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HOW DO PUBLIC SECTOR WAGES AND
EMPLOYMENT RESPOND TO
ECONOMIC CONDITIONS?

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ABSTRACT

This paper examines the changes over time in public sector wages and employment relative to private sector wages and employment using data from surveys of establishments and individuals. The paper finds that:

(1) The pay of public sector workers relative to private sector workers varies greatly over time. Contrary to the view that public sector pay is inflexible, variations in relative pay are due as much to fluctuations in public pay as to fluctuations in private pay.

(2) The relatively high paid public sector worker of the early 1970s has within the span of a decade lost much of his or her advantage over otherwise comparable private sector workers, seriously denting if not destroying the picture of the 'overpaid' public employee which developed in the early 1970s. The group of public sector workers who tend to be most highly paid in the U.S. relative to private sector workers are blacks and women, suggesting that the public sector discriminates less than does the private sector.

(3) Differentials in public and private sector pay vary greatly depending on the nature of comparisons, with for example Current Populations Survey comparisons of individuals with similar broad human capital showing federal employees to be higher paid than private employees and Bureau of Labor Statistics surveys of wage rates in particular occupations showing federal workers to be lower paid.

(4) Public sector employment follows a very different pattern of change than private sector employment. It has smaller annual variation, and moves countercyclically rather than cyclically. In terms of demographic composition the public sector employs relatively more blacks and women than the private sector.

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Nearly one in five full-time equivalent employees in the U.S. works for some branch of government; one-fifth of compensation of employees is paid by governments. In many labor markets, such as for school teachers, protective service workers, health sector workers, and white collar workers, in general, government plays an even larger, sometimes, predominant role on the demand side of markets.

How do governments act as employers of labor? Are public sector wages and employment unresponsive to changing economic conditions, as is often held? Are government workers generally paid a premium over comparable private sector workers or do public/private pay differentials vary with economic conditions? What economic forces influence public pay and employment?

In spite of wide recognition of the importance of the public sector as an employer of labor, these questions pertaining to the responsiveness of the wage and employment of government workers have been rarely addressed. The purpose of this paper is to set out the basic "facts" about public sector wage and employment patterns in the U.S. and to develop a relatively simple empirical model of public sector wage and employment setting which answers the questions of concern.

The principle findings of the paper are:

(1) The pay of public sector workers relative to private sector workers varies greatly over time. Contrary to the view that public sector pay is inflexible, variations in relative pay are due as much to fluctuations in public pay as to fluctuations in private pay.

(2) The relatively high paid public sector worker of the early 1970s has within the span of a decade lost much of his or her advantage over otherwise comparable private sector workers, seriously denting if not destroying the picture of the 'overpaid' public employee which developed in the early 1970s. The group of public sector workers who tend to be most highly paid in the U.S. relative to private sector workers are blacks and women, suggesting that the public sector has a better equal employment/affirmative action record than does the private sector.

(3) Differentials in public and private sector pay vary greatly depending on the nature of comparisons, with for example Current Populations Survey comparisons of individuals with similar broad human capital showing federal employees to be higher paid than private employees and Bureau of Labor Statistics surveys of wage rates in particular occupations showing federal workers to be lower paid.

(4) Public sector employment follows a very different pattern of change than private sector employment. There is less annual variation in public sector than in private sector employment. The rate of growth of state and local employment tends to be countercyclical rather than cyclical while federal employment growth tends to be less procyclic or countercyclical than private employment growth. In terms of demographic composition the public sector employs relatively more blacks and women than the private sector, reinforcing the belief that the government offers their workers better job opportunities than the private sector.

(5) Budgets are, not surprisingly, a major determinant of state and local public sector wage and employment. At the state and local level an increase in the ratio of budgets to GNP raises relative employment by much more than it raises relative wages. Because of differences in the response of the public sector and private sector to broad economic developments, public sector employment rises relatively in recessions and falls relatively in booms while relative wages move in the opposite direction. Relative state and local public sector employment tends, moreover, to fall in periods of rapid inflation. By contrast, federal wage and employment, which constitute only a small proportion of budgets and which can be financed by deficit financing, do not exhibit a well-defined relationship to various measures of budget size.

Changing Patterns of Pay

The principal phenomenon of concern to this study — changes in the relative pay of public sector workers — is depicted graphically in Figure 1. This figure shows that the ratio of total compensation of public sector workers relative to private sector workers in the National Income and Product Accounts (NIPA) has varied greatly in recent decades and in the Depression and World War II. During the Depression nominal public pay remained roughly constant while private nominal pay fell, producing a substantial public pay advantage. During World War II, private pay rose rapidly, lowering the public:private differential. From roughly the mid-1950s to the 1960s, public sector pay rose relative to private sector pay, while beginning in the mid 1970s relative public sector pay fell.

The changes in relative pay shown in the figure could have resulted largely from movements in private pay or largely from movements in public pay or from roughly equal movements in the two series. The notion that public pay is "inflexible" relative to private pay implies that it is movements of the latter that underly the changes in the figure.

To test this notion I have decomposed the relative pay measures in several ways using variants of the basic variance decomposition formula:

