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THE DETERMINANTS OF QUEUES FOR FEDERAL JOBS

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ABSTRACT

This paper examines the determinants of the number and quality of outside applicants for federal job openings using a variety of time-series, cross-sectional and panel data sets. The main finding is that the application rate for government jobs increases as the ratio of federal to private sector earnings increases, but does not appear to be related to the relative level of fringe benefits. Furthermore, an increase in the federal-private sector earnings differential is associated with an increase in the average quality of applicants for federal jobs. The paper discusses the implications of these findings for wage determination and recruitment in the federal government.

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Since 1962, wage determination in the federal government has ostensibly been guided by the principle of equal wages with comparable private sector jobs. To accomplish this goal, the Bureau of Labor Statistics (BLS) annually conducts a survey of wages of white collar jobs in private sector establishments, and based upon this survey a Presidential Commission recommends across the board wage adjustments to bring about equality between federal and private sector wages. Recently, the comparability process has been severely criticized, and alternative measures for guiding federal pay have been proposed.[1] Most notably, the U.S. Office of Personnel Management (OPM) has proposed analyzing data on turnover and application rates to adjust federal wages.[2] If high quit rates or low application rates make it difficult to attract, retain and motivate the federal workforce, wages would be adjusted accordingly.

Linking wage rates to the government's ability to attract and retain competent employees has the appeal of reflecting the underlying implicit job queue, and thus appears consistent with cost minimizing behavior. Furthermore, unlike the wage survey approach, these measures have the virtue of reflecting workers' evaluations of nonwage compensation, such as fringe benefits, job security and working conditions. As a matter of practice, turnover and application information are already used by the Special Rates and Analysis Division to evaluate requests for off-scale

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[1] In years when the survey finds that wages of federal workers trail wages of comparable private sector workers, econometric analyses by Smith (1976, 1977), Quinn (1979),Venti (1986), Tracy and Gyourko (1986) and Krueger (1987) find that after controlling for observed and unobserved worker characteristics federal wages exceed private wages by as much as 15% to 20%.

[2] See, for instance, OPM's controversial report, "Reforming Federal Pay: An Examination of More Realistic Pay Alternatives," December 1984.

wage rates for a small proportion of federal jobs. A precise understanding of the determinants of turnover and job applications is necessary if this approach is to be effectively used to set wages for federal workers on a wide scale.

Although there is a relatively large literature on turnover, surprisingly little is known about the determinants of applicants for job openings in the public or private sectors.[3] There are many questions that one would want to answer before using application rates as an input in wage determination. For instance, does the application rate depend on the differential in wages and fringe benefits between federal and private sector workers? Do macroeconomic factors such as unemployment affect the rate of job applicants? How does the average quality of job applicants vary with wages and macroeconomic conditions? This paper analyzes a new collection of time-series and cross-sectional data to examine the determinants of applicants for federal jobs. Section one of the paper summarizes the institutional process of applying for federal jobs. In section two a simple model of the supply of job applicants is presented. The empirical results that are presented in section three support a conclusion that the application rate for federal jobs is very responsive to relative federal-private sector wages and macroeconomic conditions, but does not appear to be related to the relative level of nonwage compensation.

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[3] See Long (1982), Utgoff (1983), Mussel (1986), Ippolito (1987) and Black, Moffitt and Warner (1987) for comparative studies of turnover in the federal and private sectors. See Barron and Bishop (1986), De Vany and Saving (1981), and Holzer, Katz and Krueger (1988) for contributions to the modest literature on job applications.

1. The Federal Job Application Process

In 1985 the federal government received about 4.5 million requests for information regarding job openings, processed nearly 1.2 million completed job applications from individuals who were not employed by the government, and hired 134,224 new employees.[4] Below I consider the system that generates and processes applications for federal jobs.

For the majority of job openings, agencies hire workers from outside the federal government through the Office of Personnel Management's Open Competitive Appointment System. This system is administered by OPM and its Area Offices. When it is decided that a position should be filled by an outside employee, OPM advertises the job opening in its Job Information Centers, specifies the minimum qualifications needed to perform the job, and announces the job's starting salary. In its instructions to job applicants, OPM advises potential applicants not to apply for a job unless they "fully meet the qualification requirements, will work in the location(s) for which applications are being accepted and will accept the salary of the position." This process is intended to screen out applicants who are not qualified for the position.

Applications are accepted only for the specific positions that have job openings. However, for many occupations, including most clerical, engineering, nursing and accounting jobs, there is a continual need for new hires, so applications are accepted on an on-going basis. Individuals may submit an application for more than one job opening.

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[4] These data and the subsequent data used in the paper are based on workers hired through the competitive appointment system which excludes postal workers.

An application consists of a completed job application blank and in many cases also includes references, academic records and civil service exam results. Job applicants are evaluated on the basis of this information. An inventory of eligible or qualified applicants is kept in federal "registers" for each occupation. OPM then refers a list of the eligible applicants ranked in order of their qualifications to the specific agency that has a job vacancy. The agency must select a candidate from the three most highly rated job applicants on the register.

Applications typically remain active on the register for a period of 12 months. After the 12 month period expires, however, the applicant may request to have his or her name remain active on the register for an additional year. Thus, the registers mainly contain applicants who currently desire government employment.

