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VOTING BEHAVIOR AND AGGREGATE POLICY TARGETS*

by

Susan J. Lepper

The structure of the United States economy is generally thought to impose, in the short run, a trade-off between unemployment and price inflation. Regardless of the reasons for this social constraint (and opinion is widely varied on the structural relations underlying it), those who believe that monetary and fiscal policy can influence the performance of the economy along the price change and unemployment dimensions are confronted with the problem of choosing a single target. Voters are likely to have strong opinions on the matter. To the extent that these opinions influence voting behavior, information regarding public preferences over unemployment-price-change targets is embedded in voting statistics.

One appealing technique for deriving statistical relationships between voting behavior and economic conditions has been demonstrated by Gerald H. Kramer in his paper "Short-term Fluctuations in U. S. Voting Behavior"[1].

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[1] The American Political Science Review, Vol. LXV, No 1, March, 1971, pp. 131-143.

Kramer successfully showed the salience of economic issues; this paper extends the use of his technique to the search for empirical evidence on social preferences among unemployment and price-change points. The first section of this paper elaborates somewhat on the derivation of a statistical specification analagous to Kramer's from assumptions regarding feasible alternatives and individual's choices. The following two sections present further variations -- both aggregate and regional -- on Kramer's statistical results. These sections are cast explicitly in terms of the price-change-unemployment trade-off.

I. THE DERIVATION OF A VOTE-UNEMPLOYMENT-PRICE-CHANGE FUNCTION

A conventional assumption of neoclassical micro-economics is that individual choice behavior can be modelled by the maximization of the individual's utility function subject to the relevant constraints. The individual's utility function is understood to be a continuous, real valued representation of his preferences over the domain of alternatives. A significant alternative assumption about choice behavior is "satisficing". Under the satisficing assumption, an individual's preferences can be described by the division of the set of alternatives into two mutually exclusive subsets, one with which the individual is "satisfied" and another with which he is "dissatisfied". Thus, the "satisficing" assumption implies much grosser discriminations by the individual, along the dimensions under consideration, than the conventional utility maximizing framework. This absence of fine discrimination may be a particularly appropriate assumption in situations where the individual making a choice has imperfect knowledge of the alternatives.

In regard to choices among unemployment-price-change alternatives, the satisficing framework can be developed as follows:

First assume that the voter's preferences on this issue are independent of all other matters, such as foreign policy, civil rights, farm policy, etc. (This assumption is formally analagous to the assumption of additive separability in conventional utility analysis.) It can then be assumed that there exists for each individual a well-defined set of unemployment-price-change points with which he is satisfied. This is bounded by a satisfaction curve and all points outside this boundary are unsatisfactory. A diminishing marginal rate of substitution between goods -- or, in this case, evils -- implies that an individual's satisfaction curve would be negatively sloped (at least in the positive ranges of price change) and concave to the origin. A single satisfaction curve fully describes each individual's preferences

Unemployment-price-change positions are attributed to electoral candidates by each voter. A voter whose preferences can be described by satisficing would be indifferent between candidates whose positions fell on the same side of his satisfaction curve; he would clearly prefer candidates whose positions were inside his satisfaction set to those whose positions were outside the boundary. In view of the possibly large range of indifference, a behavioral rule must be assumed to define choices in such situations. Following Kramer, it is assumed here that voters know more about the incumbent than the opposition and, in effect, that voters evaluate only the known position. Thus, each voter is assumed to vote for the incumbent candidate (or party) whose "objective" record is satisfactory and to vote against the incumbent whose position is outside his satisfaction curve.

Consider now the derivation of an aggregate vote-unemployment-price-change relation from the satisficing hypothesis. A convenient device is the aggregate constant vote curve -- that is, the locus of all price change-unemployment points which would elicit for the incumbent the same proportion of the total vote. The satisfaction curve of any individual is, by definition, the locus of unemployment maxima with which he is satisfied, for all given rates of price change. By extension, let an aggregate constant vote curve, V_k , be the locus of unemployment maxima, corresponding to given rates of price change, such that k percent of the voters are satisfied with the record of the incumbent.

An illustrative case is presented in Figure I in which individuals' satisfaction curves are homothetic. Their preferences differ only in terms of "how hard they are to please." In such a case, the satisfaction curve closest to the origin represents the locus of points for which the unemployment rate associated with any given rate of price change is the maximum with which all voters are satisfied. The 100 percent vote curve is identical with the satisfaction curve of the voter who is "hardest to please" and lower constant-vote curves are identical with other individual satisfaction curves, ranked in descending order from the origin.

A more realistic case, where satisfaction curves intersect, is illustrated in Figure II. Here aggregate constant vote curves are identical with segments of the satisfaction curves of individual voters but no one vote curve need be everywhere identical with the satisfaction curve of any individual voter. Changes in policy that result in a movement along an aggregate vote curve shift some voters from being satisfied to dissatisfied but shift an equal number the opposite way. Let us denote the satisfaction curve of the j^{th} voter as $u_j(\dot{P}, U)$, where $\dot{P}$ is the rate of price change, U is the unemployment rate and, for convenience, the u_j are indexed in ascending order according to their $\dot{P}$ intercepts. Then, in Figure II, the 100 percent constant vote curve is (a b c), consisting of the segment (a, b) of u_1 and segment (b, c) of u_3. The next lower constant vote curve -- that is, the constant vote curve yielding a vote of less than 100 percent for the incumbent -- is (d e b f 1). Along the (d e) and (e b) segments of this curve, voter 1 is dissatisfied but along the (b f) and (f 1) segments voter 1 is satisfied while voter 3 is dissatisfied.

It is apparent that constant vote curves, V_k, are not smooth and need not be even piecewise concave. Formally, piecewise concavity will occur if u_{j+1} intersects u_j from above for all j along V_k (for example (a b c) and (g h i) in Figure II). This condition has no sharp economic or political interpretation but is a loose type of homogeneity condition. The extreme opposite situation, where concavity most clearly does not obtain, occurs if voters' preferences are polarized so that one group tolerates extreme values of $\dot{P}$ but not of U (see u_3 in Figure II), while another group has little tolerance for extreme values of $\dot{P}$ but tolerates very large U (see u_1 in Figure II). Unfortunately it is difficult to conclude that the latter case is implausible.

