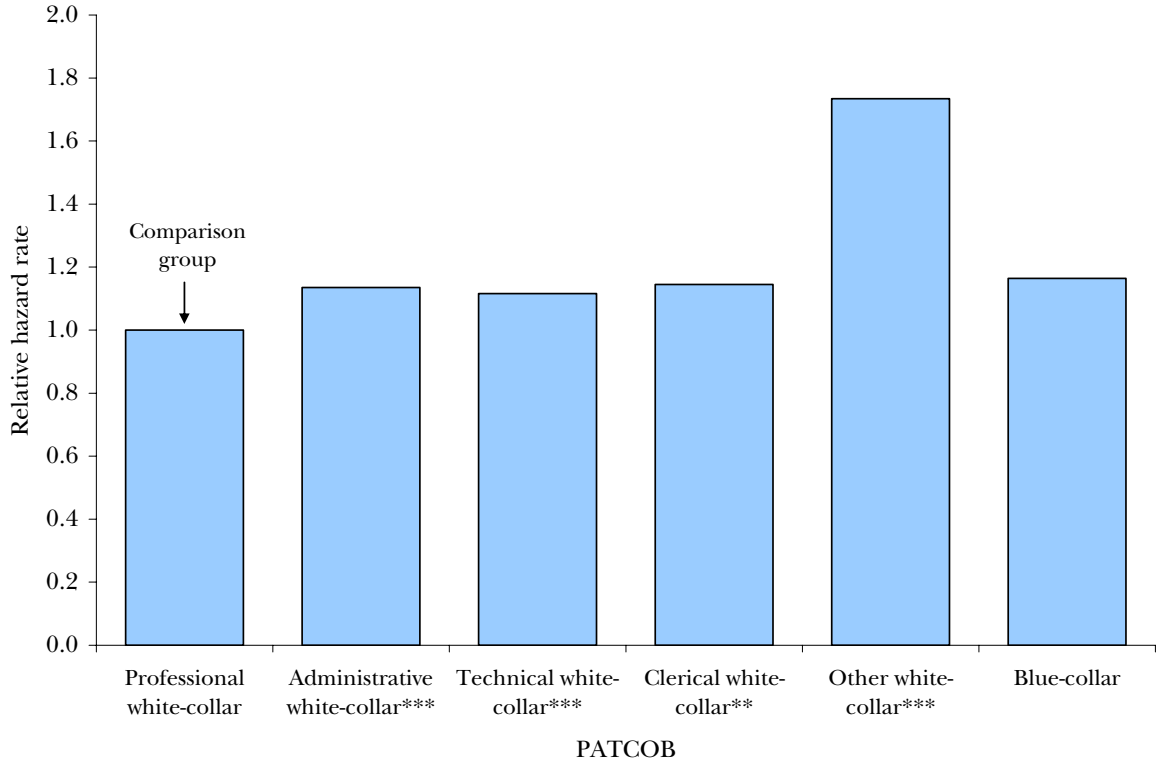
We examined the effect of earnings, supervisory status, and PATCOB[30] classification on retirement. For the range of earnings in our sample, we found that an increase in earnings significantly decreases the likelihood of retiring once eligible, all else constant. We could attribute this to pensions being dependent on the top 3 years

30. PATCOB is an acronym for professional white-collar, administrative white-collar, technical white-collar, clerical white-collar, other white-collar, and blue-collar occupations.

of earnings. Those who are supervisors are 6 percent more likely to retire once eligible than those who are not supervisors.

PATCOB classification also significantly affects the likelihood of retiring. Compared with those in professional occupations, those in the administrative, clerical, technical, and other white-collar occupations are more likely to retire (see figure 20).

Figure 20. Relative retirement probability by occupation group



Communities at risk

In this section, we identify red-line communities—that is, communities that we think face an especially high risk of employment gaps due to upcoming retirements. This requires comparing the size of the community, the share of the community that will be retirement eligible by 2013 (as shown in figure 13), and the likelihood that individuals in that community will retire once they become eligible (as shown in figure 17).