After 1978, in cases where a specific agency or local area is the sole or predominant employer of an occupation, OPM may delegate complete responsibility for recruitment and hiring to the agency or area. By 1985, about one-third of federal job applications that were processed and selections that were made were delegated to individual agencies and local areas. Examples of occupations that OPM has delegated include air traffic controllers (delegated to the Federal Aviation Authority) and ship-fitters (delegated to local federal ports).

The data used in this paper are drawn from the lists of applications maintained by OPM and its predecessor organization, the U.S. Civil Service Commission. Applications and selections that are delegated to agencies and local areas are added to the total to make the series consistent over time.

2. Model

A simple model of workers' decisions to apply for federal jobs is presented below. The basic framework is that optimizing agents compare their expected lifetime utility from applying for a job in the federal sector (including the cost of applying) to their expected lifetime utility of not applying in deciding whether to apply for a federal job.[5] An employee will apply for a government job if his expected utility is higher if he applies for the job than if he does not apply.

Assume that each individual has a utility function of the form:

$$(1) \qquad U = U(W^i, B^i) \qquad \partial U/\partial W > 0,\ \partial U/\partial B > 0\ ; \qquad i = (g,p)$$

where W^i represents the employee's discounted value of earnings in sector i, and B^i represents a vector of nonwage benefits (fringe benefits, working conditions, etc.) attached to sector i. The superscript i refers to either government jobs, g, or private sector jobs, p. I initially simplify the problem by assuming that all workers are identical in terms of their abilities and preferences, and have probability q of being selected by the government should they apply for a job. It is further assumed that individuals' preferences satisfy the von Neumann-Morgenstern axioms.

If an individual applies for a government job he is hired with probability q and has lifetime utility U^g; with probability (1-q) the

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[5] This model is formally similar to John Abowd and Henry Farber's (1982) model of implicit queues for union jobs and Rebecca Blank's (1985) model of sectoral choice. The present approach differs from these previous studies in that I explicitly model actual applications instead of implicit job queues, and in estimating the model I use direct observations on the number of applications and selections.

applicant is not selected for the job and takes his best private sector alternative which gives him utility U^p.[6] Finally, I assume that the cost in terms of utility of applying for a government job is C^g, and the utility cost of applying for a private sector job is C^p. These costs reflect the time and psychic costs of filling out an application, taking an exam, and interviewing for a job.

An individual will apply for a government job if the net expected utility of applying for the job is greater than the net utility of his or her private sector alternative. That is, he or she will apply if $qU(W^g,B^g) + (1-q)U(W^p,B^p) - C^g - (1-q)C^p > U(W^p,B^p) - C^p$, or equivalently if $q[U(W^g,B^g) - U(W^p,B^p) + C^p] > C^g$.[7] In equilibrium, open competition for federal jobs will lead individuals to apply for government jobs until the marginal applicant is indifferent between applying and not applying for the job, so

$$(2) \qquad q[U(W^g,B^g)-U(W^p,B^p) + C^p] = C^g.$$

The intuition behind equation (2) is that in expected value there are no rents to be made on the margin by applying for a government job.

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[6] As setup, the model assumes that the prospective applicant will take a private sector job with certainty if he does not apply for, or is not selected for, a government job. This will follow if the worker currently has a private sector job. If the worker does not have a certain private sector alternative, he or she will weigh the utility of the private sector job by the probability of getting a job there. As a result, the empirical analysis controls for aspects of the labor market which influence the probability of getting a private sector job, such as the unemployment rate.

[7] Note that this equation does not imply that the utility function is risk neutral; instead, it implies that the uncertain outcome of applying for a government or private sector job may be analyzed in terms of expected utility.

The number of individuals applying for job openings adjusts to eliminate ex ante rents associated with government jobs. As wage and nonwage compensation offered by the federal government rise relative to the private sector, individuals will continue to apply for a given number of federal job openings until the marginal worker is indifferent between applying to either sector. And as the cost of applying for a federal job increases or the cost of applying for a private sector job decreases, fewer individuals will apply for a given number of federal job openings so that equation (2) will again hold.

Heterogeneous Labor with Nonrandom Selection

If individuals differ in their productive capacities, and if the government is able to make job offers to applicants on the basis of workers' perceived abilities, the analysis becomes more complicated. The purpose here is only to present a heuristic discussion of these effects.

It is probably reasonable to assume that individuals have a noisy estimate of their ability relative to the population, and that the government has an imperfect but positively correlated measure of each applicant's ability. A final assumption is that there is a positive correlation between an individual's alternative wage in the private sector and his or her ability.

An increase in the relative attractiveness of government employment (i.e. an increase in W^g and B^g holding W^p and B^p constant) in this situation has two opposing effects on the application rate. First, a job candidate's expectation of being rated the most highly qualified applicant and therefore of being selected for the job is diminished. This occurs because individuals with higher alternative wages and therefore greater expected ability will apply for the job (Weiss, 1980;

Nalebuff and Stiglitz, 1982). The average quality of the job queue increases. In the extreme case, if employees know with certainty who the most qualified applicant for the job will be, only that individual will apply for the job.

The second effect occurs because the government job has become relatively more attractive and is therefore worth applying for even though the chance of ultimately being selected for the job is reduced. This is the result that is developed formally in the model above in the case of homogeneous labor.

If, as seems likely, there is considerable uncertainty as to the quality of competing job applicants and the validity of the government's selection criteria, and little cost of applying for a government job, the second effect will dominate. However, the direction and magnitude of the effect of a change in the relative attractiveness of government employment on the application rate are empirical issues.