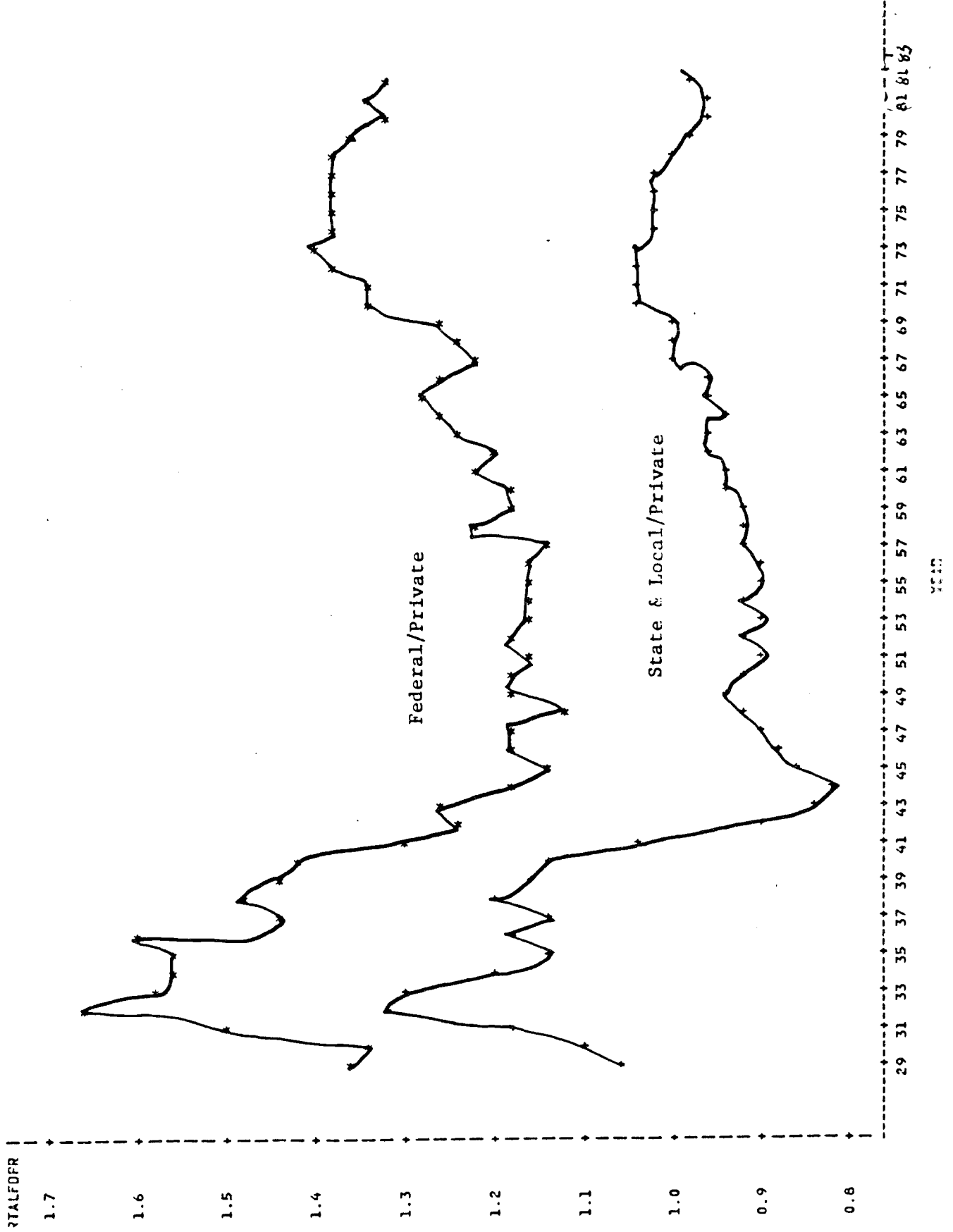
$$(1) \sigma^2 \left[\ln \left(\frac{w_g}{w_p} \right) \right] = \sigma^2 \ln w_g + \sigma^2 \ln w_p - 2\sigma (\ln w_g \ln w_p)$$

where w_g = wage in government sector

w_p = wage in private sector

Figure 1: Ratio of Federal Civilian Pay to Private Sector Pay
and of State and Local Government Pay to Private Sector Pay

1929 - 1983



$\ln = \log$

$\sigma^2 = \text{variance}$

$\sigma = \text{covariance}$

The variants of the decomposition formula that I use are: (1) decomposition of the ratio of real wages; (2) decomposition of the level of real wages after removing a linear trend term; (3) decomposition of changes in money wages; (4) decomposition after an auto-regressive adjustment of the underlying series.

The results of the exercise (summarized in Appendix Table A) show that public sector pay varies over time more or less as much as private sector pay, so that the notion of relatively inflexible public sector pay does not stand up to scrutiny. The changes in the ratio of public to private sector pay in Figure 1 are due roughly as much to variations in the former as to variations in the latter.

The Seventies Decline in Relative Public Pay

The view that public sector workers are "overpaid" gained support as the result of a set of studies of public sector wages in the early 1970s. As Figure 1 shows, the ratio of public to private pay was especially high then and declined thereafter. Because the drop in the relative public pay in the 1970s calls into question the "overpaid public employee" whose wages are insulated from the economy, I examine a wide variety of data pertaining to relative public sector wages, including the payroll data of federal, state, and local governments, the Bureau of Labor Statistics comparability surveys, US Civil

Service Commission Reports, and March and May Current Population Surveys of individuals. As my concern is more with changes than with levels of relative pay, I do not address the issue of whom should be compared to whom for the purpose of deciding whether public workers are "overpaid" nor do I deal with issues of job security, fringe benefits, turnover rates and the like which must also enter an evaluation of relative public sector compensation.

NIPA and Payroll Data

Table 1 presents information on the ratio of public to private sector pay for all workers in the sectors from 1970 to 1983 as reported in the National Income and Product Accounts. Column 1 records the ratio of "wages and salaries per full-time equivalent employees" for federal civilian employees relative to those in private industry. The drop of 15 points from the peak 1973 year to 1983 is sizeable, although it must be put into perspective by noting that relative pay increased by more than 15 points over the previous decade. Column 2 records comparable ratios for state and local government workers, including those in education. Here the drop is much less severe, with a partial recovery for relative public sector pay from 1982 to 1983, when the economy entered its worst recession since the 1930s; at the same time, the increase in relative pay in earlier decades is also less marked.

How did relative public sector pay stand in 1983 compared to earlier years? In 1983 federal civilian pay was 33% above the private sector average; from 1950 to 1983, it averaged 32% above. In 1983 state and local pay stood at 3% below the private sector average; from 1950 to 1983, it averaged 4% below.

Table 1: Ratios of Federal Civilian and State & Local Government Wages & Salaries to Private Industry Wages & Salaries, for Full-Time Equivalent Workers

	WAGE AND SALARY OF GROUP RELATIVE TO PRIVATE				
	Federal Civilian	State & Local	Federal Enterprise	State & Local Enterprise	Education
1950	1.20	.91	1.10	1.06	.92
1960	1.25	.93	1.03	.98	.98
1970	1.42	1.06	1.14	1.07	1.06
1971	1.45	1.04	1.12	1.10	1.08
1972	1.46	1.03	1.18	1.11	1.08
1973	1.48	1.04	1.21	1.13	1.07
1974	1.43	1.02	1.24	1.06	1.04
1975	1.43	1.01	1.25	1.08	1.05
1976	1.42	1.01	1.27	1.08	1.05
1977	1.43	1.01	1.27	1.06	1.04
1978	1.44	.99	1.27	1.04	1.02
1979	1.39	.97	1.25	1.02	1.005
1980	1.35	.96	1.27	1.02	.982
1981	1.34	.95	1.32	1.03	.975
1982	1.33	.97	1.28	1.05	.985
1983	1.33	1.00	1.29	1.08	1.01
Δ 1973-83	-.15	-.04	.08	-.05	-.06

Source: Calculated from U.S. Department of Commerce, Bureau of Economic Analysis, National Income Product Accounts

Hence, by 1983 relative government pay seemed roughly to be at its post-1950 average.

