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# A Preliminary Analysis of the Increase in the Average Grade of General Schedule Federal Employees

James H. Hayes, Geraldine A. Walter,  
Sharon K. Matyskiela, Elo R. Kabe

A Report prepared for  
OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE/MANPOWER,  
RESERVE AFFAIRS AND LOGISTICS

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A description of the general schedule (GS) system as it exists today and a discussion of alternative hypotheses to explain the average grade increase from 6.6 in 1959 to 7.4 in 1976. The analysis indicates: (1) "Grade creep" occurred *throughout* the federal government, not only the DOD. (2) There was a clearly observable change in the mix of occupations. (3) Before 1969, when comparability was achieved, the GS was pushed in subtle ways to increase grades as a substitute for pay raises. (4) The agencies that use GS are almost autonomous in their ability to prescribe their organizational structure. (5) Even more significant was the movement out of the lower grades into the middle grades. It is unclear what degree of importance to attach to any of the multiple factors affecting GS grades, but average grade may not be an appropriate measure of the problem. 38 pp. (ETG)

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A Report prepared for  
OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE/MANPOWER,  
RESERVE AFFAIRS AND LOGISTICS



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PREFACE

This report was prepared as part of Rand's Defense Manpower Studies Program, sponsored by the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics)--OASD (MRA&L). This study was conducted under Task Order III-1, Management of General Schedule Personnel.

With manpower issues assuming an ever greater importance in defense planning and budgeting, the purpose of this studies program is to develop broad strategies and specific solutions for dealing with present and future defense manpower problems. This includes the development of new methodologies for examining broad classes of manpower problems, as well as specific problems-oriented research. In addition to providing analysis of current and future manpower issues, it is hoped that this studies program will contribute to a better general understanding of the manpower problems confronting the Department of Defense.

This report should be useful to personnel planners in the Department of Defense as well as personnel administrators who deal with policies affecting civilian general schedule employees. The report is heuristic in nature in that it suggests several possible causes for the general increase in the grades of civilian workers but does not definitively identify the specific cause. It suggests, in this sense, areas for future research.

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SUMMARY

↘ "Grade creep" is a term that describes the symptom but not the cause of a complex problem. Grade creep had run its course in DoD by the end of 1969 or early 1970 when salary comparability for general schedule (GS) employees had been achieved. The same conclusion is largely true for all of government. The causes of the grade increase before salary comparability were varied, and it appears the process occurred *throughout* the federal government, not only the DoD. For instance, agencies related to the Congress (the GAO and the Library of Congress) and newer departments such as HEW are among those that experienced the largest increase in the average grade of their employees. DoD increases were less than the average. ←

There was a clearly observable change in the mix of occupations, which can account for much of the increase in the average grade of the occupational groups. We conjectured but could not prove that new and improved technology might account for the shift, because there is an indication that the more traditional occupations lost in their share of personnel while the more modern fields gained in their share. These newer technology occupations brought with them the price of grades that average almost three grades higher than the corresponding grades in the supplanted fields.

Prior to 1969, when comparability became a reality, the GS system was pushed by forces that acted in subtle ways to increase grades as a substitute for pay raises. The analysis indicates that somehow the system functioned to create pay raises by small and steady increases in the average grade. After comparability was achieved, the rate of change in grades in the system as a whole slowed abruptly in several agencies, including two in DoD that actually underwent a decrease in average grade.

It is important to realize that the agencies that use GS employees are almost autonomous in their ability to prescribe the organizational structure that in turn determines the numbers and grades of the GS employees they will hire. It is theoretically possible, therefore,

that some agencies could manipulate this organizational structure by specifying the content of a given GS grade. There are no data to either prove or disprove this hypothesis.

The analysis showed that high-ranking positions are inspected in microscopic detail to ensure that there is no hint of unnecessary increases. However, the number of these positions is, by comparison, so small a percentage of the total that it has little effect on the total average grade.

A more significant influence on average grade was the movement out of the lower grades into the middle grades. Part of this movement for DoD may have been generated by the process where decreases in military officer strengths were simply filled by appointing civilians to the billets that were administrative or technical in nature.

The GS system is subject to its own internal controls by means of position management and classification policies and procedures. However, these serve as only partial brakes upon the system. Only after the achievement of pay comparability was the system able to reach a level of equilibrium. What we have here is the old Roman cry "*Quis ipsos custodiet custodes*"--who guards the guardians of authority? In this sense, we note that grade creep is analogous to the situation that occurred in the military services between 1950 and 1954. The services were able to specify their distribution of ranks (position management). The marked increase in military grades prompted the Congress to pass the Officer Grade Limitation Act of 1954. The situation is also analogous to what industry calls "salary compression," that is, the pressure to increase the lower salaries and to put a lid on the higher salaries.

There is a multiplicity of factors, therefore, affecting GS grades. It is unclear what degree of importance to attach to any single indicator. Many factors are at work and average grade may not be an appropriate measure of the problem.

ACKNOWLEDGMENTS

The authors wish to thank their colleagues Arthur Alexander and Craig Foch for insightful and constructive criticisms that have markedly strengthened this report.

They also wish to thank Walter B. Bergmann, Director of Analysis and Evaluation, Office of the Assistant Secretary of Defense, Manpower, Reserve Affairs, and Logistics, for his suggestions with respect both to the organization of the report and to the tightening of the analysis. The analytic section bears the imprint of his suggestions.

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## 1. THE PROBLEM AND SCOPE

The average grade of the general schedule (GS) employees of the government has been increasing at a slow but steady rate. In particular, the average grade of the GS employees of the Department of Defense (DoD) from 1959 to 1976 increased from 6.96 to 7.74. Because the DoD is the largest single employer of civilians in the federal government, it is natural that problems associated with the GS grade structure are more visible there. This visibility is heightened by monetary considerations: A rise of half a point in the grade structure equates to roughly half a billion in salary increases. It is not surprising, because of the size of this dollar figure, that there has been considerable congressional pressure on the DoD to reduce the average grade of the GS employees under its control.<sup>1</sup>

### THE PROBLEM

The original purpose of this report was to address the issue known in the government as "grade creep," that is, the increase over time of the grade of government workers. More specifically, we intended to investigate the grade creep among general schedule employees. However, it became apparent very quickly that the term "grade creep" (usually used in a pejorative sense) is, as is so often the case when complex problems are described by shorthand notations, merely a symptom of many other problems and issues.

Our initial task, therefore, was to define the problem in terms clear enough to allow it to be separated into researchable issues. In order to do this, we first describe the GS system as it exists today. From that basis we discuss possible alternative hypotheses that alone, or in conjunction with one another, can be offered as explanations for average grade increase.

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<sup>1</sup>Letter, Office of the Assistant Secretary of Defense, Manpower, Reserve Affairs, and Logistics, from Walter B. Bergmann, Director of Analysis and Evaluation, April 28, 1977.

## THE PAY SYSTEMS

The GS employees are but one of several categories of civilian workers employed by the federal government. For some of these categories, the pay systems are established by law and for the remainder by administrative determination.<sup>1</sup>

The GS pay system is one of three major and interrelated statutory pay systems for federal white-collar employees. The other two systems are the Foreign Service and certain employees in the Veterans Administration in its Department of Medicine and Surgery.<sup>2</sup> The salaries of these three systems are contained in Subchapter 1 of Chapter 53 of Title 5 of the United States Code. This statute also establishes the important principle of comparability with pay in the private sector and prescribes a method for annual review and updating, if necessary, of federal salaries.

There are other pay systems: the executive schedule that deals with top officials in the executive branch; the Federal Wage System (Wage Board or WB) that covers the blue-collar workers; and certain administratively determined pay systems for which Congress has given the authorized heads of agencies the specific authority to fix the wages for some particular group of positions. The number of employees in these systems is given in Table 1. It is apparent that the GS and WB systems constitute the majority of DoD civilians.

Our particular concern in this report is the GS system, that is, schedules applicable to the government's white-collar workers. This pay schedule consists of eighteen grades, each broadly defined in terms of difficulty and degree of responsibility and the qualification deemed necessary to perform the duties of the position. Within each grade, salary steps are defined and include ten steps for grades GS-1

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<sup>1</sup>A comprehensive listing of wage chronology is given in *Federal Employees under the General Schedule Pay System, July 1924-October 1976*, Bulletin 1870, Bureau of Statistics, U.S. Department of Labor, 1976.

<sup>2</sup>Post office workers are, in a sense, no longer government employees.

Table 1

FEDERAL EMPLOYEES IN ALL CATEGORIES

Agency	GS	WB	Others	Totals
Department of Defense	582,609	387,326	16,424	986,359
OSD/JCS	1,688	18	72	1,778
Army	228,837	123,881	6,291	359,009
Navy	157,845	145,610	7,453	310,908
Air Force	139,748	106,455	2,093	248,296
Others	54,491	11,362	515	66,368

SOURCE: *Pay Structure of the Federal Civil Service*, March 31, 1976.

through GS-15, nine for grades GS-16, five for grades GS-17, and one for GS-18.<sup>1</sup>

Within the context of the GS employees, our principal concern will be with those employees in the Department of Defense.

POSITION MANAGEMENT

There are two major problems involved in the management of GS jobs: position management and position classification. Position management defines the duties that will compose a job. The type and number of jobs in an organization are also defined through position management. Once the organizational structure has been defined and the jobs described, position classification assesses the given job description and assigns a grade to the job. The grade is based on duties, education required, and other factors according to a system of job evaluation.

Position management is the specification of the organization structure into which various GS positions are fitted. The specification of this structure is the prerogative of the using agency, and within DoD various agencies may deal with the problem differently.

<sup>1</sup>*Pay Structure of the Federal Civil Service*, U.S. Civil Service Commission, March 31, 1976, p. 30, gives a complete listing of pay schedules.

Studies have been done<sup>1</sup> on position management problems and the difficulty of proper position classification. The main point they reveal is that position management and classification are not unshakable standards. This is particularly true in the case of GS jobs. These jobs, in contrast with Wage Board jobs, fall heavily into administrative and clerical categories, which are less easily classified than jobs with defined outputs.

