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THE IMPACT OF FEDERAL SPENDING ON HOUSE ELECTION OUTCOMES

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ABSTRACT

While it is widely believed by academics, politicians, and the popular press that incumbent congressmen are rewarded by the electorate for bringing federal dollars to their district, the empirical evidence supporting that claim is extremely weak. One explanation for the failure to uncover the expected relationship between federal spending and election outcomes is that incumbents who expect to have difficulty being reelected are likely to exert greater effort in obtaining federal outlays. Since it is generally impossible to adequately measure this effort, the estimated impact of spending is biased downward due to an omitted variable bias. We address this estimation problem using instrumental variables. For each House district, we use spending *outside* the district but *inside* the state containing the district, as an instrument for spending in the district. Federal spending is affected by a large number of actors (e.g. governors, senators, mayors, and other House members in the state delegation), leading to positive correlations in federal spending across the House districts within states. However, federal spending outside of a district is unlikely to be strongly correlated with the strength of that district's electoral challenge. Thus, spending in other districts is a plausible instrument. In contrast to previous studies, we find strong evidence that non-transfer federal spending benefits congressional incumbents: an additional $100 per capita in such spending is worth as much as two percent of the popular vote. Additional transfer spending, on the other hand, does not appear to have any electoral effects.

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1. Introduction

The dominant model of congressional behavior today posits that representatives devote much of their effort in Washington to winning reelection, leading them to focus on serving their constituencies. This model is widely used by public choice economists, political scientists, observers of congressional politics, and many of the participants as well, to explain patterns in congressional decision making, roll-call voting, and election outcomes.

One important application of this general model is in the area of government spending. Much of the theoretical work attempting to explain the distribution of federal expenditures focuses on models of individualistic politics that assume representatives are primarily interested in obtaining more federal money for their constituencies in order to win reelection. Examples include Weingast (1979), Shepsle and Weingast (1981), Weingast, Shepsle and Johnsen (1981), Niou and Ordeshook (1985), Ferejohn and Krehbiel (1987), Inman (1988), and Inman and Fitts (1990).

Despite numerous anecdotes, however, there is little systematic evidence supporting this model. Statistical analyses fail to demonstrate that individual representatives have a significant impact on the amount of federal spending or employment that flows into their constituencies (e.g., Rundquist and Griffith 1976, Ray 1980), or that additional spending or employment yields electoral benefits (e.g., Feldman and Jondrow 1984, Stein and Bickers 1994).[1]

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[1] There is stronger evidence that constituency "casework" -- providing information, providing assistance in dealing with government agencies, and so on -- is important. Representatives evidently spend a large share of their time on casework (e.g., Saloma 1969, Johannes 1980, Parker 1986, 1989, Cain, Ferejohn, and Fiorina 1987), and there is some evidence that this activity has a significant, positive electoral impact (Fiorina 1981, Rivers and

One explanation for the failure of previous studies to uncover a relationship between federal spending and election outcomes is a possible omitted-variable bias that arises because representatives are likely to exert more effort to bring money into their districts when they are electorally vulnerable than when they are electorally secure. If we could accurately measure representatives' perceptions of their electoral vulnerability, then there would be no problem. However, it is likely that all attempts to measure this variable, using proxies such as "challenger held previous office" and "incumbent involved in scandal," are plagued by significant measurement error. Consequently, there is an omitted variable that is positively correlated with the amount of federal funds in a district, but negatively correlated with the district vote. The resulting estimate of the impact of federal funds on votes is biased downward. This bias has been noted previously (Fiorina 1981, Rivers and Fiorina 1986, Stein and Bickers 1994), and a similar problem is well known in the campaign finance literature.