The figures in columns 3 and 4 treat government enterprises. In the federal government this includes the Post Office, Tennessee Valley Authority, and related organizations. For the state and local governments, it includes public utilities and the like. A different pattern emerges in these data: a rise in the ratio of federal enterprise to private sector pay contrasted with a decline in the ratio of state and local enterprise to private sector pay. Finally, column 5 treats education, where we find a decline of 10 points from 1970 to 1982 followed by an increase of .03 from 1982 to 1983.

The disparate patterns suggest the value of more disaggregate look at various publicly employed groups distinguished by function, level of government and occupation, to which we turn next.

Table 2 records data from the government employment and payroll survey of the Bureau of the Census. It shows a sharp decline in the pay of federal workers under the general schedule (GS) system (which covers federal white collar workers) which is roughly consistent with the NIPA figures, but a somewhat more complex pattern of change for workers paid under the WS system (blue collar) and for postal (PS) employees. In these cases relative wages turn down in the late 1970s rather than earlier and fall much less dramatically. For state and local government employees, the payroll data show a moderate decline in public/private pay differentials. Decomposed into education and other government functions, the figures for municipalities show a much greater con-

Table 2: Ratios of Public Sector Earnings Reported
in Payroll Series to the Private Industry
Wage and Salaries, 1970 - 1982

	Federal			State	Local	Municipal	
	GS	WS	PS			Education	Other
1970	1.44	.89	1.05	1.07	1.06	1.31	1.06
1971	1.44	.92	1.09	1.06	1.04	1.29	1.08
1972	1.45	.96	-	1.07	1.07	1.32	1.10
1973	1.44	.98	-	1.09	1.07	1.37	1.10
1974	1.38	1.00	1.19	1.08	1.06	1.29	1.11
1975	1.34	1.03	1.23	1.06	1.04	1.27	1.09
1976	1.33	1.07	1.23	1.06	1.03	1.26	1.08
1977	1.32	1.16	1.23	1.06	1.03		
1978	1.33	1.18	1.23	1.05	1.00		
1979	1.29	1.16	-	1.04	.99		
1980	1.25	1.12	1.14	1.03	.98	1.14	1.02
1981	1.26	1.12	1.09	1.03	.99	1.18	1.05
1982	1.25	1.10	-	-	-	1.19	1.06
Δ, peak year to 1982	-.20	-.08	-.04	-.06	-.07	-.13	-.05

Source: Federal, State, Local from U.S. Bureau of the Census Payroll Series
Municipal from U.S. Bureau of the Census, Statistical Abstract of the
U.S., 1984, p. 309.

centration of the decline in the education sector than found in Table 1, and also a partial recovery for both education and other municipal workers in the 1980s.

Because federal GS employee pay increases are legislated by the Congress, it is possible to compare the observed changes in GS pay to the changes that would result if legislated increases were the sole cause of change. In the period 1972-1982 legislated federal increases amounted to 84% of 1972 salary compared to an actual change of 77% of 1972 salary. Increases in the average GS level of federal employees explain the change in salary above the legislated amount. As Appendix Table B shows these increases were concentrated in the latter part of the seventies and early 1980s. From 1977 to 1982 grade increases (plus a minor "step creep", defined as increases in pay due to changes in the "steps" of workers within a GS-level) raised pay by 9.0% compared to an increase in pay due to grade increases of 3.4% from 1972 to 1977. Had the federal government not upgraded the GS-level of its work force -- which could represent a "true" increase in skill level, or a "creep" up in response to market conditions -- the 1982 ratio of federal GS pay to private sector pay in column 1 would have been 1.19. This implies that federal GS-pay fell by 25 percentage points relative to private sector pay, grade held constant.

Rates of Pay for Comparable Workers

The comparisons of public and private pay thus far are crude, in that they do not compare workers in the same occupation or with the same skills. There are two basic ways to make such more refined calculations: (1) to use

occupational wage rates on the pay in detailed occupations; (2) to use individual level data on the pay of workers with similar personal characteristics. The former method contrasts wage rates actually used in wage-setting; the latter method contrasts earnings with those of workers having comparable age, education, and the like. Which is "better" depends on the quality of data and purpose of the comparison.

Table 3 uses federal professional, administrative, technical and clerical (PATC) Survey Data to make such comparisons for white collar workers. The PATC survey provides information on average annual wages for occupations in the private sector comparable to those in the public sector for each grade of the general schedule (white collar workers) of the civil service. According to the principle of federal pay in the Federal Pay Comparability Act of 1970 adjustments in general schedule salaries are supposed to ensure that October federal wages are equal to comparable private sector wages of the previous March. When recommending actual wage increases to Congress, however, the President can suggest wage changes not based on the PATC and of course Congress can enact higher or lower pay increases. Each year since 1977 the President has recommended lower increases.

The figures in Table 3 report (unweighted) average ratios of federal to comparable private sector pay within GS-classes. To assure comparability of data over time the averages are limited to occupations which report pay in each year from 1972 to 1983. While the data can be summarized in other ways (weighted averages; inclusion of occupations contained in one year's survey but not in

Table 3: Ratios of Federal GS Pay to Private Sector
 "Comparable" Pay for Occupations by GS-Level

GS-Level (number of occupations in comparison)	1972	1976	1978	1980	1983	Δ 1972-83
GS-1 (2)	1.04	.91	.91	.89	.86	-.18
GS-2 (3)	.99	.93	.90	.89	.87	-.12
GS-3 (4)	1.02	.90	.86	.84	.77	-.25
GS-4 (2)	1.02	.91	.92	.88	.82	-.20
GS-5 (7)	1.12	.86	.86	.83	.76	-.36
GS-7 (8)	1.05	.92	.90	.86	.80	-.25
GS-9 (8)	1.03	.93	.90	.86	.80	-.23
GS-11 (9)	.97	.94	.90	.87	.81	-.16
GS-12 (6)	1.00	.94	.90	.86	.79	-.21
GS-13 (5)	1.02	.92	.90	.86	.78	-.24
GS-14 (5)	1.04	.91	.89	.83	.76	-.28
GS-15 (2)	1.07	.90	.90	.83	.75	-.32
All GS	1.03	.91	.90	.86	.80	-.23

Source: Tabulated from U.S. Bureau of Labor Statistics.