3. The Determinants of Job Applicants

Figure 1 depicts the relationship between the application rate for all federal jobs (measured by the ratio of outside applications to new hires) and the ratio of federal to private sector earnings. The relative earnings variable in this instance is drawn from the National Income and Product Accounts because this is the only available source of annual earnings data that covers the entire period over which application rate data are available.[8] The figure shows that applications per new hire and

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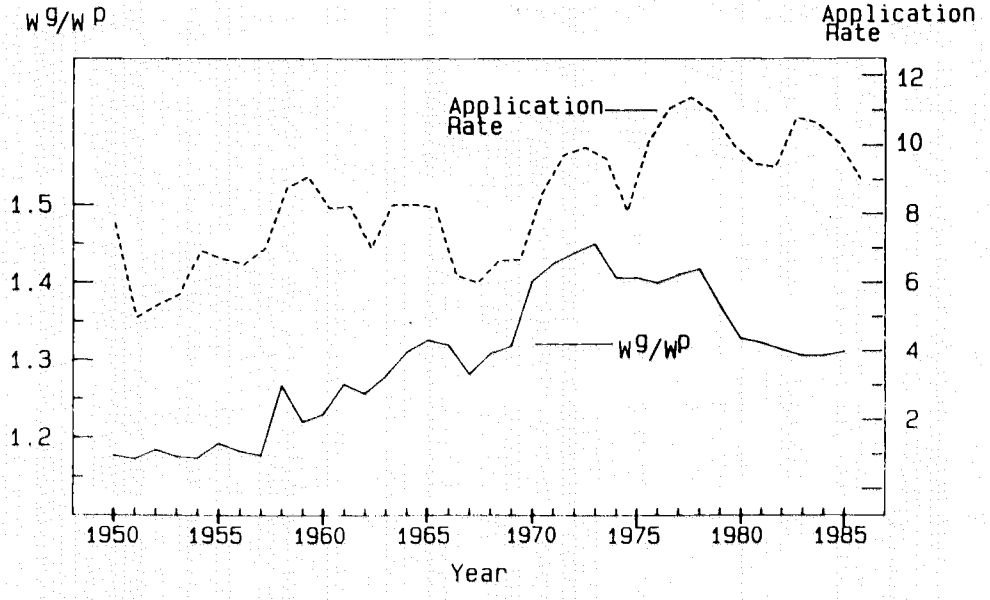
[8] Although the theoretically appropriate earnings variable is the present discounted value of lifetime earnings in each sector, because of data limitations current annual earnings for full-time equivalent employees is used.

FIGURE 1

Federal Wage Relative to Private Sector Wage and the Federal Job Application Rate



relative earnings fluctuate substantially over time. A fairly close relationship between the two variables is apparent, especially between 1960 and 1980. In years when the federal wage increases relative to the private sector wage applications per new hire generally increase, and in years when the federal wage decreases relative to the private sector wage applications per new hire tend to decrease.

The tightness or looseness of the labor market also has an important effect on the value and availability of individuals' private sector alternatives. And in this connection it should be noted that employment in the federal government displays relatively little cyclical variation (Freeman, 1987). Figure 2 illustrates the relationship between the application rate and the unemployment rate. The unemployment rate is an indicator of the availability of private sector alternatives as well as a measure of job search intensity. The application rate closely tracks the unemployment rate. The pattern strongly suggests that when the labor market becomes loose from an employee's perspective, the number of applicants for federal job openings increases.

Table 1 reports results from estimating multiple regressions to predict the log of the annual application rate for federal jobs. Since the application rate displays serial correlation, I correct for first order autocorrelation.[9] Appendix Table A1 reports results of regressions on first-differences. Several factors are held constant in the regressions to isolate the effect of the federal wage differential on the application rate. General labor market conditions are measured by the

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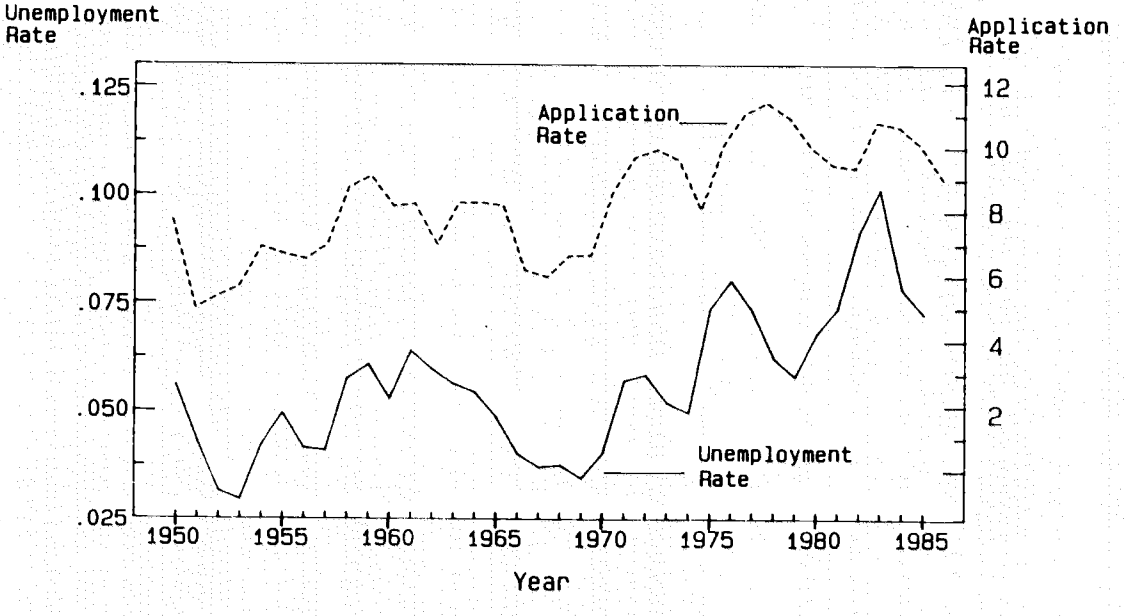
[9] The coefficient estimates are qualitatively similar when a second order autoregression is estimated and when an OLS regression is estimated.