The realization that position classification was a difficult management area led to the Whitten Amendment of 1952. This amendment requires each agency to execute the following steps yearly:

1. Review all positions created or placed in a higher basic pay level since September 1950.
2. Abolish positions found to be unnecessary.
3. Ensure that needed positions are classified properly.
4. Report the actions taken to the Appropriations and the Post Office and Civil Service Commission committees of the Senate and House.

The evidence available to us<sup>2</sup> indicates that as far as the super-grades are concerned, the Whitten Amendment is carefully observed. All services review these positions yearly to determine whether the job classification is warranted. For the lower positions, the General Accounting Office (GAO) has questioned the thoroughness of the survey and indicates that the procedure could be strengthened.<sup>3</sup> In other cases data available to us<sup>4</sup> indicate that these surveys are thorough.

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<sup>1</sup>See *Classification of White-Collar Jobs Should Be Better Controlled*, General Accounting Office, 1975, for a recent report on the subject; and *Report on the Study of Classification Accuracy in GS Grade Levels 12-15*, Bureau of Personnel Management, U.S. Civil Service Commission, December 1974, *passim*.

<sup>2</sup>Interviews with DoD officials during the period August 8-12, 1977.

<sup>3</sup>See GAO report, *op. cit.*

<sup>4</sup>See a series of Navy reports on civilian personnel management, for example, *Report of On-Site Evaluation of Civilian Personnel Management at Naval Supply Center, Oakland, California, 22 September-3 October 1975*.

On the other hand we have some indication that classification procedures can be improved.<sup>1</sup>

It must be noted that position management could theoretically be used to inflate the grade structure. For instance, a position classified as GS-12 need contain only 25 percent of its responsibilities at the GS-12 level. A section could have four GS-12 positions, each with 25 percent of its responsibilities at the GS-12 level or it could contain only one GS-12 position. Needless to say, the judgmental factors involved are difficult ones and leave room for differences of opinion.<sup>2</sup>

The first major change in the job evaluation process since the Classification Act of 1949 is currently taking place. This entails the implementation of a new system referred to as the Factor Evaluation System (FES). The proposed system will rate all nonsupervisory jobs in grades GS-1 to 15 against a single "standard for standards," the so-called primary standard. This standard describes nine factors for white-collar jobs: knowledge required, supervision, controls, guidelines, complexity, scope and effect, personal contacts, purpose of contacts, and physical demands of work environment. A conversion table, which is part of the primary standard, shows the range of total point values for each GS grade. Standards that use this system must be in accordance with the primary standard. Thus, it serves as the basic tool for aligning standards across occupational lines. In conjunction with this primary standard, benchmark and factor level descriptions are also used.

There has been some opposition to the new system, but there is general consensus that the present classification system must be overhauled. It is hoped that the FES will be implemented over the next five years, until which time the current Civil Service Commission (CSC) classification guidelines remain in effect.

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<sup>1</sup>GAO, op. cit., passim.

<sup>2</sup>It is easy to find examples where a single sentence in a job description can increase a job by one grade. In fact, one of the authors while in the Army had a personal experience of exactly this type.

### Personnel Practices

Allied to position management is the question of management practices. Personnel practices regarding rate of promotion, entry levels, hires, and separations are also factors that will have an obvious effect on average grade. Unfortunately, because of the data base available to us it is difficult to analyze these areas longitudinally. However, a research effort in the future might profitably be directed at questions involving such policies.

### Pay Comparability

Congressional actions that prescribe pay schedules have had some unforeseen effects on the GS grade structure. For instance, the Salary Reform Act of 1962 set forth the principle of pay comparability between GS employees and those in private enterprises, and the government moved toward implementation of this principle through the 1960s. Finally, full pay comparability was achieved in July 1969 under the Federal Salary Act of 1967. Failure to enact pay comparability earlier appeared to trigger a response, as will be seen later, that seemed to increase average grades. The actual implementation of pay comparability removed an incentive to build up increases, and the system began to function as was originally intended.

The Federal Pay Comparability Act of 1970 transferred primary responsibility for GS salary adjustments from Congress to the President and specified the procedures to be used in determining and implementing the adjustments. Under the Act, an agent of the President compares GS salaries with pay rates in private industry as measured by an annual survey, the National Survey of Professional, Administrative, Technical, and Clerical Pay (PATC), conducted by the Bureau of Labor Statistics (BLS). The agent then recommends an appropriate salary adjustment to the President. The law requires the agent to consider thoroughly the views and recommendations of the Federal Employees Pay Council, which is composed of five representatives from employee organizations selected by the agent on the basis of such factors as the relative number of employees the organizations represent. The agent's recommendation is next presented to the President

and the Advisory Committee on Federal Pay (a three-member public board) which reviews both recommendations and then reports to the President. The law requires the President to consider the agent's and the Advisory Committee's recommendations and then to adjust GS pay rates in accordance with the statutory principles of pay comparability. The President submits a report of the adjustment to Congress, unless a "national emergency or economic conditions affecting the general welfare" requires him to present an alternative plan. If neither house of Congress passes a resolution of disapproval within thirty days, the alternative plan goes into effect. If either House rejects the alternative plan, the President must adjust the pay rates in accordance with the comparability principle and submit a report of the adjustment to Congress.

Pay and position management, then, are the main institutional factors that determine GS structure. It would be possible to discuss each of these at greater length, but this is not important for our purposes. Here we only note their effects on the GS system.

From this background we can now present and analyze some hypotheses that purport to explain the GS increase. First, we discuss briefly the available data, which are a basic constraint on the analysis.

#### THE DATA

From the outset we were struck by the amount of data available (not surprising when we realized that the number of civilian workers in the federal government roughly equal the armed forces). However, the data are uneven with respect to the years for which they are available. For instance, data are available from approximately 1949 to 1959 that outline governmental employee statistics only in a macro sense. From 1959 onward data are available showing the number of government employees by grade and by agency--a somewhat more micro approach. Finally, some transactional data are available at a 10 percent sample level for the years 1964 through 1972--a micro sample but only at the 10 percent level and of questionable accuracy. Finally, a master file of all transactions for all GS employees from 1973 to the present is now maintained.

The effect of this variety of data, each on a different basis, is to complicate the analysis. One has, in effect, different windows from which to view the GS system, and each window gives a slightly different view of what has been and is happening. Where appropriate, we will note the differences in data and the caveats that are necessary as a result of these differences.

#### THE SCOPE OF THE INCREASES

The existence of an increase in average grade has been chronicled in other reports and hearings. Often, however, it remains just that-- a macro statistic that explains little of the shifts that brought the change. In the following discussion we subaggregate some of our data in an attempt to expose, if only briefly, the scope of this change.

The average grade of all GS employees in all government agencies rose from 6.6 in 1959 to 7.4 in 1976. *All* agencies experienced an increase. Table 2 illustrates the annual rates of growth for the largest of these agencies.

When twenty-nine of the largest governmental agencies are listed in order of their annual rates of change since 1959 one notes that DoD has in fact experienced smaller rates of increase than many of the other agencies. The table indicates that the Army, the Air Force, and the Secretary's Office and the Joint Chiefs of Staff are all in the lower half of the table. The Navy and other DoD agencies are at the bottom of the upper half.

In 1976, the table includes agencies with 1,256,855 GS employees or 92.4 percent of the total strength for this year. These same agencies each enjoyed an annual growth rate ranging from approximately 0.17 to 3.11 percent. These data of themselves do not reveal any of the causes of grade creep but they do reveal that grade creep is common to all federal agencies to a greater or lesser extent.

#### HYPOTHESES

Various hypotheses have been suggested to explain the change in GS grades. These stem in large part from conjecture, because few have been subjected to systematic analyses. We will discuss six hypotheses

Table 2

AVERAGE GS GRADE ANNUAL RATES OF GROWTH,<sup>a</sup> TOTAL GOVERNMENT, DOD,  
AND SELECTED AGENCIES, 1959/1976

Category	1959-1976 g(%)	1959-1970 g <sub>1</sub> (%)	1970-1976 g <sub>2</sub> (%)
Total government	1.16	1.64	0.29
Total DoD	0.63	0.92	0.09
Office of Economic Opportunity <sup>b</sup>	3.11	3.83	2.21
Selective Service	2.36	1.22	4.48
Smithsonian	2.01	3.08	0.08
General Accounting Office	1.91	2.11	1.55
Civil Rights Commission	1.73	3.05	-0.65
Library of Congress	1.63	1.54	1.79
General Services Administration	1.53	1.79	1.04
HEW	1.49	2.12	0.36
Agriculture	1.46	1.33	1.69
Other Defense <sup>c</sup>	1.42	2.10	0.52
Navy	1.39	1.91	1.58
National Science Foundation	1.37	2.20	-0.12
Commerce	1.35	1.72	0.66
Veterans Administration	1.28	1.62	0.62
Air Force	1.15	1.79	-0.04
SecDef/JCS	1.06	1.19	0.82
NASA	1.01	1.52	0.08
Federal Power Commission	0.97	1.62	-0.20
Transportation <sup>d</sup>	0.89	1.20	0.68
Labor	0.86	1.51	-0.32
Interior	0.79	1.32	-0.18
Civil Aeronautics Board	0.76	1.07	0.21
Army	0.76	1.25	-0.13
Federal Communications Commission	0.75	1.18	-0.04
Farm Credit Administration	0.65	0.83	0.33
Justice	0.62	0.33	1.16
Treasury	0.56	0.99	-0.24
Civil Service	0.28	0.12	0.58
Budget	0.17	0.36	-0.16

<sup>a</sup> Annual rates of growth  $g$ ,  $g_1$ , and  $g_2$  satisfy the expressions

$$G_{1976} = (1 + g)^{17} G_{1959},$$

$$G_{1970} = (1 + g_1)^{11} G_{1959},$$

$$G_{1976} = (1 + g_2)^6 G_{1970},$$

where  $G_t$  is average GS grade in year  $t$ .

