Wage Determination in the Federal Government: The Role of Constituents and Bureaucrats

George J. Borjas

University of California, Santa Barbara

The existence of significant wage differentials among "similar" individuals employed by different agencies in the federal government is explored. The theoretical framework proposes that the underlying reason for these differentials may be linked to the political influence exhibited by the constituencies and bureaucracies of federal agencies. The empirical results indicate that employees in federal agencies with small and well-organized constituencies and with bureaucracies that apparently share common interests generally receive higher wage rates. In fact, a small number of variables measuring these political factors explains about two-thirds of interagency wage differentials.

I. Introduction

The behavior of political units in reaching their wage, employment, and output decisions has been a subject of intensive interest in recent

I am grateful to Gary Becker and George Stigler for their initial encouragement of this work, and to Robert Deacon, James Heckman, Larry Kenny, Jacob Mincer, Sam Peltzman, Sharon Smith, Finis Welch, and an anonymous referee for useful suggestions. George Stigler provided detailed sets of comments on various previous drafts which substantially improved the quality of the output. The paper also benefited from comments made by participants in seminars at the University of Chicago, Columbia, NBER-West, and UCLA. An earlier draft of this paper was presented at the Econometric Society meetings in December 1979. The financial assistance received from the Center for the Study of the Economy and the State at the University of Chicago is gratefully acknowledged. This research would have been impossible without the cooperation of Dr. Philip A. D. Schneider and Ms. Christine Steele of the Office of Personnel Management in making available the data necessary for the study. Of course, I alone am responsible for the content of this paper.

[*Journal of Political Economy*, 1980, vol. 88, no. 6]

years (see, e.g., Niskanen 1971; Ehrenberg 1973; Becker and Stigler 1974). Simultaneously, economists have shown a renewed interest in the determination of earnings (Mincer 1974; Rosen 1977). This paper can be viewed as an application of economic theory and methodology to a single question: How are wages determined in the U.S. federal government? This single employer had a full-time, permanent civilian labor force of approximately 2.5 million workers in July 1977, making it the largest employer in the United States.[1] Most of these workers were classified into one of three pay systems. The General Schedule (GS) covers most white-collar positions in the government and accounts for 55.6 percent of federal employment. It consists of 18 grades, each of which is defined by law in terms of the skills and responsibilities associated with the job. The Federal Wage System covers blue-collar positions (18.8 percent of the federal labor force). The salaries of these workers are set in accordance with locally prevailing wage rates in the particular crafts. Finally, the Postal System (21.1 percent of the federal labor force) covers employees in the U.S. Postal Service.[2]

The comparison of the wage structure resulting from these pay systems with the private sector wage structure was the subject of an interesting study by Smith (1977). She found that despite the "prevailing wage" principle, by which federal pay is supposed to be set comparable to the wage paid by "similar" jobs in the private sector, federal workers have received wage rates 10–15 percent higher than equally skilled individuals employed in the private sector.

This paper differs from the Smith study by shifting the focus of analysis to a study of the wage structure within the federal government. In particular, the federal sector can be viewed as one large multiproduct firm producing various outputs through its different agencies. In July 1977, the federal government was composed of 11 cabinet-level departments and of a myriad of so-called independent agencies. Despite the strict rules provided by the pay systems discussed earlier, it will be seen that there are substantial wage differentials across agencies in the federal government after detailed standardization for differences in the average skills of the workers in each agency. This empirical fact provides a way to fill a gap in previous studies of wages in the federal sector: the role of political considerations in the wage-setting process of the government.

These political considerations arise if we view the "government" as a vote-maximizing entity. Political support is purchased by the redis-

[1] Employment figures in the federal government are available on a monthly basis from the U.S. Civil Service Commission, various issues.

[2] In the Postal Service and for some blue-collar workers (mainly in the Tennessee Valley Authority) pay is set through collective bargaining.

tribution of the government's resources to politically powerful interest groups (Peltzman 1976, 1978; Becker 1978). It is the working hypothesis of this paper that the federal bureaucracy can help or hinder the redistribution process, thus indirectly affecting the amount of political support from the public, as well as provide or withhold its own political support. In this framework, therefore, there are two important sets of factors which influence agency wage levels: (*a*) the characteristics of the agency's constituency, and (*b*) the characteristics of the agency's bureaucrats. The former set of factors would include both the size of the constituency and the degree of political organization of the interest group, while the latter set of factors would include variables measuring the degree to which the bureaucracy can control the flow of agency output and/or provide direct political support to the government.

Before proceeding to discuss these issues in detail, however, it is instructive to obtain an overall view of the wage structure in the federal government. Table 1 presents summary statistics on wages and turnover rates in selected federal agencies and in the federal government as a whole. There are several interesting empirical findings.

First, the average quit rate over the years 1961–76 shows a lot of variation across agencies.[3] For example, some agencies like the Department of Transportation or the Postal Service have a quit rate of 0.5 or 0.6 percent. Other agencies, like the Tennessee Valley Authority or the Department of Agriculture, have quit rates nearly three times as high. These findings suggest that the wage the agency pays for a particular type of labor relative to the private sector wage for that type of labor varies significantly across agencies.[4]

The fact that wages vary dramatically across agencies is also illustrated in table 1. It should be noted that these wage figures do not standardize for average skill differentials. However, note that some agencies improved the relative wage of their bureaucracies in the 1961–76 period more than others. For example, the Department of Justice barely changed the relative wage of its average employee during this period, while agencies like the Postal Service or the De-

[3] Although the separation rate was collected continuously by the Civil Service Commission, there was some experimentation in 1965–66 with the forms agencies used to report turnover statistics. As a result, the quit rate is not available for these years. Therefore, the average separation and quit rates reported in table 1 do not include the 1965–66 period.

[4] Admittedly, there are many other possible factors which might determine the level of turnover rates. However, unless costs of turnover and search vary widely among agencies, it is unlikely that these factors would explain the large turnover differentials reported in table 1.

TABLE 1

SELECTED AGENCY WAGE RATES AND TURNOVER STATISTICS

Agency	Separation*	Quit*	W_{61}†	W_{76}†	W_{76}/W_{61}
Agriculture	4.10	1.46	1.27	1.39	1.10
Commerce	4.33	1.07	1.53	1.67	1.09
Defense	1.58	.64	1.40	1.52	1.09
Health, Education, and Welfare	1.81	.90	1.35	1.43	1.06
Housing and Urban Development	1.65	.75	1.60	1.78	1.11
Interior	4.09	1.08	1.42	1.44	1.01
Justice	1.62	.94	1.65	1.64	.99
Labor	1.73	.71	1.51	1.75	1.16
Transportation	.97	.48	1.69	2.03	1.20
Treasury	1.82	.71	1.46	1.47	1.01
Postal Service	1.44	.62	1.16	1.49	1.29
State	2.12	1.03	1.91	1.98	1.03
Energy Research and Development Administration	1.06	.53	1.87	2.01	1.08
Federal Communications Commission	1.83	.75	1.67	1.77	1.06
Federal Trade Commission	2.11	.88	1.83	1.76	.96
General Services Administration	1.74	.65	1.22	1.40	1.15
National Aeronautics and Space Administration	1.44	.56	1.92	2.31	1.20
Interstate Commerce Commission	1.61	.65	1.70	1.78	1.04
Securities and Exchange Commission	1.76	.99	1.75	1.88	1.07
Tennessee Valley Authority	4.23	1.45	1.61	1.67	1.04
Veterans Administration	2.35	1.03	1.13	1.35	1.20
Total government	1.83	.74	1.33	1.52	1.14

SOURCE.—The turnover rates for 1975 and 1976 are available in the U.S. Civil Service's *Monthly Release*; the turnover rates for all agencies in the period 1961–74 were provided by the U.S. Civil Service Commission on microfiche. W_{76} is obtained from the payroll and employment information available in the 1976 issues of the *Monthly Release*. For cabinet-level agencies and large independent agencies, W_{61} was obtained from compensation statistics provided by the Civil Service Commission. For smaller agencies, it was obtained by calculating payroll from U.S. Office of Management and Budget (1961). The private sector wage was obtained from the U.S. Department of Labor (1978).

* These are average separation and quit rates between 1961 and 1976. They refer to the monthly turnover rate per 100 workers.

† These are relative wages, that is, the ratio of the agency wage to the private nonagricultural sector wage. The private sector wage rates in 1961 and 1976 were $2.14 and $4.87, respectively. The private sector wage rate is the average hourly earnings of production or nonsupervisory workers on private nonagricultural payrolls.

partment of Transportation substantially increased the relative wage of their workers.[5]

These results suggest that agency differences in wage levels deserve further study. This paper provides a discussion of the economic reasons underlying agency wage differentials and presents empirical

[5] There exists a possibility that these differences may be due to disproportionate changes in the average skill levels of the agencies. Unfortunately, the Civil Service Commission did not collect information on educational attainment by agency until 1974.

evidence showing the persistence of these differentials after standardizing for interagency skill differences. Moreover, the results show that agency "political power" partly explains the differences suggested by table 1. Section II presents the theoretical framework for the study; Section III discusses the measurement of the agency's political influence; and Section IV presents the empirical analysis using a data set which contains a 1 percent random sample of the personnel records of federal workers. The empirical results concentrate on explaining wage differentials among individuals employed by the federal government. Finally, Section V summarizes the results of the study.

II. Framework

The theoretical framework for wage and employment decisions in the public sector has been analyzed by many economists.[6] Perhaps the simplest approach is to suppose that there is a single government goal: the maximization of political support.[7] The government accomplishes this objective by redistributing its resources optimally among competing groups. This income redistribution is obtained by an allocation of the government budget among its various agencies or functions. Each agency, in turn, uses its resources to produce an output which is distributed to the agency's constituency.

Assume there are k "agencies" in the government.[8] Each of these agencies produces an output, Z^i, which is distributed to the public free of charge. Individual j in the population has a "vote" function, V_j. This function can be thought of as giving the probability that he will support the incumbent government and is defined over the output of federal agencies and a vector of "environmental" characteristics, x, which may affect his voting behavior. Thus,

$$V_j = V_j(Z^1, \ldots, Z^k; x). \tag{1}$$

The vector x may include variables measuring the strength of his convictions on any particular government program, the degree of organization of interest groups, the size of the interest groups, etc.