Note: For comparability over time the figures report unweighted averages of occupational ratios only for occupations reporting in 1972 and in all later years. The pattern for other occupations included in later surveys is consistent with that in the table. I have left out GS-8 because there were no occupations in 1972 and GS-6 because only one occupation reported in 1972.

another year's survey) the pattern is sufficiently clear as to require no more detailed computations. The effect of Presidential recommendations of lower than comparable pay increases and of resultant Congressional action in the 1970s has been to reduce relative federal pay falls sharply in all GS-levels, with an unweighted average decline of 23 percentage points!

Table 4 records the results of similar comparisons for clerical and skilled maintenance workers for the federal government; for clerical and skilled maintenance workers in municipal government employment; and of firefighters, police and teachers. At the federal level, we see the drop in relative pay for clerical workers but not for skilled maintenance workers. At the municipal level we see sharp drops for all occupations, with police and firefighters experiencing surprisingly large declines nearly as great as those for teachers.

All told, these comparisons of workers in given occupations suggests that the drop in public/private pay indicated in Tables 1 and 2 may underestimate the fall in public sector pay, particularly for employees of local governments.

Current Population Survey

An alternative widely used way to compare workers with similar attributes is to use data on individuals from the Current Population Survey tapes. These tapes provide detailed information on personal characteristics of workers but less adequate information on occupation and, in some cases, on type of employer. The CPS tapes contain two questions on public sector employment: a class of worker question which divides workers between private employment, self

Table 4: Municipal and Federal Government Salaries
Compared to Those in Private Industry, 1970-1980

	Ratio of Government Salary To Private Industry			Δ
	1970	1975	1980	
<u>Federal</u>				
Clerical	--	1.00	.85	-.15
Skilled Maintenance	--	1.01	1.00	-.01
<u>Municipal</u>				
Clerical	--	1.04	.98	-.06
Skilled Maintenance	--	1.07	.97	-.10
Policemen (Minimum Scale)	1.10	1.05	.96	-.14
Firefighters (Minimum Scale)	1.05	1.01	.91	-.14
Teachers	1.21	1.09	1.04	-.17

Source: Clerical and Skilled Maintenance: A Comparison in Large Labor Markets, Monthly Labor Review, July 1981, Table 1.

Police and Firefighters: U.S. Bureau of Census, Statistical Abstract of the U.S., 1984 p. 187.

Teachers: National Center for Education Statistics, The Condition of Education, 1984, Table 1.19.

employment, and governmental employment and the "industry" of employment question, which includes public administration by level of government. As the claim that government workers are "overpaid" received its strongest support in Sharon Smith's analysis of CPS tapes in the mid 1970s, it is important to see how public-private pay differentials have changed in the CPS.

Table 5 presents the results of an analysis of usual hourly pay from the May CPS tapes for 1973, 1978, and 1983, and of annual earnings from the March CPS tapes for 1968, 1977 and 1982. While there are some inconsistencies between the two CPS surveys and between them and the earlier data sources the general picture of declining public sector differentials in the seventies holds for most government branches. In particular, both the May and March CPS files show declines in the relative pay of all government employees in the 1970s, though the magnitude of the drop differs with the survey, group, and years covered. The coefficients on federal public administration in the May tape indicate a sizeable 7 point drop and an 11 point drop in the March tape. The pay of teachers drops more sharply in the March CPS, and both tapes show drops for nonpublic administration, and rises, 8 points for postal workers. The principal aberrant result is the rise in pay in local public administration found in both CPS tapes, which contrasts with virtually all other data on local pay rates. It may be due to the change in classification between the 1982 and 1983 surveys due to implementation of 1980 census definition as described in Appendix C.

When we turn attention to the level of public to private pay

Table 5: Estimates of the Effect of Government Employment on the Pay of Workers, Controlling for Demographic and Occupational Characteristics, 1969 - 1983

A. Usual Hourly Earnings, May Current Population Tapes

Group and Percent Employed	1973	1978	1983	Δ
Number of Observations	34935	39092	12261	
Government Worker	.06	.02	.02	-.04
<u>Type</u>				
Federal Public Admin.	.26	.21	.19	-.07
State Public Admin.	.06	.01	.04	-.02
Local Public Admin.	-.03	-.07	.06	.09
Non Public Admin.	.01	-.04	-.04	-.05
Teacher	.01	-.08	-.06	-.07
Postal	.18	.31	.26	.08
Firefighters	.14	.14	.11	-.03
Police	.41	.34	.33	-.08

B. Annual Earnings, March Current Population Tapes

	1972	1977	1982	Δ
Number of Observations	31613	45082	47478	
Government Worker	.06	.03	.01	-.05
<u>Type</u>				
Federal Public Admin.	.27	.23	.18	-.11
State Public Admin.	.05	.07	.06	.01
Local Public Admin.	-.05	.06	.10	.15
Non Public Admin.	.01	-.02	-.07	-.08
Teacher	-.01	-.07	-.11	-.10
Postal	.22	.28	.30	.08

Source: Tabulated from May and March Current Population Surveys. Based on log linear regressions with demographic controls, occupation and industry controls.

See Appendix C for Sample Sizes.

differentials and to the magnitude of changes in differentials, the difference between CPS-based data and the other data sets examined in this study becomes striking, indeed. In general, the CPS-based data show smaller relative declines in public sector pay than do the payroll (NIPA) and occupation-based data and higher public to private ratios of relative pay, whereas the levels of relative pay also differ significantly in some cases. In particular, in the PATC and other detailed job surveys we found federal GS workers paid less than other workers, in the CPS we find workers in federal public administration earning more than the typical private sector worker in the same occupation, with the same personal characteristics.

There are two basic reasons for this inconsistency. First, in contrast to the CPS which gathers data on all workers, the PATC survey is limited to workers in relatively large firms, whose pay traditionally exceeds that of workers in smaller firms. Whether this makes the CPS or PATC comparisons "better" is a matter of judgement. Some (Wachter and Perloff) have interpreted comparability as calling for comparisons of federal employees with all workers. Others argue that it is wrong to compare employees of the largest single enterprise in the U.S. to workers from Joe's corner store (Hartman), making the PATC comparison a more accurate picture of where the federal government stands in labor markets. Second is the difference between comparisons of wages in well-defined jobs and of wages of persons with similar demographic characteristics. Here, the PATC data has a clear advantage, as it refers to specific occupations (computer programmer, accountant) for which the

federal government hires persons rather than of broadly defined groups (professionals, with college education, of a given age) most of whom may lack the skill for the particular job.