Table 3 shows the results of this comparison. The three largest communities, Engineering, Intelligence, and Administration, together account for more than half of all Navy civil servants. We consider these communities to be red-line communities since more than a third of the personnel will be eligible to retire by 2013 and those personnel have comparatively high relative hazard rates. In addition, while the Financial, Contracts, Manufacturing and Production, and Community Support communities represent only a small slice of the overall Navy civil service, we also consider them to be red-line communities since they have among the highest retirement-eligibility and relative hazard rates.

In contrast, the Security and Law Enforcement and Medical communities face much lower risk of employment gaps due to future retirements. In these communities, less than 30 percent of personnel will be eligible to retire by 2013 while relative hazard rates are moderate. Similarly, the Science, Education and Training, Media and Public Affairs, and Legal communities face relatively low risk of employment gaps since, in spite of their moderate to high retirement-eligibility rates, their relative hazard rates are among the lowest across all communities.

Table 3. Red-line communities

Community	N	Percent of total	Percent eligible by 2013	N eligible by 2013	Relative hazard rate
Engineering	30,809	22%	34%	10,474	33%
Industrial Trades	30,612	21%	41%	12,447	17%
Administration	14,187	10%	43%	6,071	29%
IT/IM	9,118	6%	37%	3,388	31%
Logistics	8,601	6%	49%	4,221	29%
Security and Law Enforcement	7,145	5%	22%	1,594	35%
Financial	6,207	4%	42%	2,619	45%
Medical	5,887	4%	29%	1,705	30%
Contracts	5,136	4%	42%	2,166	48%
Manufacturing and Production	4,470	3%	57%	2,542	44%
Science	3,505	2%	37%	1,314	14%
Human Resources	2,964	2%	39%	1,152	25%
Education and Training	2,919	2%	39%	1,142	17%
Community Support	1,547	1%	40%	617	46%
Program Management	1,450	1%	36%	522	36%
Facilities	1,315	1%	40%	526	44%
Environment	1,172	1%	42%	487	41%
Intelligence	1,115	1%	19%	207	43%
Media and Public Affairs	1,001	1%	45%	449	24%
Legal	852	1%	36%	308	0%
Analyst	757	1%	29%	222	36%
Safety and Occupational Health	726	1%	50%	365	32%
Science and Engineering	576	0%	38%	219	47%
No community assigned	549	0%	3%	17	36%

Mitigating retirement-related manning shortages

In this section, we suggest some ways that community managers who are likely to face employment gaps in the future due to retirements, such as those managing the red-line communities identified in the previous section, might mitigate this problem. Although community managers must consider workers' capabilities in addressing manning shortfalls, such an analysis is beyond the scope of this paper. Instead, we address the more basic concern of where to find new personnel. We propose two sources of additional employment: the private sector and the pool of recently retired military personnel.

Availability of personnel from the private sector

Using data from the BLS, we created a crosswalk between occupations in the private sector and Navy civilian communities in order to estimate the extent to which Navy civilian communities could pull from the private sector to boost employment. Table 4 compares 2008 total national private-sector employment to employment in corresponding Navy civilian communities.[31] As shown, for each Navy civilian community, there is an abundance of private-sector employees who work in similar occupations.[32] Based on this, community managers could consider turning to the private sector to fill in employment gaps in Navy civil service.

31. We exclude the Safety and Occupational Health Navy civilian community from table 4 because there are no corresponding private-sector occupations.

32. Since private-sector occupations can map to more than one Navy civilian community, the sum of private-sector employment across all Navy civilian communities in table 4 will exceed the size of the total private-sector labor force. However, employment in the private sector greatly exceeds employment in the Navy civilian communities, so this overlap in private-sector occupations across Navy civilian communities should have little impact on the relative supply of private-sector labor for any given community.