[6] See Niskanen 1971, Barro 1973, Ehrenberg 1973, Becker and Stigler 1974, Ashenfelter and Ehrenberg 1975, Lentz 1976, and Victor 1977. A very useful discussion of utility maximization by firms with some implications for the behavior of government units is found in Williamson (1964).

[7] This objective function was introduced in the work of Downs (1957) and Becker (1958).

[8] The agency is chosen as the unit of observation due to the fact that congressional oversight over an agency's budget is an important way of monitoring bureaucratic behavior. Although this regulatory process is quite complex, an interesting description can be found in U.S. Senate, Committee on Government Operations (1977).

It is assumed that the objective of the government is to maximize its total political support defined as

$$\bar{V} = \sum_{j=1}^{N} V_j(Z^1, \ldots, Z^k; x), \tag{2}$$

where N is the number of voting individuals in the population.

The government faces two constraints. The first is that Z^i must be produced by the agency. Assume that Z^i is produced using a fixed capital stock, the agency's labor force, and the bureaucrats' cooperation or effort. The fundamental assumption of the analysis, therefore, is that the treatment of bureaucrats by the government affects agency output: Bureaucrats will hinder the flow of agency output when their wage is low and will increase the flow when the wage is high. Thus the production function for agency i is given by

$$Z^i = Z^i(w_i, L_i; \alpha_i), \qquad i = 1, \ldots, k, \tag{3}$$

where w_i is the agency wage ($Z^i_w > 0$); L_i is the agency's labor force ($Z^i_L > 0$); and α_i is an environmental vector of variables capturing the degree of organization of the agency's bureaucracy, etc. It is assumed that the production functions in (3) are concave and that w_i is not an inferior input in the production of Z^i.

The second constraint faced by the government is that its revenues equal its expenditures.[9] In this simple model, the size of the government budget is taken as exogenous although it, too, is chosen so as to maximize political support.[10] Letting T be the government's revenue (and ignoring the fixed costs):

$$T = \sum_{i=1}^{k} w_i L_i. \tag{4}$$

Note a crucial characteristic of this model: Since the government is to choose optimal values of w_i and L_i (for all i), the budget constraint is nonlinear in these variables. Thus the model (and its predictions) bears a close resemblance to the quality-quantity models of Houthakker (1952), Theil (1952), and Becker and Lewis (1973).

The first-order conditions are:

$$\left.\begin{aligned} \sum_j V^i_{jZ} Z^i_w - \lambda L_i = 0 \\ \sum_j V^i_{jZ} Z^i_L - \lambda w_i = 0 \end{aligned}\right\}, \qquad i = 1, \ldots, k, \tag{5}$$

[9] A discussion of how the government chooses the optimal level of public debt is contained in Barro (1974, 1979).

[10] This is formally equivalent to the firm choosing optimal inputs for given levels of output and then choosing the optimal output so as to maximize profits. For an analysis of optimal levels of government expenditures, see Peltzman (1978).

where $V^i_{jZ} = \partial V_j / \partial Z^i$ and λ is the marginal vote gain obtained from an increase in total government expenditures.

It should be noted that the equalities in (5) are a result of the implicit assumption that the government can hire its desired labor force at the wages given by the solution to (5). Obviously, there are supply constraints on the government's behavior. It may be that the optimal government wage lies below the competitive wage so that the labor force the government wishes to hire is unavailable at the wage it is paying. To focus the problem on the effects of political variables on the wage structure these supply constraints are not introduced in the model, but their role in the empirical work will be discussed in Section IV.

In order to introduce the size of the agency's constituency directly into the first-order conditions it is useful to make two additional assumptions specifying how vote functions differ across individuals. First, it is important to note that agency output is not distributed equally across the population for a variety of reasons. These reasons could be geographic since, for example, the average person in California receives little direct benefit from expenditures in the Ozarks Regional Commission. Moreover, certain government programs are designed to benefit certain target groups. I make the assumption that if a given person does not benefit from expenditures in a given agency then (small) changes in that agency's output do not affect his political support. That is, $V^i_{jZ} = 0$ for all individuals who view the ith agency as producing an output which is not meant to benefit them. This will hold true for the set of individuals who are not constituents of the agency. Thus the constituency of the agency is formed by individuals who view the agency's output as beneficial to their utility. I further assume that all constituents are identical in that they have the same vote function and share equally in agency output. Then the marginal vote gain from increases in the output of agency i is the same for all individuals who obtain benefits from that agency; thus $V^i_{jZ} = V^i_Z$ for all j who are constituents of the agency. Given these simplifying assumptions, the summations in (5) are carried out only over the agency's constituency:[11]

$$\left.\begin{aligned} n_i V^i_Z Z^i_w - \lambda L_i &= 0 \\ n_i V^i_Z Z^i_L - \lambda w_i &= 0 \end{aligned}\right\}, \qquad i = 1, \ldots, k, \tag{5'}$$

where n_i is the size of the constituency of agency i.

[11] A more general model would, of course, incorporate the fact that the size of the beneficiaries is itself an endogenous variable. For an analysis of the factors determining the optimal size of the constituency, see Peltzman (1976). It should be noted that the analysis concentrates on the role of constituents, defined as the beneficiaries of agency output, while ignoring the role of "opponents," the group of individuals whose political support to the government is negatively related to the production of agency output.

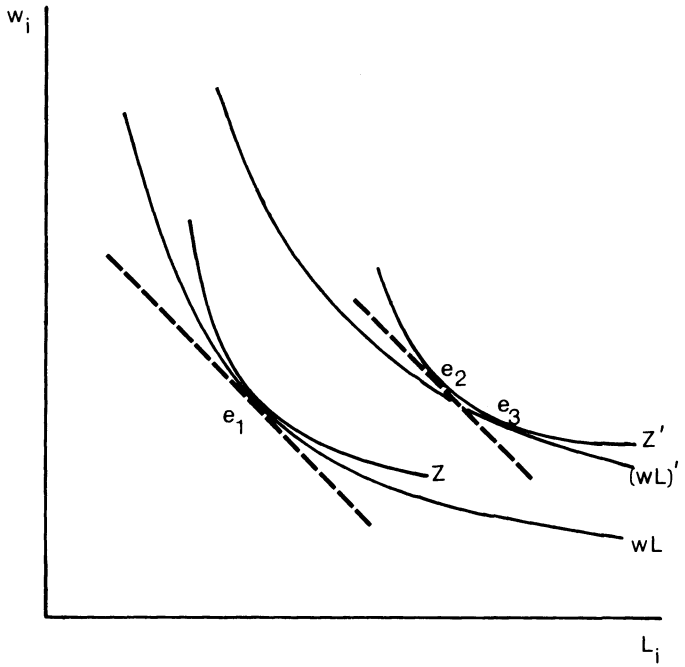

FIG. 1

Equations (5′) have a straightforward interpretation: The marginal vote gain from further expenditures in wages and labor of agency i must equal the respective marginal costs. Note that the marginal cost of raising the wage is not a constant but equals L_i; similarly, the marginal cost of labor is w_i, an endogenous variable. Equations (5′) yield

$$\frac{Z_w^i}{Z_L^i} = \frac{L_i}{w_i}, \qquad i = 1, \ldots, k. \tag{6}$$

The ratio of marginal products equals the ratio of marginal costs in equilibrium. Therefore, each agency's output is produced at the cost-minimizing position. Figure 1 represents such an equilibrium position at point e_1.

The difficulty with obtaining unambiguous comparative-statics predictions in this type of model is well known. This difficulty arises because w_i and L_i enter multiplicatively in the budget constraint. To illustrate the problem, consider what happens when the government budget is increased exogenously. As long as Z^i is a normal input in the public's vote functions, the budget allocation to the ith agency increases as illustrated in figure 1. Suppose further that production is "biased" toward L_i; that is, changes in the agency's revenues lead to

larger percentage changes in L_i than in w_i. The increase in the agency's budget tends to increase—as a first-order effect—the demand for both w_i and L_i. *If* the shadow prices of wages and labor could be held constant that movement would correspond to the shift from e_1 to e_2. This change would represent a "pure" income effect—that is, the expansion of w_i and L_i due to an increase in T, holding relative marginal costs constant. However, because production is assumed to be biased toward L_i the relative price of the wage input in the production function increases. This induces a substitution effect from wages to labor represented by the shift from e_2 to e_3. Thus it could be that the *observed* income effect (the move from e_1 to e_3) indicates that wages are "inferior," when in fact the *true* income effect (the move from e_1 to e_2) indicates that wages increase as T increases.[12]

This fact has important implications for what follows. In particular, let us consider what happens to agency wages with three kinds of parametric changes: (*a*) a change in the number of constituents; (*b*) a change in the political organization of the constituency; and (*c*) a change in the ability of bureaucrats to control the flow of output.

A. The Number of Constituents

It is clear from the first-order conditions in (5′) that the number of constituents has a direct effect on wages and employment since it affects the marginal vote gain from expenditures in that agency. Recall, however, that the vote function depends on a set of environmental variables x. It can be argued that a very likely entry in this vector is the number of constituents. There are at least two reasons for n_i to enter directly the constituent's vote function. First, if Z^i is not a pure public good then presumably the individual's vote depends on his share of the output. It would, therefore, be necessary to control in the vote function for the size of the constituency, or $V = V(Z^1, \ldots, Z^k, n_1, \ldots, n_k)$. For the purpose at hand, an important implication is that

$$V^i_{Zn} = \frac{\partial^2 V}{\partial Z^i \partial n_i} < 0, \tag{7}$$

since the vote gain from increasing output is lower if that output must be distributed over a larger constituency. In other words, since the individual's share of a given increase in agency output diminishes the larger the number of beneficiaries, the additional political support by the individual from a given increase in agency output is smaller the larger the constituency. Second, even if Z^i is a pure public good we would expect (7) to hold since a larger group of constituents may be

[12] Becker and Lewis (1973) present a very detailed discussion of the relationship between true and observed income elasticities.

harder to organize politically. Thus increasing Z^i will lead to a larger marginal vote gain if the group is "small" than if it is "large."[13]

If, to simplify the comparative-statics problem, we assume strong separability across agencies in the vote function, we obtain[14]

$$\frac{dw_i}{dn_i} = \frac{\phi(V^i_Z + n_iV^i_{Zn})}{\Delta} n_iV^i_Z(Z^i_{wL}Z^i_L - Z^i_{LL}Z^i_w) - \frac{\phi(V^i_Z + n_iV^i_{Zn})}{\Delta}\lambda Z^i_L \tag{8}$$

and

$$\operatorname{sign} \frac{d(w_iL_i)}{dn_i} = \operatorname{sign} (V^i_Z + n_iV^i_{Zn}), \tag{9}$$

where ϕ is the minor that remains from the Hessian determinant Δ when the two rows and columns referring to the ith agency are deleted. Note that the second-order conditions ensure that ϕ and Δ are both positive.

