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(Why) Is There a Public/Private Pay Gap?☆

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ABSTRACT

The government is facing a severe shortage of skilled workers. The conventional wisdom in branches of policy and public administration is that the shortage is driven by low salaries that are not competitive for attracting top talent. Using longitudinal data on high skilled workers between 1993 and 2013, this paper shows that, if anything, government employees earn more than their private sector counterparts. Although government workers tend to earn less in the raw data, these differences are driven by the correlation between unobserved productivity and selection into private sector jobs. Instead, this paper provides empirical evidence that low non-pecuniary amenities, such as development opportunities and management, can explain earnings differences between the public and private sectors.

1. Introduction

The public sector, especially the Federal government, faces a significant shortage of skilled workers (Goldenkoff, 2015), including information technology and cyber security jobs (Libicki et al., 2014). While the acquisition and retention of skilled workers has been a challenge in the public sector since at least the 1970s (Lewis, 1991a; 1991b), it has intensified in recent years, including across other countries, such as Britain (Murphy et al., 2019) and France (Bargain et al., 2016). One proposed solution to the skills gap, advanced by a combination of researchers, the popular press, and think-tanks, involves an increase in compensation for those serving in the public sector (Donahue, 2008).

Identifying genuine earnings differences between public and private sector employees is challenging because selection into public service is not a random decision. In particular, individuals sort into jobs based on their preferences and productivity, meaning that simple comparisons of means between public and private sector jobs could prompt spurious implications for public policy. Using longitudinal data on high skilled workers between 1993 and 2013, my primary contribution is to examine the earnings differences between public and private sector workers and their source. Together with data on job satisfaction and work-place practices, I show that bureaucracy and poor management practices are more plausible reasons for the skills shortage in the public sector. These results suggest that public sector organizations may find that focusing on non-pecuniary amenities, such as development opportunities and social impact, are more effective vehicles for raising retention and attraction of skilled workers, relative to increasing pay.

The first part of the paper introduces the data and estimates differences in pay between government and private sector workers. Although government employees earn 4.1% less compared to their private sector counterparts after controlling for demographic characteristics, these estimates of the public-private earnings difference may be downwards biased if higher productivity workers sort into the private sector. The preferred specification, instead, exploits longitudinal variation among individuals who switch between public and private sector jobs, thereby comparing the same individual before versus after a switch from the private to public sector, or vice versa. These results suggest that government workers earn 3.9% more than their counterparts. Moreover, I show that 3.9% is a lower bound for the overall compensation premium since government employees receive greater non-wage benefits, such as healthcare and pensions, on top of their salary income. The compensation premium among public sector workers is not driven by differences in labor supply; the data suggests that public sector workers allocated less time towards work activities.

The second part of the paper examines an alternative explanation behind the articulated skills gap in the public sector. Using additional information on work-place practices and job satisfaction for a subset of the sample, I show that government workers report significantly fewer opportunities for advancement in their careers, less intellectually stimulating and challenging work, less independence and autonomy, and less responsibility and ownership, relative to their private sector counterparts. Moreover, after controlling for these differences in work-place practices, the earnings gap between government and private sector workers becomes statistically indistinguishable from zero. These results suggest

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that lower non-pecuniary amenities behave as a compensating differential for higher pay in the public sector.

This paper contributes directly to an ongoing debate about differences in pay between public and private sector workers. While some argue that there is a significant pay gap (PPA, 2012), others have argued that there is actually a pay premium (Biggs and Richwine, 2011). For example, using the Current Population Survey (CPS) between 2006 and 2010, and controlling for differences in education, occupation, and demographics, Biggs and Richwine (2011) find that federal workers earn 14% more than their counterparts, in addition to receiving 63% greater benefits. In contrast, President's Pay Agent (PPA) (2012)) use the National Compensation Survey (NCS), which measures compensation at a job-level in a rotating sample of establishments, and find that there is a 26% pay gap. Time series evidence from Britain (Murphy et al., 2019) and France (Bargain et al., 2016), however, suggests that the public sector earnings premium might be declining.

The paper also contributes to a large literature on public service motivation (PSM), which is largely based on the insight that public sector jobs contain more of an inspiring mission and motivational culture that can be used to attract talented employees and retain them; see Ritz et al. (2016) for a survey of the evidence and Bozeman and Su (2014) for a critical review. Moreover, the paper builds upon a large literature in public administration about the design of compensation contracts for federal employees. On one hand, there is a robust relationship between PSM and job satisfaction independent of financial compensation Homberg et al. (2015). More generally, Pitts et al. (2011) find that job satisfaction is one of the most important predictors of retention in federal service. On the other hand, some amount of financial incentives are still needed (Jeannette and Taylor, 2010) even if the incentives are relatively minor (Pedersen, 2015). However, Feeney (2007) suggests that non-wage characteristics, like perceptions of red tape, matter considerably for attracting and retaining skilled professionals. My results reinforce the importance of drawing upon PSM for engaging and retaining federal employees (Christensen et al., 2017; Esteve et al., 2017), particularly when the private sector offers lucrative outside contracts. Moreover, these results are consistent with those from Lewis and Hu (2005) who argue that faster promotion schedules for skilled information technology workers serve as effective mechanisms for retention.