Table 4. Private-sector employment in occupations that correspond to Navy civilian communities, 2008

Navy civilian community	Private-sector employment	Navy civilian employment
Administration	6,230,370	14,187
Analyst	416,960	757
Community Support	1,374,610	1,547
Contracts	1,016,510	5,136
Education and Training	1,046,630	2,919
Engineering	1,836,250	30,809
Environment	11,700	1,172
Facilities	760,520	1,315
Financial	3,550,080	6,207
Human Resources	1,614,410	2,964
Industrial Trades	7,265,860	30,612
Intelligence	95,290	1,115
IT/IM	3,611,910	9,118
Legal	61,830	852
Logistics	2,185,940	8,601
Manufacturing and Production	1,061,140	4,470
Media and Public Affairs	3,726,750	1,001
Medical	7,688,250	5,887
Program Management	201,240	1,450
Science	6,454,760	3,505
Science and Engineering	434,940	576
Security and Law Enforcement	1,862,950	7,145

In addition, data from the BLS could be further refined to make these estimates by geographic location (i.e., state or metropolitan area). Armed with this information, community managers would be better able to recruit private-sector workers who are currently located in the area where there is a gapped Navy civil service position. One caveat to this potential source of new personnel is that there can be a great administrative burden associated with hiring from the private sector, and community managers will need to take this into consideration.

Hiring recently retired military

In addition to hiring private-sector workers, Navy civilian communities could look to recent military retirees as a source of labor. As we demonstrated earlier, retired military personnel make up a growing

share of the Navy civilian inventory (figure 2). Policy-makers will need further research to get a sense of how viable this group might be as a source of new personnel for the various Navy civilian communities. To do this, one should consider both the kind of work that people performed in the military and their geographic locations. The latter could be proxied for by people's last duty stations, their homes of record, or the stations at which they spent the most years while in the military.

We point out two caveats to consider when deciding whether to hire from the private sector or to hire people as they retire from the military. First, once the waiver for the 180-day waiting period for hiring retired military personnel into the DOD civil service expires, the number of retired military personnel who will be eligible to work in the Navy civil service will decrease. Second, since military retirees tend to be older on average than other new hires (see figure 10), hiring retired military to fill vacancies will shift the age distribution of the Navy civilian workforce to the right. Therefore, if the Navy brings more military retirees into its civilian workforce, it might lessen employment gaps in the short run but cause larger gaps in the future.

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Recommendations and conclusions

Human resource specialists need to consider many components when determining how to organize the civil service workforce to meet the goals of the government. Among those components are how organizations are structured, how jobs are designed, training and development policies, and ensuring that future leadership roles will be filled. Another important component is workforce-shaping policies (i.e., policies that affect accession and retention). In our analysis, we focus on retirement behavior, which has an impact on retention. In making recommendations, therefore, we concentrate on policies that might provide access to people who could replace retirees.

As the Navy considers the future of its civilian workforce, it must pay close attention to future retirement trends and the potential for employment gaps. These are a concern for the overall workforce as well as for particular Navy civilian communities. In identifying communities that are in particularly difficult situations, planners need to consider not only the size of the community but also future retirement-eligibility rates and the likelihood that people in that community will retire once they are eligible, which can be approximated on the basis of past retirement behavior.

In our analysis, we identify a handful of red-line communities (see table 3), which we argue deserve extra attention. These communities are both large (Engineering, Intelligence, and Administration) and small (Financial, Contracts, Manufacturing and Production, and Community Support), but they all share the unfortunate circumstance of having among the highest retirement-eligibility and relative hazard rates. In contrast, several communities face lower risks of employment gaps caused by retirements, either because they have fewer people eligible to retire or because retirement rates are lower.