Equation (9) reflects the fact that an agency's budget increases when a larger constituency leads to a larger number of votes and decreases when a larger constituency leads to a smaller number of votes since the term $V^i_Z + n_iV^i_{Zn}$ indicates how a change in the number of constituents affects the number of votes.[15] Assume for concreteness that $V^i_Z + n_iV^i_{Zn} > 0$. The first term in equation (8) reflects the income effect of this increase in the agency's budget on w_i and is nonnegative as long as the wage is not an inferior input. The second term, however, is negative and measures the resulting price effect due to a change in relative marginal costs. Note that, since (9) is positive, the theory predicts that perhaps w_i or L_i declines as n_i increases, but that both cannot decline simultaneously.

More insight into the relative importance of these effects can be obtained by considering the following conceptual experiment: What happens to w_i and L_i if n_i increases and we hold constant the marginal costs of these variables at the initial levels of the shadow prices?[16] This would, of course, define the true expansion effects. This experiment yields

$$\frac{dw^*_i}{dn_i} = \frac{\phi^*(V^i_Z + n_iV^i_{Zn})}{\Delta^*} n_iV^i_Z(Z^i_{wL}Z^i_L - Z^i_{LL}Z^i_w), \tag{10}$$

[13] This hypothesis forms the basis of the study by Olson (1965).

[14] That is, for a representative individual, $V = \Sigma^k_{i=1} V^i(Z^i, X_{ij})$. This assumption clearly leads to problems if we interpret V as a probability of support measure, but it greatly simplifies the derivation of the comparative-statics results.

[15] The term $V^i_Z + n_iV^i_{Zn}$ can be rewritten as $V^i_Z(1 + \eta)$, where $\eta = d \ln V^i_Z/d \ln n_i$. Thus votes increase (decrease) if the response in the marginal vote gain is inelastic (elastic).

[16] The relevant income concept for this experiment would be $T^* = \Sigma^k_{i=1} (w_ip_{w_i} + L_ip_{L_i})$, where $p_{w_i} = L_i$ and is the marginal cost of raising the wage and $p_{L_i} = w_i$ and is the marginal cost of hiring labor. In the experiment described in the text p_{w_i} and p_{L_i} are held constant.

where * indicates that these are true effects, as compared with the price-contaminated expansion effect in (8). The determinants ϕ^* and Δ^* follow the same definitions as in the earlier maximization problem.

Equation (10) reveals that the true change in w_i (holding shadow prices constant) will be nonnegative as long as $V^i_Z + n_i V^i_{Zn}$ is positive and w_i is not an inferior input. In fact, the relationship between the true and the observed expansion effects is summarized by[17]

$$\epsilon_{w_i} = \beta_1 \epsilon^*_{w_i} - \beta_2 \epsilon^*_{L_i} \tag{11}$$

where β_1 and β_2 are positive and depend on various determinants from the underlying maximization problems and

$$\epsilon_{w_i} = \frac{d \ln w_i}{d \ln n_i}, \quad \epsilon^*_{w_i} = \frac{d \ln w^*_i}{d \ln n_i}, \quad \epsilon^*_{L_i} = \frac{d \ln L^*_i}{d \ln n_i}.$$

Therefore, the observed elasticity of wages with respect to number of constituents (ϵ_{w_i}) depends positively on the true elasticity ($\epsilon^*_{w_i}$) and negatively on the true elasticity of L_i with respect to n_i ($\epsilon^*_{L_i}$). If $V^i_Z + n_i V^i_{Zn}$ is positive we may obtain the result that larger groups provide fewer votes when, in fact, the opposite is true. In fact, a necessary condition for ϵ_{w_i} to be negative (if the true elasticity is positive) is that $\epsilon^*_{w_i} < \epsilon^*_{L_i}$; that is, production of agency output is biased toward labor.

B. *The Organization of the Constituency*

Clearly two agencies with the same number of constituents may still receive different treatment because, for a variety of reasons, one group of constituents "matters" more than the other group. That is, the favored agency has a group of constituents who can provide a larger amount of political support. Thus the vote function should be expanded to include another environmental variable, s_i, measuring the political savvy of the constituency of the ith agency. Define s_i such that higher values of s_i indicate a larger amount of political cohesiveness by the constituency. Clearly a more general framework would incorporate the fact that the weight of the constituency is likely to be the result of another optimizing process, namely, the amount the constituency invests in influencing policy. Obviously, this will depend on the benefits and costs of the investment. This insight will be helpful below in obtaining empirical proxies for s_i.

The basic hypothesis is that

$$V^i_{Zs} = \frac{\partial^2 V}{\partial Z^i \partial s_i} > 0. \tag{12}$$

[17] The methodology needed to prove (11) can be found in Borjas (1979). That paper gives a technical discussion of income effects in quality-quantity models where the utility function exhibits the separability property assumed in n. 14 above.

Thus a more organized constituency (larger s_i) can provide a larger number of votes for any given increase in Z^i. Government expenditures in agencies with better constituency organization will be larger since a larger number of effective votes can be obtained. This expansion of the agency budget will affect the agency's wage level. As before, the observed wage effect depends on the true values of the elasticities of wages and labor with respect to s_i:

$$\mu_{w_i} = \beta_1 \mu^*_{w_i} - \beta_2 \mu^*_{L_i}, \tag{13}$$

where the μ's are the respective elasticities.

As s_i rises, the expansion in the agency budget will create an incentive to increase agency wages. However, the corresponding rise in L_i will change the marginal cost of raising the agency wage rate. Thus if production is biased toward L_i we may observe that there exists a negative relationship between w_i and s_i, when the true effect is positive.

C. *The Organization of the Bureaucracy*

The driving force underlying the results in this section has been the maintained assumption that bureaucrats can control the flow of agency output. It should be clear that well-organized bureaucrats can control this flow better than disorganized bureaucrats. The degree of organization may be observed, as in a union, or be implicit in the organizational structure of the agency. In the production functions given by (3), α_i acts as the environmental variable indicating the extent of bureaucratic control over agency output. In order to derive the sign of $dw_i^*/d\alpha_i$ (clearly the observed effect includes the price change induced by the corresponding shift in L_i), the nature of the dependence between the technology and α_i must be specified exactly.

The most immediate consideration is to describe how α_i affects the slope of the agency's isoquant. Clearly, as long as larger α_i gives bureaucrats a tighter grasp of control over agency output, we might expect the well-organized agencies to respond much more sensitively to changes in the agency wage. Thus:

$$\frac{\partial(Z^i_w/Z^i_L)}{\partial\alpha_i} > 0. \tag{14}$$

An extreme form of this argument, used in the comparative-statics because of its simplicity, is that $Z^i_{w\alpha} > 0$ and $Z^i_{L\alpha} = 0$. Thus, for any level of agency budget an increase in α_i leads to a change in equilibrium from e_1 to e_2 as shown in figure 2.

The second effect we must consider is how better organization of bureaucrats affects the level of agency output for given w_i and L_i. That is, what is the sign of $Z^i_\alpha = \partial Z^i/\partial\alpha_i$? It would seem that the basic

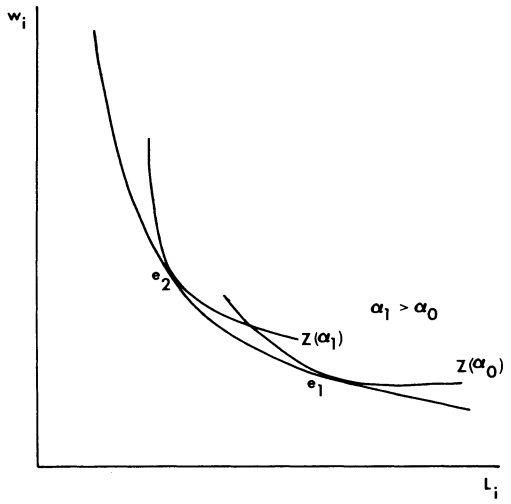

FIG. 2

goal of bureaucratic power would be to improve their economic conditions and to use that power in ways that will further this objective. Thus it would be odd to find a strong "union" of bureaucrats in a firm paying w_i wages and hiring L_i individuals to be producing more output than a weaker union of bureaucrats in a similar size firm. These considerations suggest that $Z^i_\alpha < 0$. If these assumptions concerning the effect of bureaucratic power on the agency's production technology are correct it is easy to show that

$$\frac{dw_i^*}{d\alpha_i} > 0. \tag{15}$$

Essentially there are two effects taking place. On the one hand, the relative increase in the marginal product of w_i over L_i makes a shift toward a wage-intensive production technique profitable. Moreover, since Z^i_α is negative, to obtain the desired level of Z^i more resources are transferred to that agency, causing the expansion effects that we have seen earlier.

III. Data

The data set that will be analyzed in this paper is a 1 percent random sample from the Central Personnel Data File (CPDF) compiled by the U.S. Civil Service Commission. The CPDF analyzed in this paper contains data for civilian federal workers employed as of July 1977. These workers were classified as permanent, full-time civil servants working within the United States. Note that by restricting the sample

to these workers, and since annual earnings in the data refer to the individual's full-time salary, annual earnings are strictly proportional to the wage rate.