FIGURE 2

Unemployment and the Federal Job Application Rate



unemployment rate and by the Conference Board's national index of help wanted ads.[10] Two dummy variables are included to control for differences in federal recruitment practices over time: specifically, in years after 1974 Post Offices were no longer used for recruiting, and in years after 1965 OPM consolidated several of its regional offices. Finally, a time trend is included to control for secular trends in applications. The variables and data sources used in the regressions are described in greater detail in the Data Appendix.[11]

The regression results reinforce the conclusions drawn from Figures 1 and 2. The economic variables account for a large share of annual variations in the application rate. Furthermore, the log of the government wage relative to the private sector wage denoted by $\ln(W^g/W^p)$ has an economically sizable and statistically significant effect on the number of applications per worker hired.[12] A one percent increase in the wage of federal workers over the wage of private sector workers is associated with about a two percent increase in the number of job applications per federal worker hired. Moreover, this relationship becomes stronger when additional variables are held constant.

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[10] See Medoff (1983) for a discussion of the relationship between unemployment, help wanted ads, and labor market pressure.

[11] In results not reported here I also control for the size and growth rate of the labor force, the size of the federal government (measured by the log of employment), one period lagged relative wages, and years in which the Carter-Reagan hiring freeze was in effect. Controlling for these variables does not qualitatively change the regression estimates.

[12] Following Ehrenberg (1973) and Ashenfelter and Ehrenberg's (1975) work on public sector labor demand, the government wage differential is taken as exogenous of the length of the job queue. This assumption seems reasonable because of the political factors that influence determination of wages in the federal government, and because the federal wage is unlikely to have an important effect on the aggregate private sector wage (see Borjas, 1980 and 1984; Reder, 1975).

Table 1

The Determinants of Applicants for Federal Jobs, 1951-1985[a]

(Standard Errors in Parentheses)

Independent Variables	Equation[b] (1)	(2)	(3)	(4)	(5)
Intercept	1.082*** (.110)	1.699*** (.211)	1.304*** (.171)	1.250*** (.219)	-14.165 (12.038)
$Ln(W^g/W^p)$[c]	1.801*** (.389)	2.738*** (.608)	2.075*** (.416)	2.693*** (.482)	2.487*** (.504)
Unemployment Rate	8.333*** (1.361)	---	6.486*** (1.708)	4.656* (2.369)	3.249 (2.574)
Help Wanted Index	---	-.360*** [.089]	-.171* (.100)	-.150 (.111)	-.181 (.113)
Dummy Variable (Post 1965=1)	---	---	---	-.144* (.072)	-.210** (.088)
Dummy Variable (Post 1974=1)	---	---	---	.136* (.077)	.091 (.083)
Time Trend	---	---	---	---	.008 (.006)
ρ	.343* (.169)	.627*** (.140)	.362** (.170)	.296 (.180)	.293* (.176)
Adjusted R^2	.846	.812	.855	.869	.872
Durbin-Watson	1.445	1.626	1.496	1.349	1.288

Notes:

a. Dependent variable is ln(Applicants/New Hires). Mean [SD] of dependent variable is 2.06 [.23]. Sample size is 35.

b. The Cochrane-Orcutt procedure is used to correct for first order serial correlation.

c. W^g is the average wage of full-time equivalent federal civilian employees, and W^p is the average wage of full-time equivalent private sector employees. Both variables are derived from the National Income and Product Accounts. See Data Appendix.

* Significant at the 10% level; ** significant of the 5% level; *** significant at the 1% level.

The specification of the relative earnings variable in Table 1 constrains the federal salary and private sector salary to have equal but opposite signed effects on the application rate. To check the appropriateness of this specification, the regressions are re-estimated allowing $\ln(W^g)$ and $\ln(W^p)$ to enter as separate regressors. The results of this exercise provide support for the specification in Table 1. For example, the results of re-estimating column (1) which are reported below show that the government wage and private sector wage have virtually equal but opposite effects on the application rate (AR) for federal jobs, holding the unemployment rate (UR) and help wanted index (HWI) constant.

$$\ln(AR) = \underset{(.18)}{1.34} + \underset{(.46)}{1.96}\ln(W^g) - \underset{(.50)}{1.92}\ln(W^p) + \underset{(2.52)}{5.36}\,UR - \underset{(.12)}{.21}\,HWI$$

$\text{Adj.-}R^2 = .85$ $\quad \rho = .37$ $\quad DW = 1.47$ (S.E.'s in parentheses)

Although the estimates reported above and in Table 1 rely on wage data from the National Income and Product Accounts (NIPA), the effect of relative wages on applications is positive and statistically significant when other sources of wage data are used. For instance, when the average wage of federal employees directly estimated from OPM's Central Personnel Data File is used to re-estimate column (3) of Table 1, the coefficient (standard error) on the relative earnings variable is 1.66 (.35).[13] Alternatively, when the same regression is estimated using the earnings