The shape of the constant vote curves in the region of feasible $(\dot{P}, U)$ points is relevant to the specification of vote-unemployment-price change functions. Assuming that the set of feasible alternatives can be described by a single negatively sloped convex function, F, then each concave constant vote

Figure I

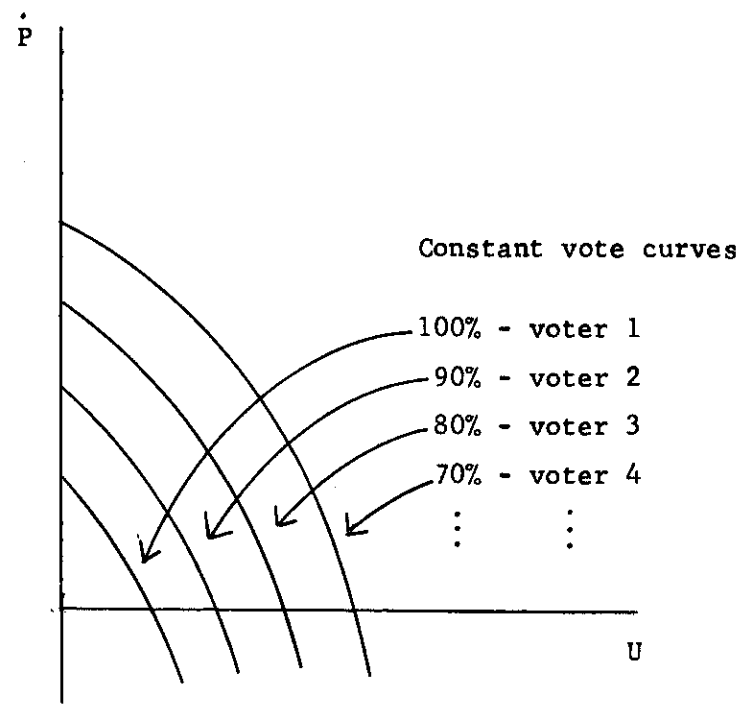
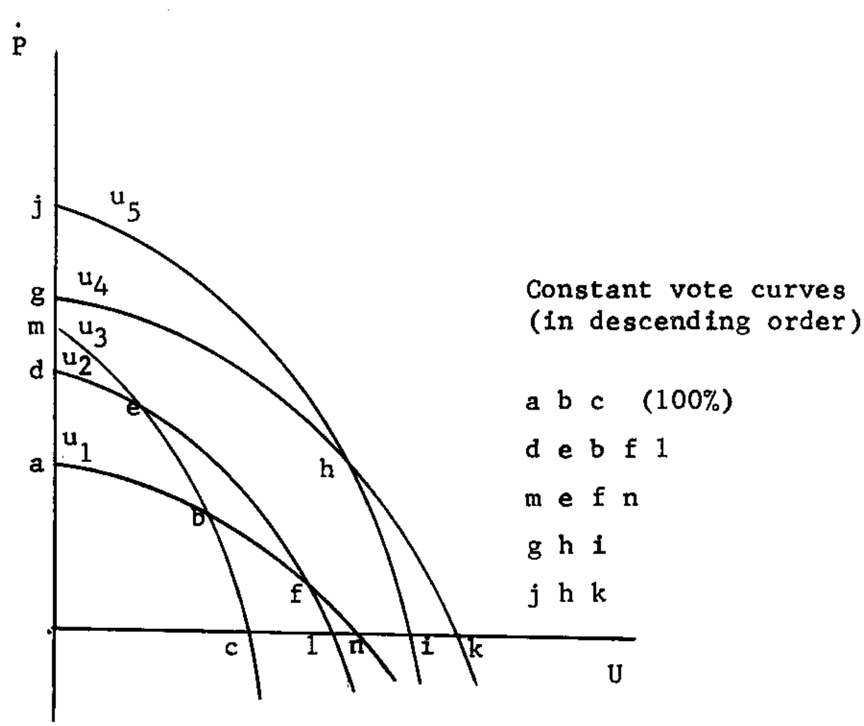


Figure II



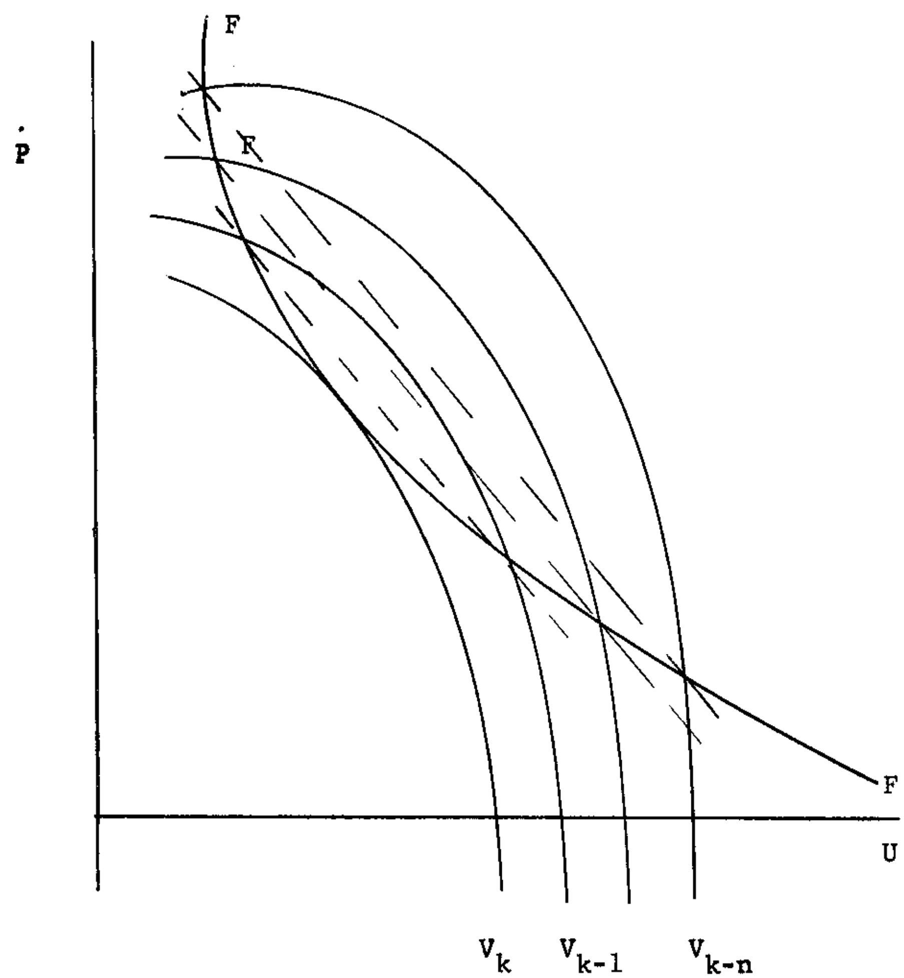
curve would have a single tangency, or two intersections, with F. If the V_k functions are approximately convex, however, they might have any number of tangencies or intersections with F. The aggregate vote data consist of these points of tangency and intersection.