The theoretical model discussed in the previous section suggests three important variables that are likely to affect bureaucratic wages and create interagency wage differentials: the number of constituents, the degree of constituent organization, and the degree of bureaucratic organization. Obviously, none of these concepts is well defined empirically, and hence proxies must be created.

A. The Number of Constituents

This variable has no close empirical counterpart since no enumeration exists of the number of people directly benefiting from expenditures in a given agency. There are, however, two approaches that can be used to derive empirical measures of n_i. The first involves the populations of areas where agency expenditures are made and the second involves the matching of particular interest groups with particular agencies. Let us first construct a population-based measure of n_i. There exists a very detailed listing of federal expenditures by state and by agency (U.S. Community Services Administration 1977). If two simplifying assumptions are made, a number-of-constituents variable can be estimated. The first is that only individuals living in the state where the expenditure is made benefit from the agency output. Thus Z^i is perceived to be of use strictly in the state where the funds are distributed. Obviously, this is a very strong assumption although the basic idea—that those benefiting directly matter "more"—seems plausible. The second assumption is that expenditures in a given state benefit all citizens of that state equally. To derive a population-based measure of the size of the constituency, define a Herfindahl index, H, as[18]

$$H = \sum_k \sum_{j=1}^{N_k} e_{jk}^2, \tag{16}$$

where e_{jk} gives the share of the budget of a representative agency going to individual j in state k and N_k is the population in state k. Note that to simplify notation the agency subscript is omitted.

As is well known, the upper limit for H is unity, occurring when one individual obtains the total budget. If all individuals in the country share equally, it is easy to show that $H = 1/N$, where $N = \Sigma_k N_k$. To simplify and to allow the utilization of existing data, suppose that all

[18] A detailed discussion of the benefits and problems associated with Herfindahl indexes is contained in Stigler (1968).

individuals in a given state share equally from agency expenditures (although expenditures may differ from state to state). Let the share of the agency budget going to the representative individual in state k be e_k; then (16) becomes

$$H = \sum_k N_k e_k^2. \tag{17}$$

It is easy to show from (17) that if one state gets all the agency funds, then $H = 1/N_k$. Thus the reciprocal of the Herfindahl index gives a number of "equivalent constituents" for the agency. The variable used in the empirical work below is defined as

$$\text{CONPOP1} = \frac{(1/H)}{N}, \tag{18}$$

which gives the proportion of the population that receives "direct" benefits from expenditures in the agency. Clearly (18) can be easily calculated given the detailed data available on federal expenditures by agency and by state.[19]

An alternative population-based constituency variable can be derived by simply adding up the population in states where the share of agency expenditures in the state ($N_k e_k$) exceeds the share of population in the state (N_k/N). That is, if one believes that only those who benefit substantially from government expenditures are likely to be active in electoral politics, then this index (CONPOP2) may be a better measure of the size of the agency's constituency. A formal definition is

$$\text{CONPOP2} = \frac{\begin{array}{c}\text{sum of population of states} \\ \text{where } N_k e_k > N_k/N\end{array}}{N}. \tag{19}$$

Thus it gives the fraction of the country's population who benefit "significantly" from the agency's output. Since the Washington, D.C., area is a district where $N_k e_k > N_k/N$ for almost all agencies, its population is deleted from the summation in the numerator of (19).

A second method of obtaining proxies for n_i involves identification of interest groups for particular agencies. There is a tradition in industrial organization claiming that (at least) regulatory agencies are "captured" by or created for the benefit of the industries they are supposed to regulate.[20] Thus it may be possible to assume, at least as a first-order approximation, that the Civil Aeronautics Board's constituency is formed by the number of employees in the transportation-

[19] It should be noted that in constructing the variables discussed in this section all small agencies (i.e., agencies with fewer than 500 employees) were combined into a single group. This affected about 4 percent of the sample.

[20] A detailed discussion of these hypotheses can be found in Stigler (1971).

by-air industry; the Interstate Commerce Commission's constituents are employed in the trucking, warehousing, and railroad transportation industries; the Agriculture Department's constituents are the employees in the agricultural industry, etc. Appendix A describes in detail the interest groups associated with each major federal agency. Admittedly, there is a certain element of arbitrariness in matching interest groups with agencies. However, in many cases the classification was easy and clearly followed from the description of agency responsibilities found in the *United States Government Manual* (U.S. General Services Administration 1978). The "industry-based" constituency variable CONIND1 is defined as the fraction of the civilian labor force employed in industries associated with the federal agency. For some major agencies—especially the Defense Department, the Postal Service, and the Department of Health, Education, and Welfare (HEW)—no natural constituencies could be found. Hence CONIND1 was simply set equal to CONPOP1 for these agencies. That is, for agencies where the constituency was hard to identify I simply resorted to the population-based measure CONPOP1. Alternatively, I could resort to the second population-based measure leading to the creation of CONIND2.

It should be obvious that these constituency variables are likely to have large measurement error. If so, then the effects of these variables on agency earnings will reflect a lot of noise and will tend toward zero. As will be seen below, however, there is a remarkable consistency in the effects of each of the four constituency variables on agency wage rates.

B. The Organization of Constituents

The theory presented above suggests that not only is the number of constituents important, but that their political organization also matters. Again this variable is unobserved but clearly depends on the costs and benefits of organizing in order to influence agency policy. One aspect of costs of organization is the geographic dispersion of the constituency, since presumably the more widely dispersed the beneficiaries the more costly it would be to have a cohesive constituency. Fortunately, by using the same data used to construct CONPOP1, it is possible to get a measure of the geographic dispersion of the constituency. In particular, define

$$H^* = \sum_k E_k^2, \tag{20}$$

where E_k is the share of the agency budget going to state k ($= N_k e_k$). Clearly, if one political unit (i.e., state) receives all the funds $H^* = 1$,

whereas if all political units receive equal shares the reciprocal of H^* gives the number of "equivalent" political units. One dispersion variable used in the empirical analysis below is

$$\text{STATE1} = 1/H^*. \tag{21}$$

An alternative measure of geographic dispersion would be to count the number of states where the share of the agency's budget going to that state is greater than the share of the population of the state. This variable is denoted by STATE2 and supposedly measures the number of states that "matter." In constructing STATE2 I follow the convention used in calculating CONPOP2 and omit the District of Columbia from the calculations.

The variable used to measure the benefits of constituency organization is the proportion of the agency's budget spent in the form of direct grants to localities and individuals. Presumably, the benefits to organization are greater if the money is received directly from the government and is not spent on overhead and other transaction costs. This variable is denoted by GRANT.[21]

C. *The Degree of Bureaucratic Organization*

We seek an empirical variable that measures whether a group of bureaucrats can easily translate a low agency wage into disruption of agency output and a high agency wage into cooperation with agency management. The empirical hypothesis used in this paper is that groups of bureaucrats which are homogeneous in relevant characteristics should have an easier time in "organizing" themselves so as to make their response to wage changes known. In other words, in agencies where labor is of varying skills, at different stages in government careers, and more geographically dispersed, there are likely to be fewer common interests, raising the costs of organization by the bureaucracy and hence lowering the agency wage. Therefore, variables measuring inequality in relevant characteristics of the bureaucrats within the agency should have negative effects on wage levels.

It could be argued that agency homogeneity is not a relevant measure of bureaucratic power since senior bureaucrats in a relatively homogeneous agency might take over the agency and exploit junior bureaucrats if the latter are easy to replace. Undoubtedly some of this may occur, but presumably rewards to senior bureaucrats depend on the agency's output. Clearly the incentive of junior bureaucrats to produce output and thus contribute to the power of senior bureau-

[21] The data underlying the creation of GRANT can be obtained from U.S. Community Services Administration (1977).

crats will be greater the higher their wage. Hence there is an incentive for senior bureaucrats to "share" the rewards of increased output with the agency's labor force, though the distribution of the rewards may be highly skewed.

The empirical work below uses three measures of inequality in bureaucratic characteristics: the standard deviation of educational attainment within the agency, σ(EDUC); the standard deviation of age in the agency, σ(AGE); and the standard deviation of job tenure within the agency, σ(JOB). Each of these variables is constructed from the CPDF.

An alternative measure of agency homogeneity is given by the number of bureaus organized within the agency (NUM). Although most agencies contain only one bureau, superagencies like the Department of Defense contain over seventy, and a moderately sized Department of Justice contains eight administrative bureaus. One can argue that such diversity in agency output is likely to fragment the common interests of the agency's bureaucracy, since bureaucrats within the agency will have to compete among themselves for a share of the agency's money. Thus the model outlined earlier would predict that agencies with many bureaus would have relatively lower wages.[22]

Table 2 presents estimated values of the variables discussed in this section for selected agencies. As expected, agencies like HEW, the Postal Service, and the Veterans Administration (VA) serve the largest number of constituents in a considerable number of equivalent political units. By contrast, regulatory agencies tend to have small constituencies since their funds are mostly spent in the District of Columbia or they regulate industries which form only a small proportion of the nation's labor force. Since this may create a potential measurement-error problem, the results in the next section will be estimated in different samples to ascertain the sensitivity of the estimated effects to measurement errors.

IV. The Wage Structure

The data analyzed in this section are a sample of 21,681 federal civilian personnel records from the CPDF.[23] These observations were selected from the random 1 percent sample on the basis of their

[22] There are some problems associated with the variable NUM. It may reflect not only the diversity of the agency, but also its size. Although the correlation between NUM and the agency's budget is not perfect, it is quite high (0.85). Due to this potential problem, the earnings functions below are sometimes estimated omitting NUM.

[23] It should be noted that some agencies are not represented in the CPDF. These include intelligence agencies and employees in the legislative branch of the government. The only sizable independent agency omitted from the CPDF is the Tennessee Valley Authority.