Finally, it is important to recognize that part of the observed premium to federal public administration shown in Table 5 reflects different public than private pay policies toward minorities and women. Table 6 documents this point for usual hourly earnings in May 1983 and for annual earnings, adjusted for hours and weeks worked in 1977 and 1982. In all periods and surveys, public employees tend to have smaller differences in pay by sex and by race than private employees, though there is some indication that the differential between sectors narrowed in the late 1970s - early 1980s. As Asher and Popkin have stressed, to the extent that government pay is relatively good because of more equal treatment of minorities and women, interpretation of Current Population Survey differentials in terms of "over paid" government workers requires reconsideration by analysts.

Table 6: Regression Estimates and Standard Errors:
The Effect of Ethnicity and Sex on Pay,
by Public and Private Sector

	Hourly Earnings	Annual Earnings, Controlling for Hours and Weeks	
	May 1983	March Tapes 1977	1982
<u>Black</u>			
Private	-.08 (.02)	-.06 (.01)	-.05 (.01)
Public	.01 (.03)	.02 (.02)	-.01 (.02)
Federal	-.08 (.05)	-.03 (.04)	-.09 (.04)
State	.00 (.05)	.01 (.04)	-.05 (.04)
Local	.02 (.04)	.03 (.03)	.02 (.03)
Postal	.02 (.06)	-.05 (.06)	-.12 (.06)
<u>Women</u>			
Private	-.31 (.01)	-.52 (.01)	-.42 (.01)
Public	-.28 (.02)	-.38 (.01)	-.34 (.01)
Federal	-.33 (.04)	-.33 (.03)	-.30 (.03)
State	-.18 (.04)	-.21 (.02)	-.19 (.02)
Local	-.22 (.02)	-.37 (.02)	-.32 (.02)
Postal	-.15 (.05)	-.17 (.04)	-.25 (.05)

Source: Calculated from March and May CPS tapes
See Appendix C for Sample Sizes

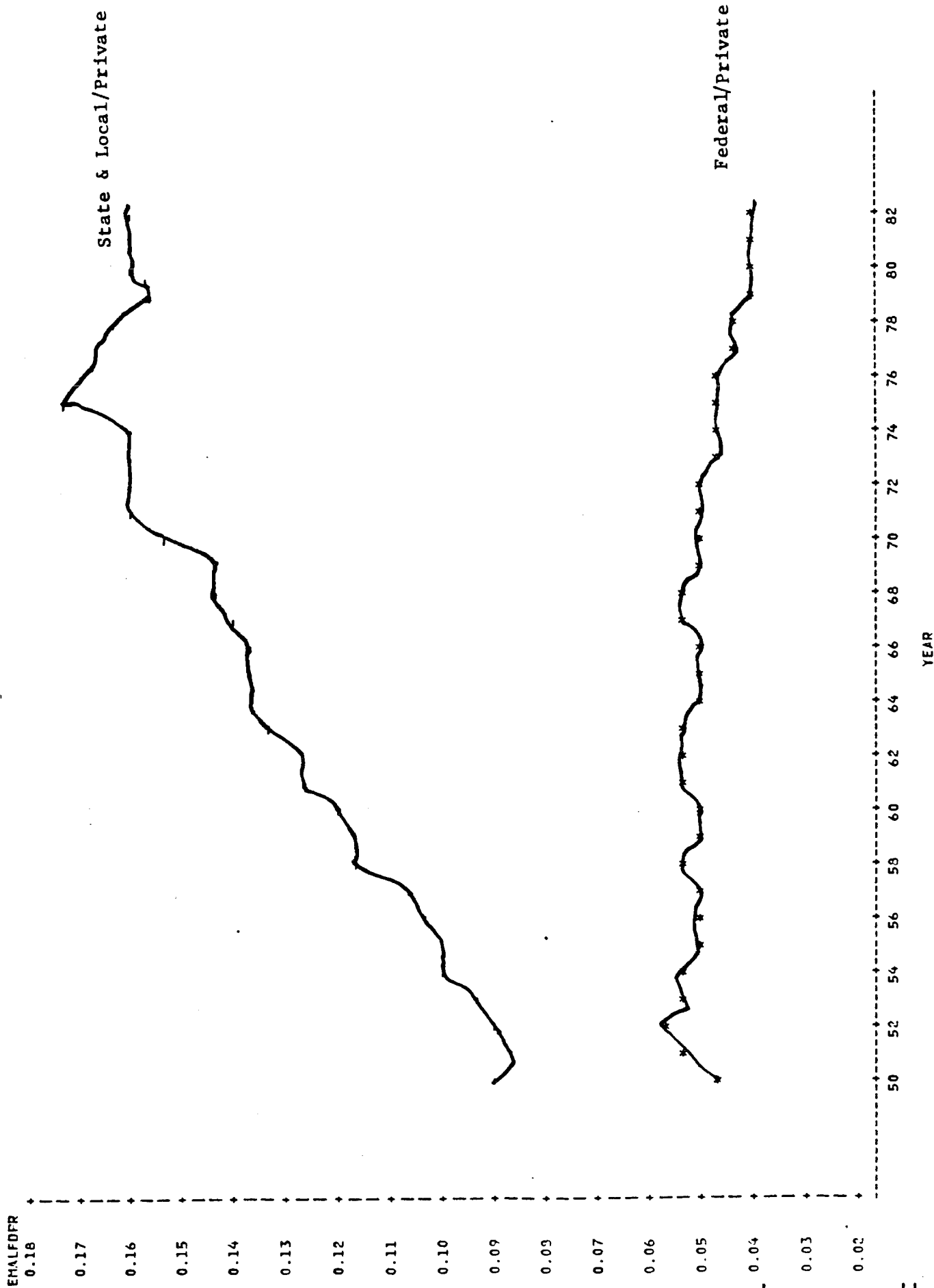
Changing Patterns of Employment

It is well known that in the post-World War II period public sector employment has risen relative to private sector employment. In 1950 15.6% of full-time equivalent workers were government employees; in 1983 19.0% of full-time equivalent workers were government employees.

In this section I examine the pattern of change in this employment over the cycle, by level of government and type of workers. The evidence shows public sector employment not only to be less variable over time than private sector employment but also to exhibit a strikingly different pattern of change over the business cycle. In addition the public sector employs relatively more blacks and women than the private sector, which in conjunction with relatively higher pay shown in Table 6, suggests greater public sector demand for those workers.