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[13] Tabulations from OPM's Central Personnel Data File are reported annually in Pay Structure of the Federal Civil Service (Washington, D.C.: OPM). An employment-weighted average of blue collar and white collar earnings of federal workers is the numerator of the relative wage variable; the denominator is the average private sector wage from the National Income and Product Accounts.

differential derived from the PATC comparability survey, which is available only in the years between 1968 and 1985, the coefficient (standard error) on relative earnings is 1.44 (.46).[14]

Turning next to measures of the general condition of the labor market, the unemployment rate and help wanted index have their expected signs and usually border on statistical significance. A one percentage point increase in the unemployment rate, for instance, is associated with a 6.49 percent increase in the application rate according to the estimate in column (3). However, the size and significance of the effect of the unemployment rate diminishes when the dummy variables for recruitment policies and the time trend are added to the regression.[15]

An increase in the index of help wanted ads is associated with a decline in the number of applicants per federal job opening. In comparison to the wage ratio and the unemployment rate, however, the regressions imply that a one standard deviation change in the help wanted index has a relatively small effect on the application rate. Finally, I note that after controlling for the government wage differential, labor market conditions, and changes in recruitment practices, the application rate displays a slight upward trend over time.

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[14] Since Freeman finds that the various estimates of the federal-private sector wage differential from the PATC survey, OPM's Personnel Data File, and NIPA tend to move together over time although at a point in time they often seem inconsistent, it is not very surprising that all three variables yield relatively similar results here.

[15] Results are qualitatively unchanged when the unemployment rate and help wanted index are entered in log form.

Fringe Benefits

There is a widespread perception that fringe benefits in the federal government exceed those in the private sector (e.g. Hartman 1983). To examine the impact of the relative level of fringe benefits on the federal job application rate, the regression reported below controls for the log of the ratio of average federal nonwage compensation to average private sector nonwage compensation for full-time equivalent employees (B^g/B^p), using NIPA wage and nonwage data.

$$\ln(AR) = \underset{(.23)}{1.21} + \underset{(.46)}{2.12}\ln(W^g/W^p) - \underset{(.08)}{.02}\ln(B^g/B^p) + \underset{(1.96)}{6.71}\,UR - \underset{(.11)}{.16}\,HWI$$

Adj.-R^2 = .85 ρ = .36 DW = 1.49 (S.E.'s in parentheses)

Surprisingly, the regression indicates that an increase in the level of fringe benefits in the federal government relative to the private sector has a small, statistically insignificant, negative effect on the application rate.[16] Moreover, the small standard error of this estimate implies that the economically negligible effect of relative fringe benefits on applications is precisely estimated. The relative earnings variable, however, continues to have a sizeable, positive impact on federal job applicants after controlling for nonwage compensation.

Why might fringe benefits be unrelated to job applicants? One possible explanation is that prospective job applicants are not

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[16] It should be noted that this result does not appear to be entirely driven by multicollinearity between relative earnings and relative fringe benefits because the relative fringe benefits variable has a small, statistically insignificant (though positive) effect on the application rate when the relative earnings variable is dropped from the regression.

immediately cognizant of the availability or generosity of fringe benefits. Nonwage compensation, such as pension benefits and health insurance, might not be a very salient or relevant feature of work for job applicants, while in contrast, earnings are easily measured and immediately relevant. On the other hand, another possible explanation is that nonwage labor costs are a very noisy measure of the value of fringe benefits to workers. Random measurement error would have the effect of biasing the relative fringe benefit coefficient toward zero.

Sex Differences

The federal government's equal employment opportunity policy and affirmative action program give preferential treatment in hiring to women.[17] This might be expected to lead to a different relationship between applications and wages for men and women. In addition, differences in geographic mobility between men and women might also affect application rates. Unfortunately, disaggregated application data are not available to perform a separate analysis by sex. However, it is possible to estimate the effect of sex differences in the relative federal-private sector earnings differential on the overall application rate.

Table 2 presents log application regressions controlling for the log of the ratio of federal to private sector earnings for the median,

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[17] The same argument can be applied to the hiring of minorities and verterans, but these issues are not examined empirically because sufficient time-series data on relative earnings by sector are not available for these groups.

Table 2

The Effect of the Federal to Private Sector Earnings Ratio for Men and Women on the Overall Application Rate, 1959-1985[a]

(Standard Errors in Parentheses)

Independent Variables	Mean [SD]	Equation[b] (1)	(2)	(3)
Intercept	1.00 [.00]	1.488*** (.266)	1.175*** (.362)	1.150*** (.359)
Male $\ln(W^g/W^p)$[c]	.12 [.06]	1.438*** (.514)	---	1.086* (.580)
Female $\ln(W^g/W^p)$[c]	.37 [.05]	---	1.316** (.510)	.799 (.548)
Unemployment Rate	.06 [.02]	6.894*** (2.273)	7.718*** (2.592)	7.892*** (2.452)
Help Wanted Index	1.12 [.23]	.038 (.131)	.004 (.131)	.061 (.129)
ρ		.529*** (.177)	.763*** (.146)	.615*** (.171)
Adjusted R^2		.783	.775	.792
Durbin-Watson		1.952	1.675	1.840

Notes:

a. Dependent variable is ln(Applications/New Hires). Sample size is 27.

b. The Cochrane-Orcutt procedure is used to correct for first order serial correlation.

c. W^g is the median earnings of full-time, year-round workers, and W^p is the median earnings of full-time, year-round private sector workers. These data are from the CPS.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

full-time, year-round male and female worker.[18] Changes in the federal-private earnings differential for the median male and median female worker have about an equal, positive impact on the overall job application rate. The elasticity of the overall application rate with respect to relative earnings is slightly greater for male workers than female workers, but the difference is not statistically significant at conventional levels. Furthermore, these conclusions are unchanged when the sample period is restricted to years after the Civil Rights Act took effect.