TABLE 2

VALUES OF POLITICAL VARIABLES FOR SELECTED AGENCIES

Agency	CONPOP1	CONPOP2	CONIND1	CONIND2	STATE1	STATE2	GRANT	σ(EDUC)	σ(AGE)	σ(JOB)	NUM
Postal Service	.97	.33	.97	.33	22.6	14	0	1.7	11.4	9.1	4
Defense	.72	.35	.72	.35	17.6	17	.001	2.4	10.5	9.8	75
Veterans Administration	.97	.38	.97	.38	26.3	18	0	2.5	13.5	9.8	5
Agriculture	.67	.31	.04	.04	32.1	21	.45	2.5	13.3	10.0	32
Commerce	.62	.48	.62	.48	22.0	27	.80	2.6	11.1	9.6	1
Health, Education, and Welfare	.98	.38	.98	.38	22.9	10	.22	2.6	12.4	9.1	12
Interior	.17	.11	.01	.01	21.7	13	.12	2.7	12.2	9.7	15
Housing and Urban Development	.55	.25	.04	.04	26.2	14	.90	2.4	12.5	9.3	1
Justice	.11	.37	.11	.37	16.0	11	.38	2.6	11.8	9.0	8
Labor	.68	.28	.26	.26	24.4	11	.80	2.2	12.9	9.2	7

State	.01	.11	.01	.11	2.2	3	0	2.1	10.1	8.8	3
Transportation	.18	.29	.03	.03	23.2	18	.77	1.8	11.4	9.4	10
Treasury	.58	.28	.58	.28	21.4	8	.71	2.2	12.9	9.5	13
Civil Aeronautics Board	.07	.20	.004	.004	8.9	9	0	2.5	13.9	10.1	1
Energy Research Development Administration	.20	.26	.01	.01	13.1	11	.002	2.7	13.0	10.6	1
Federal Communications Commission	.004	.02	.01	.01	1.4	3	0	2.4	12.6	11.5	1
National Aeronautics and Space Administration	.32	.29	.01	.01	4.3	9	0	2.4	12.2	9.7	12
National Science Foundation	.26	.29	.01	.01	15.7	12	.98	3.2	17.0	10.6	1
Securities and Exchange Commission	.01	.14	.002	.002	2.2	4	0	3.7	9.8	6.2	1

having complete information for the variables used in this study. The theoretical model presented earlier suggests that to measure "observed" effects we estimate an equation of the form

$$\ln w_{ij} = f(y_j, n_i, \alpha_i, s_i), \tag{22}$$

where y_j is a vector of standardizing socioeconomic variables for individual j.[24]

Table 3 presents regressions of (ln) earnings on y_j for the federal sector as well as for each of the three largest agencies. The variables can be partitioned into three sets: first, standard earnings-function variables such as education, experience, and job tenure; second, personal characteristics such as sex, race, veteran's status, retired military status, and health; finally, region dummies where the left-out region is the Washington, D.C., Standard Metropolitan Statistical Area (SMSA).[25]

The results for the pooled sample are interesting. The coefficient of education, which in simple versions of the human capital model estimates the rate of return to schooling, is about 6.6 percent. The regression also indicates the importance of current job tenure in the determination of individual earnings. Note the very strong sex and race differentials in the federal government: White males earn 10.7 percent more than black males and 26.7 percent more than white females.[26] The region dummies are all statistically significant and show a substantial pro-D.C. wage bias. In general, wages in the District of Columbia range about 10 percent higher than in other areas of the country. Finally, being a veteran, being in bad health, or having retired from the military, all reduce earnings. The interesting effect is that of the veteran variable. According to civil service regulations, veterans are given point preferences so that their score on civil service exams is higher than that of equally able nonveteran candidates and are, therefore, more likely to be hired. Thus the veteran dummy may be, partly, an inverse ability measure, and the results in table 3 indicate that even in the federal government ability has a positive effect on earnings. Moreover, the veteran variable may be capturing a misspecification of the variable "previous experience" which is defined as a residual AGE − EDUC − JOB − 6. For the veteran, this

[24] Actually, the model in Section II suggests that the wage in agency i depends not only on political variables associated with agency i but also on the variables associated with all other agencies. At this stage of the analysis of federal wage policy I concentrate on estimating own-effects and assume cross-effects to be insignificant.

[25] In fact, only state codes are available in the public version of the CPDF. The District of Columbia region is then defined as D.C., Maryland, and Virginia. This definition reflects the fact that many government headquarters in the D.C. area are not located within the district's boundaries.

[26] See Borjas (1978) for a detailed analysis of racial and sexual wage differentials in a large government agency, the Department of Health, Education, and Welfare.

TABLE 3

EARNINGS FUNCTIONS
DEPENDENT VARIABLE = ln (ANNUAL EARNINGS)

	POOLED SAMPLE		DEFENSE		POSTAL SERVICE		VETERANS ADMINISTRATION	
VARIABLE	Coefficient	t	Coefficient	t	Coefficient	t	Coefficient	t
Constant	8.1304	...	8.1994	...	9.3689	...	7.6455	...
EDUC	.0658	86.95	.0557	45.98	.0133	12.72	.1030	43.68
PREV	.0121	16.83	.0071	60.68	.0036	4.35	.0180	8.77
JOB	.0559	80.01	.0493	43.50	.0152	16.14	.0443	17.98
PREV^2	−.0001	−9.34	.00002	.61	−.00001	−.53	−.0002	−3.51
JOB^2	−.0010	−54.86	−.0008	−28.12	−.0002	−10.26	−.0007	−11.04
PREV*JOB	−.0007	−25.66	−.0005	−12.99	−.0003	−2.30	−.0005	−6.09
White male	.2947	44.99	.4028	33.92	.0141	1.93	.1397	6.70
Black male	.1882	24.65	.2881	21.49	−.0099	−1.25	.0436	1.86
White female	.0277	4.24	.0561	4.68	−.0324	−4.02	.0334	1.98
Northeast	−.0873	−16.05	−.1014	−11.40	−.0186	−2.78	−.0528	−2.34
North central	−.0797	−14.87	−.0653	−7.27	−.0183	−2.76	−.0640	−2.87
South	−.1231	−24.57	−.1259	−16.41	−.0120	−1.75	−.1266	−5.76
West	−.0957	−18.37	−.0614	−7.71	−.0186	−2.60	−.0846	−3.54
RETM	−.0439	−9.81	−.0275	−2.23	...	...	−.1248	−2.78
VET	−.0525	−12.19	−.0577	−9.08	−.0184	−4.36	−.0324	−1.94
HLTH	−.0529	−7.45	−.0316	−3.39	−.00002	−.00	−.0233	−1.44
R^2	.588	...	.616	...	.201	...	.622	...
N	21,681	...	8,177	...	4,520	...	2,026	...

NOTE.—EDUC = completed years of schooling; JOB = years of tenure of government service; PREV = AGE − EDUC − JOB − 6; white male = 1 if white male, etc.; Northeast, North central, South, West = 1 if resides in Northeast, North central, South, and West, respectively; RETM = 1 if retired military; VET = 1 if veteran; HLTH = 1 if agency reported individual has some kind of handicap. The average (ln) annual earnings in the pooled sample is 9.62.

variable represents both time at other jobs and time in the army. If, on the average, army experience is less valuable in the federal government than labor market experience, one would expect veterans to receive lower wages.

In the remaining columns of table 3, earnings functions for the largest three agencies are shown. The important finding is the remarkable difference in the structure of wages across agencies. Most striking of all is the small (numerically though not statistically) effect of practically all variables in determining post office salaries. For example, the value of an additional year of schooling ranges from 1.3 percent in the Postal Service to 5.6 percent in the Defense Department to 10.3 percent for employees of the VA. This result is similar to that found in the comparison of skill differentials in the union and nonunion sectors, where these differentials are significantly narrower in the unionized sector (Bloch and Kuskin 1978). Another remarkable result concerning the Postal Service is the difference in R^2 across agencies. In the Defense Department or the VA, over 60 percent of the total variance in earnings is explained by the set of variables in table 3. In the Postal Service, on the other hand, barely 20 percent of the total variance is explained. This result raises an interesting puzzle: Why is it that in the most heavily organized agency in the federal government observable-skill variables explain so little?

Interagency differences in wage levels are further documented in table 4, which extends the comparison to all agencies and holds constant a much better measure of educational attainment. In particular, the pooled earnings function of table 3 is expanded by replacing the continuous variable measuring years of completed schooling (EDUC) by a vector of dummies indicating the amount and type of educational attainment. The new education vector contains 21 dummy variables (defined in Appendix B) explicitly indicating whether the education was vocational or academic, and even the nature of an advanced degree (e.g., medical vs. Ph.D.). Clearly this detailed standardization of skill should help in further establishing the differences in wage structures across agencies. Given this detailed set of skill variables, table 4 adds a vector of dummies indicating the agency of employment.[27] As can be seen, the coefficients indicate significant wage differentials across agencies even after detailed standardization for skills. An alternative way of seeing the importance of agency wage differentials is by noting that prior to the inclusion of the agency dummies the earnings function could explain 63 percent of

[27] All agencies with fewer than 250 employees were lumped into an OTHER category. These small agencies are composed mainly of a wide assortment of presidential study commissions. Further, the table presents only those coefficients whose t-ratio was absolutely greater than unity. The left-out agency is HEW.

TABLE 4

AGENCY EFFECTS ON WAGE LEVELS*
DEPENDENT VARIABLE = ln (ANNUAL EARNINGS)

Agency	Coefficient	t‡	Agency	Coefficient	t‡
Agriculture	−.1113	−11.81	Federal Trade Commission	.1011	2.09
Housing and Urban Development	.1630	8.08	Government Accounting Office	.1355	4.13
Justice	.0587	5.06	Government Printing Office	.1637	5.93
Labor	.1430	7.29	General Services Administration	−.0194	−1.41
State	.0739	2.77	Interstate Commerce Commission	.2906	4.65
Transportation	.2333	21.69	National Aeronautics and Space Administration	.1137	7.40
Treasury	.0113	1.28	National Labor Relations Board	.1191	2.41
Action	−.0610	−1.21	National Science Foundation	−.3154	−1.41
Community Services Administration	.2402	3.99	Nuclear Regulatory Commission	.2372	5.23
Consumer Product Safety Commission	.2017	2.01	Postal Service	.0806	10.97
Energy Research Development Administration	.1730	7.12	Securities and Exchange Commission	.0792	1.64
Equal Employment Opportunity Commission	.1133	2.07	Selective Service System	−.3208	−2.02
Executive Office of the President	.1994	3.19	Small Business Administration	.0834	1.38
Federal Communications Commission	.0762	1.47	Smithsonian Institution	−.0734	−1.65
Federal Energy Administration	.2004	5.07	U.S. Information Agency	.1892	3.92
Federal Power Commission	−.0699	−1.24	Soldiers' Home	−.0978	−1.23
			Veterans Administration	−.0390	−4.91
			Other	.1047	3.88

* The left-out agency is the Department of Health, Education, and Welfare; thus all wage differentials are relative to HEW.
‡ The regression holds constant a detailed education vector, PREV, JOB, PREV², JOB², PREV*JOB, race and sex, region, RETM, VET, and HLTH.

the variance in earnings across individuals and across agencies. After the inclusion of the agency dummies, R^2 increases to 66 percent. The F-statistic associated with this increase in R^2 is 42.9, highly significant at all conventional confidence levels.