Figure 2 depicts the ratios of federal civilian to private employment and of state and local to private employment from 1950 to 1983, as given in the NIPA data set. With respect to state and local employment, the data show a marked rise until the mid-1970s, followed by a relatively sharp decline. Indeed, from 1981 to 1983 state and local employment actually fell, partly as a result of reductions in CETA employment, and partly as a result of declines in education due to changes in the size of the school age population. At the federal level, the employment share follows a very different pattern: from the early 1950s to the late 1960s it is roughly constant at 3.8 - 3.9% of nonagricultural employment. Thereafter it drops sharply to less than 3.0% of nonagri-

Figure 2: Ratio of Federal Government to Private Employment and State & Local Government to Private Employment



cultural employment. The result is a striking change in the composition of public employment. In 1950 one in three public employees was a federal worker; in 1983 one in six was a federal worker.

What about the cyclical and short term variation in public employment?

To determine how public sector employment varies in the short run, I have performed a two-part analysis. First I calculated the standard deviation of log changes in employment annually for the public and private sectors; over the period 1955 - 1982 (leaving out the Korean War episode). Such a calculation confirms the widely held belief that public sector employment is less variable over time than private sector employment, with the following calculated standard deviations: private non agricultural employment (.026); federal civilian employment (.020) state and local employment (.017). Second I examined changes in employment over NBER business cycles. As Table 7 shows, there is a striking difference in cyclical changes in employment between sectors, particularly between state and local and private employment, in 6 of 7 cyclical swings post 1953, state and local employment moves countercyclically. The growth of federal employment moved countercyclically in the 1970s but varied with the cycle earlier. Even then, however, it showed smaller cyclic variation than private employment. In conjunction with our analysis of changes over time in public/private pay differentials these calculations indicate that public sector payrolls vary differently over time than private sector payrolls do, and thus must be responding to unique public sector factors rather than to broad swings in the overall state of the economy.

Table 7: Employment Changes Over the Business Cycle,
Public v. Private Employers

Period (Peak - Trough - Peak)	Average Percentage Change Per Year								
	Recession		Recovery		Recovery - Recession				
	Private	Federal State Local	Private	Federal State Local	Private	Federal State Local	Private	Federal State Local	
July '53 - May '54 - August '57	-5.6	-6.4	13.1	3.0	0.8	4.1	8.6	7.2	-9.0
Aug. '57 - April '58 - April '60	-10.6	-4.2	12.5	3.7	5.1	4.5	3.6	14.4	9.3
April '60 - Feb. '61 - Dec. '69	-5.7	-8.8	5.6	4.0	2.7	7.4	5.8	9.7	11.6
Dec. '69 - Nov. '70 - Nov. '73	-3.6	-5.1	7.9	3.8	-0.2	3.0	4.5	7.4	4.9
Nov. '73 - March '75 - Jan. '80	-4.4	2.0	5.9	4.4	0.3	1.9	2.1	8.8	-1.7
Jan. '80 - July '80 - July '81	1.0	10.3	6.6	3.2	-4.0	-0.4	-1.8	2.2	-15.3
July '81 - Nov. '82 - June '84	-2.4	2.9	5.9	4.9	2.2	-2.2	-0.0	7.3	-0.7

Source: Business Cycles, based on NBER Reference Cycles Employment, from U.S. Department of Labor Employment and Earnings, various editions.

Sex and Race

Our earlier analysis found that pay differentials by sex and race were smaller in public than in private employment. What about patterns of employment? Table 8 records the race and sex distribution of private and public employment in 1978 and 1983. It shows that governments tend to hire proportionally more blacks and women than does the private sector, though with noticeable variation among levels of growth. In the 1978-1983 period, the proportion of blacks in government relative to the proportion of blacks in the private sector rose while the proportion of women in government increased above the 50% rate.

Budgets and Macro Determinants of Public Sector Wage and Employment Changes

Preceding sections have shown that far from being inflexible or rigid, public sector wages have changed substantially relative to private sector wages over time, and that the growth of public sector employment varies over time.

Can we identify the factors that affect the ratio of public to private pay, and that affect the variability of public sector employment?

In this section I examine the hypothesis that the public sector, like other "industries" alters employment and wages in response to the changes in the economic conditions and incentives facing it. What distinguishes public from private sectors is that the principal economic force on the public side is not the competitive economic market but budgets determined in political markets. In Dunlop's words, "the public sector responds to the discipline of the budget

Table 8: Percent Female and Percent Black
of Workers, by Employer, 1978 - 1983

	March Tapes		
	1978	1983	%W
<u>Blacks</u>			
Private	.083	.073	-12.0
Public	.114	.115	0.9
<u>Women</u>			
Private	.414	.446	7.8
Public	.492	.522	6.1

Source: Calculated from March CPS tapes

rather than to the discipline of the market." I shall take as given budgets or tax rates, although in a complete model they are certainly endogenous, and examine how short-term variations in these factors influence relative public sector wages and employment in the same way that one might examine how short-term variations in industry output and prices (value added, productivity, profits) affect private wages and employment. Because of the very different way in which their decisions are likely to be affected by budgets, such an analysis must distinguish between federal and state or local governments. State and local governments face, in general, hard budget constraints, whereas the federal government can run continual deficits to fund its outlays. There is a serious budget constraint in the one case, but not in the other, which we expect to produce differential employment and wage responses to budgetary changes.

To begin, Table 9 presents readily available figures on payrolls and budgets in the 1970s, designed to provide a crude indication of the extent to which governments faced budget "crunches" in the period.

At the federal level outlays as a share of GNP rose sharply in the period covered, without a compensating increase in taxes, producing a sizeable deficit. Despite increases in outlays, however, the ratio of federal compensation to GNP fell, indicative of a sizeable decline in the payroll share of budgets. As lines 2a - d in Table 9 show, the only budget figures against which payroll shares have not dropped drastically are "controllable outlays".