In cases where (1) the V_k are piecewise concave in the feasible region, (2) F shifts through time, and (3) governments pursue policies that generate several points along any one F, vote-unemployment-price change points would be scattered over a smooth surface corresponding to the function V. This would permit direct statistical testing of the form, and estimation of the parameters, of V.

If F did not shift through time, however, all the observable points would lie along a single F and the form of V would not be identifiable. To cite an extreme but useful example, assume the V_k's are peicewise concave functions and that lines connecting the points of intersection of each V_k with F are parallel to each other (see Figure III). In this case, the true nonlinear V function, conforming to our a priori expectations, and a linear function would fit the data equally well. Indeed, this is a justification for the linear regressions, reported in a later section of this paper, which fit a plane to the data.

If preferences are such that the V_k's in the region of a stable F are not concave, estimation of any continuous aggregate vote function may be unsuccessful. The locally concave segments might be successfully estimated, however, if voters could be grouped by regional or other criteria such that voters within a group had relatively homogeneous preferences. (Homogeneity here refers to approximate parallelism of satisfaction curves.)

Figure III



Thus, it may be concluded that:

(a) Aggregate vote-unemployment-price change functions can be derived by a well defined procedure from the assumption that individual voters behave according to a satisficing hypothesis.

(b) Conventional assumptions about the shapes of individuals' satisfaction curves provide little evidence about the shape of the aggregate constant vote curves. Hence, it is reasonable to interpret estimated aggregate vote functions only as proxies for the "true" functions.

(c) In view of the possibility that aggregate vote functions would be "lumpy" in the range of feasible unemployment-price change points, it seems advisable to consider sub-aggregates in estimation where it is reasonable to postulate that voters in any sub-aggregate may have more homogeneous preferences than the total population of voters.

Some attempts at statistical estimation reflecting these conclusions are reported in the following sections of this paper.

II. SOME EMPIRICAL RESULTS WITH AGGREGATE DATA

Kramer's work suggests that economic variables and a time trend account for one-half to two-thirds of the variance in the aggregate popular vote for U.S. Representatives after allowing, through a clever technique, for the estimated effect of the popularity of the Presidential candidate in Presidential election years. In his examination of the influence of real or money income, price changes and unemployment, real income was found to have a consistently significant positive effect and price inflation to have a smaller but significant negative effect[2]. The unemployment rate was usually found to have a counter-intuitive, but insignificant, positive coefficient.

Real income is, undoubtedly, the most salient indicator of economic prosperity and, given the correlation between this and other economic variables, it is not surprising that the effects of the three variables were statistically indistinguishable. In addition to this reason for not attempting to estimate the influence on voters of all three of these variables simultaneously, it is also appropriate, in the context of this paper, to consider the best way of measuring the feasible alternatives available to the economy. Unemployment is the most directly observable measure of the intensity of utilization of economic resources. The rate of change of real gross national income will be strongly (inversely) correlated with changes in the unemployment rate in the short-run. In the longer run, however, changes in the rate of growth of the capital stock (or other influences on labor productivity) and changes in the growth rate, and age-sex composition, of the population will mean that a given unemployment rate will be associated with different rates of growth of total production and income. Thus, the economic policy maker's question regarding the public's preferences for a target rate of resource utilization is answered less directly by information on real income and price changes than by information on unemployment and price changes.

Short-run changes in the unemployment rate may serve fairly well as a proxy for the more pervasive changes in income since average weekly hours of

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[2]The consistent positive response to increases in real income is reported in the previously cited paper by Kramer. The response to price inflation was demonstrated only after an error in the pre-1920 observations on income was discovered by George Stigler who re-estimated Kramer's regressions after correcting the income series.

work (both on regular and second jobs) and business profits have a fairly strong (inverse) correlation with unemployment over significant ranges. Those who are not actually unemployed are likely to be experiencing a less rapid growth of income when unemployment is high than when it is low. An awkward problem is posed, however, by the influence of taxes and transfer payments on real household disposable income. Changes in tax provisions and in social security, unemployment compensation, and welfare payments will change the relation between gross national income or unemployment and disposable income receipts of households. And changes in transfer payments, in particular, could change the way households feel about unemployment and price changes. If unemployment compensation coverage is extended, the effect of unemployment on voters will be reduced; if social security payments rise with the cost of living reaction to inflation will be different than if the amount of these transfers lags behind an uptrend in prices. Despite this problem, unemployment variables are used, in preference to changes in real income, in all the regressions reported below.

The regressions, in all cases, have the following basic form, derived from the satisficing hypothesis:

$$V_t = c + b_1 T + b_2 \delta + \sum_{i>2} b_i \, \delta x_{i,t} + u_t \, .$$

V_t, the dependent variable, is the proportion of the total vote cast for all Republican candidates for U.S. Representative, when a Republican occupies the White House, or the proportion of the vote cast for Republican plus minor party candidates, when there is a Democratic President (modified in all cases for the coattails effect, as explained below). T is a linear time trend which, in effect, shifts the basic party allegience indicated by the constant term, c.

The x_i are the economic variables that are included in each regression. Table I presents a complete list of variables used and their definitions[3].

u_t, the disturbance term, picks up the effect of all omitted influences. The underlying hypothesis that preferences are "additively separable" implies that these influences are independent of the explanatory variables and enter the vote function additively. Additionally, if the estimates are to be efficient, it is necessary to assume that the u_t are not autocorrelated, a questionable assumption in view of the persistence of certain issues that would influence voters. There are, of course, many reasons to believe that these two assumptions do not hold exactly but they will be more closely met if war years are omitted from the regressions.