The theoretical framework presented earlier suggested several factors which may be partly responsible for the observed wage differentials across agencies. Table 5 adds variables measuring these political factors to the pooled earnings function presented in table 3 using the detailed education vector. Columns 1–4 present the coefficients of these variables for all four alternative constituency variables and using the standard deviation variables (instead of NUM, the number of bureaus) to control for the cohesiveness of bureaucrats.

Note the very strong negative effect of the number of constituents, regardless of the way it is measured, on wage rates. The qualitative consistency in this finding is striking considering the derivation of these variables and the fact that the correlation among these variables is not excessive.[28] Given this evidence, one must conclude that the observed effect of the size of constituents on agency wages is negative. Recall, however, that even though raising the size of the constituency may lead to a larger wage rate it also leads to a larger labor force. Since the size of the labor force is the price of raising the wage rate, the observed relationship is contaminated by a negative price effect. We will see below that controlling for the size of the agency's labor force generally leads to nonnegative effects of n_i on w_i.

Note also that the variables measuring the cohesiveness of the constituency (STATE1 or STATE2, and GRANT) behave as expected. The larger the geographic dispersion of the beneficiaries, the lower agency wage rates. Similarly, the greater the benefits to be gained from organizing (the larger GRANT), the higher agency wage rates. Thus, as predicted by the model, bureaucratic wages respond to investments made by the constituency in influencing the distribution of agency output.

Table 5 shows that each of the three standard deviation variables (σ[EDUC], σ[AGE], and σ[JOB]) has a strong negative effect on agency wages as predicted by the model. Therefore, homogeneous groups of workers do indeed receive higher wage rates. It would, of course, be interesting to know whether private sector firms also pay

[28] The correlation matrix for the four constituency variables is

	CONPOP1	CONPOP2	CONIND1	CONIND2
CONPOP1	1.	.67	.74	.61
CONPOP2		1.	.50	.73
CONIND1			1.	.77
CONIND2				1.

higher wages to homogeneous groups of workers. Unfortunately, little evidence exists either supporting or refuting the hypothesis in the private sector.[29] To the extent that homogeneity among bureaucrats measures common interests and, therefore, lower costs of organizing, the results indicate that more cohesive bureaucratic groups fare better in the federal government.

At this point it is worthwhile to conduct two empirical experiments designed to determine the robustness of the results concerning the standard deviation variables. First, it could be argued that the homogeneity variables are capturing some kinds of nonlinearities in EDUC, JOB, and AGE. In fact, the regressions allow for nonlinearities in all these variables. Moreover, when I estimated the regression in column 1 of table 5 on a subsample of individuals who have only a high school education (EDUC = 12), the estimated coefficients for σ(EDUC), σ(AGE), and σ(JOB) were $-.1704$ ($t = -16.8$), $-.0291$ ($t = -7.8$), and $-.0424$ ($t = -5.4$), respectively. Thus the homogeneity variables, and in particular σ(EDUC), were significant even within schooling levels.

A second potential problem with the standard deviation variables is that they may be proxying for factors other than the homogeneity hypothesis outlined earlier. For example, it is possible that the σ's are smaller in very large agencies (such as Defense, HEW, or the Postal Service) which have large clerical labor forces, or groups of relatively similar individuals doing identical jobs (e.g., mail carriers). Thus the strong negative effect of the homogeneity variables may be due to the fact that homogeneous agencies have larger labor forces and that larger groups of bureaucrats have more political clout and hence receive higher wages.[30] The simplest way to test this hypothesis is to replace the standard deviation variables by L_i, the size of the agency's labor force (measured in thousands). This experiment is shown in column 5 using CONIND1 as the size of the constituency variable. As can be seen, the coefficient of L_i is strongly negative, refuting the hypothesis that the standard deviation variables are proxying for the political clout of larger groups of bureaucrats.[31] Moreover R^2 drops

[29] It would seem that a simple way of testing the hypothesis in the private sector would be by comparing the wage effects of craft versus industrial unions. The empirical evidence on this is not unanimous (see, e.g., Lewis 1963 and Leigh 1978).

[30] Simply looking at the correlation coefficient between L_i and the standard deviation variables leads to inconclusive results. The coefficients are -0.22, -0.81, and 0.28 for σ(EDUC), σ(AGE), and σ(JOB), respectively.

[31] It is important to note that just adding L_i to the socioeconomic characteristics listed in the notes to table 5 (and thus leaving out the constituency variables and other political measures) yields a coefficient for L_i equal to -0.00002 ($t = -4.85$). Thus, unlike the positive effect of firm size on wages in the private sector (Masters 1969), agency size in the government has a strong negative effect on agency wage rates.

TABLE 5

EFFECTS OF AGENCY VARIABLES ON EARNINGS
DEPENDENT VARIABLE = ln (ANNUAL EARNINGS)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CONPOP1	−.0643 (−6.57)	...	...	...	...	...	...
CONPOP2	...	−.0642 (−2.05)	...	...	...	...	...
CONIND1	...	...	−.0456 (−6.71)	...	.0629 (9.79)	−.0318 (−4.58)	...
CONIND2	...	...	...	−.1239 (−7.75)	...	...	−.0960 (−5.93)
STATE1	−.0022 (−3.80)	...	−.0036 (−7.33)	...	−.0069 (−15.02)	−.0038 (−7.56)	...
STATE2	...	−.0014 (−2.45)	...	−.0018 (−3.52)	...	...	−.0021 (−4.15)

GRANT	.0341 (3.71)	.0439 (6.09)	.0517 (6.44)	.0336 (4.58)	.0832 (10.12)	.0727 (8.74)	.0550 (7.21)
σ(EDUC)	−.1272 (−20.91)	−.1157 (−18.83)	−.1310 (−21.20)	−.1123 (−18.29)	...	−.0666 (−7.25)	−.0484 (−5.45)
σ(AGE)	−.0047 (−2.43)	−.0145 (−8.73)	−.0089 (−4.18)	−.0180 (−10.46)	...	−.0424 (−10.25)	−.0541 (−13.45)
σ(JOB)	−.0274 (−6.45)	−.0161 (−3.51)	−.0287 (−6.68)	−.0204 (−4.52)	...	.0128 (2.09)	.0229 (3.65)
NUM	...	...	...	...	...	−.0015 (−9.44)	−.0016 (−9.93)
DC	.0086 (.46)	.0918 (5.50)	.0090 (.48)	.0752 (4.54)	−.1386 (−7.14)	−.0644 (−3.18)	−.0068 (−.37)
GEMP	.0010 (5.40)	.0012 (6.40)	.0010 (5.27)	.0011 (6.09)	.0018 (9.56)	.0011 (5.72)	.0012 (6.35)
L_i	...	...	...	...	−.00006 (−7.84)	...	...
R^2	.651	.649	.651	.650	.640	.653	.652

NOTE.—See notes to table 4 for list of variables held constant in the regression. The t-ratios are given in parentheses.

substantially when replacing the homogeneity variables with L_i. Thus the results in column 5 suggest that the σ variables are proxying for factors not directly related to agency size.[32]

Table 5 also introduces two additional variables: the proportion of the agency's labor force located in the District of Columbia SMSA (DC) and the proportion of agency employment allocated to a given state *divided* by the percentage of the country's population in that state (GEMP).[33] Note that GEMP will have a value of unity when the number of bureaucrats in a state exactly equals what one would expect from a population-based geographic distribution of bureaucrats. Values greater (less) than unity indicate an overrepresentation (underrepresentation) of bureaucrats in the state employing the individual. As can be seen in columns 1–4, DC has a positive (and sometimes significant) effect on earnings. This may reflect either a cost of living differential or a true structural effect due perhaps to political rewards associated with having bureaucrats assembled in a small geographic region. What these political rewards entail is hard to visualize since the centralization of bureaucrats in the District of Columbia would seem to imply that their direct votes affect few political offices. Similarly, GEMP, the relative penetration of bureaucrats in a political unit, has a strong positive effect on government wages. Moreover, if the sample is restricted to employees outside the District of Columbia area (regressions are not shown), where GEMP forms an outlier, GEMP remains positive and significant.

It is worthwhile to note that the four constituency variables have about the same predictive capacity. If anything, R^2 increases slightly when the constituency variable tries to match agency with the affected industry grouping (i.e., variables CONIND1 and CONIND2). Using these two industry-based constituency variables, columns 6 and 7 introduce the standard deviation variables and NUM simultaneously. The latter has a strong negative effect on agency wage rates. This result may be interpreted as indicating that more diverse agencies lead to less cohesive bureaucratic organizations. However, as was pointed out earlier, to some extent NUM may be proxying for size of agency, an endogenous variable. Note also that the introduction of NUM generally leaves the qualitative effects of the other variables (except σ[JOB]) unaffected.

[32] The regression in col. 5 of table 5 should not be interpreted as a structural demand function. The estimation of regressions holding shadow prices constant is discussed below.

[33] The variable DC was constructed using data from the U.S. Civil Service Commission *Monthly Release*. Its range is from 0 to 1. The variable GEMP was constructed from data available in U.S. Community Services Administration (1977).