2. Materials and Methods

2.1. Data and Measurement

Individual-level Panel of Educated Workers (1993-2013).—The primary dataset is the IPUMS Higher Ed data, which is based on a series of surveys of science and engineering graduates by the National Science Foundation since the 1990s, including the Survey of Doctorate Recipients, National Survey of College Graduates, and the Survey of Recent College Graduates (Minnesota Population Center, 2016). These surveys are combined into a single, integrated set of files called Scientists and Engineers Statistical Data System (SESTAT). The IPUMS Higher Ed dataset creates harmonized variables and definitions across the different NSF survey waves between 1993 and 2013 (1993, 1995, 1997, 1999, 2003, 2006, 2008, 2010, 2013).

Table 1 documents descriptive statistics for government sector workers, private sector workers, those who switch at least once from the government to private sector (or vice versa), and non-switchers. Starting with demographic characteristics, there are a few minor differences between government and private sector workers. For example, the private sector has more graduates with professional degrees (10% versus 8% in government), whereas the government sector has more masters and PhD degree holders (28% masters and 4% PhD versus 25% and 3% in the private sector). There are only minor differences in gender, age, and race. However, there are much larger differences between those who switch from government to private (or vice versa). For example, whereas 54% of switchers are male, 65% are male among non-switchers. Non-switchers are also slightly older and more likely to be White.

Turning towards earnings and work, the average salary among government workers is $68,659, whereas it is $76,540 for private sector workers. Private sector workers also have a two percentage point higher earnings growth a rate of 12 percentage points (compared with 10 percentage points among government workers). There are only minor differences in hours worked. Interestingly, however, switchers have lower earnings at $62,487, whereas non-switchers are at $81,040. That largely reflects the fact that switching jobs is associated with an earnings decline in the short-run due to the depreciation of firm-specific or occupation-specific human capital (Kambourov and Manovskii, 2009a). However, switchers have a much higher earnings growth rate at 19 percentage points, whereas non-switchers have a growth rate of 10 percentage points.

What about differences in job satisfaction and work-place practices? Although these differences are explored in much more detail later, workers in government jobs tend to report lower levels, except for non-wage benefits, job security, and perceived social impact. These measures are all denoted in terms of standardized z-scores with a mean of zero and a standard deviation of one in the cross-section, but can take negative or positive values when averaging across different partitions of the data (e.g., public versus private workers). Switchers have a lower average job satisfaction, which at least partially reflects the fact that these workers are switching for a reason. Similarly, the survey also contains questions that ask individuals whether they spend over 10% of their time completing different tasks at work, ranging from business development to management. One interesting observation about the differences between government and private sector workers, apart from obvious differences relating to the focus on sales and development / design in the private sector, is a greater focus on computer services and management in the private sector.

Repeated Cross-section of Nationally Representative Workers (2005-2017).—While the IPUMS Higher Ed dataset provides excellent information on skilled workers over time, one of the major drawbacks is that it is not a representative sample of the average government or private sector worker since individuals in the sample have at least a college degree, whereas the actual share of college graduates in the United States is slightly over 30%. To address this shortcoming of the Higher Ed data, I extract more comprehensive data from the American Community Survey (ACS) between 2005 and 2017 restricted to full-time workers between ages 25 and 65 earning over $2/hour. I use the ACS to examine the external validity of the baseline results.

Repeated Cross-section of Time Use (2003-2017).—To rule out the possibility that the main result is driven by differences in the allocation of time, I also draw on the American Time Use Survey (ATUS) from 2003-2017 accessed through the Integrated Public Use Microdata (IPUMS) data portal at the University of Minnesota. The ATUS is conducted by the Bureau of Labor Statistics (BLS) on individuals who are sampled about three months after completing the final CPS of the year (Hamermesh et al., 2005). It is a three-stage stratified sample: after taking a subsample of CPS households, the ATUS sample is distributed equally across states based on each state's population share, households are stratified by race, presence and age of children, and number of adults in the household and, finally, an eligible individual in the household at least 15 years old is randomly selected to participate. Each wave is based on 24-hour time diaries where individuals report their activities from the previous day. To harmonize all the observations, the survey personnel assign activities reported by individuals to categories that the BLS has set relating to time use.

2.2. Empirical Specification

To understand the potential presence of a public-private sector earnings gap, I consider fixed effects regressions of the form:

$$y_{it} = \gamma GOVT_{it} + \phi X_{it} + g(J_{it}, \theta) + \xi_i + \lambda_t + \epsilon_{it} \quad (1)$$