Quality of Applicants

The results presented so far do not control for the quality of job applicants. Unfortunately, only scant evidence is available on the quality of applicants for federal jobs. One admittedly crude measure of the quality of applicants for federal jobs is the number of applicants who were judged minimally qualified to perform their prospective job.[19] OPM collected such data nationally in 22 of the last 36 years. On average, 59% of applicants were judged minimally qualified for their prospective jobs during these years.

Table 3 presents regression results predicting the log of the number of minimally qualified applicants per new hire for the years in which

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[18] The relative earnings variables are drawn from unpublished tabulations of the March Current Population Survey and were provided by the Census Bureau. For years between 1975 and 1985 all federal employees are identified in the CPS; for the period 1958 to 1975, only federal public administration employees are identified.

[19] A potential problem with this measure is that standards and tests for determining minimally qualified applicants may vary somewhat over time. If the standards used to judge applicants are lowered when it is difficult to recruit workers, the relationship between qualified applicants and relative wages will be biased toward zero.

data are available. To save degrees of freedom, only the relative wage rate and labor market factors are held constant. For comparison, the second column of the table reports regression estimates of the log of the overall application rate on the same set of controls and sample. The third column examines the effect of the independent variables on the log of the ratio of minimally qualified applicants to all applicants.

The table shows that a one percent change in the federal wage differential has a greater positive impact on the number of qualified applicants per new hire than on the total application rate during this time period. As a result, the fraction of job applicants who are at least minimally qualified to perform the job they applied for increases as the average federal-private wage differential increases.

Finally, it appears that the application rate of qualified workers is less responsive than the total application rate to changes in the unemployment rate and help wanted index. The effect of these two variables on the fraction of the applicant pool that is considered qualified, however, is statistically insignificant.

Within-Occupation Analysis

The aggregate time-series analysis above reflects the entire spectrum of federal and private sector jobs. This approach is appropriate if the mix of federal and private sector jobs remained relatively constant over the time period studied.

To examine the effect of relative wages on the number of applicants for federal jobs within the same occupation, the following equation is estimated with panel data:

Table 3

The Determinants of Qualified Applicants for Federal Jobs[a]

(Standard Errors in Parentheses)

Independent Variables	Mean [SD]	Dependent Variable (1) Ln (Qualified Applications/ New Hires)	(2) Ln (All Applications/ New Hires)	(3) Ln (Qualified Applications/ All Applications)
Intercept	1.00 [.00]	.132 (.260)	1.270*** (.200)	-1.138*** (.233)
$Ln(W^g/W^p)$[b]	.27 [.08]	3.974*** (.531)	1.764*** (.408)	2.210*** (.477)
Unemployment Rate	.05 [.01]	3.964 (3.364)	8.132*** (2.586)	-4.167 (3.023)
Help Wanted Index	1.08 [.20]	.068 (.189)	-.130 (.145)	.198 (.170)
Adjusted R^2		.878	.822	.671
Durbin-Watson		1.118	1.295	.553

Notes:

a. Equations are estimated by OLS. Sample contains annual observations from 1950-1962 and 1970-1978. Mean [SD] of dependent variable in column (1) is 1.48 [.39], in column (2) is 2.04 [.25], and in column (3) is -.55 [.21]. Sample size is 22.

b. W^g is the average wage of full-time equivalent federal civilian employees, and W^p is the average wage of full-time equivalent private sector employees. Both variables are derived from the National Income and Product Accounts.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

$$(4) \quad \ln(AR_{it}) = \beta_0 + \beta_1 \ln(W^g_{it}/W^p_{it}) + \beta_2 UR_t + \beta_3 HWI_t + \alpha_i + \varepsilon_{it}$$

$$(i=1,\ldots,N) \quad (t=1,\ldots,T)$$

where AR_{it} denotes the application rate in the federal government, W^g_{it}/W^p_{it} denotes the average government wage relative to the average private sector wage derived from the PATC survey, UR_t denotes the unemployment rate, HWI_t denotes the index of help wanted ads, and α_i is a fixed occupation effect. The subscript i refers to occupation and t to year. Data are available for five occupational groups -- steno-typists, secretaries, engineers, accountants and auditors, and computer specialists -- for the years 1978 to 1985.

The equation is estimated by generalized least squares to allow for correlation in the error term, ε_{it}, across occupations in a given year. The results of this estimation are reported in Table 4. Adding occupation dummies to the regression reduces the effect of the relative wage variable on the application rate, but the relative wage variable continues to have a statistically significant and sizable impact on the application rate. A one percent increase in the government wage differential is associated with a 2.37 percent increase in the application rate according to the within-occupation regression. This estimate is similar in magnitude to the elasticity of applications with respect to relative wages obtained from the aggregate time-series analysis.