Several political effects are allowed for in the manner proposed and tested by Kramer. First, the proportion of the total popular vote for all Republican (or Republican plus minor party) candidates for U.S. Representative is modified by a "coattails" parameter (γ) times the Presidential vote to allow for the effect on the dependent variable of the popularity of the Presidential candidate on the other candidates running on the same ticket[4]. Second, the possibility that the incumbent party has an advantage in an election is allowed for by including an incumbency index (δ) as a separate term in the regression. δ equals plus one when a Republican is President (minus one otherwise) thus measuring the advantage (disadvantage) to Republicans. Third, since the underlying hypothesis is cast in terms of voting for or against the incumbent on the basis of his record, the economic variables which constitute the record must be multiplied by an attribution index to indicate

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[3]Kramer's data was used for all variables except the "responsive parameters". See Appendix B in Kramer, <u>op. cit.</u>, for a description of the data and original data sources.

[4]See Appendix for a discussion of this transformation.

whether a favorable record helps the Republicans, or hurts them (i.e. by favoring the incumbent Democrats). In regressions run on the aggregate vote for U.S. Representatives it is assumed that the President and Congressmen operate as a team and are held collectively responsible for the record. Hence, the attribution index is the same as the Presidential incumbency index.

A number of experiments were run for the sample period 1896-1964 omitting 1912, '18, '42, '44, '52. This is the same sample period that Kramer used with the additional omission of 1952. These regressions were expected, first, to reveal a negative response to unemployment that would correspond to Kramer's finding of a positive response to growth in real income. Second, it was hoped that voters' trade-off's between unemployment and inflation could be made clearer by exploring the effect of introducing price change in differing forms. The results of this "data mining" show the magnitude and significance of coefficients to vary somewhat from one specification to another. Nevertheless, a few conclusions emerge fairly strongly.

(a) The coefficient of the level of the unemployment rate tends to be very small and insignificant. In a few cases it has the wrong (i.e. positive) sign. (Lagged unemployment performs no better.)

(b) The coefficient of change in the unemployment rate is always negative and, in most specifications, significantly so. Since movements in the level of the unemployment rate are associated with fluctuations in the rate of growth of real income, these results are qualitatively consistent with the notion that unemployment serves as a proxy for real income in many voters' preferences. The argument that change in the unemployment rate is the appropriate variable is reinforced by the coefficients (identical except for sign) when current and lagged unemployment are introduced together in the same equation.

TABLE I

DEFINITION OF SYMBOLS

c	constant term indicating underlying party loyalty
γ	coattails parameter
δ	incumbency index; $\delta = +1$ when Republicans are incumbent, $\delta = -1$ when Democrats are incumbent
T	linear time trend; $T = 1$ in the first period used for estimation
ΔP	percentage change in the consumer price index from the preceding year to the election year, in decimal form
U	unemployment rate in the election year, in percentage points
ΔU	absolute change in the unemployment rate from the preceding year to the year of the election
U_{-1}	unemployment rate in the year preceding the election
ΔP_{-1}	percentage change in the price index between one year, and two years, preceding the election
$\|\Delta P\|$ and $\|\Delta P_{-1}\|$	absolute values of ΔP and of ΔP_{-1}
α_1 and α_2	responsive parameters $\alpha_1 = 1$ if either U_{t-1} or $U_{t-2} > \overline{U}_t + 2.0$, and if $\alpha_2 = 0$, otherwise $\alpha_1 = 0$; $\alpha_2 = 1$ if either ΔP_{t-1} or $\Delta P_{t-2} > \overline{\Delta P} + .01$ after 1940, $\overline{\Delta P} + .03$ prior to 1940; where $\overline{U}$ and $\overline{P}$ are moving averages for the 6 years preceding the election. (Note that α_1 and α_2 can never equal one simultaneously.)
α_3, α_4, α_7	$\alpha_3 = \min U_\tau$, $\alpha_4 = \min \Delta P_\tau$, $\alpha_7 = \min\|\Delta P_\tau\|$, $\tau = t-1, \dots t-6$
α_5 and α_6	the same as α_1 and α_2 except that both α_5 and α_6 can equal one simultaneously

(c) The coefficient of the change in consumer prices is usually negative and is significantly so in specifications which exclude variables, such as lagged price change, with which current price change is highly correlated.

(d) In specifications that allow for aversion to deflation as well as inflation, the coefficient of $|\Delta P|$ or of $(\Delta P)^2$ is significantly negative.

The following regressions are illustrative of the results just described (t-statistics appear below the coefficients):

$$
\begin{array}{llllllll}
1) & V = .546 - .0024T & - .0072\delta & - .0066\delta\Delta U & - .395\delta\Delta P & & (\gamma = .25) \\
 & \quad (3.26) & (.837) & (2.57) & (2.22) & & R^2 = .496
\end{array}
$$

$$
\begin{array}{llllllll}
2) & V = .547 - .0027T & - .012\delta & - .0006\ell U & - .312\delta\Delta P & & (\gamma = .40) \\
 & \quad (3.36) & (.665) & (.313) & (1.31) & & R^2 = .416
\end{array}
$$

$$
\begin{array}{llllllll}
3) & V = .550 - .0023T & - .002\delta & - .0053\delta\Delta U & - .0017\ell U & - .660\delta|\Delta P| & (\gamma = .10) \\
 & \quad (3.48) & (.156) & (2.18) & (1.33) & (3.39) & R^2 = .597
\end{array}
$$

$$
\begin{array}{llllllll}
4) & V = .542 - .0021T & - .000\delta & - .0041\delta\Delta U & - 5.010(\Delta P)^2 & & (\gamma = .10) \\
 & \quad (3.17) & (.002) & (1.76) & (3.51) & & R^2 = .579
\end{array}
$$

These regressions were estimated by ordinary least squares after making the coattails adjustment. Since that adjustment involves a search procedure, however, the t-distribution of the ratio of a coefficient to its standard error is not strictly applicable. Assuming it to apply approximately, the critical value of the t-statistic for 5 per cent significance in a one-tail test (applicable to the economic variables for which there are strong theoretical presumptions about the sign of the coefficient) is 1.7.

A question of econometric methodology is raised by the fact that the dependent variable, percentage of the total vote cast for Republican (or Republican plus minor party) candidates, is bounded between zero and one.