Table 1
Descriptive Statistics on Government and Private Sector Workers

	Government		Private		Switchers		Non-Switchers	
	mean	sd	mean	sd	mean	sd	mean	sd
Demographics								
Male	0.61	0.49	0.62	0.48	0.54	0.50	0.65	0.48
Age	44.3	10.4	43.2	10.6	42.8	10.6	45.2	9.8
White	0.73	0.44	0.78	0.41	0.72	0.45	0.79	0.40
# of Children	2.2	0.8	2.2	0.8	2.2	0.8	2.2	0.8
Bachelor's Degree	0.60	0.49	0.62	0.48	0.58	0.49	0.60	0.49
Master's Degree	0.28	0.45	0.25	0.43	0.27	0.44	0.25	0.44
Professional Degree	0.08	0.27	0.10	0.30	0.11	0.32	0.10	0.30
PhD	0.04	0.19	0.03	0.18	0.04	0.19	0.04	0.19
Work								
Salary	68659	31520	76540	44275	62487	36449	81040	42438
Salary Growth	0.10	0.38	0.12	0.53	0.19	0.67	0.10	0.47
Hours Worked	1821	395	1847	517	1748	502	1886	473
Job Satisfaction								
Overall	0.01	0.99	-0.02	1.01	0.03	1.01	0.03	0.99
Career Opportunities	-0.08	1.01	0.02	1.02	0.04	0.95	0.02	1.00
Benefits	0.33	0.82	-0.14	1.06	0.05	0.99	-0.01	0.99
Independence	-0.07	1.01	0.02	1.00	-0.09	1.06	0.05	0.97
Responsibility	-0.00	1.00	0.01	1.01	-0.03	1.00	0.05	0.98
Salary	0.06	0.97	0.06	0.99	0.02	1.05	0.13	0.95
Job Security	0.28	0.84	-0.02	1.00	0.07	0.95	0.05	0.96
Social Impact	0.22	0.89	-0.12	1.07	0.22	0.89	-0.08	1.04
Job Activities								
Development	0.23	0.42	0.28	0.45	0.23	0.42	0.27	0.44
Design	0.19	0.40	0.27	0.45	0.19	0.39	0.27	0.44
Employee Relations	0.36	0.48	0.31	0.46	0.29	0.46	0.32	0.47
Management	0.60	0.49	0.58	0.49	0.52	0.50	0.61	0.49
Maintenance	0.11	0.32	0.16	0.36	0.11	0.32	0.15	0.35
Quality Management	0.29	0.45	0.31	0.46	0.27	0.45	0.32	0.47
Sales	0.24	0.43	0.40	0.49	0.31	0.46	0.39	0.49
Professional Services	0.40	0.49	0.38	0.49	0.46	0.50	0.38	0.48
Teaching	0.23	0.42	0.20	0.40	0.24	0.43	0.20	0.40
Computer Services	0.27	0.44	0.31	0.46	0.24	0.43	0.30	0.46
Supervising	0.45	0.50	0.47	0.50	0.39	0.49	0.50	0.50
Observations	97151		470312		9176		277054	

Notes. Sources: IPUMS Higher Ed, 1993-2013. The table reports the means and standard deviations associated with various demographic, work, job satisfaction, and job activity characteristics separately for government sector workers, private sector workers, those who switch from government to private (or private to government) at least once during the sample, and the non-switchers. Hours worked is made into a continuous variable by taking the product of different weekly hours worked and annual weeks worked groups. Hours worked is partitioned into the following four groups: 20 or less, 21-35, 36-40, and over 40; weeks worked is partitioned into the following four groups: 1-10, 11-20, 21-39, and 40-52. Job satisfaction indices are reported as z-scores, which are created by standardizing the indices, which range on a scale of one to four. Job activities are indicator variables that denote whether the worker allocates at least 10% of their time in the corresponding activity. The sample is restricted to individuals between the age of 25 and 65 years old. Sample weights are used.

where y denotes the outcome of interest (e.g., logged annual earnings), $GOVT$ denotes an indicator for working in a government (rather than private sector) job, X denotes a vector of individual controls, $g(J,\theta)$ denotes a semi-parametric function of job-specific characteristics (e.g., the types of tasks that are required), and ξ and λ denote individual and year fixed effects. In the specifications containing person fixed effects, many of the individual demographic characteristics (e.g., race and gender) drop out due to collinearity. The indicator for working in the government (public sector) is admittedly coarse due to data constraints, especially given the types of public and private institutions, but results are also robust to controlling for various dimensions of employer heterogeneity (e.g., firm size).[1] Standard errors are clustered at an individual-level to allow for autocorrelation in the error over time.

The controls in X include the following: a quadratic in age, an indicator for being male, an indicator for being white, and education fixed effects (bachelors, masters, professional, normalized to having a PhD/MD). These controls help mitigate concerns about self-selection into different types of jobs (e.g., based on risk preferences or career aspirations (Bozeman and Kingsley, 1998)) that also vary in their sensitivity to business cycle shocks. Moreover, job-level characteristics also help mitigate concerns about omitted characteristics across jobs that are correlated with individual compensation; these controls include indicators for whether the individual allocates at least 10% of their time towards: development, design, employee relations, management and administration, miscellaneous, production / operations / maintenance, quality / productivity management, sales / purchasing / marketing, professional services, teaching, accounting / finance / contracts, applied research, basic research, computer applications.

Identification of γ in Equation 1 requires that unobserved shocks to earnings are uncorrelated with selection into public versus private sector jobs, conditional on all the controls. The inclusion of person fixed effects is especially important to purge variation in earnings that is driven by, for example, unobserved ability. That is, some individuals may vary in unobserved ways (e.g., work ethic) that correlate with both earnings capabilities and preferences for public versus private sector worker. Un-

[1] See Bozeman and Moulton (2011) for a discussion of the concept of "publicness" in the public administration literature, referring "the degree to which organizations are affected by political authority" (Bozeman, 1987).