<sup>b</sup> Average grades are as of 1965, 1970, and 1974.

<sup>c</sup> Average grades are as of 1962, 1970, and 1976.

<sup>d</sup> Average grades are as of 1966, 1970, and 1976.

in turn, presenting what analyses are possible with the data available. Given below is the cause of the increase in GS grades for each hypothesis:

1. The large number of employees in the supergrades (GS-16 to 18).
2. Changes in the occupational mix of GS employees.
3. Substitution of civilians for military personnel.
4. Substitution of contract labor for lower ranking GS employees.
5. Uneven attrition rates where lower GS grades have higher attrition rates than the higher GS grades.
6. A disparity in pay scales between government and the civil sector (or comparability).

## II. ANALYSIS

The following analysis of the hypotheses explaining the change in GS grades is limited by the availability of data. Creation of such data would be a separate study beyond the scope of this first effort. In this sense the analysis is admittedly limited.

### SUPERGRADE HYPOTHESIS

There is a widely held belief that the proliferation of supergrades (GS-16 to 18) has been a significant factor in average grade increase. That this is untrue is obvious from a cursory analysis of the data.

Table 3 shows the percentage of GS employees by grade. Although grades 16 to 18 doubled as a percent of total from 1959 to 1976, the absolute numbers are far too small to have a major effect on average grade increase. Rather, the increase in GS-12 to 15 from 12.3 to 23.6 percent of the total would seem significant, along with the increases in strength in the higher grades. The lower grades 1 to 3, in contrast, saw substantial decreases. These two trends, given the number of employees involved, would have more effect on average grade than any change in supergrades--even their complete elimination.

Despite their relative insignificance in terms of total numbers, the supergrades receive considerable policy attention. These grades are carefully controlled by the Congress, with ceilings put on the allowable number for each agency. This control is due in part to the power inherent in these positions and to their consequent political visibility. These factors may justify congressional control, but as a means of affecting average grade such control is of little importance. Other trends seem to have much greater effect.

When examined in detail, Table 3 demonstrates some of these other trends:

1. There is a decrease in strength of GS-1 to 4.
2. There is an increase in strength of GS-12 to 15.

3. The ratio of grades 12 to 15 to grades 1 to 11 went from 1:7.8 in 1959 to 1:3.9 in 1976.

Table 4 presents the same data but for DoD employees only. It is clear that the same trends exist.

As a further analysis, we decided to take one agency that had the same number of employees in 1964 and 1975 and examine the grade changes. The Farm Credit Administration in both years had 204 GS employees. In the interim years the strength fluctuated to a small degree but never in a marked manner. The details are shown in Table 5.

It is apparent that the grades 1 to 11 and grades 16 to 18 decreased. Conversely, grades 12 to 15 increased by the same amount. There was an overall decrease of one billet in these three supergrades.

Table 3

GS EMPLOYEES BY GRADE, 1959/1976

Grade	Percent of Total Employees		Cumulative Percent of Total		Change in Total Strengths
	1959	1976	1959	1976	1959-1976
1	0.35	0.17	0.35	0.17	-1,162
2	4.65	1.88	5.00	2.05	-19,525
3	17.89	7.31	22.90	9.36	-74,191
4	16.76	12.81	39.65	22.17	11,575
5	11.30	13.41	50.95	35.58	72,618
6	4.82	6.31	55.77	41.89	38,972
7	9.34	9.39	65.11	51.28	36,944
8	2.55	2.05	67.67	53.33	2,977
9	10.28	10.26	77.95	63.59	39,672
10	1.45	1.63	79.40	65.22	7,979
11	8.19	10.82	87.59	76.04	67,482
12	5.99	10.28			81,593
13	3.83	7.90			70,159
14	1.68	3.64	12.25	23.63	33,105
15	0.75	1.81			17,275
16	0.10	0.25			2,368
17	0.04	0.07	0.16	0.32	594
18	0.02	0.03			189

SOURCE: *Pay Structure of the Federal Civil Service, 1959 and 1976.*

NOTE: May not total 100 percent due to rounding.

Table 4

DOD GENERAL SCHEDULE EMPLOYEES BY GRADE, 1959/1976

Grade	Percent of Total Employees		Cumulative Percent of Total		Change in Total Strengths
	1959	1976	1959	1976	1959-1976
1	0.22	0.10	0.22	0.10	-526
2	3.83	1.53	4.05	1.63	-10,168
3	18.35	8.33	22.40	9.96	-42,840
4	18.63	13.43	41.03	23.39	-14,514
5	12.12	14.12	53.15	37.51	21,919
6	4.64	5.88	57.79	43.39	11,149
7	9.54	9.58	67.33	52.97	8,290
8	1.78	2.12	69.11	55.09	3,498
9	9.85	11.12	78.96	66.21	15,729
10	1.29	1.13	80.25	67.34	149
11	8.26	11.68	88.51	79.02	26,954
12	5.99	10.63			32,077
13	3.40	6.61	11.42	20.86	21,542
14	1.44	2.58			7,875
15	0.59	1.04			3,808
16	0.04	0.10	0.07	0.13	414
17	0.02	0.02			56
18	0.01	0.01			12

SOURCE: *Pay Structure of the Federal Civil Service*, 1959 and 1976.

NOTE: Percentages may not total 100 because of rounding.

The most marked decrease, however, occurred in grades 1 to 3, while grades 12 to 15 increased substantially.

The Farm Credit Administration then seems to reflect on a micro level the same changes that occurred throughout government. It also illustrates that supergrades as now controlled are not significant in changing the average grade.

The question of what drives the increase in grades 12 to 15 is difficult to answer. In an initial attempt to define the increases, we examined the percent of supervisory personnel in each grade. We felt that the increase in 12 to 15 might reflect decreasing ratios of subordinates to supervisors. Interestingly, Table 6 shows that supervisors are not the major part of grades 12 to 15. However, beyond

Table 5  
FARM CREDIT ADMINISTRATION GS GRADE TOTAL

Year	GS1	GS2	GS3	GS4	GS5	GS6	GS7	GS8	GS9	GS10	GS11	GS12	GS13	GS14	GS15	GS16	GS17	GS18	Total	Average Grade
1959	2	0	5	19	24	9	26	2	30	0	15	19	21	19	8	3	2	0	204	9.16
1960	2	0	4	27	18	24	24	0	31	0	14	38	23	18	6	3	2	0	224	9.27
1961	2	0	2	27	14	17	21	0	18	0	23	39	20	22	6	3	2	0	216	9.53
1962	1	0	1	31	12	16	22	0	16	0	23	26	33	22	5	4	2	0	214	9.61
1963	0	2	1	30	14	16	17	4	17	0	23	23	35	23	5	4	2	0	216	9.61
1964	0	2	2	27	15	19	14	4	16	0	24	19	35	22	6	4	2	0	211	9.59
1965	0	2	1	27	18	20	16	4	14	0	23	19	32	22	7	4	2	0	211	9.49
1966	0	3	3	23	15	23	15	4	15	0	23	21	30	23	8	4	2	0	212	9.56
1967	0	0	5	12	26	19	14	4	8	0	30	21	25	24	9	4	2	0	203	9.78
1968	0	0	4	9	27	15	19	1	10	0	28	25	23	27	9	4	2	0	203	9.96
1969	0	0	4	11	24	17	18	0	9	1	27	23	31	26	8	4	2	0	205	10.01
1970	0	0	5	8	24	20	22	1	8	1	24	20	32	27	12	4	2	0	210	10.03
1971	0	0	6	10	29	16	25	1	8	1	19	26	32	28	10	4	2	0	217	9.87
1972	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1973	0	0	4	3	18	15	15	4	13	0	15	25	25	30	14	4	0	0	185	10.50
1974	0	1	0	9	10	15	17	4	13	1	19	23	21	26	9	6	0	0	174	10.40
1975	0	0	2	8	13	16	20	3	14	0	23	24	23	24	14	6	0	0	190	10.37
1976	0	1	2	6	20	18	18	2	16	0	23	30	27	22	15	4	0	0	204	10.23
Change (1959-1976)	-2	+1	-3	-13	-4	+9	-8	0	-14	0	+8	+11	+6	+3	+7	+1	-2	0	0	+1.07
Cumulative change											-26				+27				0	11.68
Cumulative percent change (1959 basis) <sup>a</sup>											-19.70%				40.30%					-20.00%

SOURCE: Pay Structure of the Federal Civil Service, various years.

<sup>a</sup>The percentages shown are based on the total numbers of 1 to 11, 12 to 15, and 16 to 18 positions in 1959.

Table 6

SUPERVISORY PERSONNEL IN VARIOUS GS GRADES, 1973/1976

Grade	Total Employees		Supervisors		Percent of Supervisors	
	1973	1976	1973	1976	1973	1976
1	1,303	1,045	0	0	0.0	0.0
2	9,582	10,530	22	10	0.2	0.1
3	40,258	49,091	80	91	0.2	0.2
4	65,679	78,661	560	773	0.9	1.0
5	67,587	82,561	2,088	3,081	3.1	3.7
6	28,791	34,310	2,846	4,382	9.9	12.8
7	45,716	55,478	3,743	5,417	8.2	9.8
8	10,613	12,461	2,322	3,082	21.9	24.7
9	58,290	64,699	4,877	6,763	8.4	10.5
10	5,806	6,495	1,990	2,730	34.3	42.0
11	59,779	68,383	6,468	9,491	10.8	13.9
12	49,308	62,026	8,170	12,891	16.6	20.8
13	32,587	38,500	7,482	12,820	23.0	33.3
14	12,504	15,152	3,796	7,410	30.4	48.9
15	5,038	6,093	1,918	3,659	38.1	60.1
16	516	602	185	433	35.9	71.9
17	70	132	29	97	41.4	73.5
18	15	39	7	36	46.7	92.3
Total	493,442	586,258	46,583	73,166		

SOURCE: Civil Service Commission Central Personnel Data File (maintained at the Defense Manpower Data Center, Monterey, Calif.), 1973 and 1976.

this, there is little else that can be said. The data for a time series from 1959 to the present are not available, and we do not have the means to view the increases within specific occupations.