This particular property suggests the use of the log-odds, or logit, transformation. Consequently, the dependent variable was redefined as $L_t = \log \frac{V_t}{1-V_t}$ and the regressions were re-estimated. The logit results were very similar to the ordinary-least-squares results in goodness-of-fit and in the pattern of significance or insignificance of the coefficients. The magnitudes of coefficients are not directly comparable but the partial derivatives $\frac{\partial V}{\partial x_i}$ can be compared. The partial derivatives in the ordinary linear case are, of course, the relevant coefficients, b_i . Denoting the corresponding coefficients estimated by logit as β_i , the partial derivatives are $\beta_i[V(1-V)]$. In the 1896-1964 sample period, the mean of V was .504. This implies that the desired partial derivatives evaluated at the mean of V (which corresponds to evaluating them at the joint means of the explanatory variables) are one quarter of the estimated coefficients. In the case of Equation 1 above, the partial derivative $\frac{\partial V}{\partial(\delta \Delta U)}$ estimated by logit is -.0068 and the partial derivative $\frac{\partial V}{\partial(\delta \Delta P)}$ is -.403. The range of V over the sample period was from .43 to .64. Evaluating the derivatives at the extremes of the range reduces them, of course, but the maximum difference is approximately 8 per cent. (A similar relationship applied for the other estimated equations.) Thus, although the assumptions of the regression model regarding the distribution of the errors are formally more applicable to the logit specification, the observations were clustered sufficiently in mid-range that the alternative estimation procedures made little significant difference in the results.

The possibility that preferences shift over time led to two further experiments with the aggregate data. First, a series of "responsive parameters" were introduced to test (somewhat crudely) the hypothesis that preferences shift in a systematic response to events in the recent past. Terms reflecting either the occurance of serious "problems" in the recent past, or the best performance in the recent past, were added to the basic equations. The first pair of responsive parameters would, in effect, classify as "problems" only extreme points on a given unemployment-price change, (F) function (α_1 and α_2 did not simultaneously take on the value one) while the other pair would include in the "problem" category points generated by an adverse shift in the F function (making α_5 and α_6 both equal to one).

Intuitively, it seemed reasonable to expect that introduction of terms containing α_1 and α_2 or α_5 and α_6 would raise the absolute size of the coefficients ΔP and U, or ΔU, and that the coefficients of the responsive terms themselves would be positive. In fact, the size of the coefficients of the basic economic variables did appear to increase in most cases. The coefficients of the responsive terms involving U or ΔU were, in virtually every case, insignificantly negative, however; a positive coefficient occurred in some specifications for responsive ΔP terms. Two illustrative equations are:

$$5)\quad V = .536 - \underset{(2.64)}{.0022T} - \underset{(.455)}{.0046\delta} - \underset{(2.86)}{.0074\delta\Delta U} - \underset{(1.645)}{.413\delta\Delta P} - \underset{(1.21)}{.0015\delta\alpha_1 U} - \underset{(.586)}{.180\delta\alpha_2\Delta P}$$

$$(\gamma = .15) \qquad R^2 = .579$$

$$6)\quad V = .554 - \underset{(3.60)}{.0027T} - \underset{(.046)}{.0007\delta} - \underset{(2.74)}{.0067\delta\Delta U} - \underset{(2.87)}{.729\delta|\Delta P|} - \underset{(1.55)}{.003\delta U} - \underset{(1.07)}{.002\delta\alpha_5 U} + \underset{(2.90)}{.079\delta\alpha_6\Delta P}$$

$$(\gamma = 0) \qquad R^2 = .726$$

Coefficients of responsive terms containing α_3 , α_4 and α_7 (the best values of U , ΔP and $|\Delta P|$, respectively, in the recent past) were statistically insignificant in most cases. One exception was the term $\delta\alpha_4\Delta P$ which served, in effect, as a proxy for $(\Delta P)^2$ and had a significant coefficient of the expected negative sign.

$$7)\quad V = .536 - \underset{(3.09)}{.0022T} - \underset{(.820)}{.0088\delta} - \underset{(2.78)}{.0061\delta\Delta U} - \underset{(3.64)}{.705\delta\Delta P} - \underset{(.041)}{.000\delta\alpha_3 U} - \underset{(3.44)}{.109\delta\alpha_4\Delta P}$$

$$(\gamma = .05) \qquad R^2 = .710$$

Colinearity between $\alpha_2\Delta P$ and ΔP and between $\alpha_5 U$ and U may explain the insignificance and perverse signs of these coefficients. Responsive terms containing U were not colinear, however, with ΔU . Thus, systematic lagged response of voters seems to be associated only with price trends, if it exists at all.

Stability of preferences was also considered by re-estimating regressions, using the shorter sample period 1930 to 1964. Again the size and significance of coefficients was sensitive to the exact specification, resulting in part from troublesome colinearities. In every specification, the coefficient of the change in unemployment was negative and the value of the t-statistic was greater than one. In many specifications, however, the t-statistic fell short of the 5-percent confidence value of 2. Simple correlations above .5 between change in unemployment and $(\Delta P)^2$, $|\Delta P|$ and $|\Delta P|$ lagged are almost certainly part of the explanation. The coefficient of change in prices was insignificantly positive in many specifications. Coefficients of $(\Delta P)^2$, however, were consistently significantly negative.

The first four of the following results can be compared with the results presented above for the longer sample period.