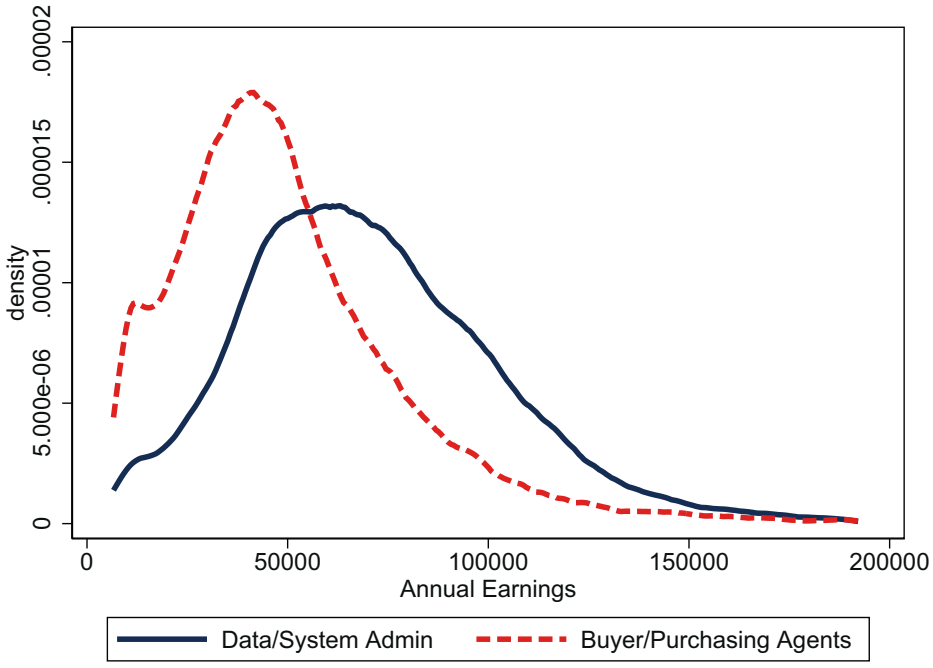

Fig. 1. Dispersion of Annual Labor Income in Two Example Occupations. Notes. Sources: American Community Survey, 2005-2016. The figure plots the distribution of annual labor income in two five-digit SOC occupations: database and system administrators (15-114) and buyers and purchasing agents (13-102). Nominal labor income is deflated using the 2010 personal consumption expenditure index.

der the assumption that more productive workers sort into private sector jobs because they offer more autonomy and performance pay compensation (Lazear, 1986), then estimation of γ without panel data will be downwards biased. The inclusion of ξ, however, enables me to compare earnings before versus after switching into (or out of) a public sector job. (Roughly 5-10% of the individuals in the sample switch from the private to public sector at least once.)

Since longitudinal survey data is often not available, I also present estimates that control for occupational fixed effects at a six-digit level. These fixed effects generally do a good job at removing unobserved heterogeneity across jobs (Moulton, 1990)—that is, certain jobs are concentrated in the one sector over another, which attracts different types of workers. However, as I will show, these occupational fixed effects are insufficient for dealing with unobserved heterogeneity since there is still dispersion in ability within an occupation. For example, Figure 1 documents significant heterogeneity in labor income among two sample five-digit occupations—database & system administrators and buyers & purchasing agents—with standard deviations of $28,423 and $25,855, respectively. The inclusion of job-level characteristics also helps control for potential confounding differences between selection into public sector jobs and earnings.

3. Results

3.1. Baseline Specification

Table 2 documents the main results associated with Equation 1 when the outcome is logged annual labor income. Before exploring the main results of interest associated with the coefficient on serving in a government job, it is informative to look at the coefficients on the demographic characteristics. For example, age is positively associated with earnings, which reflects the potential for learning by doing over the course of a career (Imai and Keane, 2004). Male employees tend to earn more than their female counterparts, but it is important not to interpret the coefficient in a causal way since males and females have different preferences that lead to non-random sorting into jobs. Normalizing educational attainment to those who have a college degree, increases in education (especially professional degrees) are highly correlated with earnings.

Starting with column 1, government workers have 4.1% lower earnings, conditional on a range of individual demographic characteristics. However, these controls are coarse—they only explain 19% of the variation in earnings. For example, harder working individuals are potentially more likely to sort into private sector jobs and earn more money, which would produce downwards biased estimates of the coefficient on working in the government. Column 2 attempts to address these identification problems in part by introducing six-digit occupational and year fixed effects, which may help control for non-random sorting into different types of jobs. However, because these are already high skilled workers with at least a college degree, heterogeneity across jobs is already less of an issue, which is why the fixed effects do not statistically affect the estimates.

While demographic characteristics, such as occupation and education are important controls for differences in task and skill content across jobs (Murphy et al., 2019), they fall short of controlling for non-random sorting into different employment arrangements because of significant dispersion in productivity even within an occupation. For example, Figure 1 displayed the dispersion in earnings within two common high skilled occupations, illustrating that the standard deviation of pay in these two occupations is over half of their average pay. To address these concerns, column 3 introduces person and year fixed effects, which exploits variation in earnings arising from job switches. Interestingly, the gradient becomes positive, suggesting that government workers earn 3.9% more. Since the identifying variation is within-person over the course of their career, the result suggests that when, for example, a given individual moves from private sector to the government, they earn 3.8% more. The estimate is robust to the inclusion of a wide array of job-level controls for the type of work that the person conducts on a daily basis (column 4). The results are also robust to restricting the sample from 2003 to 2013, which is used later in the paper.