We address the estimation problem by exploiting the fact that the distribution of federal spending across House districts is positively correlated for the districts of a given state or region. The omitted variable -- the perceived strength of the electoral challenge faced by a given congressman -- is likely to be only weakly correlated with federal spending

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Fiorina 1986, but see also Johannes and McAdams 1981). The welfare costs of casework are much smaller than the potential costs of misallocating or wasting large amounts of tax revenue, however. Casework may even have net benefits (in a second-best sense), as Parker (1989) points out -- in performing casework representatives provide valuable oversight of bureaucratic rules and decisions, allowing constituents to pull "fire-alarms" when confronted with excessive bureaucratic interference (McCubbins and Schwartz 1984).

in other districts in the state.[2] Consequently, federal spending in all other districts in the state can serve as a plausible instrument for identifying the effect of federal spending on election outcomes.[3]

There are many theoretical reasons why we might expect to observe positively correlated shocks to federal spending in districts of a given state. The inflow of federal funds to a district is affected by the decisions of a large number of actors, not simply by a congressman acting in isolation. Governors, mayors, and state and local bureaucrats, who apply for and lobby for federal grants and contracts, are important actors. The president plays a major role, both in the budget process and as chief executive. Authorizing and appropriating funds requires legislation passed by coalitions of representatives and senators. As a result, the amount of federal spending in a House district depends not only on the effort and skill of the district's representative, but also on the effort and skill of other actors. Importantly, very few of these actors have the same constituency as the district's representative, and many have broader constituencies. Senators and governors care about states; big-city mayors care about cities that typically contain several House districts. Presidential campaigning also focuses on winning states, a product of the "winner-takes-all" rule in the electoral college. Finally, House and Senate coalitions often contain a strong regional component, especially on appropriations legislation (e.g., Dilger 1982).

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[2] To the extent that the benefits of a legislator's effort spills over to other districts in the state, there will be a positive correlation between our instrument and the omitted variable, leading our estimates to understate the true effect of federal dollars on election outcomes.

[3] This type of instrument is well known among labor economists, but has not been used previously in the political economy literature.

Empirically, we demonstrate in this paper that spending shocks to the districts within a state do, in fact, tend to be positively correlated ($\rho \approx .24$), as the theoretical arguments above suggest.

Using federal spending in other districts in the state as an instrument, we find that the electoral impact of certain types of federal spending is substantial. An additional \$100 per capita (approximately \$50 million for the district) in non-transfer federal spending translates into a 2 percent increase in the popular vote for an incumbent congressman. In contrast, additional transfer payments have no discernible effect on the electoral fortunes of the incumbent. Throughout the empirical sections of the paper, the pattern of estimates we obtain is consistent with the hypothesis that a substantial omitted variable bias exists. In particular, the instrumental variable estimates are five times larger than those from OLS.

We also demonstrate that even when district-level spending data are not available, state-level data on federal outlays can provide reasonably good (but downward biased) estimates of the impact of federal outlays. In fact, somewhat surprisingly, it is straightforward to show theoretically that as long as the omitted variable problem exists, estimates obtained using state-mean spending are asymptotically less biased than estimates using own-district spending. The empirical results we obtain using a longer time series of state-level data are remarkably consistent with the results from the district-level data. Non-transfer spending, particularly intergovernmental grants, continues to have a large effect on the incumbent's electoral fortunes, while transfer payments have no effect.

The outline of the paper is as follows. Section 2 develops the theoretical model, and demonstrates how correlated spending shocks across districts in a given state or region allow relative campaign funds, local scandals, and national partisan swings).[4] According to equation 2, the amount of federal money coming into a district is composed of three components: (1) the vulnerability of the incumbent,[5] who may exert greater effort to obtain federal grants and projects in response to a strong challenge; (2) a shock η, assumed to be common across all districts in a state;[6] and (3) a district-specific shock ϵ. The a priori expectation is that $\alpha_1 > 0$, $\alpha_2 < 0$, and $\theta > 0$.

The standard assumptions required for consistency of OLS are made with respect to the distributions of the stochastic elements of the model. In particular, the three different types of shocks (ϵ, η, and μ) are assumed to be uncorrelated both with each other across districts and over time, and with Z.[7] ϵ is also assumed uncorrelated with X. The variances of the various stochastic components are given by

$$var(Z_{sdt}) = \sigma^2_Z; \quad var(\epsilon_{sdt}) = \sigma^2_\epsilon; \quad var(\mu_{sdt}) = \sigma^2_\mu; \quad var(\eta_{st}) = \sigma^2_\eta$$

Denote the average federal spending per capita across all districts in state s as X_{st}, where

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[4] The formulation of equations 1 and 2 assumes that the means of all variables across both districts and time have been removed.