Given our findings, we make the following recommendations:

- Communities with the highest risks of employment gaps (i.e., red-line communities) should be tracked and given priority in mitigation efforts.
- Two potential sources of new personnel should be considered: the private sector and the pool of recently retired military personnel. We make this recommendation recognizing each source's potential shortcoming:
  - Hiring from the private sector can involve substantial administrative costs.
  - Hiring from the pool of recently retired military personnel will become more difficult once the 180-day waiting period waiver expires.
- Consideration should be given to both short- and long-run effects on the Navy civilian workforce of accessing different sources of personnel to mitigate shortages. In particular, the consequences of recruiting military retirees and the limitations of this policy should be kept in mind. Military retires are less diverse than the Navy civilian workforce and would enter at higher grades. Also, having additional military retirees would increase the seniority of a federal workforce that is already older than the private-sector workforce. Finally, military retirees tend to be trained in a concentrated set of occupations that may not correspond to the occupations where shortages exist.
- Additional empirical research should be conducted on the extent to which private-sector employees and recently retired military personnel might close Navy civilian employment gaps, especially once required workforce capabilities are taken into account.

Appendix: Hazard model results

Table 5. Variables used in the hazard model

Variable	Definition
CSRS	1 if under the CSRS retirement plan and calculated start date before January 1, 1984
	0 otherwise
Joined CSRS after 1984 (CSRS late)	1 if under the CSRS retirement plan and calculated start date on or after January 1, 1984
	0 otherwise
	0 otherwise
FERS only	1 if under the FERS retirement plan and calculated start date on or after January 1, 1984
	0 otherwise
Switched to FERS (FERS switch)	1 if under the FERS retirement plan and calculated start date before January 1, 1984
	0 otherwise
Age 57 to 58	1 if age 57 to 58
	0 otherwise
Age 59 to 60	1 if age 59 to 60
	0 otherwise
Age 61 to 63	1 if age 61 to 63
	0 otherwise
Age 64 to 67	1 if age 64 to 67
	0 otherwise
Age 68 to 72	1 if age 68 to 72
	0 otherwise
Age 73 & older	1 if age 73 or older
	0 otherwise
Female	1 if female
	0 otherwise
African-American	1 if non-Hispanic African-American
	0 otherwise
Hispanic	1 if Hispanic
	0 otherwise
Other race	1 if other race or multiple race
	0 otherwise
Unknown race	1 if unknown race
	0 otherwise
Less than high school	1 if less than a high school degree
	0 otherwise
Some college	1 if Associate's degree or some college
	0 otherwise
B.A. or higher	1 if B.A. degree or higher
	0 otherwise
Unknown education	1 if unknown education
	0 otherwise

No promotion data in file	1 if no promotion date in file 0 otherwise
Promoted within last two years	1 if promotion occurred within two years of file date 0 otherwise
"No pay" episode	1 if currently in a no pay episode 0 otherwise
Not on file in the previous year	1 if Social Security number was not on prior year's file 0 otherwise
State-level UR, average over fiscal year	State level unemployment rate, averaged over fiscal year
Ln(earnings)	Natural logarithm of earnings
Retired from active duty military	1 if retired from the active-duty military 0 otherwise
Veteran	1 if military veteran 0 otherwise
Complete paralysis	1 if disability classified as complete paralysis 0 otherwise
Deaf	1 if disability classified as deaf 0 otherwise
Diabetes	1 if disability classified as diabetes 0 otherwise
Heart disease	1 if disability classified as heart disease 0 otherwise
Learning disability	1 if disability classified as learning disability 0 otherwise
Limited sight/blind	1 if disability classified as limited sight/blind 0 otherwise
Missing extremity(ies)	1 if disability classified as missing extremity(ies) 0 otherwise
No corresponding code for disability	1 if disability does not have a corresponding code 0 otherwise
Nonparalytic limited use/movement body parts	1 if disability classified as nonparalytic or limited use/movement of body parts 0 otherwise
Other disability	1 if disability classified as other 0 otherwise
Partial paralysis	1 if disability classified as partial paralysis 0 otherwise
Pulmonary/ respiratory disorder	1 if disability classified as pulmonary/respiratory disorder 0 otherwise
Supervisor/Manager	1 if position coded as supervisor or manager 0 otherwise
Administrative white-collar PATCOB	1 if PATCOB code is Administrative White-Collar 0 otherwise
Technical white-collar PATCOB	1 if PATCOB code is Technical White-Collar 0 otherwise
Clerical white-collar PATCOB	1 if PATCOB code is Clerical White-Collar 0 otherwise