In addition to differences in labor income, jobs are also defined by an array of non-wage benefits, which have become increasingly important for attracting talented workers (Liu et al., 2019). Fortunately, individuals are asked for three years (1997, 2010, 2013) in the longitudinal data about the presence of non-wage benefits in their work-place, as well as their overall rating of benefit quality. In the regressions that follow, I examine differences in the presence of four types of non-wage benefits: healthcare insurance, pensions, profit sharing, and vacation / paid time off. The first four columns are estimated through a series of logit regressions, whereas the last column, which measures a one to four index

Table 2
Baseline Earnings Differences Across Government and Private Sector Jobs

Dep. var. =	log(Annual Earnings)			
	(1)	(2)	(3)	(4)
Government Worker	-.039***	-.043***	.039**	.038**
	[.007]	[.008]	[.017]	[.017]
Age	.090***	.066***	.083***	.006
	[.004]	[.004]	[.007]	[.004]
Age^2	-.001***	-.001***	-.001***	
	[.000]	[.000]	[.000]	
# of Children	-.010***	-.004	-.012***	.003
	[.004]	[.004]	[.004]	[.003]
Male	.511***	.299***		
	[.008]	[.009]		
Asian	.073***	.043***		
	[.014]	[.014]		
White	.077***	.051***		
	[.011]	[.011]		
Master's Degree	.202***	.153***		
	[.008]	[.007]		
Professional Degree	.525***	.593***		
	[.011]	[.016]		
Doctoral Degree	.360***	.307***		
	[.009]	[.008]		
R-squared	.20	.26	.82	.82
Sample Size	271462	208287	212230	212230
Controls	Yes	Yes	Yes	Yes
Occupation FE	No	Yes	No	No
Person FE	No	No	Yes	Yes
Year FE	No	Yes	Yes	Yes
Job Controls	No	No	No	Yes

Notes. Sources: IPUMS Higher Ed, 1993-2013. The table reports the coefficients associated with regressions of logged annual labor income (deflated using the 2009 consumer price index) on an indicator for whether the individual is in the government (zero if in the private sector), conditional on controls. Individual controls include: age, number of children, race (Asian and white), education (masters, professional, PhD, normalized to college). Job-level controls include indicators for whether the individual allocates over 10% of their time in the following activities: development, design, employee relations, management and administration, miscellaneous, production / operations / maintenance, quality / productivity management, sales / purchasing / marketing, professional services, teaching, accounting / finance / contracts, applied research, basic research, computer applications. Standard errors are clustered at the person-level and observations are weighted by the sample weights.

of benefit quality that has been standardized into a z-score, is estimated through a standard least squares regression. Because these questions are asked of respondents less often, and given the non-linear estimator, for columns 1-4, I only include year and six-digit occupational fixed effects to avoid the incidental parameter problem (Lancaster, 2000).

Table 3 documents these results. Government workers overwhelmingly have more benefits. In particular, government workers are 16.7% more likely to have healthcare provided by their employer (column 1), 35.2% more likely to have pension / direct contribution plans (column 2), and 25.6% more likely to have paid time off (column 4). The only benefit that government workers are less likely to have is profit sharing, which is sometimes used in private sector jobs as a form of broad-based equity compensation (Kruse, 1996). Recognizing that benefits are clearly heterogeneous—for example, some health insurance plans are better than others—one concern with these differences in benefits is that they overlook the importance of quality. To address this concern, column 5 shows that government workers report 0.368 standard deviation higher quality benefits. Put together, these results suggest that simply looking at differences in salary will understate the overall compensation premium in the public sector.

3.2. External Validity

While the above results highlight the importance of controlling for unobserved heterogeneity by focusing on within-person variation (e.g., job switches), they raise a potential concern about external validity. In particular, if people who switch between government and private sector jobs, and vice versa, are systematically different than their counterparts, then the identifying variation is not necessarily informative about the broader population of public and private sector workers.

To examine whether this is a source of bias, I estimate logit regressions of an indicator for whether the individual has switched jobs on a vector of individual covariates (e.g., number of children, gender, race, education, age) and an indicator for whether the individual works in the government. I find that these public sector workers 8% less likely to switch jobs. If private sector workers earn more, then the fact that government workers move less frequently to the private sector (than private sector workers move to government) means that I will underestimate the public-private earnings ratio since any switching would bias in the opposite direction.

A second possibility is that earnings differences between the public and private pay sector censor the distribution of talent observed in the data. For example, if higher earnings in the private sector create a selection effect whereby certain types of individuals are unwilling to consider switching into the public sector, then conducting inference on the set of switchers could generate bias. To understand whether this is present in the data, I introduce new annual data from the American Community Survey (ACS), coupled with the Quarterly Workforce Indicators (QWI), between 2005 and 2017. Using these nationally representative data, I estimate regressions of logged hourly wages on an indicator for whether the individual works in government, the industry × state turnover rate, their interaction, and a vector of controls.

The intuition behind this exercise is as follows. If lower earnings in the public, relative to private, sector censor the distribution of potential entrants into the public sector, then the estimated coefficient on the interaction should be positive. That is, increases in the turnover rate positively affect the public-private wage premium. Table 4 documents the results associated with these specifications. Although the interaction is positive and statistically significant in column 1, which contains only basic demographic characteristics as controls, both the economic and statistical significance drop once industry, state, and time fixed effects are introduced in column 2. Moreover, once four-digit occupation fixed effects are introduced in column 3, the interaction effect becomes negative and statistically insignificant. These results suggest that, after controlling for heterogeneity in task content across jobs, changes in the turnover rate do not affect public sector workers systematically more than their private sector counterparts. This does not mean that increases in the turnover rate are uncorrelated with skill premia. Rather, these results suggest that within-worker variation may be externally valid.