The white collar unemployment rate appears to have a very large effect on the application rate in both the inter and intra-occupation analyses. The point estimates indicate that a one percentage point increase in the unemployment rate has a much greater effect on the

Table 4

The Determinants of Applicants for Federal Jobs: Within Occupation Analysis[a]

(Standard Errors in Parentheses)

Independent Variables	Mean [SD]	Model (1)	Model (2)
Intercept	1.00 [.00]	1.443*** (.101)	1.675*** (.122)
$\ln(W_g/W_p)$[b]	-.12 [.11]	2.613*** (.241)	2.368*** (.231)
White Collar Unempl. Rate	.04 [.01]	23.88*** (1.96)	22.105*** (1.544)
Help Wanted Index	1.12 [.26]	.040 (.060)	-.020 (.047)
Steno-Typist	.20 [.40]	---	-.314 (.167)
Secretary	.20 [.40]	---	-.320** (.082)
Engineer	.20 [.40]	---	-.482** (.104)
Accountant-Auditor	.20 [.40]	---	.525 (.150)

Notes:

a. Dependent variable is ln(Applications/New Hires). Mean [SD] of dependent variable is 2.17 [.52]. Sample size is 40. Equations are estimated by constrained seemingly unrelated regression.

b. Relative wages are derived from the PATC survey.

c. The omitted occupation dummy variable is computer specialist.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

application rate in the white collar occupation analysis than in the aggregate time-series analysis. The index of help wanted ads, however, has an insignificant effect in the occupational analysis.

Lastly, I note that there is considerable variation in the application rate across occupational lines even after controlling for occupation specific relative wage differentials. Engineers appear to have the lowest application rate while accountants and auditors appear to have the greatest application rate among the five occupational groups. This pattern might reflect the relative supply of workers with these types of skills or unmeasured aspects of the relative attractiveness of government employment that varies across these occupations.

Inter-City Analysis

With relatively few exceptions, the government pays the same wage to workers who are in the same grade of an occupation nationwide.[20] Private sector wages, on the other hand, vary considerably across regions and cities of the U.S. The rigid government nominal wage schedule therefore leads to differences in the ratio of government wages to private sector wages across cities, and if workers are mobile, should influence the number of applicants for federal jobs across cities. To what extent can inter-city variability in the federal to private sector wage ratio explain the inter-city pattern of application rates?

City-wide application rates for federal nursing jobs are examined here because the qualifications for these jobs are well defined, and because requisite data are available for eleven cities. In terms of

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[20] Special wage rates introduce some regional flexibility in the federal wage schedule. In addition, inflated job classifications introduce another source of flexibility. Borjas (1980) finds evidence of wage dispersion within occupations across federal agencies.

number of employees, nursing is the fifth largest white collar occupation in the federal government. It it noteworthy that more than three-quarters of federal nurses work in Veterans Administration hospitals, and that 91% of federal nursing jobs were filled by women in 1985. The proper alternative wage for federal nurses is probably the wage of nurses employed by non-federal hospitals in the nearby geographic area.

Table 5 presents the application rate for federal nursing jobs and the ratio of average earnings of nurses employed by federal VA hospitals to average earnings of nurses employed by non-federal hospitals in each city. Looking across cities, there appears to be a weak positive relationship between the application rate and relative earnings (r=.22). In Washington, D.C. and St. Louis, for instance, the federal wage is relatively high compared to non-federal sector wages for nurses, and the government receives relatively many applicants per new hire. And in spite of the above scale federal wage rate that is in effect for federal nurses in San Francisco, the extremely high wage rate offered by the non-federal sector appears to lead to a very low application rate for federal nursing jobs in that city. Nonetheless, some significant anomalies are evident. For example, the number of applications per nurse hired in New York is the highest among the eleven cities, while the ratio of federal to non-federal earnings is relatively low in New York.

Table 5

Applicants for Federal Nursing Jobs and Relative Earnings in Eleven Cities, Fiscal Year 1985[a]

City	Applications per New Hire	Ratio of Federal to Non-Federal Earnings
Atlanta	8.15	1.30
Boston	3.77	1.14
Chicago	9.78	1.22
Dallas	3.12	1.30
Denver	1.00	1.15
New York	27.40	1.09
Philadelphia	7.37	1.19
Seattle	2.81	1.14
San Francisco	2.73	.90[b]
St. Louis	10.17	1.24
Washington, D.C.	19.34	1.21[b]

Notes:

a. The number of applications per selection were kindly provided by Margaret Higgins of OPM. Non-federal hourly nursing wages are reported in the August 1985 Industry Wage Survery: Hospitals (Washington, D.C.: Bulletin 2273, February 1987), and are converted to annual earnings by multiplying by 2,000. The average salary of federal nurses is reported in Pay Structure of the Federal Civil Service (Washington, D.C.: OPM, 1985, p. 31).

b. Special above-scale wage rates are in effect for federal nurses in San Francisco and Washington, D.C. The reported earnings ratios are not adjusted for these special rates.

4. Conclusion

This paper has examined the determinants of queues for federal government jobs as measured by the job application rate. The principal findings are: 1) the number of job applications filed per worker hired increases sharply as the average wage of government workers increases relative to the average wage of private sector workers; 2) the number of qualified applicants per worker hired, as well as the fraction of job applicants who are qualified to perform their prospective job, increases as the relative average wage of government workers increases; 3) the number of applications per new hire does not appear to be related to the relative level of fringe benefits; and 4) the number of applications per new hire increases as the unemployment rate increases, and decreases as the help wanted index increases. Moreover, these conclusions seem to hold in both aggregate time-series data and in longitudinal data on occupational groups over time.