At the state and local level, receipts have risen more rapidly than outlays, producing surpluses, and payrolls has risen relative to GNP (and to

Table 9: Federal and State & Local Finances
and Civilian Payrolls, 1970-1983

	1970	1980	1983
<u>Federal Government</u>			
1. Financial variables as percentage of GNP			
a. Outlays	20.2	22.9	25.2
b. Receipts	19.9	20.9	18.7
c. Deficit	-0.3	-2.0	-6.5
d. Compensation	2.4	2.0	1.9
2. Payroll as Percentage of Budget Variables			
a. Outlays	14.6	10.1	8.7
b. "Controllable" outlays	39.5	37.0	36.7
c. "Civilian controllable" outlays	127.9	89.4	96.7
d. Receipts	14.8	11.1	11.7
<u>State and Local Government</u>			
3. Financial variables as percentage of GNP			
a. Outlays	13.5	13.5	13.1
b. Receipts	13.6	14.7	14.5
c. Surplus or Deficit	0.2	1.2	1.3
d. Payroll compensation	7.6	7.7	7.8
4. Payroll as Percentage of Budget Variables			
a. Outlays	53.4	53.4	55.6
b. Purchase of Goods & Services	57.1	55.8	58.1
c. Receipts	52.5	49.2	50.4

Source: Lines 1a - c, U.S. Bureau of the Census Statistical Abstract, 1984, p. 315; lines 1d, 3 and 4 U.S. Bureau of the Census National Income and Product Accounts; line 2a - c, Statistical Abstract, p. 318, 333.

^aPayroll data are through 1982 only. I have updated using NIPA figures on compensation to estimate percentage growth to 1983.

private sector payrolls). However, the share of payroll in budgets has been relatively fixed over time. Here, the problem with a simple "budget crunch" story of employment and pay changes are the surpluses run. Payrolls could have been increased by nearly 15% had the 1983 surplus been spent on payrolls and by 4% had the payroll share of receipts been constant at its 1970 level.

What the figures in Table 9 suggest is that crude budget pressures on public sector payrolls are not enough to explain the observed patterns of change in public sector payrolls and thus in compensation and employment. The budget "constraint" is not hard enough to be the sole factor at work.

A Small Regression Model: State and Local Governments

As a final step in evaluating the pattern of change over time in public sector wages and employment I have estimated the effect of budgets and selected macro-economic variables on relative public sector wages and employment. More specifically, I have regressed the ratio of compensation and employment in various parts of the public sector on the ratio of the relevant budget to GNP, the rate of inflation in the GNP deflator, and the level of unemployment.

The budget/GNP ratio is expected to be the key determinant of relative employment and wages, with the relative magnitude of the coefficients of interest. Inflation is expected to reduce relative public sector pay due to the likely slower response of public wages to inflation while unemployment is expected to raise relative state and local employment due to the observed counter-cyclical movement of public sector employment.

Table 10 presents the results for state and local governments and for noneducation activities of these governments. Panel A treats the public sector variables relative to private sector variables. The importance of public budgets in determination of employment and wage is clear in the results, with a 10% increase in budgets/GNP being divided between employment and wages in a ratio of roughly 2 to 1. The macro-economic factors affect relative pay and employment in the expected manner, suggesting that the drop in public sector pay relative to private sector pay in the 1970s was at least facilitated by inflation and that the weak macro-labor market of the period marked an even greater slowdown in relative public sector employment than is indicated in Figure 2. Somewhat surprisingly the figures also show some effect of unemployment on wages, with the level and ratio of public to private pay falling with high unemployment. Less the results in Panel A be misinterpreted as resulting from "inflexible" public sector factors relative to flexible private sector factors, I report in Panel B calculations focused on the level of the public sector variables themselves. As can be seen, these calculations show the variability and responsiveness of public sector employment and wages and also inflation with respect to budgets.

Several studies of public sector employment have taken wages as exogenous and payrolls as exogenous or "pre-determined" by other equations (Ehrenberg, Heiney, Ashenfelter and Ehrenberg, for example) and examined the elasticity of the employment response to wages. While the process of public sector wage, employment, and budget determination is more complex than can be repre-

Table 10: Coefficients and Standard Errors for
Macro-Economic and Budget Determinants of State
and Local Public Sector Employment and Wages

A. Employment and Wages Relative to Private Sector

<u>State and Local</u>	Expenditures/GNP	\dot{P}	UNE	R	R ²
1. Employment	.81 (.05)	.02 (.26)	.51 (.29)	-.61	.965
2. Wages	.29 (.03)	-.41 (.17)	-.47 (.21)	-.58	.810
<u>State and Local NonEducation</u>					
3. Employment	.65 (.06)	-.09 (.22)	.94 (.39)	-.75	.922
4. Wages	.24 (.05)	-.08 (.21)	-.26 (.30)	-.64	.580

B. Employment and Wages

<u>State and Local</u>					
5. Employment	.66 (.01)	.37 (.15)	.01 (.17)	-.67	.995
6. Wages	.35 (.02)	-.78 (.22)	-.52 (.25)	-.62	.959
<u>State and Local NonEducation</u>					
7. Employment	.60 (.02)	.32 (.19)	.20 (.23)	-.70	.986
8. Wages	.35 (.02)	-.53 (.21)	-.43 (.25)	-.61	.948

Source: Calculated using NIPA data 1952-1983

Note: R = auto correlation coefficient

\dot{P} = log (GNP deflator/GNP deflator (-1))
UNE = Rate of unemployment

sented by such a demand determined model, it is useful to note that the aggregate time series data show such demand type relations for the state and local sectors. Regressing ln employment on ln wages, budget, and macroeconomic variables yields the following for all state and local workers:

$$(1) \ln \text{ employment} = 3.69 + .84 \ln \text{ Exp} - .08 \ln \text{ P/P } (-1) - .17 \text{UNE} - .51 \ln \text{ wage}$$

$$(\text{.04}) \quad (\text{.16}) \quad (\text{.16}) \quad (\text{.10})$$

$$R^2 = .998$$

and for noneducation state and local workers:

$$(2) \ln \text{ employment} = 4.33 + .80 \ln \text{ Exp} + .05 \ln \text{ P/P } (-1) + .05 \text{UNE} - .56 \ln \text{ wage}$$

$$(\text{.16}) \quad (\text{.21}) \quad (\text{.23}) \quad (\text{.16})$$

$$R^2 = .994$$

where the equations were estimated correcting for first order serial correlation and where UNE = unemployment rate

EXP = expenditures

P = GNP deflator

These results confirm the findings of demand-type behavior and a marked tradeoff between employment and wages for state and local governments.