3.3. The Role of Workplace Characteristics

The fact that there is still a pronounced skills gap in the public sector, despite the fact that they incur both an earnings and benefit premium, implies that other job-specific amenities must play an overwhelming role at discouraging talented workers from joining. What are these potential factors? To better understand the work-place practices that might contribute to differences in the attractiveness of a job, apart from compensation, I draw on two years of data (2010, 2013) in the survey where respondents articulate their satisfaction about a range of features about their job.

Before examining differences between government and private sector workers along these dimensions, I begin by quantifying the relative importance of each job amenity by regressing a standardized z-score of job satisfaction on these standardized characteristics, controlling for individual characteristics and both occupational and year fixed effects. These job amenities include the following: opportunities for advance-

Table 3
Baseline Benefits Differences Across Government and Private Sector Jobs

Dep. var. =	Healthcare	Pension	Profit Sharing	Vacation	Overall Index
	(1)	(2)	(3)	(4)	(5)
Government Worker	.167***	.352***	-.317***	.256***	.368***
	[.021]	[.017]	[.013]	[.015]	[.026]
R-squared					.03
Sample Size	69079	90040	90040	90040	48511
Controls	Yes	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes. Sources: IPUMS Higher Ed, 1993-2013. The table reports the coefficients associated with regressions of benefits on an indicator for whether the individual is in the government (zero if in the private sector), conditional on controls. Benefits in columns 1-4 are measured as binary variables for whether the individual has the benefit, whereas column 5 measures an overall standardized z-score index of benefits with a mean of zero and standard deviation of unity. Individual controls include: age, number of children, race (Asian and white), education (masters, professional, PhD, normalized to college). Standard errors are clustered at the person-level and observations are weighted by the sample weights.

Table 4
Assessing the Severity of Selection Effects and External Validity

Dep. var. =	log(Hourly Wage)		
	(1)	(2)	(3)
Government Worker	-.106***	.011	.057***
	[.027]	[.010]	[.009]
Turnover Rate	-2.663***	-.171	-.234
	[.086]	[.200]	[.190]
× Government Worker	.827***	.258**	-.135
	[.272]	[.103]	[.097]
R-squared	.33	.37	.46
Sample Size	14426532	14426532	14426532
Controls	Yes	Yes	Yes
Industry FE	No	Yes	Yes
Occupation FE	No	No	Yes
Year FE	No	Yes	Yes

Notes. Sources: American Community Survey, Quarterly Workforce Indicators, 2005-2017. The table reports the coefficients associated with regressions of the logged hourly wage on an indicator for whether the individual works in the Federal, state, or local government, the turnover rate at a two-digit NAICS and state level, their interaction, and a vector of demographic controls, including: a quadratic in age, a quadratic in years of schooling, race, gender, and marital status fixed effects. Standard errors are clustered at the state-level and observations are weighted by the sample weights.

ment and development, non-wage benefits, intellectual stimulation and challenging worker, independence and autonomy, (physical) location and convenience, responsibility, wage compensation, job security, and social contribution (broader impact). Table 5 documents the results associated with these regressions.

Not surprisingly, every job amenity is statistically significant and positively correlated with job satisfaction. Interestingly, opportunities for advancement and career development are the most predictive of job satisfaction in the cross-section, although it becomes second most predictive after salary when all characteristics are included in column 10. In the preferred specification that controls for each characteristic, a 1sd rise in advancement is associated with a 0.162sd rise in job satisfaction, controlling for other characteristics. Interestingly, benefits are among the least important predictors of job satisfaction, which may simply reflect the fact that different quality of benefits might be valued less than simply the presence of having some degree of non-wage benefits (e.g., health insurance). Following salary, advancement opportunities and responsibility at work are the two most important predictors of job satisfaction. These results are consistent with the fact that individuals, especially millennials, are increasingly valuing these types of amenities in the work-place—that is, work is more than just an income stream, but rather a place where individuals find and create meaning (Gallup, 2018; Liu et al., 2019; Makridis, 2018).

With these determinants of job satisfaction in mind, how do they differ between public and private sector jobs? Table 6 begins by regressing each of these measures of work-place practices (separately) on an indicator for being a government worker, controlling for other individual characteristics and both occupational and year fixed effects (columns 1-7). Although person fixed effects are possible due to having two years in the sample, there is not enough statistical power to identify the parameters of interest with precise enough standard errors, although the coefficient estimates are quite similar. While government jobs have 0.33sd higher perception of job security (column 6) and 0.184sd higher perception of social contribution (column 7), they have much lower ratings on career advancement, intellectual stimulation, job independence, and responsibility (columns 1-4). Given that many workers, especially millennials, are looking for learning and career advancement opportunities, these differences are both qualitatively and quantitatively important to point out.