8) $$V = .517 - \underset{(1.73)}{.0033T} - \underset{(.087)}{.0009\delta} - \underset{(2.06)}{.0084\delta\Delta U} - \underset{(.436)}{.119\delta\Delta P} \qquad (\gamma = .20) \quad R^2 = .440$$

9) $$V = .522 - \underset{(1.72)}{.0043T} - \underset{(1.58)}{.048\delta} + \underset{(.907)}{.0024\delta U} + \underset{(.874)}{.453\delta\Delta P} \qquad (\gamma = .45) \quad R^2 = .462$$

10) $$V = .526 - \underset{(2.30)}{.0040T} + \underset{(1.39)}{.002\delta} - \underset{(1.67)}{.0071\delta\Delta U} + \underset{(.985)}{.0013\delta U} - \underset{(1.65)}{.520\delta|\Delta P|} \qquad (\gamma = .10) \quad R^2 = .587$$

11) $$V = .519 - \underset{(2.29)}{.0036T} + \underset{(.722)}{.007\delta} - \underset{(1.38)}{.0054\delta\Delta U} - \underset{(1.92)}{5.593\delta(\Delta P)^2} \qquad (\delta = .10) \quad R^2 = .581$$

12) $$V = .574 - \underset{(3.91)}{.0079T} - \underset{(3.00)}{.064\delta} - \underset{(2.90)}{.0060\delta U} + \underset{(2.75)}{1.084\delta\Delta P} - \underset{(3.90)}{9.895\delta(\Delta P)^2} \qquad (\gamma = .35) \quad R^2 = .757$$

These results suggest the same qualitative conclusions as the results from the longer sample period: voters' aversion to increases in unemployment and to changes (in <u>either</u> direction) in prices. The aversion to price changes must be qualified in view of Equation 12, however, since $\frac{\partial V}{\partial \Delta P}$ is <u>positive</u> in that relation for ΔP less than .05. Economically, both the slightly larger negative coefficients for ΔU and the possibility that aversion to price changes applies only to large price movements seem plausibile. In this more recent sample period, the agricultural sector -- where measured unemployment is less of a problem and fortunes are most directly affected by prices -- was a much smaller part of the economy. Downward rigidity of industrial sector prices and the "normal" upcreep of the consumer price index were more pervasive phenomena. At the same time, more of the public was inclined to believe that the government could "do something" about job opportunities, the availability of full-shift and overtime work, and maintaining conditions in which wages can rise more rapidly.

For this more recent sample period, it is interesting to compare Equation 8 above with the following relation in which change in per capita real personal income (ΔR) is substituted for change in unemployment:

$$13)\quad V = .523 - \underset{(2.09)}{.0038T} - \underset{(1.119)}{.0097\delta} + \underset{(2.67)}{.420\delta\Delta R} - \underset{(.284)}{.070\delta\Delta P} \qquad (\gamma = .15)$$

$$R^2 = .517$$

The familiar "Okun's Law" relationship between unemployment and growth in real income suggests that real GNP must rise by approximately 3 percent per year to hold the unemployment rate constant and that an additional increase in real GNP of about 3 percent is required to lower the unemployment rate by one percentage point. (The parameters of this relationship shift, of course, over time depending on the age-sex composition of the population and fluctuations in the rate of growth of productivity.) Okun's Law applies to real GNP which is somewhat more volatile than real personal income; furthermore, the income variable in Equation 13 is calculated in per capita terms whereas the parameters in the Okun relationship absorb the effect of population growth. Population growth of about 1 percent per year would call for reducing each of the Okun parameters by 1 percentage point if the relation is applied to per capita income. Using these roughly adjusted magnitudes, it appears that the coefficients of ΔR in Equation 13 and ΔU in Equation 8 are quite consistent. The constant term in Equation 8 should be larger than the corresponding term in Equation 13 -- the difference should be approximately .008 rather than the estimated -.006 -- but this discrepancy is well within the range of sampling error.

It is also interesting to consider the implications of the voting relations in the context of estimates of the Phillips trade-off between unemployment and inflation. Complex and shifting Phillips relations can be derived from the major macroeconometric models but for simplicity the following illustrative calculations were derived from the more simple model of Perry[5]. His unemployment-price-change function is

$$14)\qquad \Delta P = -6.814 - 1.580\rho_t + 23.24U_t^{-1} + 0.670\pi_t$$

Where ρ_t is the annual rate of growth of productivity, assumed to equal 3%, and π_t is the rate of return on shareholder's equity, assumed to equal 10.8% per year.

Using this relation, the vote maximizing unemployment and inflation rates implied by Equation 12 above are 2.4 per cent unemployment and 5.5 per cent price inflation -- the point at which the derivative of this vote function with respect to prices alone is zero. Equation 11 yields results that are significantly different in terms of policy implications. Since this equation is defined in terms of ΔU and $(\Delta P)^2$, the obvious vote maximizing point in a steady state would be ΔU equals zero and ΔP equals zero. The associated level of the unemployment rate is 5.4 percent, according to Equation 14. This point is not, however, a stable equilibrium. The equilibrium point with the highest vote is at an unemployment rate of 3.9 percent and an associated inflation rate of 1.6 percent.

The period of the 1950's and 1960's, prior to the upsurge of the price index in 1968, is reasonably well captured by the Phillips curve used in these calculations but the subsequent inflationary episode is quite clearly associated

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[5]Perry, George L. Unemployment, Money Wage Rates, and Inflation, The M.I.T. Press, Cambridge, Mass., 1966, pp. 61-63.

with an unfavorable shift in this social constraint[6]. For the period to which Perry's estimate of the constraint is most applicable, a macroeconomic policy target of U equal to 3.9 percent and ΔP equal to 1.6 percent is quite reasonable -- and indeed closely approximates a target that was explicitly pursued during part of that period. The range of uncertainty about social preferences remaining after the exercise of estimating vote functions is distressingly large, however, as illus tated by the difference between target unemployment rates of 3.9 percent and 2.4 percent.

III. EXPERIMENTS WITH REGIONAL DATA

The first section of this paper suggested that an aggregate vote-unemployment-price change relation might not have a smooth form if voters' preferences were heterogeneous. More homogeneity of preferences might exist within smaller geographical regions. Thus, regional relationships might be estimated more accurately and comparisons among regional relationships might be illuminating. In contrast with these hopes, the results presented in Table II show that the response of voters to economic conditions is not greatly illuminated by regional data. The coefficients of unemployment variables were negative in 13 of the 15 regions but were significant only in 8 regions. The coefficients of the price-change terms were usually negative but rarely significant. The regions which exhibited a significant response to unemployment were not readily distinguishable from the others in terms of contemporary urbanization, income or susceptability to cyclical unemployment.

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[6] Perry himself has analysed demographic reasons for such an adverse shift, in his article "Changing Labor Markets and Inflation", Brookings Papers on Economic Activity, 1970 number 3. Dynamic models of price and wage interaction also provide some explanation.