Other white-collar PATCOB	1 if PATCOB code is Other White-Collar 0 otherwise
Blue-collar PATCOB	1 if PATCOB code is Blue-Collar 0 otherwise
Federal Wage System	1 if under Federal Wage System pay plan 0 otherwise
General Schedule, paygrades 01 to 04	1 if under the General Schedule pay plan and paygrades 01 to 04 0 otherwise
General Schedule, paygrade 05	1 if under the General Schedule pay plan and paygrade 05 0 otherwise
General Schedule, paygrade 06	1 if under the General Schedule pay plan and paygrade 06 0 otherwise
General Schedule, paygrade 07	1 if under the General Schedule pay plan and paygrade 07 0 otherwise
General Schedule, paygrade 08	1 if under the General Schedule pay plan and paygrade 08 0 otherwise
General Schedule, paygrade 09	1 if under the General Schedule pay plan and paygrade 09 0 otherwise
General Schedule, paygrade 11	1 if under the General Schedule pay plan and paygrade 11 0 otherwise
General Schedule, paygrade 12	1 if under the General Schedule pay plan and paygrade 12 0 otherwise
General Schedule, paygrade 13	1 if under the General Schedule pay plan and paygrade 13 0 otherwise
General Schedule, paygrade 14	1 if under the General Schedule pay plan and paygrade 14 0 otherwise
General Schedule, paygrade 15	1 if under the General Schedule pay plan and paygrade 15 0 otherwise
NSPS	1 if under the NSPS pay plan 0 otherwise
SES	1 if under SES pay plan 0 otherwise
Other pay plan	1 if under a pay plan other than the Federal Wage System, General Schedule, NSPS, or SES 0 otherwise
22 to 23 years of service	1 if 22 to 23 years of service 0 otherwise
24 to 25 years of service	1 if 24 to 25 years of service 0 otherwise
26 to 27 years of service	1 if 26 to 27 years of service 0 otherwise
28 to 29 years of service	1 if 28 to 29 years of service 0 otherwise
30 to 31 years of service	1 if 30 to 31 years of service 0 otherwise
32 to 33 years of service	1 if 32 to 33 years of service 0 otherwise
34 to 35 years of service	1 if 34 to 35 years of service 0 otherwise

36 to 37 years of service	1 if 36 to 37 years of service 0 otherwise
38 to 39 years of service	1 if 38 to 39 years of service 0 otherwise
40 and over years of service	1 if 40 and over years of service 0 otherwise
East North Central	1 if East North Central 0 otherwise
East South Central	1 if East South Central 0 otherwise
Mid Atlantic	1 if Mid Atlantic 0 otherwise
New England	1 if New England 0 otherwise
Pacific	1 if Pacific 0 otherwise
West North Central	1 if West North Central 0 otherwise
West South Central	1 if West South Central 0 otherwise
Other region	1 if Other region 0 otherwise
Fiscal year 2001	1 if Fiscal year 2001 0 otherwise
Fiscal year 2002	1 if Fiscal year 2002 0 otherwise
Fiscal year 2003	1 if Fiscal year 2003 0 otherwise
Fiscal year 2004	1 if Fiscal year 2004 0 otherwise
Fiscal year 2005	1 if Fiscal year 2005 0 otherwise
Fiscal year 2006	1 if Fiscal year 2006 0 otherwise
Fiscal year 2007	1 if Fiscal year 2007 0 otherwise
IT/IM	1 if Department of the Navy (DoN) Community of Interest (COI) is IT/IM 0 otherwise
Administration	1 if DoN COI is Administration 0 otherwise
Analyst	1 if DoN COI is Analyst 0 otherwise
Community Support	1 if DoN COI is Community Support 0 otherwise
Contracts	1 if DoN COI is Contracts 0 otherwise
Education and Training	1 if DoN COI is Education and training 0 otherwise