Can these differences in work-place practices / job characteristics explain the differences in pay observed between public and private jobs? As a back-of-the-envelope way of gauging their quantitative importance for explaining pay differences as a source of compensating differentials (Rosen, 1986), column 8 now regresses logged salary on the indicator for working in the government, controlling for the usual individual characteristics and both person and year fixed effects. Not surprisingly, the point estimate—government workers earn 3.8% more than their private sector counterparts—is quite similar from Table 2 with the exception that it is identified off of variation from only two years (2010 and 2013). And yet, once all the work-place practices are included as controls, the point estimate on the indicator becomes statistically insignificant—that is, I cannot reject the null that government and private sector workers earn the same amount of money for an observationally equivalent job. These results suggest that, once differences in work-place characteristics are accounted for, the public-private pay gap disappears.[2]

One possible concern is that these differences in perceptions about work-place practices are driven by differences in work requirements. For

[2] One of the limitations of these results, however, is that the lack of statistical significance could be a result of not having enough power. That is unlikely for at least two reasons. First, the baseline result in Table 2 is robust to restricting the sample to 2003 to 2013, meaning that the restricted time series in Table 6 is not driven by the fewer years of observations. Second, even when the baseline results (or these specifications) are restricted to the sample of workers who switch at least once from government to the private sector (or vice versa), the results remain. That is likely because the differences between switchers and

Table 5
Understanding the Determinants of Job Satisfaction

Dep. var. =	Overall Job Satisfaction									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Advancement	.550***									.162***
	[.011]									[.009]
Benefits		.366***								.045***
		[.012]								[.010]
Challenging			.541***							.092***
			[.011]							[.012]
Independence				.470***						.129***
				[.011]						[.012]
Location					.306***					.061***
					[.010]					[.009]
Responsibility						.562***				.148***
						[.011]				[.014]
Salary							.503***			.199***
							[.012]			[.010]
Job Security								.466***		.145***
								[.011]		[.010]
Social Contribution									.448***	.130***
									[.011]	[.011]
R-squared	.33	.16	.29	.24	.12	.33	.25	.24	.22	.55
Sample Size	48511	48511	48511	48511	48511	48511	48511	48511	48511	48511
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Sources: IPUMS Higher Ed, 2010, 2013. The table reports the coefficients associated with regressions of a standardized z-score of job satisfaction on standardized measures of the job, conditional on controls. Each rating is based off of a one to four index. Individual controls include: age, number of children, race (Asian and white), education (masters, professional, PhD, normalized to college). These job amenities include the following: opportunities for advancement and development, non-wage benefits, intellectual stimulation and challenging worker, independence and autonomy, (physical) location and convenience, responsibility, wage compensation, job security, and social contribution (broader impact). Standard errors are clustered at the person-level and observations are weighted by the sample weights.

example, if public sector workers are required to allocate more time at work with more high-pressure schedules, then they might report lower levels of job satisfaction, which would be correlated with these indicator variables. Using the American Time Use Survey (ATUS) between 2003 and 2017, I now examine cross-sectional differences in the way public versus private sector workers allocate their time. To ensure that the comparison among workers is as close as possible, I include not only an array of individual characteristics (age, education, marital status, gender, and race), but also occupation and time fixed effects, thereby exploiting variation within narrow five-digit SOC categories of work.

Table 7 documents these results. Column 1 suggests that public sector workers allocate 15.1% less time towards work activities per day. To put the marginal effect in perspective, if the outcome variable is in levels, rather than logarithms, that amounts to nearly 19 minutes less per day at work. However, these differences could be driven by composition effects among federal, state, and local workers. Using information on whether an individual works at the federal, state, or local level, I create an indicator equal to one if the person is federal (zero otherwise and missing if the individual is state or local), taking a similar approach for the state and local indicators.

Turning towards columns 2-4, I find that federal workers allocate 20.2% less time to work activities, relative to their private sector counterparts. While the elasticity is similar for local government workers, I do not find statistically significant differences in time allocated per day towards work activities among state government workers and their private sector counterparts. The remaining four columns replicate these results among individuals with at least a college degree. Perhaps surprisingly, these elasticities are even greater in magnitude. For example, federal government workers with a college degree allocate 36% more time at work, relative to private sector counterparts. These results imply that, even among higher skilled jobs, differences in time use cannot account for differences in perceptions of work-place practices or overall work demands.

Although one limitation is the lack of longitudinal variation since only 2010 and 2013 contain respondent answers to these questions about work-place evidence, there are nonetheless clear major differences in work-place practices in public versus private sector jobs. And yet, the public sector has a unique advantage in attracting and engaging employees in the cultural aspects and social impact of their work; see a longitudinal case study from participation in AmeriCorps as one example (Ward, 2013). Although there is disagreement about how managers might best motivate workers in the public sector (Bozeman and Su, 2014), there is now clear evidence that public service motivation is an important mechanism for promoting good organizational outcomes and high employee engagement (Ritz et al., 2016). Tools for raising public service motivation are especially important since individuals often sort into the public sector because they value the social impact of their work over financial compensation (Bullock et al., 2015) and because they value job security over greater degrees of more risky revenue flows (Bullock et al., 2018), so non-pecuniary amenities may be better motivators public employees.

Another limitation of the available data is that it does not contain observations on especially high skilled workers since 2013 when the skills gap is thought to have especially widened. However, given that the average government worker earns just under $70,000 per year and the average private sector worker earns just over $75,000 per year between 2000-2013 (see Table 1), my results in this paper are fairly representative of high skilled workers. Moreover, all these workers in the baseline dataset have at least a college degree—and nearly 10% of them have a doctorate. In this sense, while the results might underestimate the pay gap at the top part of the skill distribution in certain high technology jobs, they are a reliable approximation for the bulk of the skill distribution.

non-switchers are not that large. Moreover, since switchers have lower earnings, if anything, selection effects would run in the opposing direction.