Table II

Region	Regional Regressions, 1926-66								Regional Characteristics, 1960			
	R^2	Intercept	T	δ	E	δΔU	δΔP	$δ(ΔP)^2$	% Urban	% Negro	Median Income ($)	% Unemployed
Oregon 2	.794	.584	-.003 (2.602)	-.004 (.229)	.088 (3.772)	-.012 (2.076)	.024 (.049)		48.5	.3	5544	7.2
Pennsylvania 12	.605	.622	-.002 (1.402)	.014 (.601)	.076 (1.716)	-.019 (2.571)	-.175 (.341)	.144 (.021)	36.3	.9	4659	6.9
Manhattan, N.Y.	.876	.454	-.000 (.081)	-.054 (6.129)	.103 (2.817)	-.007 (2.086)		1.079 (.316)	100.0	23.4	5338	6.6
Portland, Ore.	.822	.583	-.004 (1.827)	.000 (.027)	.062 (1.918)	-.019 (1.995)	-.146 (.258)	-3.603 (.353)	96.7	3.5	6272	5.4
Connecticut 5	.661	.537	-.002 (1.726)	.019 (.962)	.028 (1.226)	-.020 (2.902)	-.394 (.843)	.986 (.163)	80.7	2.9	6848	5.2
Milwaukee, Wis.	.803	.525	-.004 (1.773)	.020 (.530)	.042 (1.154)	δU -.011 (2.770)		-4.017 (.505)	100.0	6.1	6657	4.6
New Hampshire 2	.482	.579	.000 (1.085)	.025 (2.149)	.005 (.230)	-.009 (1.687)	-.304 (.841)	-2.874 (.665)	54.3	.1	5502	4.3
Westchester, N.Y.	.482	.605	-.000 (.277)	-.002 (.133)	-.008 (.344)	-.011 (1.916)	.318 (.825)	-3.279 (.723)	92.7	7.5	8052	3.2

Table II , continued

Region	Regional Regressions, 1926-66								Regional Characteristics, 1960			
	R^2	Intercept	T	δ	E	δΔU	δΔP	$δ(ΔP)^2$	% Urban	% Negro	Median Income ($)	% Unemployed
Detroit Area	.808	.581	-.006 (2.495)	.029 (1.229)	.089 (1.763)	.000 (.044)	.113 (.173)	-10.90 (1.432)	97.5	19.9	6597	8.1
Pittsburgh Area	.643	.588	-.003 (1.982)	-.008 (.211)	.169 (2.482)	-.001 (.131)	1.417 (1.642)	-6.630 (.776)	93.2	8.2	6173	6.5
New York-Upstate	.414	.735	.000 (.807)	.001 (.964)	-.090 (1.095)	-.003 (.519)	-.206 (.623)	-5.825 (1.467)	44.4	.7	5455	5.9
Wyoming	.417	.520	.000 (.318)	.026 (1.443)	.032 (1.444)	-.007 (.998)	.031 (.062)	-.841 (.149)	56.8	.7	5877	5.1
North Carolina II	.132	.426	-.000 (.463)	.011 (.566)	.000 (.000)	-.005 (.696)	-.419 (.875)	.121 (.018)	26.3	6.5	3717	5.0
Nebraska	.608	.547	-.000 (.227)	.001 (.054)	.065 (1.777)	-.005 (.612)	-.020 (.033)	-9.831 (1.300)	35.0	.1	4247	3.2
Wisconsin 2	.874	.919	-.013 (7.717)	-.066 (2.616)	.020 (.754)	.006 (.625)	2.673 (4.142)	-11.10 (1.288)	60.7	.5	5864	2.5

The number of regions included in these calculations is, of course, quite small and not necessarily representative according to any formal statistical criterion. The unit of aggregation is also not ideal since it fails to distinguish central city and suburban voting patterns. Despite these limitations, one is tempted to conclude that the political response to economic conditions takes the form of "swing-voting" (as hypothesized in Kramer's model) for a significant number of voters but, for another large group, economic considerations are embedded in the longer-term dynamics of party identification, intra-party negiotiations, lobbying, etc.

*Notes to Table II: Regions are counties (in the case of metropolitan areas this was the smallest geographical unit for which data could be obtained over the sample period) or 1966 Congressional Districts where the same geographical area could be represented by summing across counties in earlier periods. The sample period omits 1942, '44 and '52. The independent variables are the same as those defined in Table I; ϵ is the incumbency index for the local Congressman (+1 if the incumbent Republican is running, -1 if the incumbent Democrat is running and 0 if the incumbent is not running for re-election.)

STATISTICAL APPENDIX

The "coattails" adjustment used by Kramer is derived in this manner:

Assume that the Congressional vote is determined by the following relation in presidential election years,

1) $V^c = c + b_1 T + b_2 \delta + \Sigma b_i \delta x_i + u + \gamma v$

and the Presidential vote is determined by

2) $V^p = c + b_1 T + b_2 \delta + \Sigma b_i \delta x_i + u + v$

where v is an additional disturbance term reflecting the popularity of a particular presidential candidate and γv is the amount by which this influence carries over to congressional elections. If it is assumed that the congressional and presidential relations contain the same explanetory variables which enter with identical coefficients in each relation, then

3) $$\frac{V^c - \gamma V^p}{1 - \gamma} = c + b_1 T + b_2 \delta + \quad b \;\; \delta x \quad + u \; .$$

Since the congressional vote in off-years can be assumed to be determined by the same relation as Equation 3, applying the coattails transformation to presidential election observations removes the heteroscedasticity that would otherwise be present in a regression including both presidential and off-year observations. Furthermore, iterating over values of γ to minimize the standard error of an ordinary-least-squares regression is shown by Kramer (see Appendix A in Kramer, op.cit.) to provide maximum likelihood estimates of all the parameters of Equation 3 including γ .

This procedure was used in all the aggregate regressions estimated in this paper. In the case of the regional regressions, containing the local incumbency variable ϵ , which does not appear in the presidential relation, the value of γ was assumed to be 0.1 and presidential election year observations of ϵ were divided by $(1 - \gamma)$ before regressions were estimated.

The assumption that the regression coefficients in Equations 1 and 2 above are identical is, of course, a very strong assumption. The procedure used is that for testing equality of coefficients across pairs of "seemingly unrelated" equations. (See Henri Theil, Principles of Econometrics, John Wiley and Sons, New York, 1971, Chapter 7.)