Engineering	1 if DoN COI is Engineering 0 otherwise
Environment	1 if DoN COI is Environment 0 otherwise
Facilities	1 if DoN COI is Facilities 0 otherwise
Financial	1 if DoN COI is Financial 0 otherwise
Human Resources	1 if DoN COI is Human Resources 0 otherwise
Industrial Trades	1 if DoN COI is Industrial Trades 0 otherwise
Intelligence	1 if DoN COI is Intelligence 0 otherwise
Logistics	1 if DoN COI is Logistics 0 otherwise
Manufacturing and Production	1 if DoN COI is Manufacturing and Production 0 otherwise
Media and Public Affairs	1 if DoN COI is Media and Public Affairs 0 otherwise
Medical	1 if DoN COI is Medical 0 otherwise
Program Management	1 if DoN COI is Program Management 0 otherwise
Safety and Occupational Health	1 if DoN COI is Safety and Occupational Health 0 otherwise
Science and Engineering	1 if DoN COI is Science and Engineering 0 otherwise
Science	1 if DoN COI is Science 0 otherwise
Security and Law Enforcement	1 if DoN COI is Security and Law Enforcement 0 otherwise
No community assigned	1 if no DoN COI assigned 0 otherwise

Table 6. Full results from the hazard model estimation

Variable	Hazard Ratio	Standard Error	P-level
Joined CSRS after 1984 (CSRS late)	0.839	0.378	0.696
FERS only	0.980	0.074	0.793
Switched to FERS (FERS switch)	0.600	0.055	0.000
Age 57 to 58	0.607	0.019	0.000
Age 59 to 60	0.837	0.027	0.000
Age 61 to 63	0.775	0.030	0.000
Age 64 to 67	0.772	0.040	0.000
Age 68 to 72	0.646	0.048	0.000
Age 73 & older	0.592	0.074	0.000
CSRS late, age 59 to 60	0.898	0.514	0.851
CSRS late, age 61 to 63	1.319	0.633	0.564
CSRS late, age 64 to 67	0.958	0.475	0.931
CSRS late, age 73 & older	1.083	0.912	0.924
FERS only, age 59 to 60	0.455	0.053	0.000
FERS only, age 61 to 63	1.288	0.100	0.001
FERS only, age 64 to 67	0.955	0.074	0.551
FERS only, age 73 & older	1.157	0.196	0.391
FERS switch, age 57 to 58	0.854	0.132	0.306
FERS switch, age 59 to 60	1.128	0.124	0.274
FERS switch, age 61 to 63	2.123	0.209	0.000
FERS switch, age 64 to 67	1.801	0.188	0.000
FERS switch, age 68 to 72	1.466	0.194	0.004
FERS switch, age 73 & older	2.137	0.371	0.000
Female	1.135	0.026	0.000
African-American	0.666	0.017	0.000
Hispanic	0.643	0.029	0.000
Other race	1.051	0.021	0.014
Unknown race	1.935	0.289	0.000
Less than high school	1.074	0.041	0.060
Some college	0.986	0.016	0.392
B.A. or higher	0.874	0.020	0.000
Unknown education	0.488	0.219	0.109
No promotion data in file	1.003	0.024	0.902
Promoted within last two years	0.956	0.031	0.172
"No pay" episode	1.232	0.212	0.225
Previous "no pay" episode	0.956	0.277	0.877
Not on file in the previous year	1.084	0.100	0.385
State-level UR, average over fiscal year	1.046	0.007	0.000
Ln(earnings)	0.056	0.074	0.030
Ln(earnings) squared	1.145	0.070	0.026
Retired	1.178	0.029	0.000
Veteran	1.051	0.018	0.003
Complete paralysis	0.967	0.343	0.926
Deaf	0.797	0.175	0.301
Diabetes	1.276	0.078	0.000