Table 6
Examining Whether Differences in Work-place Practices Explain the Pay Difference

Dep. var. =	Advancement	Challenging	Independence	Location	Responsibility	Job Security	Social Contribution	log(Salary)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Government Worker	-.128***	-.126***	-.124***	-.055	-.068*	.330***	.184***	.039**	.044
	[.034]	[.035]	[.032]	[.033]	[.036]	[.028]	[.038]	[.018]	[.045]
Advancement									.002
									[.013]
Challenging									-.023
									[.015]
Independence									.008
									[.011]
Location									.022**
									[.011]
Responsibility									.008
									[.013]
Job Security									-.002
									[.014]
Social Contribution									.016
									[.013]
R-squared	.03	.04	.01	.01	.04	.03	.12	.82	.89
Sample Size	48511	48511	48511	48511	48511	48511	48511	212230	26650
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Person FE	No	No	No	No	No	No	No	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Sources: IPUMS Higher Ed, 2010, 2013. The table reports the coefficients associated with regressions of a standardized z-score of different measures of the job / work-place practices and logged salary on an indicator for whether the individual works for the government, conditional on controls. Each rating is based off of a one to four index. Individual controls include: age, number of children, race (Asian and white), education (masters, professional, PhD, normalized to college). These job amenities include the following: opportunities for advancement and development, intellectual stimulation and challenging worker, independence and autonomy, (physical) location and convenience, responsibility, job security, and social contribution (broader impact). Standard errors are clustered at the person-level and observations are weighted by the sample weights.

Table 7
Understanding Differences in Time Use between Government and Private Workers

Dep. var. =	log(Time Allocated to Work Activities)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Government Worker	-.151***				-.205***			
	[.043]				[.055]			
Federal Government Worker		-.202**				-.364***		
		[.086]				[.108]		
State Government Worker			-.043				-.148*	
			[.063]				[.078]	
Local Government Worker				-.210***				-.203**
				[.061]				[.080]
R-squared	.02	.03	.03	.03	.04	.04	.04	.04
Sample Size	62853	52173	53862	56626	28465	21918	23259	24685
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
College?	No	No	No	No	Yes	Yes	Yes	Yes

Notes. Sources: American Time Use Survey, 2003-2017. The table reports the coefficients associated with regressions of logged time allocated to work activities in minutes per day on an indicator for whether an individual workers in the government, conditional on individual controls and both occupation (five-digit SOC) and time (year and month) fixed effects. Individual controls include: a quadratic in age, marital status, gender, race, number of children, and years of schooling. The sample is restricted to individuals between ages 30 and 55. Columns 6-8 are restricted to individuals with at least a college degree. Standard errors are heteroskedasticity-robust and observations are weighted by the sample weights.

4. Discussion and Conclusion

While there is a well-known shortage of skilled workers in the public sector, particularly in information security jobs, there remains controversy over the underlying causes. One frequently proposed explanation is that the private sector poaches public sector employees with larger salaries. Using several different sources of micro-data, this paper quantitatively examines the claim and provides an alternative explanation: differences in management and career opportunities account for differences in public-private sector earnings and sorting into these jobs.

Two main results emerge. First, although public sector workers earn less than their counterparts in the cross-section, these differences reflect a correlation between unobserved individual productivity and sorting into public versus private jobs. After exploiting within-person variation—that is, comparing earnings for a given individual before versus after they make a switch into or out of the public sector—I find that public sector workers earn a 3.9% annual earnings premium. Moreover, they report a greater incidence and quality of non-wage benefits, which implies that their overall compensation premium is even larger. Second, public sector workers tend to report much lower levels of work-place practices, including fewer career opportunities, less intellectually stimulating work, and less responsibility and scope in their work. Controlling for these factors eliminates the estimated pay gap, suggesting that dif-

ferences in work-place characteristics behave as compensating factors behind the differences in pay.

Public sector personnel systems have been criticized for their rigidity (Goodsell, 2004) and many skilled professionals perceive limited opportunity in the public sector (Kirpatrick et al., 1964). Using microeconomic evidence on state-level managers in Illinois and Georgia, Feeney (2007) shows that perceptions of red tape among these managers increases their dissatisfaction with the public sector and leads to alienation of other state workers. Moreover, using the 2006 Federal Human Capital Survey, Pitts et al. (2011) suggest that job satisfaction is one of the most important predictors of retention in federal service. My results on the importance of workplace practices—for example, the desire for autonomy and development & learning opportunities—are consistent with a larger literature and suggest that these differences can account for earnings differences between public and private sector workers of comparable age, experience, and education.

These results have important implications for policymakers and public administrators. The good news, especially given the increasing federal deficit, is that solving the worker shortage problem will not require obtaining additional authorization for funds to raise salaries. The bad news is that overhauling work-place practices across divisions and agencies is challenging and requires a long-run commitment to excellence at the top layers of decision-making. Policymakers and other governmental leaders should evaluate how to better create better incentives and a culture that encourages performance and career development. These mechanisms are left for future research.

This paper contributes to a literature in public administration about the ways to attract and retain talented workers. The public sector, especially the federal government, has the advantage of retaining a clear mission. The values inspired by a clear mission are important for attracting like-minded workers and motivating them to drive positive outcomes. The results from this paper suggest that additional compensation, on average, is not the answer to the retention and selection problem within the federal government, but rather a revitalization of workplace characteristics that are valued by employees, such as learning & development opportunities and a shared purpose. How employees value compensation, relative to improvements other non-pecuniary characteristics, is an open question that is left for further research.

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