The results in table 5 can be briefly summarized as follows: The *observed* effects of political power variables suggest that the civil service pay structure is far from being an inflexible collection of rules and regulations. Instead, most of the empirical results can be interpreted in terms of a rational policy by the government to use civil service pay as a political tool. Interestingly, it is important to note that a few summary statistics measuring agency and bureaucratic power increase R^2 from .63 to .65. Recall that a complete set of agency dummies increases R^2 from .63 to .66. In effect, therefore, the characteristics in table 5 "explain" about two thirds of the interagency variance in earnings.[34]

In order to show the robustness of the results in table 5, selected regressions presented in table 6 show that the effects are not due to sample peculiarities. In particular, table 6 presents the coefficients of the political variables for a sample of individuals not employed in regulatory agencies and individuals employed within the General Schedule (i.e., white-collar workers).[35] As can be seen, the size of the constituency continues to have a negative effect on wage rates, geographic dispersion of the constituents has a negative effect, and benefits from organization of the beneficiaries (GRANT) a positive effect. Similarly, dispersion of interests among the bureaucrats, whether measured by the standard deviation variables or NUM, has strong negative effects on agency wages.

The theoretical discussion made an important distinction between "true" and "observed" effects. To obtain the true effects, shadow prices of wages and labor must he held constant. Thus the theory suggests a demand function of the form

$$\ln w_{ij} = g(y_j, n_i, \alpha_i, s_i, p_{w_i}, p_{L_i}), \tag{23}$$

where p_{w_i} is the marginal cost of raising the wage ($= L_i$), and p_{L_i} is the marginal cost of hiring labor ($= w_i$). Since w_i appears on both sides of the equation, define the true demand function as that obtained after "solving out" for the wage:

$$\ln w_{ij} = h(y_j, n_i, \alpha_i, s_i, p_{w_i}). \tag{23'}$$

[34] Actually the results in table 5 imply that the differentials documented in table 4 cannot all be due to skill differences. Unlike the studies of labor market discrimination which attribute unexplained wage differentials to discrimination, table 5 tries to provide an economic rationale for the unexplained wage differentials in table 4.

[35] The group of "regulatory agencies" includes the Civil Aeronautics Board, the Commodity Futures Trading Commission, the Consumer Product Safety Commission, the Environmental Protection Agency, the Federal Communications Commission, the Federal Energy Administration, the Federal Maritime Commission, the Federal Power Commission, the Federal Trade Commission, the Interstate Commerce Commission, the Nuclear Regulatory Commission, and the Securities and Exchange Commission.

TABLE 6

EFFECTS OF AGENCY VARIABLES ON EARNINGS IN SELECTED SAMPLES
DEPENDENT VARIABLE = ln (ANNUAL EARNINGS)

	NONREGULATORY AGENCIES		GENERAL SCHEDULE WORKERS	
VARIABLES	(1)	(2)	(1)	(2)
CONIND1	−.0450	−.0249	−.0144	−.0850
	(−6.35)	(−3.38)	(−1.84)	(−4.74)
STATE1	−.0039	−.0041	−.0045	−.0042
	(−7.72)	(−8.24)	(−7.83)	(−7.53)
GRANT	.0656	.0937	.1032	.0802
	(7.76)	(10.55)	(8.58)	(7.54)
σ(EDUC)	−.1230	−.0523	−.1148	−.0739
	(−18.09)	(−5.38)	(−8.24)	(−5.21)
σ(AGE)	−.0104	−.0471	−.0039	−.0585
	(−4.71)	(−11.13)	(−1.55)	(−12.73)
σ(JOB)	−.0384	.0136	−.0374	.0097
	(−6.79)	(1.78)	(−7.41)	(1.44)
NUM	...	−.0017	...	−.0019
		(−10.16)		(−9.78)
DC	−.0218	−.1047	.0440	−.0279
	(−1.09)	(−4.84)	(1.91)	(−1.22)
GEMP	.0011	.0013	.0005	.0004
	(5.91)	(6.54)	(2.40)	(2.05)
R^2	.650	.651	.731	.733
Observations (N)	21,408	...	12,812	...

NOTE.—See notes to table 4 for list of variables held constant in the regression. The t-ratios are given in parentheses.

Clearly since L_i and w_i depend, in general, on the same set of variables there are difficult problems involved in identifying the stochastic equivalent of equation (23′).[36] The easiest approach to identification in this context is to recall that there are supply constraints that were not introduced in the model. In particular, the government faces a structural supply function giving the amount of labor it can hire at the wage it is willing to pay for given skill and other socioeconomic characteristics. Thus the governmental agency may not be able to hire the amount of labor it desires and will end up in corner solutions in terms of the model in Section II. The important point is that there exist shift variables affecting the supply of workers which do not directly determine the agency's wage. The predicted value of L_i was estimated from a regression using the agency as the unit of observa-

[36] Tomes (1978) presents a detailed discussion of the problems encountered in empirically identifying quality-quantity models.

TABLE 7

EFFECTS OF AGENCY VARIABLES ON EARNINGS, HOLDING CONSTANT $\hat{L}_i$
DEPENDENT VARIABLE = ln (ANNUAL EARNINGS)

Variable	(1)	(2)	(3)	(4)
CONPOP1	−.0093	...	...	...
	(−.76)			
CONPOP2	...	.0659	...	...
		(1.98)		
CONIND1	...	...	−.0098	...
			(−1.17)	
CONIND2	...	...	...	−.0359
				(−1.87)
STATE1	−.0031	...	−.0033	...
	(−5.18)		(−6.57)	
STATE2	...	−.0017	...	−.0012
		(−2.99)		(−2.40)
GRANT	.0116	−.0141	.0146	−.0076
	(1.21)	(−1.59)	(1.54)	(−.87)
σ(EDUC)	−.1302	−.1296	−.1312	−.1251
	(−21.37)	(−20.73)	(−21.25)	(−19.80)
σ(AGE)	−.0373	−.0541	−.0374	−.0487
	(−7.77)	(−13.88)	(−8.45)	(−12.00)
σ(JOB)	.0008	.0147	−.0006	.0060
	(.14)	(2.75)	(−.10)	(1.10)
DC	−.0664	−.0219	−.0647	−.0149
	(−3.11)	(−1.12)	(−3.04)	(−.76)
GEMP	.0011	.0012	.0011	.0011
	(5.69)	(6.34)	(5.61)	(6.02)
$\hat{L}_i$	−.0001	−.0002	−.0001	−.0001
	(−7.41)	(−11.23)	(−7.34)	(−8.35)
R^2	.652	.651	.652	.651

NOTE.—See notes to table 4 for list of variables held constant in the regression. The t-ratios are given in parentheses.

tion where the various exogenous variables of the model and supply shift factors were included as independent variables.[37]

Table 7 presents coefficients from regresssions where the predicted size of the labor force (measured in thousands), $\hat{L}_i$, is held constant. These coefficients are interpreted as the true effects of the variables since the marginal cost of increasing the wage is being held constant. As in table 5, columns 1–4 present the coefficients using the alterna-

[37] The independent variables included DC, average age, tenure, and education of workers in the agency; percent black or female; percent blue-collar positions; σ(EDUC); σ(AGE); σ(JOB); size of the constituency; geographic dispersion of the constituency; and GRANT.

tive measures for the size of constituency and the standard deviation variables as proxies for bureaucratic heterogeneity.

As can be seen, the coefficient of $\hat{L}_i$ is negative and significant, confirming the view that the agency's labor force is the price of the wage input in the production function. The true coefficient of the size of the constituency is worth noting. It was shown earlier that as long as the increase in constituency led to more votes, we would expect to find higher wages and employment. If this expansion effect was significantly biased in favor of employment, the relative cost of raising wages would rise, and hence an induced substitution effect would occur and perhaps result in an observed effect being negative when the true effect was, in fact, positive. The introduction of $\hat{L}_i$ to control for this price effect systematically reduces (in absolute value) the effect of size of constituency on wages as expected. In one case, the size of constituency has a strong positive effect on agency wage rate, while, with the remaining measures, even though the effect is still negative it is often insignificant. Thus the results suggest that the true effect of n_i may be nonnegative.

V. Summary

This paper has attempted to provide an economic analysis of the internal structure of wages in the federal government. The underlying hypothesis of the study is that the wage paid to federal bureaucrats reflects not only labor market conditions but political factors as well. In particular, because bureaucrats can control the flow of agency output—thus affecting the public image of the government and political support for the incumbents—the government will rationally choose a wage-employment package which depends on the various factors that determine the extent of political support.

The major empirical result of the analysis is the finding of significant wage differentials among federal agencies. More important, it was seen that these wage differentials could be explained by resorting to variables measuring agency political power. In particular, employees in agencies with small and well-organized constituencies, and with bureaucracies that apparently share common interests, generally receive higher wage rates. These facts were interpreted in terms of a political model in which the government chooses the optimal wage-employment combination that will maximize the vote effectiveness of agency output. It should be noted that an easy criticism of this interpretation would be to claim that the analysis ignores the institutional framework used by each agency's personnel department. The problem with this view is that institutions are not created out of thin air. Rather, institutions are developed to simplify the

mechanism through which optimal allocation of resources is made in any organization. Thus, an alternative interpretation of the results could be that the behavior of the institutions developed by federal agencies to hire, place, and promote bureaucrats is consistent with the vote-maximization hypothesis.

The analysis suggests several areas where further research into government wage policy would be useful. First, a more complete analysis would undertake the empirical study of a multiequation dynamic model incorporating the wage, employment, and budgetary decisions of the government. Second, testing of alternative hypotheses of government behavior should be conducted more systematically. The literature is full of models purporting to describe government behavior. Some of these models even lead to empirically testable implications. A systematic analysis attempting to discriminate among these models would provide further insight into the underlying processes. Third, the wage differentials documented in this paper must lead to some job rationing among applicants. A careful study of applications for civil service jobs would be useful in further documenting the civil service wage structure. Fourth, the problem of congressional oversight over budgets of federal agencies is quite complex, and case studies describing the process for major agencies may lead to some understanding of the controls on bureaucratic behavior. Fifth, although this paper has focused on the agency as the natural unit of analysis, wage differentials among bureaus within an agency could presumably be explained by the same framework. Finally, in 1978, Public Law 95-454, better known as the Civil Service Reform Act, became effective. Most of the major provisions in the law are designed to relax the stringent rules imposed by the civil service regulations concerning promotion and dismissal of federal workers. The new law gives federal agencies wider powers in initiating either adverse or favorable personnel actions. It would seem that such changes in the law should increase the flexibility of bureaucratic managers to create the wage differentials that have been the focus of this paper. Whether this, in fact, occurs will make a worthwhile research project in the future.