Other possible explanations for shifts in grade lend themselves to a somewhat more rigorous analysis. The next hypothesis, that of occupational shift, is one such explanation.

OCCUPATIONAL SHIFT HYPOTHESIS

The occupational shift hypothesis attributes the increase of the GS average grade to a change in the occupational composition of the work force. That is, according to this hypothesis, a change in

the mix of occupations has brought about the increase in the average grade.<sup>1</sup>

Equation (1) shows how a change in the mix of occupations can cause the average grade of a group of occupations to rise. The average grade of a group of occupations is dependent on two factors, the average grade of each occupation in the group and the occupational share of each occupation. Occupational share is defined here as the proportion of all employees in each occupation, that is, occupational share of occupation  $i$  equals

$$\frac{\text{No. of employees in occupation } i}{\text{No. of all employees in group of occupations}}$$

Therefore, even if the average grade of each occupation remains constant, the group average can increase if there is a shift of the work force from occupations with low average grades to occupations with high average grades. Thus,

$$\bar{g} = \sum_{i=1}^n \bar{g}_i s_i, \quad (1)$$

where  $\bar{g}$  = average grade of group of occupations,  
 $\bar{g}_i$  = average grade of occupation  $i$ ,  
 $s_i$  = occupational share of occupation  $i$ ,  
 $n$  = number of occupations in group.

We examined the mechanism associated with changes in occupational mix in some detail for two groups of GS employee occupations. Table 7 shows the changes in average grade and occupational share for the "General Administrative, Clerical, and Office Services Group" (003XX) occupations. The 003XX group is one of 22 groups of occupations

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<sup>1</sup>Bergmann, op. cit. An attachment to the letter indicates that about 75 percent of the grade increase can be attributed to occupational shift. That work, however, was based on macro data whereas Tables 7 and 8 present some of the micro data.

Table 7

ANALYSIS OF THE DOD GENERAL ADMINISTRATION GS GROUP, 1964/1975

Occupation	Changes in Mean Grade and Occupational Share in Decreasing Series					
	Mean Grade 1964	Mean Grade 1975	Change in Mean Grade and Total Number of Employees	Occupational Share 1964 (%)	Occupational Share 1975 (%)	Change in Occupational Share (%)
302 Messenger	1.81	2.06	.25	.41	.27	-.14
305 Mailand file	3.62	3.63	.01	5.09	3.71	-1.38
309 Correspondence clerk	4.47	4.67	.20	.27	.10	-.17
312 Clerk stenographer and reporter	4.04	4.09	.05	12.19	8.15	-4.04
313 Stenographic or typing unit supervising	4.98	5.74	.76	.04	.01	-.03
318 Secretary	5.27	5.48	.21	13.47	12.54	-.93
322 Clerk typist	3.12	3.11	-.01	21.24	20.44	-.80
324 Cold-type composing machine	3.85	3.93	.08	.23	.18	-.05
330 Digital computer system administrator	12.18	12.60	.42	.43	.40	-.03
340 Program management	13.69	13.51	-.18	.24	.19	-.05
341 Administrative officer	9.61	9.79	.18	2.02	1.32	-.70
342 Office services management	7.99	8.26	.27	.49	.41	-.08
343 Management analysis	10.69	10.81	.12	3.04	2.74	-.30
350 Office machine operating	2.62	2.78	.16	.32	.25	-.07
351 Printing clerical	4.47	4.42	-.05	.08	.06	-.02
354 Bookkeeping machine operation	3.05	3.00	-.05	.08	.01	-.07
356 Data transcriber	3.08	3.14	.06	4.11	3.13	-.98
357 Coding	4.03	3.91	-.12	.32	.29	-.03
359 Electric accounting machine operation	3.94	4.14	.20	2.30	.42	-1.88
362 Electric accounting machine planning	8.09	8.44	.35	.59	.09	-.50
382 Telephone operating	3.47	3.41	-.06	2.31	1.46	-.85
385 Teletypist	4.61	4.49	-.12	.77	.19	-.58
388 Cryptographic equipment operation	6.00	6.40	.40	.26	.04	-.22
389 Radio operating	5.10	4.92	-.18	.03	.02	-.01
390 Communications relay operation	5.53	7.13	1.60	.28	.10	-.18
Total	4.48	4.53	0.05	70.61	56.52	-14.09
Total number of employees	130,924	112,278	-18,646			
Occupation	Changes in Mean Grade and Occupational Share in Increasing Series					
	Mean Grade 1964	Mean Grade 1975	Change in Mean Grade and Total Number of Employees	Occupational Share 1964 (%)	Occupational Share 1975 (%)	Change in Occupational Share (%)
301 General clerical and administration	6.91	6.39	-.52	20.19	26.78	6.59
304 Information receptionist	3.68	3.49	-.19	.19	.26	.07
316 Clerk-dictating machine transcribing	4.03	4.15	.12	.83	1.06	.23
319 Closed microphone reporter	6.86	7.30	.44	.11	.15	.04
332 Computer operation	6.92	6.73	-.19	1.68	3.61	1.93
334 Computer specialist	10.38	11.23	.85	3.55	7.60	4.05
344 Management clerical and assistant	8.07	6.77	-1.30	1.40	1.41	.01
391 Communication management	10.16	12.05	1.89	.09	.44	.35
392 General communications	5.57	5.93	.36	.82	1.33	.51
393 Communications specialist	11.60	11.34	-.26	.43	.65	.22
394 Communications clerical	4.47	4.35	-.12	.09	.18	.09
Total	7.32	7.32	0.00	29.38	43.47	14.09
Total number of employees	54,485	86,311	31,826			
Total decreasing and increasing	5.31	5.74	.42	100	100	
Total number of employees	185,409	198,589	31,180			

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of GS employees and the one with the largest number of DoD GS employees. Table 8 shows the same information for the "Engineering and Architecture Group" (008XX).

Table 7 shows that the occupations with decreasing occupational shares had a lower average grade (4.48) in 1964 than did the occupations with increasing shares (7.32). However, although the average grade for the entire group of occupations increased from 5.31 in 1964 to 5.74 in 1975, the mean grades of the subgroups with increasing and decreasing occupational shares remained almost unchanged. That is, the mean grades in 1975 for the decreasing and increasing subgroups were 4.53 and 7.32, respectively. There had, however, occurred a 14 percent shift of personnel from the occupations of average grade 4.5 to occupations of average grade 7.3. Although the overall population of employees experienced a net increase of over 13,000 workers, more than 18,000 were lost from occupations with a mean grade of 4.5 and almost 32,000 were gained in occupations with a mean grade of 7.3. It is clear from Eq. (1) that this change in occupational mix would cause the overall average grade to rise.

When we make a similar analysis of the engineering professions group (008XX), we see a corresponding shift in occupational shares. As Table 8 shows, there was an 11 percent shift of personnel away from occupations of average grade 10.05 to occupations of average grade 11.60. However, there had also been a slight change in grade within the decreasing and increasing subgroups. The proportion of the increase in the average grade of the group of occupations due to a change in occupational shares and the increase due to a change in grade within the subgroups is shown in Table 9. The proportions of the increase in the average grade due to the two factors for the Administration group are also presented in Table 9.

The data in this table show that 100 percent of the increase in average grade in the Administration group can be explained by the change in occupational mix, while 70 percent of the increase in the Engineering group can be explained by the same reason. Thus, most of the increase in the GS average grade in these groups of occupations can be accounted for by a shift in occupational shares.

Table 8  
ENGINEERING GROUP

Occupation	Decreasing Series						Change in Occupational Share (%)
	Mean Grade 1964	Mean Grade 1975	Change in Mean Grade and Total Number of Employees	Occupational Share 1964 (%)	Occupational Share 1975 (%)	Change in Occupational Share (%)	
802 Engineering technician	9.19	9.10	-.09	18.82	18.63	-.19	
803 Safety engineering	12.23	11.99	-.24	.37	.29	-.08	
804 Fire prevention engineering	12.18	12.06	-.12	.09	.06	-.03	
806 Materials engineering	11.94	12.42	.48	1.21	.62	-.59	
808 Architecture	11.52	11.17	-.35	.86	.78	-.08	
809 Construction control	7.25	8.17	.92	2.54	2.52	-.02	
810 Civil engineering	11.48	11.61	.13	12.56	9.54	-3.02	
817 Surveying technician	5.27	5.32	.05	2.23	1.17	-1.06	
818 Engineering drafting	5.97	5.34	-.63	3.78	1.86	-1.92	
828 Construction analysis	9.71	12.00	2.29	.07	.00	-.07	
830 Mechanical engineering	11.46	11.67	.21	11.54	9.71	-1.83	
850 Electrical engineering	11.09	11.10	.01	3.19	2.32	-.87	
871 Naval architecture	11.70	12.36	.66	1.42	1.10	-.32	
873 Ship survey	10.19	10.71	.52	.09	.04	-.05	
893 Chemical engineering	11.61	11.77	.16	1.06	.82	-.24	
894 Welding engineering	11.08	11.80	.72	.09	.08	-.01	
896 Industrial engineering	11.42	11.72	.30	2.49	2.17	-.32	
Total	10.05	10.19	.14	62.41	51.71	-10.70	
Total number of employees	45,088	46,066	-1,022				
	Increasing Series						
801 General engineering	12.89	12.85	-.04	9.84	10.89	1.05	
807 Landscape architecture	11.17	10.66	-.51	.14	.21	.07	
819 Sanitary engineering	11.95	11.57	-.38	.15	.29	.14	
840 Nuclear engineering	11.82	11.89	.07	.28	.96	.68	
855 Electronic engineering	11.84	12.03	.19	13.80	17.37	3.57	
856 Electronic technician	10.05	9.94	-.11	8.67	13.14	4.47	
861 Aerospace engineering	12.32	12.40	.08	4.02	4.66	.64	
899 Student trainee	3.62	3.69	.07	.68	.77	.09	
Total	11.60	11.54	-.06	37.58	48.29	10.71	
Total number of employees	27,142	41,147	14,005	100	100		
Total decreasing and increasing	10.64	10.84	.20				
Total number of employees	72,230	85,213	12,983				

Table 9

CHANGE IN GS MEAN GRADE, 1964/1975

Category	Administration Group	Engineering Group
Mean grade 1964	5.31	10.64
Mean grade 1975	5.74	10.84
Increase in mean grade	0.42	0.20
Increase due to change in occupational shares	0.47	0.14
Increase due to within-occupation increase in grade	-0.05	0.06
Percent of increase explained by changes in occupational shares	100%	70%

We can only conjecture at this point as to what caused the shift in occupational shares. One possible cause could be the introduction of new and improved technology. Tables 7 and 8 show that many of the occupations with the greatest increases in shares of the population are concerned with computer operations and electronic and nuclear engineering, that is, "newer" technology occupations. Also, the decrease appears to be away from the more traditional occupations. Apparently, then, at least part of the shift in occupational mix and subsequently the rise in the GS average grade might be attributed to new and improved technology. This hypothesis is further supported by the fact that the occupations in 1975 that did not exist in 1964<sup>1</sup> all represent "newer" technology and generally have a substantially higher average grade than the overall average for their group of occupations.<sup>2</sup>

More study will be required to trace the pattern of shifts over time to pinpoint the cause of the shifts. At this time, the data for such an analysis are not available.