Heart disease	1.111	0.069	0.089
Learning disability	1.009	0.036	0.811
Limited sight/blind	1.036	0.078	0.643
Missing extremity(ies)	0.836	0.161	0.353
No corresponding code for disability	1.011	0.046	0.808
Nonparalytic limited use/movement body parts	1.035	0.041	0.389
Other disability	1.007	0.063	0.917
Partial paralysis	0.952	0.098	0.632
Pulmonary/respiratory disorder	1.036	0.081	0.651
Supervisor/Manager	1.063	0.020	0.001
Administrative white-collar PATCOB	1.135	0.034	0.000
Technical white-collar PATCOB	1.116	0.033	0.000
Clerical white-collar PATCOB	1.144	0.056	0.006
Other white-collar PATCOB	1.734	0.149	0.000
Blue-collar PATCOB	1.164	0.147	0.228
Federal Wage System	1.021	0.095	0.820
General Schedule, paygrades 01 to 04	0.898	0.095	0.308
General Schedule, paygrade 05	0.941	0.086	0.503
General Schedule, paygrade 06	0.920	0.082	0.354
General Schedule, paygrade 07	0.982	0.084	0.833
General Schedule, paygrade 08	0.869	0.089	0.171
General Schedule, paygrade 09	0.947	0.078	0.509
General Schedule, paygrade 11	1.031	0.083	0.699
General Schedule, paygrade 12	1.063	0.085	0.443
General Schedule, paygrade 13	1.103	0.091	0.237
General Schedule, paygrade 14	1.061	0.094	0.503
General Schedule, paygrade 15	1.085	0.102	0.388
NSPS	1.019	0.138	0.892
SES	1.013	0.137	0.924
Other pay plan	0.995	0.081	0.948
20 to 21 years of service	1.331	0.047	0.000
22 to 23 years of service	1.009	0.042	0.839
24 to 25 years of service	1.099	0.051	0.044
26 to 27 years of service	1.044	0.051	0.378
28 to 29 years of service	0.734	0.037	0.000
30 to 31 years of service	1.199	0.059	0.000
32 to 33 years of service	0.985	0.050	0.766
34 to 35 years of service	1.104	0.058	0.060
36 to 37 years of service	1.116	0.060	0.041
38 to 39 years of service	1.140	0.066	0.023
40 and over years of service	1.276	0.079	0.000
East North Central	0.871	0.034	0.000
East South Central	0.955	0.044	0.318
Mid Atlantic	0.960	0.026	0.134
New England	0.925	0.025	0.004
Pacific	0.907	0.015	0.000

West North Central	0.857	0.248	0.593
West South Central	1.054	0.048	0.245
Other region	0.958	0.150	0.786
Fiscal year 2001	1.068	0.031	0.026
Fiscal year 2002	1.428	0.041	0.000
Fiscal year 2003	1.451	0.043	0.000
Fiscal year 2004	0.953	0.027	0.087
Fiscal year 2005	1.344	0.038	0.000
Fiscal year 2006	1.437	0.041	0.000
Fiscal year 2007	1.311	0.039	0.000
IT/IM	1.432	0.155	0.001
Administration	1.294	0.138	0.016
Analyst	1.362	0.196	0.031
Community Support	1.456	0.174	0.002
Contracts	1.480	0.162	0.000
Education and Training	1.173	0.134	0.162
Engineering	1.327	0.141	0.008
Environment	1.409	0.182	0.008
Facilities	1.437	0.172	0.002
Financial	1.451	0.158	0.001
Human Resources	1.255	0.145	0.049
Industrial Trades	1.314	0.214	0.094
Intelligence	1.174	0.191	0.322
Logistics	1.288	0.139	0.019
Manufacturing and Production	1.444	0.158	0.001
Media and Public Affairs	1.236	0.150	0.081
Medical	1.297	0.147	0.021
Program Management	1.363	0.178	0.017
Safety and Occupational Health	1.325	0.179	0.037
Science and Engineering	1.474	0.198	0.004
Science	1.144	0.129	0.231
Security and Law Enforcement	1.347	0.163	0.014
No community assigned	1.359	0.206	0.043
Number of individuals in the sample: 49,074			
Number of observations in the sample: 155,134			

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