Denote the coefficients of Equation 1 above as b_i and of Equation 2 above as β_i . Unconstrained regressions for these two relations separately yield estimated of the b_i , β_i , and the variances and covariance of the residuals from the two regressions. Denote the residual variance-covariance matrix as Ω , and the matrix of sums of squares and cross-products of the independent variables as $(X'X)$. Then the test statistic is

$$(R\hat{\pi}' - \bar{0})'\{R[\Omega \otimes (X'X)'R'\}^{-1}(R\hat{\pi}' - \bar{0}) \times \frac{2N - 2K}{q} \quad ;$$

this statistic has an F distribution with degrees of freedom $(q, 2N-2K)$. $\hat{\pi}$ is the vector $\{\hat{\beta}, \hat{b}\}$. R is a matrix of constraints. It has one row for each pair of coefficients (β_i and b_i) which are hypothesized to be the same. Each row has entries 1 and -1, respectively, in the positions corresponding to the relevant β_i and b_i in the π vector and zeros in all other positions. (In the degrees of freedom adjustment, N is the number of observations, K the number of estimated coefficients, and q the number of constraints.)

The F-test just described was performed on the following regressions, estimated only for presidential election years:

$$4)\quad V^c = .575 + \underset{(1.41)}{.0126\delta} - \underset{(4.40)}{.0035T} - \underset{(.298)}{.0757\delta\Delta P} - \underset{(1.52)}{.0080\delta\Delta U} - \underset{(1.87)}{4.281\delta(\Delta P)^2}$$

$$5)\quad V^P = .564 + \underset{(4.33)}{.0449\delta} - \underset{(2.87)}{.0027T} - \underset{(.540)}{.159\delta\Delta P} - \underset{(2.04)}{.0125\delta\Delta U} - \underset{(2.24)}{5.956\delta(\Delta P)^2}$$

The test resoundingly rejected the null hypothesis that the coefficients were the same in the two relations.

The same regression estimated for off-year elections is

$$6)\quad V^c = .509 + \underset{(.114)}{.0016\delta} - \underset{(.459)}{.0008T} - \underset{(1.02)}{.340\delta\Delta P} - \underset{(1.68)}{.0067\delta\Delta U} - \underset{(.723)}{4.101(\Delta P)^2}$$

and estimation by the method used in the text (including Presidential election and off-year data) gives

$$7)\quad V = .539 + \underset{(.200)}{.0016\delta} - \underset{(3.13)}{.0021T} - \underset{(.894)}{.170\delta\Delta P} - \underset{(1.96)}{.0050\delta\Delta U} - \underset{(2.51)}{4.226\delta(\Delta P)^2} \quad (\gamma = .1)$$

$$7')\quad V = .538 + \underset{(.453)}{.0036\delta} - \underset{(2.99)}{.0020T} - \underset{(.904)}{.173\delta\Delta P} - \underset{(2.05)}{.0052\delta\Delta U} - \underset{(2.62)}{4.412\delta(\Delta P)^2} \quad (\gamma = 0)$$

All four regressions give the same qualitative impressions. For the purposes of this paper, however, quantative comparisons are significant. Thus, it is interesting to note, first, that the slopes of the constant vote curves for given values of ΔP are virtually the same for Equations 4 and 5. Second, note that the slope of the constant vote curves implied by Equation 6 is about one-half as large as those in Equations 4 and 5, and very close to those implied by Equation 7. Finally, Equation 7' is the same as Equation 7 but was estimated assuming that γ equaled zero -- i.e. utilizing congressional election data only, <u>without</u> a coattails adjustment, but including data for both presidential election and off-years. The virtually identical coefficients of all terms except δ in Equations 7 and 7' indicate that the coattails adjustment is not distorting the results. Similarly, the virtually identical slopes of constant vote curves implied by Equations 4 and 5, suggest that the coattails adjustment is not biasing the economically relevant information in presidential election year data. The crucial question is how to interpret the differences between behavior in presidential election years and off years. Pooling data for both types of elections utilizes twice as much information; such results should, therefore, be more accurate. However, an alternative adjustment for heteroscedasticity might be more appropriate.

DATA APPENDIX

For the regional regressions, a preliminary sample of about 50 Congressional districts was selected on the basis of geographic location, percent urban population and percent Negro population, using the 1960 Census data as compiled in the Congressional District Data Book [14]. The sample for which regressions were run resulted from eliminating from the preliminary sample, regions in which uncontested elections occurred, states where state-wide at-large elections occurred, regions where counties of a current district were split among two or more districts at some previous time, and where data were not readily available.

Congressional Directories [18] of the 69th through 90th Congresses were used to determine the incumbencies from 1926 through 1966. In the case of redistricting, each county or part of county in a current district was traced to discover the district in which it was located at the time of each general election.

Congressional vote was gathered for each district, for each general election, from the 70th to the 90th Congresses inclusive, from (1) America Votes [12], (2) the relevant Congressional Directory [16] and, when county or sub-county data were dalled for, (3) the relevant state bluebook, handbook, manual, etc., [1] - [10], [13] (in the order of priority in which they are cited).

Presidential vote was tabulated by county for each current district from America at the Polls [11]. Since historical series of presidential vote by current congressional districts are not available, county data were aggregated to the best geographic approximation.

National economic data, presidential incumbency, control of the House of Representatives, and control of the Senate were drawn from Historical Statistics of the United States [16] and Statistical Abstract of the United States [17].

All data used in the aggregate regressions were generously provided by Gerald H. Kramer from his earlier work.

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[4] Michigan, Secretary of State. Michigan Manual. State of Michigan, various years.

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[10] Pennsylvania. The Pennsylvania Manual. Pennsylvania Department of Property and Supplies, various years.

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*Hereafter, "various years" refers to the volumes of the relevant state bluebook, handbook, manual, etc. which contain general election results for the years 1924 through 1966.

[13] Wisconsin Legislative Reference Bureau. The Wisconsin Blue Book. State of Wisconsin, various years.

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[15] ________. County and City Data Book, 1967 (a Statistical Abstract Supplement). U.S. Government Printing Office, Washington, D.C., 1967.

[16] ________. Historical Statistics of the United States, Colonial Times to 1957 (HSUS). U.S. Government Printing Office, Washington, D.C., 1960.

[17] ________. Statistical Abstract of the United States (SAUS). U.S. Government Printing Office, Washington, D.C., various issues.

[18] United States Congress. Congressional Directory. U.S. Government Printing Office, Washington, D.C., 69th through 90th Congresses.