<sup>1</sup>These are not included in Tables 7 and 8.

<sup>2</sup>If we include the three new occupations in the Administration group when computing the overall average grade, the average is increased from 5.74 to 5.93 in 1975.

THE SUBSTITUTION HYPOTHESIS

Specific forces at work within the DoD have also affected average grade. For the services, the trade-off of military for civilian personnel is a possibility that can serve as an explanation for increases in grades 12 to 15. Table 10 shows the increases in civilian workers in contrast with the decrease in military officers.<sup>1</sup>

If we can assume that each service has a specified series of executive responsibilities that it must perform, it can accomplish its mission by assigning either military officers or civilian personnel in some mix to carry out the necessary functions. In economic terms, the curves in Fig. 1 are isoquants, any given point of which shows the trade-off used in determining how many civilians versus military personnel are needed to perform a specified set of functions.

We know that after the Vietnam War buildup in 1966 there was an overall decrease (as the war began to wind down) in officers in grades major through general or those military grades corresponding to civilian grades GS-12 to 18. From our hypothesis we would expect that as officer strength dropped from point A to point D, the corresponding trade-off in the number of civilians needed would increase from point C to point F. This is very close to what happened, as seen from the bottom half of Table 10. The number of Army officers in the indicated grades dropped by 7227 and the number of civilians in the indicated grades increased by 7017. The inference, of course, is that the Army used the civilians on a one-to-one basis to substitute for officer personnel dropped from administrative functions of one sort or another.

The picture for the Navy is not clear. What it indicates is that instead of the civilian strength increasing to the point F as expected, civilians increased much more to point K. There are several possible inferences here: The Navy assumed more administrative responsibilities during the period; or it was less able to cut civilian strengths because of seniority rules; or it had some different formulas (voiced or unvoiced) regarding its own trade-off functions between civilian and

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<sup>1</sup>We are indebted to Brig. Gen. Paul Phillips, U.S. Army retired and now Deputy Assistant Secretary of the Army (Manpower), for this insight.

Table 10  
COMPARISON OF MILITARY OFFICER AND CIVILIAN GRADE LEVELS

GS	Military Rank	1975 (September 30)												1966															
		Army				Navy				Air Force				Army				Navy				Air Force							
		Mil	Civ	Total	Change	Mil	Civ	Total	Change	Mil	Civ	Total	Change	Mil	Civ	Total	Change	Mil	Civ	Total	Change	Mil	Civ	Total	Change				
18	General--admiral	10	8	18	-3	10	10	20	12	13	26	16	13	26	8	20	28	12	8	20	10	12	22	10	8	18			
17	Lt. general--vice admiral	32	27	59	-12	37	27	64	64	43	107	70	40	107	40	147	107	40	147	107	38	64	102	38	18	56			
16	Maj. general--rear admiral	182	148	330	-20	169	148	317	296	112	260	216	104	260	108	368	260	108	368	368	167	215	382	167	125	292			
15	Brig. general--rear admiral	211	1,874	2,085	-45	2,039	1,874	3,913	2,489	189	4,102	1,117	150	4,102	150 <sup>a</sup>	4,252	1,852	2,108	1,508	219	1,031	1,508	1,358	1,508	1,031	1,250			
14	Colonel--captain	4,369	5,261	9,630	-1,247	4,417	4,844	9,261	8,641	5,070	2,985	8,055	2,566	5,070	2,566	7,636	4,844	10,480	4,337	6,143	10,480	6,474	11,948	6,474	2,861	9,315			
13	Lt. colonel--commander	10,726	14,320	25,046	-2,353	12,373	14,320	26,693	19,741	12,373	8,927	21,300	14,273	11,231	25,504	8,442	16,709	16,709	16,733	7,397	24,130	22,745	11,919	26,530	12,155	34,906			
12	Major--lt. commander	17,159	22,273	39,432	-7,227	32,205	22,273	54,478	33,453	19,964	13,055	33,019	19,512	18,763	38,275	14,611	52,886	38,275	14,611	52,886	52,886	22,745	75,631	22,745	12,155	87,786			
		Army				Navy				Air Force				Army				Navy				Air Force							
		Mil	1966	Change	1975	Mil	1966	Change	1975	Mil	1966	Change	1975	Mil	1966	Change	1975	Mil	1966	Change	1975	Mil	1966	Change	1975	Mil	1966	Change	1975
18	General--admiral	10	13	-3	10	8	10	2	8	10	8	2	10	8	2	8	2	13	12	1	13	12	1	13	12	1	13	8	
17	Lt. general--vice admiral	32	44	-12	28	27	97	40	27	97	40	-3	40	27	13	43	27	112	167	55	112	167	55	112	167	55	112	18	
16	Maj. general--rear admiral	182	202	-20	169	148	97	108	148	97	108	-11	108	199	112	189	199	189	219	-30	189	219	-30	189	219	-30	189	21	
15	Brig. general--rear admiral	211	256	-45	222	1,874	133	150	1,874	133	150	-17	150	2,356	150	2,356	2,356	189	219	-30	189	219	-30	189	219	-30	189	94	
14	Colonel--captain	4,369	5,616	-1,247	4,417	4,844	3,418	4,337	4,844	3,418	4,337	-919	4,337	5,223	4,337	5,223	5,223	5,070	6,474	-1,404	5,070	6,474	-1,404	5,070	6,474	-1,404	5,070	285	
13	Lt. colonel--commander	10,726	14,273	-3,547	11,231	14,320	7,266	8,442	14,320	7,266	8,442	-1,176	8,442	12,475	14,273	12,475	12,475	14,273	16,733	-4,360	14,273	16,733	-4,360	14,273	16,733	-4,360	14,273	9,927	
12	Major--lt. commander	17,159	19,512	-2,353	18,763	22,273	13,767	14,611	22,273	13,767	14,611	-844	14,611	18,692	19,964	18,692	18,692	19,964	22,745	-2,781	19,964	22,745	-2,781	19,964	22,745	-2,781	19,964	13,355	
		Army				Navy				Air Force				Army				Navy				Air Force							
		Mil	1966	Change	1975	Mil	1966	Change	1975	Mil	1966	Change	1975	Mil	1966	Change	1975	Mil	1966	Change	1975	Mil	1966	Change	1975	Mil	1966	Change	1975
18	General--admiral	10	13	-3	10	8	10	2	8	10	8	2	10	8	2	8	2	13	12	1	13	12	1	13	12	1	13	8	
17	Lt. general--vice admiral	32	44	-12	28	27	97	40	27	97	40	-3	40	27	13	43	27	112	167	55	112	167	55	112	167	55	112	18	
16	Maj. general--rear admiral	182	202	-20	169	148	97	108	148	97	108	-11	108	199	112	189	199	189	219	-30	189	219	-30	189	219	-30	189	21	
15	Brig. general--rear admiral	211	256	-45	222	1,874	133	150	1,874	133	150	-17	150	2,356	150	2,356	2,356	189	219	-30	189	219	-30	189	219	-30	189	94	
14	Colonel--captain	4,369	5,616	-1,247	4,417	4,844	3,418	4,337	4,844	3,418	4,337	-919	4,337	5,223	4,337	5,223	5,223	5,070	6,474	-1,404	5,070	6,474	-1,404	5,070	6,474	-1,404	5,070	285	
13	Lt. colonel--commander	10,726	14,273	-3,547	11,231	14,320	7,266	8,442	14,320	7,266	8,442	-1,176	8,442	12,475	14,273	12,475	12,475	14,273	16,733	-4,360	14,273	16,733	-4,360	14,273	16,733	-4,360	14,273	9,927	
12	Major--lt. commander	17,159	19,512	-2,353	18,763	22,273	13,767	14,611	22,273	13,767	14,611	-844	14,611	18,692	19,964	18,692	18,692	19,964	22,745	-2,781	19,964	22,745	-2,781	19,964	22,745	-2,781	19,964	13,355	

SOURCE: Officer strength is from Selected manpower Statistics, DoD, various years; civilian data are from Pay Structure of the Federal Civil Service, various years.

<sup>a</sup>The Navy has no equivalent to brigadier general; it has only rear admirals, who are listed in the upper half and lower half of the list. This figure is an estimate.