Appendix A

FEDERAL AGENCIES AND INTEREST GROUPS

Agency	Composition of Constituency
Agriculture	Percentage of labor force employed in agricultural industry
Housing and Urban Development	Percentage of labor force employed in contract construction industry
Interior	Percentage of labor force employed in mining industries
Labor	Percentage of labor force that is unionized
Transportation	Percentage of labor force employed in trucking and warehousing, pipeline transportation, local and interurban passenger transit, other transportation and services, water transportation, and transportation services (SIC = 41, 42, 44, 46, and 47)
Civil Aeronautics Board	Percentage of labor force employed in transportation by air industry (SIC = 45)
Civil Service Commission	Percentage of labor force employed by the federal government
Commission on Civil Rights	Percentage of population that is nonwhite or female
Commodity Futures Trading Commission	Percentage of labor force employed in security, commodity brokers, and services industries (SIC = 62)
Energy Research and Development Administration	Percentage of labor force employed in oil and gas extraction and coal mining (SIC = 13) and petroleum and coal products (SIC = 29)
Equal Employment Opportunity Commission	Percentage of population that is nonwhite or female
Farm Credit Administration	Percentage of labor force employed in agricultural industry
Federal Communications Commission	Percentage of labor force employed in the communication industry (SIC = 48)
Federal Energy Administration	Percentage of labor force employed in oil and gas extraction and coal mining (SIC = 13) and petroleum and coal products (SIC = 29)
Federal Power Commission	Percentage of labor force employed in electric, gas, and combination companies and systems (SIC = 491, 492, and 493)
Federal Mediation and Conciliation Service	Percentage of labor force that is unionized
Interstate Commerce Commission	Percentage of labor force employed in trucking and warehousing (SIC = 42) and railroad transportation (SIC = 40)
National Aeronautics and Space Administration	Percentage of labor force employed in aircraft and parts manufacturing (SIC = 372)
National Labor Relations Board	Percentage of labor force that is unionized
National Science Foundation	Percentage of labor force employed in educational services, colleges, and universities (SIC = 822)

Appendix A (*Continued*)

FEDERAL AGENCIES AND INTEREST GROUPS

Agency	Composition of Constituency
Railroad Retirement Board	Percentage of labor force employed in railroad transportation (SIC = 40)
Securities and Exchange Commission	Percentage of labor force in security, commodity brokers, and services (SIC = 62)
Soldiers' and Airmen's Home	Percentage of labor force composed of veterans
Veterans Administration	Percentage of labor force composed of veterans

SOURCE.—U.S. Department of Commerce (1977); U.S. Department of Labor (1977).
NOTE.—The variable CONINDI is created from these definitions. For agencies whose constituency was left undefined, CONIND1 was set equal to CONPOP1. A second industry-based constituency measure, CONIND2, is obtained by setting CONIND2 equal to CONPOP2 for those agencies with undefined constituencies.

Appendix B

The detailed education vector is composed of 21 dummies plus a left-out category. The 22 elements in the vector are:

1. Some elementary school—did not complete.
2. Elementary school completed—no high school.
3. Some high school—did not graduate.
4. High school graduate or certificate of equivalency.
5. Terminal occupational program—did not complete.
6. Terminal occupational program—completed.
7. Some college—less than one year.
8. One year college.
9. Two years college.
10. Associate degree.
11. Three years college.
12. Four years college.
13. Bachelor's degree.
14. Postbachelor work but no additional higher degrees.
15. First professional degree—e.g., Dentistry, Law, Medicine, etc.
16. Postfirst professional degree but no additional higher degree.
17. Master's degree.
18. Postmaster's but no additional higher degree.
19. Sixth-year degree—e.g., advanced certificate in education, advanced master's in education, certificate of advanced graduate study, etc.
20. Postsixth year but no additional higher degree.
21. Doctorate degree includes Doctor of Education, Doctor of Juridical Science, and Ph.D.
22. Postdoctorate work.

References

Ashenfelter, Orley, and Ehrenberg, Ronald G. "The Demand for Labor in the Public Sector." In *Labor in the Public and Nonprofit Sectors*, edited by Daniel S. Hamermesh. Princeton, N.J.: Princeton Univ. Press, 1975.

Barro, Robert J. "The Control of Politicians: An Economic Model." *Public Choice* 14 (Spring 1973): 19–42.

——→. "Are Government Bonds Net Wealth?" *J.P.E.* 82, no. 6 (November/December 1974): 1095–1117.

——→. "On the Determination of the Public Debt." *J.P.E.* 87, no. 5, pt. 1 (October 1979): 940–71.

→ Becker, Gary S. "Competition and Democracy." *J. Law and Econ.* 1 (October 1958): 105–9.

———. "A Positive Theory of the Redistribution of Income." Mimeographed. Chicago: Univ. Chicago, Center Study Econ. and State, 1978.

→ Becker, Gary S., and Lewis, H. Gregg. "On the Interaction between the Quantity and Quality of Children." *J.P.E.* 81, no. 2, pt. 2 (March/April 1973): S279–88.

→ Becker, Gary S., and Stigler, George J. "Law Enforcement, Malfeasance, and Compensation of Enforcers." *J. Legal Studies* 3 (January 1974): 1–18.

Bloch, Farrel E., and Kuskin, Mark S. "Wage Determination in the Union and Non-Union Sectors." *Indus. and Labor Relations Rev.* 31 (January 1978): 182–92.

→ Borjas, George J. "Discrimination in HEW: Is the Doctor Sick or Are the Patients Healthy?" *J. Law and Econ.* 21 (April 1978): 97–110.

——→. "Income Effects in Quality-Quantity Models." *Econ. Letters* 3, no. 2 (1979): 125–31.

Downs, Anthony. *An Economic Theory of Democracy.* New York: Harper & Row, 1957.

→ Ehrenberg, Ronald G. "The Demand for State and Local Government Employees." *A.E.R.* 63 (June 1973): 366–79.

Houthakker, Hendrik S. "Compensated Changes in Quantities and Qualities Consumed." *Rev. Econ. Studies* 19, no. 3 (1952): 155–64.

→ Leigh, Duane E. "Racial Discrimination and Labor Unions: Evidence from the NLS Sample of Middle-aged Men." *J. Human Resources* 13 (Fall 1978): 568–77.

Lentz, Bernard F. "Public Sector Wage Determination: A Democratic Theory of Economics." Ph.D. dissertation, Yale Univ., 1976.

Lewis, H. Gregg. *Unionism and Relative Wages in the United States: An Empirical Inquiry.* Chicago: Univ. Chicago Press, 1963.

→ Masters, Stanley H. "Wages and Plant Size: An Interindustry Analysis." *Rev. Econ. and Statis.* 51 (August 1969): 341–45.

Mincer, Jacob. *Schooling, Experience, and Earnings.* New York: Columbia Univ. Press (for Nat. Bur. Econ. Res.), 1974.

Niskanen, William A. *Bureaucracy and Representative Government.* Chicago: Aldine, 1971.

Olson, Mancur. *The Logic of Collective Action: Public Goods and the Theory of Groups.* Cambridge, Mass.: Harvard Univ. Press, 1965.

→ Peltzman, Sam. "Toward a More General Theory of Regulation." *J. Law and Econ.* 19 (August 1976): 211–40.

———. "The Growth of Government." Mimeographed. Chicago: Univ. Chicago, Center Study Econ. and State, 1978.

Rosen, Sherwin. "Human Capital: A Survey of Empirical Research." In *Research in Labor Economics.* Vol. 1. Edited by Ronald G. Ehrenberg. Greenwich, Conn.: JAI, 1977.

Smith, Sharon P. *Equal Pay in the Public Sector: Fact or Fantasy.* Princeton, N.J.: Princeton Univ. Press, 1977.

Stigler, George J. *The Organization of Industry.* Homewood, Ill.: Irwin, 1968.

——→. "The Theory of Economic Regulation." *Bell J. Econ. and Management Sci.* 2 (Spring 1971): 3–21.

Theil, Henri. "Qualities, Prices and Budget Enquiries." *Rev. Econ. Studies* 19, no. 3 (1952): 129–47.

Tomes, Nigel. "A Model of Child Endowments, and the Quality and Quantity of Children." Ph.D. dissertation, Univ. Chicago, 1978.

U.S. Civil Service Commission. Federal Civilian Workforce Statistics. *Monthly Release*, various issues.

U.S. Community Services Administration. *Geographic Distribution of Federal Funds in Summary.* Silver Springs, Md.: Community Services Admin., fiscal year 1977.

U.S. Department of Commerce. *Statistical Abstract of the United States.* Washington: Government Printing Office, 1977.

U.S. Department of Labor. *Employment and Earnings.* Washington: Government Printing Office, October 1977.

———. *Handbook of Labor Statistics.* Washington: Government Printing Office, various issues.

U.S. General Services Administration. *United States Government Manual.* Washington: Government Printing Office, 1978.

U.S. Office of Management and Budget. *The Budget of the United States, Appendix.* Washington: Government Printing Office, various issues.

U.S. Senate, Committee on Government Operations. *Study on Federal Regulation: Congressional Oversight of Regulatory Agencies.* Vol. 2. Washington: Government Printing Office, February 1977.

Victor, Richard B. "A Multiconstituency, Vote-maximizing Model for the Determination of Public Sector Wage and Employment Level." Mimeographed. Santa Monica, Calif.: RAND, August 1977.

Williamson, Oliver E. *The Economics of Discretionary Behavior: Managerial Objectives in a Theory of the Firm.* Englewood Cliffs, N.J.: Prentice-Hall, 1964.