These findings have several implications for federal wage setting and recruitment policy. The analysis shows that an increase in the wage of federal workers will lead to an increase in the number and average quality of applicants for federal jobs. Since job application rates appear to reflect economic incentives, the case for using application data as a mechanism for adjusting wages is strengthened. If the number of job applications for a given job opening falls below or rises above a certain level, wages can be adjusted accordingly to minimize costs. In addition, the results suggest that increasing fringe benefits is not an effective way to recruit workers.

An important unresolved issue is the determination of the proper standard for judging the optimal number of applicants for job openings ir

the federal government. A backlog of applicants allows vacancies to be filled rapidly and facilitates efficient job matches, but resources are used inefficiently if wages are set above the optimal level. A natural standard of comparison for the government's application rate is the application rate for jobs in the private sector. A first attempt to compare job queues in the government and private sector is presented in Krueger (1987). However, a comparison between the application rate in the private and public sectors is hindered by the salience of the government and by differences in recruitment practices used by public and private sector employers. It is noteworthy that Bishop, Barron and Hollenbeck (1984) and others find that employer size and search activities have an important effect on the number of applications received by private sector establishments. The application rate for federal sector jobs and private sector jobs may not be directly comparable.

An alternative approach would be to study the effect of differences in application rates on the productivity and efficiency of government agencies. The optimal application rate can be based on organizational performance and actual experience rather than on a rigid comparison with private sector employers. Finally, a valuable complement to the analysis here would be an examination of the determinants of the rate at which workers turn down job offers. Like the application rate, the turn down rate reflects workers' alternative opportunities in the labor market. The job turn down rate can serve as a additional indicator of the relative generosity of compensation.

Data Appendix

The sources and definitions of the variables used in the time-series analysis in Tables 1 and A1 are below.

Variable	Mean [S.D.]
Application Rate = The total number of applicants for federal nonpostal civilian jobs divided by the total number of workers hired from those applicants. The data are on a federal fiscal year basis. From 1950 to 1978 the data are reported in various issues of the Annual Report of the U.S. Civil Service Commission. (The applicant rate for 1968 and 1969 are approximate.) Application and new hire data for years after 1978 were kindly provided by Margaret Higgins and Van Yee of OPM and include delegations.	8.02 [1.78]
W^g/W^p = The annual average wage of full-time equivalent civilian non-postal federal employees divided by the average annual wage of full-time equivalent private sector workers. Data are on a calendar year basis. Source: National Income and Product Accounts.	1.32 [.09]
B^g/B^p = The annual nonwage compensation of full-time equivalent civilian non-postal federal workers divided by the average annual nonwage compensation of full-time equivalent private sector workers. Nonwage compensation includes mandatory employer contributions to social insurance, voluntary fringe benefits, and other labor income. Data are on a calendar year basis. Source: National Income and Product Accounts.	1.15 [.32]
Unemployment Rate = Average of twelve monthly unemployment rates on a federal fiscal year basis. Source: Employment and Earnings (Washington, D.C.: Bureau of Labor Statistics, various years).	.06 [.02]
Help Wanted Index = Conference Board Index of Help Wanted Ads in 50 newspapers. The index was adjusted for changes in competition in the newspaper industry and in the occupational composition of the labor force over time using the procedure developed by Katherine Abraham in "What Does the Help Wanted Index Measure" (Bookings Paper on Economic Activity, 1986).	1.12 [.23]
Dummy Variable (Post 1965) = 0 if before 1966, and 1 in 1966 and after. In 1966, the 688 agency boards of Civil Service Examiners were consolidated into 65 Inter-agency Boards.	.31 [.47]

Dummy Variable (Post 1974) = 0 in years before 1975, and 1 in 1975 and after. By 1975 the Civil Service Commission had assumed complete responsibility from the U.S. Postal Service for testing job applicants and providing information to prospective applicants.	.56 [.50]

Table A1

The Determinants of Applicants for Federal Jobs, 1951-1985
OLS Regressions on First Differences

(Standard Errors in Parentheses)

Independent Variables	Equation[a] (1)	(2)	(3)	(4)	(5)
$Ln(W^g/W^p)$[b]	2.22**	2.354***	2.155**	2.192***	2.180**
	(.837)	(.827)	(.801)	(.779)	(.801)
Unemployment Rate	7.690***	---	4.605*	3.995	3.999
	(1.887)		(2.356)	(2.414)	(2.456)
Help Wanted Index	---	-.346***	-.214**	-.188*	-.189*
		(.084)	(.105)	(.103)	(.105)
Dummy Variable (Post 1965=1)	---	---	---	-.202*	-.204*
				(.103)	(.106)
Dummy Variable (Post 1974=1)	---	---	---	.069	.068
				(.111)	(.115)
Time Trend	---	---	---	---	.002
					(.018)
SEE	.109	.109	.104	.101	.103
Durbin-Watson	2.106	1.965	2.052	1.927	1.927

Notes:

a. Models were estimated with OLS after taking first differences of the dependent and independent variables. Sample size is 35.

b. W^g is the average wage of full-time equivalent federal civilian employees, and W^p is the average wage of full-time equivalent private sector employees. Both variables are derived from the National Income and Product Accounts. See Data Appendix for definitions and sources of other variables.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

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