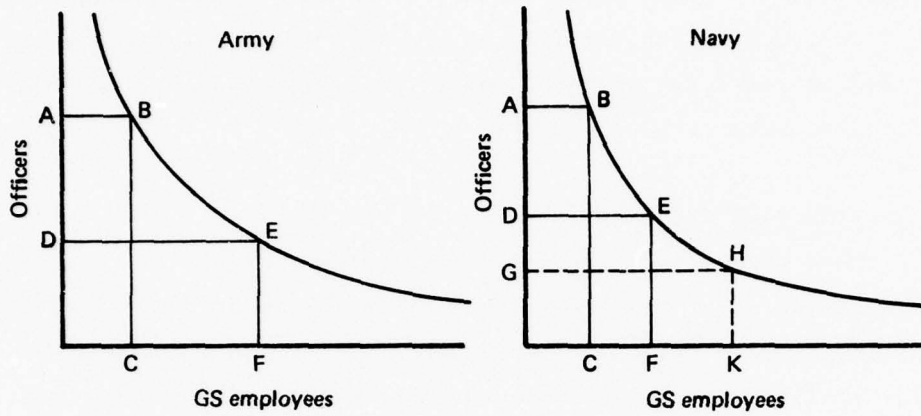


Fig. 1—Officer versus GS trade-off

military personnel. We are unable to arrive at an answer with the data available to us.

At first glance, the Air Force figures are also out of line with the original hypothesis. However, if we further assume that pilots and navigators are not replaced by civilians, we find that there is a closer correspondence because the decrease in officer strength included a decrease of 7073 pilots and navigators. Thus, roughly 1600 officers have been replaced by 2500 civilians.

The evidence is not conclusive but it does suggest that two of the services have used civilians to replace officers. Because the officers replaced were in ranks equivalent to grades GS-12 to 18, the net effect is to increase the average grade of the GS workers employed by this service.

CONTRACT LABOR HYPOTHESIS

The lowest grades GS-1 to 4 contain numbers of service personnel who can easily be replaced by contract labor. Such types of service permit individual entrepreneurs, less bound by governmental hiring practices and benefit packages, to perform some services more economically than the DoD. At this time, we find no data to investigate

this hypothesis.<sup>1</sup> But the possibility deserves further research, because if contracting for services is practiced on a large scale it would tend to raise average grade over the years by depleting the force of its lowest graded workers.

#### THE ATTRITION RATE HYPOTHESIS

If there were severe attrition in the lower GS grades that remained unfilled and there were stability in the middle and higher GS grades, the average grade of the GS work force would tend to rise.

The available data do not support the hypothesis.<sup>2</sup> What they do show is that attrition defined as "only out-of-DoD transfers" is dependent on a series of factors that do not affect average grade.

Of the 113 occupations having significant grade creep, 58 showed attrition rates above the FY75/FY76 means calculated for PATCO classification . . . 45 showed attrition rates below the mean and 10 occupations could not be readily measured. . . . The weighted [for population] averages for those occupations with significant grade increases from FY 1964 to FY 1974 showed no anomalous attrition patterns suggesting a correlation with either high or low attrition rates relative to the same occupations in a control group or to other occupations in similar PATCO classifications.

Other factors do affect attrition rates but they do not affect "grade creep":<sup>3</sup>

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<sup>1</sup>According to information obtained in our interviews with DoD officials, such contracting is increasingly encouraged. However, data are lacking as to exact numbers and the occupational series involved.

<sup>2</sup>The discussion of attrition rate is based on work by D. Richard McGonigal for the Office of Assistant Secretary of Defense (MRA&L). His preliminary findings and interim study reports have been generously provided to us by the Department of Defense. See "Baseline Data on DoD Civilian Work Force Attrition," Human Resources Research Office, October 1977, and "Interim Presentation on Study of DoD Civilian Attrition," HUMRRO, January 1978.

<sup>3</sup>Letter, D. Richard McGonigal to Walter B. Bergmann, November 1, 1977.

1. There are relatively large differences in attrition rates between services, with the Navy having the highest rate of 10.4 percent.
2. Women showed an average attrition rate of 12.8 percent as against a 6.6 percent rate for men.
3. College education generally drives male separation rates down but drives female separation rates up.
4. Retention rates for GS-11 to 18 are high (as are those for GS workers with 5 to 29 years of service and those between the ages of 30 and 55).

Despite these factors, there is a constant influx of new workers. Promotion within ranks provides needed replacements, and the work force as a whole tends to be quite stable.

#### THE COMPARABILITY HYPOTHESIS

The comparability hypothesis was generated from the observation that average grade increase was not constant over time. In considering this change, we investigated the possibility that the average grade increase was linked to the cost of living. It seemed that the GS system, constrained by fixed pay schedules, might attempt to achieve pay comparability through many small decisions for promotion of individual workers, which in turn would result in average grade increases.

An analysis of Table 11 indicates a relationship between the initial average grade in 1959 and the final percentage increase in this grade between 1959 and 1976. The relationship is better suggested by reference to the scatter diagram that depicts Table 11 in graphical form (Fig. 2).

The actual relationship suggested is

$$C = \alpha + \beta G + \mu, \quad \mu \sim N(0, \sigma),$$

where C is the percentage increase in grade of a given agency between 1959 and 1976, G is the initial average grade, and  $\mu$  is normally

distributed in accordance with classical assumptions. Our computation shows:

$$C = 58.8 - 5G, \quad R^2 = 0.39 \quad (t = 5.28)$$

or correspondence at the 0.999 level.

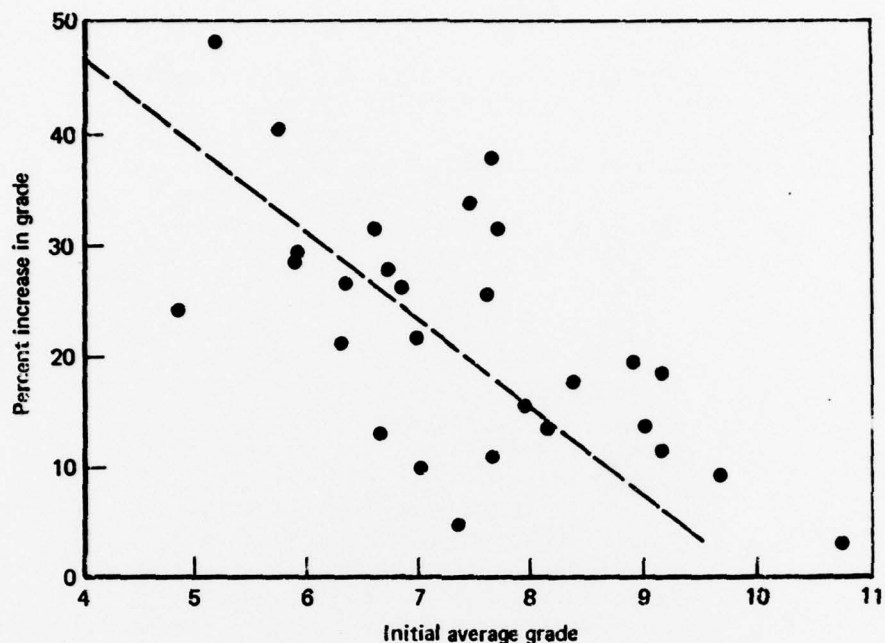
Table 11

CHANGE IN AVERAGE GS GRADE FOR SELECTED AGENCIES, 1959/1976

Agency	Strength		Average Grade		Percent Change
	1959	1976	1959	1976	To 1976
Selective Service	973	498	5.18	7.70	48.7
Smithsonian	927	2,485	5.75	8.07	40.4
General Accounting Office	5,133	4,836	7.66	10.57	38.0
Civil Rights Commission	3,685	262	7.47	10.00	33.9
Office of Economic Opportunity	988 <sup>a</sup>	1,094 <sup>b</sup>	7.68	10.12	31.8
Library of Congress	2,436	4,329	6.56	8.63	31.6
General Services Administration	12,896	21,410	5.89	7.62	29.4
HEW	48,091	121,282	5.87	7.55	28.6
Agriculture	70,983	79,315	6.71	8.58	27.9
Navy	131,950	157,845	6.34	8.02	26.5
National Science Foundation	330	802	6.85	8.64	26.1
Commerce	23,112	26,919	7.59	9.54	25.7
Veterans Administration	92,548	124,616	4.86	6.03	24.1
Defense other than Services and JCS	15,599 <sup>c</sup>	15,531	6.98	8.50	21.8
Air Force	148,077	139,748	6.29	7.64	21.5
SecDef/JCS	1,633	1,688	8.87	10.61	19.6
NASA	5,281	22,832	9.15	10.87	18.6
Federal Power Commission	844	1,167	8.34	9.83	17.9
Labor	5,552	14,716	7.94	9.18	15.6
Interior	36,033	54,118	7.40	8.46	14.3
Civil Aeronautics Board	704	653	8.97	10.21	13.8
Federal Communications Commission	1,235	1,950	8.12	9.22	13.6
Army	216,254	228,837	6.62	7.53	13.2
Farm Credit Administration	204	204	9.16	10.23	11.7
Justice	27,469	47,406	7.67	8.52	11.1
Treasury	67,224	109,362	6.98	7.67	9.9
Transportation	49,127 <sup>d</sup>	65,299	9.65	10.54	9.2
Civil Service	3,685	7,044	7.32	7.68	4.9
Budget	417	608	10.72	11.04	3.0

SOURCE: *Pay Structure of the Federal Civil Service*, various dates.

<sup>a</sup>As of 1965. <sup>b</sup>As of 1974. <sup>c</sup>As of 1962. <sup>d</sup>As of 1967.



**Fig. 2—Scatter diagram: percent increase in grade versus average grade**

This suggested to us that the GS system operated to maximize the gains to itself. There are several indications that such a hypothesis may be true. For instance, the wage comparison shown in Table 12 indicates that the lower GS grade levels might appear quite low, particularly to a married worker with children.

The workers in the three grades shown in this table represented 23 percent of the total GS work force in 1959. These workers probably felt themselves hard put to make financial ends meet. Congress ultimately granted relief, and several pay raises were made, culminating in the enunciation of the principle of "comparability" in 1962. However, little was done to implement comparability until several years later, and it was not achieved until 1969.