While the evidence in Table 10 reveals "reasonable" time series patterns at the state and local level, the calculations should be viewed cautiously. With nearly half of state and local government employees covered by collective bargaining, and the division of a budget a matter for both collective bargaining and public policy, of concern to taxpayers whose willingness to finance any given budget will certainly depend on its division between employment (services) and cost, it is clear that a more complex analysis is

required to determine the underlying behavior. The development of an appropriate simultaneous employment, wage and budget model lies, however, beyond the purview of this paper. For our purposes, it suffices to note that fluctuations in pay and employment are related to broader macro-economic factors and to budgets in a reasonable way over time.

In addition to the estimates given in Table 10, I performed comparable calculations for federal government wages and employment. These calculations give quite different results, with coefficients on budgets unstable depending on years selected and precise model specification. This is roughly consistent with the Table 9 evidence that federal payrolls are too small a proportion of budgets to run into significant constraints, that the payroll share of federal budgets has been falling, and with the fact that the federal government can and does use deficit financing -- all of which suggest no clear stable budget "constraint" on payrolls.

Conclusion

The principal result of this paper is that public sector relative wages and employment changes substantially in both the short and long run, apparently in response to changes in broad economic factors and to the financial status of the various governments. The seventies were a period of relative decline in public pay, of significant magnitudes at the level of specific occupations, and of a slowdown in the growth of government employment. The paper has highlighted the divergent picture one gets of the magnitude of public sector pay relative to private sector pay dependent on whether one controls for broad human capital or for specific occupations, but also finds that nearly all data show the same pattern of change over time. It has documented the counter-cyclical pattern of public sector employment and shown that variation over time at the state and local level follows reasonable patterns with respect to budgets and macro-economic variables. While the paper leaves open the appropriate model with which we should address these response patterns, it has provided a clear answer to the question posed. Yes, public sector wages and employment respond to economic conditions.

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Appendix A

To evaluate the relative contribution of variation in government and private pay to the observed change in the ratio of pay, we calculated the standard deviations of variation of each component separately, using four different forms:

- (1) variation in levels of log pay
- (2) variation in first differences in log pay
- (3) variation in the deviation of residuals of log pay from trend
- (4) variation in the residual of log pay from an AR(2) process

The results are given below for the period 1952-1982.

Standard Deviation of Relevant Measures of Wages

	Private	Federal	State & Local
1. log of real wages	.126	.194	.174
2. first difference of log of real wages	.020	.032	.026
3. residual of log of real wages from trend	.062	.081	.089
4. residual from AR(2) process	.029	.039	.033

As can be seen, the variation in government pay exceeds that in private pay in lines 2 and 3 but is less than that in private pay in lines 1 and 4. Since the results depend on the particular computation, we conclude that public sector pay is not noticeably less variable than private sector pay. Changes in the private sector denominator do not drive changes in relative public sector pay.

Appendix B: Calculation of Relative Contributions of Scheduled Increases, Increases due to "Grade Creep" and to "Step Creep" in the GS-pay Schedule

There are eighteen grades and ten steps in the GS schedule. Grades are for promotion, steps are for longevity and merit pay increases. In addition, longevity increases above step ten are possible. (These additional increases cause some additional calculations below.)

The relative contributions of the three components were calculated as follows:

Scheduled Increases

A. The average annual salary for the initial year was calculated by taking actual salaries [avsal].

B. The increase attributable to changes in the pay schedule was calculated by first year employment by grade and sex to calculate a weighted average of the final year pay structure. Since the number of workers above step 10 changes between years, this calculation required adjustment of the final year wage schedule to reflect the number of persons above step ten in the first year [acin].

C. Increase in average wage attributable to step and pay increases, was calculated by taking first year employment by grade to calculate a weighted average of final year average wage by grade. This reflects both the increase in average step and the increase/decrease in the number of persons above step 10 [avslstep].

D. Increase in average wage attributable to step, pay, and grade increase was calculated by taking the average wge [avsal] in the final year.

Thus:

pay increase = B - A

step increase = C - B

grade increase = D - C

For the period 1972 - 1982 these calculations are as follows:

1972 - 1982

Totals			Contributors		
Avsal 72	12552.8		Scheduled increase	9707	92.6%
Acin 72 82	2259.8		Step creep	-54.4	
Avslstep	22295.4		Grade creep	835.2	8.0%
Acasl	23040.6	83.5%	Overall increase	10487.8	

1972 - 1977

Avsal 72	12552.8	28.4%	Scheduled increase	3567.9	96.6%
Acin 72 77	16120.7		Step creep	-66.9	
Avslstep	16053.8	-16.4	Grade creep	170.8	5.2%
Acasl 77	16244.6	29.4	Overall increase	3691.8	

1977 - 1982

Avsal 72	16244.6	38.1%	Scheduled increase	6185.6	91.0%
Acin 72 77	22430.2		Step creep	41.6	
Avslstep	22471.8	-21.	Grade creep	568.8	8.4
Acasl 77	23040.6	41.8%	Overall increase	679.6	

Appendix C: Note on Sources for Public Sector Pay and Employment

Time series on relative wages were calculated from:

- 1) Average salary for full-time equivalent employees is found in the National Income and Products accounts produced by the Bureau of Labor Statistics.
- 2) Average Salary for full-time federal employees (General Schedule, Wage System, Postal and other pay systems) employed on March 31st of each year is found in the Pay Structure of the Federal Civil Service published by the Office of Personnel Management.
- 3) Relative pay of general schedule employees for comparable occupations are calculated in the National Survey of Professional Administration, Technical and Clerical employees (PATC surveys) published by the Bureau of Labor Statistics.
- 4) Average salaries and employment based on October payroll are found in the Bureau of the Census Series (Public Employment (Series GE-1)).
- 5) Current Population Survey paper: Relative pay differentials controlling for geographic personnel and human capital characteristics were calculated from the March and May tapes for 1973, 1978, and 1983. The March tapes survey annual earnings for the previous year, only those workers for whom industry and occupation did not change were included. 1980 Industry and Occupation codes were implemented in 1983. This led to some exaggeration of the increase in the coefficient on local public administration employees compared to similar regressions using the 1970 classifications on the 1982 data.

Sample size for each level of government in each year were as follows:

	1973		1978		1983	
	March	May	March	May	March	May
Postal	384	407	448	350	419	117
Federal Public Administration	827	700	1,082	831	1,105	260
State Public Administration	301	317	588	498	870	215
Local Public Administration	388	781	1,120	914	1,081	245
Teachers	1,446	1,389	1,596	1,498	1,609	415
Non Public Administration	2,532	3,325	4,812	4,125	4,813	1,183
Private	25,735	28,016	35,436	30,876	37,581	9,826