In the interim period, an interesting phenomenon occurred. Figure 3 shows that the slopes of the cost-of-living index curve and the rise in average grade curve are similar until 1969, the year when comparability was finally achieved. Thereafter, the two curves diverge markedly with the average grade curve becoming almost horizontal and

Table 12

COMPARISON OF GS SALARIES WITH POVERTY  
LEVELS AT 1959 LEVELS

GS Level	Salary <sup>a</sup>	Poverty Level, Family of Four <sup>b</sup>
GS1	2,960	2,974
GS2	3,255	
GS3	3,495	

SOURCES: *Pay Structure of the Federal Civil Service*, 1959; "Statistical Abstract of the United States, 1976," Table 672, p. 415.

NOTE: It must be pointed out, though, that we cannot determine a priori the appropriateness of the comparison shown in the table, because the poverty wage shown is for a *family of four*, whereas the distribution of family sizes for workers in grades GS-1 to 3 is unknown.

<sup>a</sup>Starting levels in 1959.

<sup>b</sup>1959 levels.

the consumer price index (CPI) curve moving rapidly upward. However, the slope of the curve depicting average wage for the GS employee moves with the CPI curve even after 1969.

The series of curves suggests that until 1969 the GS system functioned to give pay increases by advancing its employees in grade. However, once comparability was reached there was no need to use this de facto device because there was a de jure method for ensuring that there would be a pay increase on a yearly basis as a result of the provisions of the Federal Pay Comparability Act of 1970.

To investigate the possibility of a de facto device, we initially isolated the data on the Army alone. Until 1975 the U.S. Army could be considered as consisting of six armies, located in the Northeast, the Washington, D.C. area, the South, the Midwest, the Southwest, and the West. Each of these armies was essentially a housekeeping unit and, therefore, performed very nearly the same mission. Moreover, each Army was roughly located in a part of the country that is an

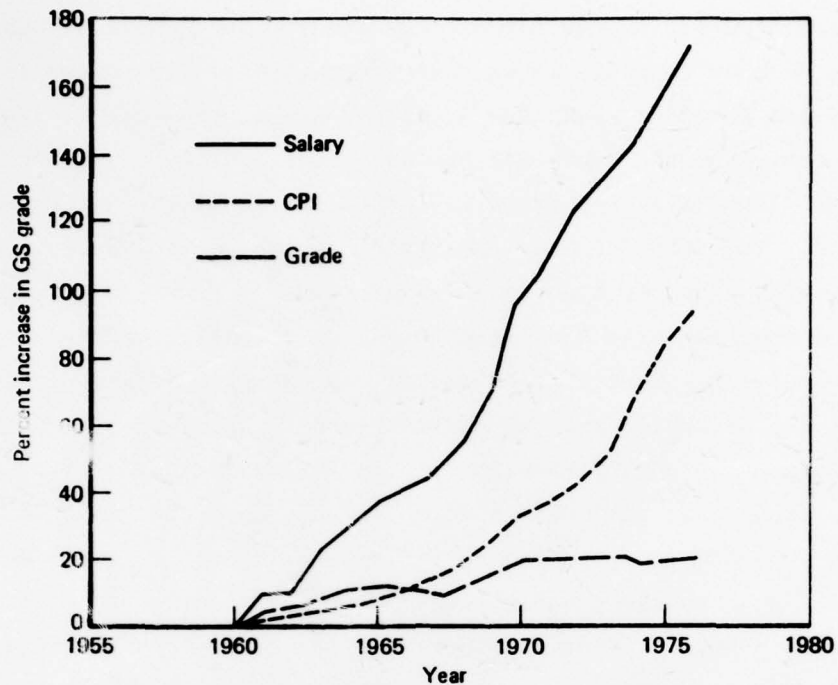


Fig. 3--Percent change in GS grade and salary versus consumer price index

economic entity, in large part, by itself. Hence, if the average grade of each Army was different, it would tend to substantiate the argument that economic factors enter into the GS grade-fixing process. The argument would be strengthened even more if Navy and Air Force average grades in these economic areas also followed a similar pattern. Table 13 shows the average grade of employees in each of the general sections of the country in which each of the armies were located (although the armies were reduced to three in 1975, we have extended our computation to 1976 because few installations were relocated as a result of the reorganization).

The data in Table 14, showing budget indices for lower budget families, correspond very closely with those of the Bureau of Labor Statistics.<sup>1</sup> These indices are unfortunately not computed on the

<sup>1</sup>See "NEWS, Bureau of Labor Statistics," U.S. Department of Labor, 77-369, April 27, 1977. Unfortunately, the indices for annual budgets

same area breakout of the former Army areas. Nevertheless, what the indices do show in Table 14 is that the most expensive areas in the country are the Northeast, the Great Lakes, and the West, while the least costly are the South and the Southwest. With the exception of the Sixth Army, all Army areas fall into the rankings that would be expected. The data for Navy and Air Force average grades correspond exactly with what our hypothesis predicts.

The data are also consistent with two recently reported studies.<sup>1</sup> One sponsored by two coalition groups represents the economic interests of the Northeast and the Midwest (Great Lakes area). The other is by DoD but is unpublished except for internal distribution. The studies found that even though total defense personnel have increased between 1950 and 1976, the so-called Frostbelt experienced a decline. Moreover, the Frostbelt had a larger share of closing of defense establishments between 1961 and 1976 than other sections of the country. This finding is to be expected, given the data in Table 14, because it represents a shift from high personnel cost areas into low personnel cost areas during a period when DoD personnel costs were assuming an ever increasing percentage of the total budget costs. The shift is consistent with the hypothesis that the GS system acted, quite probably unconsciously, to maximize its own returns.

We attempted to test the data of Table 13 to determine the similarity of installations in the various areas, but the data available to us do not permit the identification of individual installations and their manning levels.

Some observations connected with the principle of comparability also tend to support the hypothesis. As highlighted in Table 15, we

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for families at various income levels is based on selected metropolitan areas and nonurban areas that do not coincide with the boundaries of the U.S. CONUS armies. However, by rough interpolation it is possible to generalize to the broad national areas as we have done.

<sup>1</sup>"Frostbelt States Complain of Lag in Defense Dollars," Financial Section, *Los Angeles Times*, September 22, 1977. See also *Memorandum for Distribution, Subject: Preliminary Analysis of Personnel Assignment Patterns of the DoD Work Force, 1956-1975*, December 1, 1976, Assistant Secretary of Defense, Manpower and Reserve Affairs (Planning and Requirements); these findings agree with the Frostbelt study.

Table 13

AVERAGE GS GRADES IN ARMY AREAS, 1973/1976

Army Area	Area	Army		Navy		Air Force	
		Average Grade 1973	Average Grade 1976	Average Grade 1973	Average Grade 1976	Average Grade 1973	Average Grade 1976
1st	Northeast	7.87	7.81	8.01	8.22	8.52	8.55
2nd	Washington, D.C.	8.12	8.20	9.28	9.28	8.15	8.26
3rd	South	7.39	7.33	6.93	7.03	7.25	7.41
4th	Southwest	6.75	6.84	6.23	6.02	7.11	7.29
5th	Great Lakes	7.29	7.33	7.24	7.58	6.90	7.04
6th	West	7.03	7.20	7.90	8.04	7.46	7.59
ConUS	Continental U.S.	7.47	7.47	7.98	8.08	7.50	7.63

SOURCE: *Civilian Personnel Data File*, Defense Manpower Data Center, 1973 and 1976.

Table 14

SELECTED BUDGET INDICES FOR LOWER BUDGET,  
FOUR-PERSON FAMILY

Urban United States	100
Metropolitan	101
Nonmetropolitan	93
Northeast	
Boston	108
Nonmetropolitan	98
North Central	
Chicago	103
Kansas City	97
Nonmetropolitan	96
South/Southwest	
Atlanta	92
Houston	90
Nonmetropolitan	90
West	
Los Angeles	105
Nonmetropolitan	100
Washington, D.C.-Maryland	106

Table 15  
CHANGE IN AVERAGE GS GRADE FOR SELECTED AGENCIES,  
1959/1970/1976

Agency	Average Grade			Percent Change		Percent of Total Change
	1959	1970	1976	To 1970	To 1976	1959-1970
Selective Service	5.18	5.92	7.70	12.5	48.7	25.7
Smithsonian	5.75	8.03	8.07	39.7	40.4	98.3
General Accounting Office	7.66	9.64	10.57	25.8	38.0	68.0
Civil Rights Commission	7.47	10.40	10.00	39.2	33.9	100.0
Office of Economic Opportunity	7.68 <sup>a</sup>	9.27	10.12 <sup>b</sup>	20.7	31.8	65.0
Library of Congress	6.56	7.76	8.63	18.3	31.6	57.9
General Services Administration	5.89	7.16	7.62	21.6	29.4	73.3
HEW	5.87	7.39	7.55	25.9	28.6	90.5
Agriculture	6.71	7.76	8.58	15.6	27.9	55.9
Navy	6.34	7.81	8.02	23.2	26.5	87.5
National Science Foundation	6.85	8.70	8.64	27.0	26.1	100.0
Commerce	7.59	9.17	9.54	20.8	25.7	81.0
Veterans Administration	4.86	5.81	6.03	19.5	24.1	81.1
Defense other than Services and JCS	6.98 <sup>c</sup>	8.24	8.50	20.0	21.8	91.9
Air Force	6.29	7.66	7.64	21.8	21.5	100.0
SecDef/JCS	8.87	10.10	10.61	13.9	19.6	70.7
NASA	9.15	10.80	10.85	18.0	18.6	97.0
Federal Power Commission	8.34	9.95	9.83	19.3	17.9	100.0
Labor	7.94	9.36	9.18	17.9	15.6	100.0
Interior	7.40	8.55	8.46	15.5	14.3	100.0
Civil Aeronautics Board	8.97	10.08	10.21	12.4	13.8	89.7
Federal Communications Commission	8.12	9.24	9.22	13.8	13.6	100.0
Army	6.62	7.59	7.53	12.8	13.2	96.8
Farm Credit Administration	9.16	10.03	10.23	9.5	11.7	81.2
Justice	7.67	7.95	8.52	3.7	11.1	32.9
Treasury	6.98	7.78	7.67	11.5	9.9	100.0
Transportation	9.65 <sup>d</sup>	10.12	10.54	4.9	9.2	52.9
Civil Service	7.32	7.42	7.68	1.4	4.9	27.9
Budget	10.72	11.15	11.04	4.0	3.0	100.0

SOURCE: *Pay Structure of the Federal Civil Service.*

<sup>a</sup>As of 1965. <sup>b</sup>As of 1974. <sup>c</sup>As of 1962. <sup>d</sup>As of 1966.

show the percentage of the total change up to 1976 that had already occurred by 1970, the first year after comparability had occurred. We chose this year because it would be the first year in which any effects of the achievement of comparability would be reflected. In Table 16 we extract the data that pertain to DoD agencies only. The data are revealing.

It is clear that by the end of the year in which comparability between GS employee salaries and salaries in the private sector had

Table 16

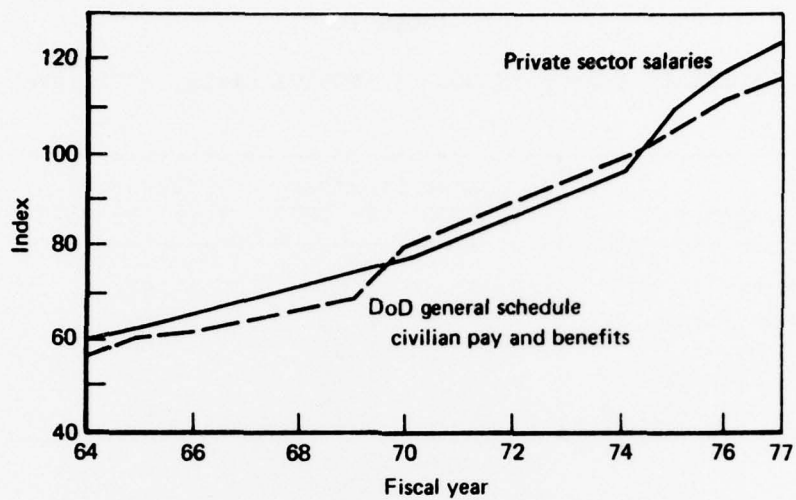
PERCENTAGE CHANGE IN DOD GS AVERAGE GRADE, 1970/1976

Agency	Change in Grade		Percent of Total by 1970
	To 1970	To 1976	
Navy	1.38	1.68	82
Air Force	1.37	1.35	100
Army	0.97	0.91	100
SecDef/JCS	1.23	1.74	71
Other Defense	1.26	1.52	83

been reached, a dramatic decrease occurred in the rate of growth of the average grades of GS employees in DoD (and elsewhere in the government). Thereafter, there are small perturbations of the average grade but there are none of the dramatic increases that caused so much concern initially. Indeed, in two instances, the Army and the Air Force, the average grade actually began to decline after 1970.

A new trend was introduced, however, in fiscal year 1973 when "grade creep" per se came to almost everyone's attention because of rising personnel costs. Efforts were made by the President to decrease these costs by reducing the percentages of increase recommended by his panel, which considered the comparability of industry and government pay scales. The results of these efforts are shown in Fig. 4.

This figure is in very close agreement with Fig. 3 and the hypothesis we derived from it and have supported in the preceding paragraphs. Note, however, that beginning in 1974 the percentage change in civilian sector pay began to outstrip the percentage change in government pay and the two began to diverge. If our hypothesis is correct, what we will see is another gradual increase in average grade. We may say, therefore, that while grade creep in DoD was apparently not a problem between 1970 and 1976, it may once again exert itself as a de facto way to assure comparability.



SOURCES:

"A Comparison of DoD Manpower Costs with National and Corporate Business Manpower Costs," OASD (MRA), November 1976.

"Percent Increases in Average Salaries, 1961-76, by Occupation and Group," *National Survey of Professional, Administrative, Technical, and Clerical Pay*, March, 1976, Bureau of Labor Statistics, U.S. Department of Labor, 1976, p. 2.

"Compensation Indices," December 1976; table furnished by OASD (MRA&L).

**Fig. 4—Index of relative changes in GS and private sector salaries  
(FY 1974 = 100)**

### III. CONCLUSION

The preceding sections of this report have attempted to show that "grade creep" is merely a term that describes the symptom but not the cause of a complex problem. The problem for the GS system is to determine what the appropriate grade level is for a series of occupational groups involving some 350 series. In this sense, the problem for DoD (and the whole GS system) is to devise procedures as well as checks and balances that will ultimately result in an efficient distribution of grades in the GS system in view of the various economic, social, and political forces at work in the nation.

It is clear, we believe, from the analysis that grade creep *per se* had run its course in DoD by the end of 1969 or early 1970 when salary comparability for GS employees had been achieved. The same conclusion is largely true for all of government. The causes of the grade increase before salary comparability were varied, and there is no way, with the available data, to state unequivocally that there was any *one* cause. Rather, it appears that many factors came to bear on the average grade increase.

In our analysis we have observed, first, that "grade creep" is a phenomenon that has occurred *throughout* the federal government, not only the DoD. Indeed, the DoD has in general witnessed average or less than average grade growth, as compared with the rest of the federal government. For instance, agencies related to the Congress (the GAO and the Library of Congress) and newer departments such as HEW are among those that experienced the largest increase in the average grade of their employees. In fact, the average worker in these agencies will today cost the government and the taxpayer on the order of \$16,000 exclusive of any fringe benefits to which he may be entitled. In contrast, the average GS worker costs the Army and the Air Force about \$13,000 in wages exclusive of fringe benefits.

Second, there was a clearly observable change in the mix of occupations as shown by the analysis of the 003XX and 008XX occupational groups. This occupational shift can account for most of the increase

in the average grade of the occupational groups. What the analysis could not explain directly is what has caused the shift in occupations. We conjectured that new and improved technology might account for the shift because there is an indication that the more traditional occupations, such as those involving the use of business machines and accounting machines in the 003XX group and electrical and mechanical engineering in the 008XX group, lost in their share of personnel while the more modern fields of computers in 003XX and electronic and nuclear engineering in 008XX gained in their share of personnel. These newer technology occupations brought with them the price of grades that average almost three grades higher than the corresponding grades in the supplanted fields. What is clearly needed is research into the relative grades of the newer and older fields and to determine whether it is now possible to attract and hold entrants into the new technology fields at lower GS grades. Also, it is clear that the causes of the occupational shift must be better understood before it is possible to justify the increase of the average grade with the occupational shift explanation.

Third, we are persuaded by the analysis that before 1969, when comparability became a reality, the GS system was pushed by forces that acted in subtle ways to increase grades as a substitute for pay raises. Figure 3 and the accompanying analysis indicate that somehow the system functioned to create de facto pay raises by small and steady increases in the average grade. After comparability was achieved, the rate of change in grades in the system as a whole slowed abruptly in several agencies, including two in DoD that actually underwent a decrease in average grade. We do not believe the system deliberately set out to achieve this result. Rather, it occurred as the accumulation of numerous small decisions in which the decisionmaker had considerable discretion to move one way or the other in granting a grade increase, whatever the cause. It may also reflect supply and demand factors for certain types of skills.

Fourth, it is important to realize that the agencies that use GS employees are almost autonomous in their ability to prescribe the organizational structure that in turn determines the numbers and

grades of the GS employees they will hire. It is theoretically possible, therefore, that some agencies, both in the macro and in the micro sense, could manipulate this organizational structure by specifying the content of a given GS grade. By specifying a smaller percentage of such responsibilities, one obtains more of the GS grade; by specifying more of the responsibility, one obtains fewer of the GS grade. There must be considerable discretion available to the individual who makes the decision in this process, and the end product could theoretically be quite uneven between agencies.

Our analysis revealed that in this country there is a well-known policy of surveiling the GS system. High-ranking officials and their positions are inspected in microscopic detail to ensure that there is no hint of special favor. Thus, it is quite palatable, politically speaking, to insert restrictions against the number of persons who can occupy GS-16 to 18 positions, the supergrades. These positions, therefore, are carefully controlled by both the DoD and by Congress. The fact is, however, that the total numbers of persons in these positions are, by comparison, so small a percentage of the total employees that they have little effect on the total average grade.

A more significant influence on average grade was the movement out of the lower grades into the middle grades (supergrades may add nothing to the problem precisely because they are so carefully controlled). Part of this movement into the middle grades for DoD may have been generated by the process where decreases in officer strengths were simply filled by appointing civilians to the billets that are administrative or technical in nature. The data indicate that the Army and Air Force used this device as an almost one-for-one trade-off; but the Navy either used a different trade-off ratio or sharply enlarged the number of tasks it performed. Because the officers who were replaced were equivalent to grades GS-12 to 18, it is a natural consequence that there was some increase in the number of these grades with a positive increase in average grade.

The GS system is subject to its own internal controls by means of position management and classification policies and procedures. However, these serve as only partial brakes upon the system. Only after the achievement of pay comparability was the system able to reach a

level of equilibrium. What we have here is the old Roman cry "*Quis ipsos custodiet custodes*"--who guards the guardians of authority? In this sense, we note that "grade creep" is analogous to the situation that occurred in the military services between 1950 and 1954. The services were able to specify their distribution of ranks (position management). The marked increase in military grades prompted Congress to pass the Officer Grade Limitation Act of 1954. The situation is also analogous to what industry calls "salary compression," that is, the pressure to increase the lower salaries and to put a lid on the higher salaries.

To conclude, there is a multiplicity of factors affecting GS grades. It is unclear what degree of importance to attach to any single indicator. Many factors are at work and average grade may not be an appropriate measure of the problem. The term "grade creep" came about when the 1964 distribution was compared with that of 1976. There is, however, nothing magical about 1964 except that data are available for the first time for this year. Also, in view of the changing nature of government functions, increasing technology, and the economic factors at work in the country, it is not clear what purpose is served by an indicator like average grade. The real problem is what mix of grades and occupations is necessary to conduct governmental business. This question of mix, coupled with judicious considerations and constraints involving personnel costs, may in the long run be a more efficient control mechanism than average grade.

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