[5] For simplicity, we model the number of dollars of federal spending produced as a linear function of the strength of the electoral challenge. There is no loss of generality in this assumption because the strength of the challenge is unobserved, and consequently, the scaling is arbitrary.

[6] For the purposes of this analysis, we will generally take the state as the area over which common shocks are felt, but either smaller (e.g. metropolitan areas) or larger (e.g. census regions) geographic borders are alternative choices.

[7] With the exception, of course, that the state-level shock η_{st} is perfectly correlated for the districts within each state.

$$\bar{X}_{st} = \frac{1}{D}\sum_{d=1}^{D} X_{sdt}$$

and D is the number of districts in the state. Similarly, let $\bar{R}_{sdt}$ denote the average federal spending per capita across all districts in state s *except district d*; that is,

$$\bar{R}_{sdt} = \frac{1}{D-1}\sum_{j \neq d}^{D} X_{sjt}$$

When an unobserved variable is correlated with both the left-hand side variable and the observed right-hand side variables, ordinary least squares does not provide consistent parameter estimates. In the case considered here, the perceived intensity of the electoral challenge (Z_{sdt}) is unobserved and is a determinant of both electoral outcomes and federal dollars, leading to inconsistent estimates. What differentiates our model from the typical omitted variable bias case is the presence of the common shock η within a given state. Although this common shock is not directly observable, it nonetheless proves useful in identifying the parameters of the model.

We examine the properties of three alternative estimation strategies:

$$V_{sdt} = \gamma X_{sdt} + \epsilon_{sdt} \qquad (M1)$$

$$V_{sdt} = \delta \bar{X}_{st} + \epsilon'_{sdt} \qquad (M2)$$

$$IV \text{ on } (M1) \text{ instrumenting with } \bar{R}_{sdt} \qquad (M3)$$

Model M1 uses district-level spending as the regressor, while M2 uses state-average spending as a proxy for district-level spending. Model M3 is an IV estimator using mean spending in all other districts in the state, $\bar{R}_{sdt}$, as an instrument for spending in the district.

Given our assumptions the following is straightforward:

$$\bar{X}_{st} = \frac{1}{D}\sum_{d=1}^{D} X_{sdt}$$

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Given our assumptions the following is straightforward:

Comment 1: The instrumental variables estimator in M3 yields a consistent estimate of α.

A valid instrument must be correlated with the federal spending in the district (X), but uncorrelated with the intensity of the electoral challenge (denoted Z). The presence of common shocks η across districts of a given state provides such an instrument. Because of the common shock, federal spending will be correlated across districts in a state. Since the common shock is assumed uncorrelated with Z, $\bar{R}_{sdt}$ is a valid instrument, and M3 provides consistent estimates if the assumptions of the model are true.

In the real world, a positive correlation might exist between the intensity of the electoral challenge in one district and federal spending in other districts in the state. In particular, one congressman's effort may lead to spillovers of additional federal dollars for other districts in the state. It is easily demonstrated that if such an effect is present, then our estimates are biased downwards. Thus, the IV coefficients reported in sections 3 and 4 below are probably best interpreted as lower bounds on the true impact of federal spending on election outcomes.

Although we focus much of our attention on the IV estimates, both the structure of the available data (the district-level spending data are quite limited compared to the state-level data) and the desire to make direct comparisons with previous estimates suggest that the properties of M1 and M2 are also worth exploring. While neither of these specifications provides consistent estimates, the following proposition demonstrates that M2 asymptotically outperforms M1 in the presence of omitted variable bias.

Proposition 1:

(i) The estimates of α_1 are asymptotically downwardly biased in both M1 and M2 (i.e., $\gamma < \beta_1$ and $\delta < \beta_1$).

(ii) The asymptotic bias on β_1 is strictly smaller in M2 than M1 (i.e., $\delta > \gamma$), as long as there is a common shock across districts in a state and states have more than one district.

(iii) The bias in M2 is decreasing in the number of districts in a state.

Proof: It is straightforward to show the following:

$$var(X_{sdt}) = \theta^2\sigma_Z^2 + \sigma_\mu^2 + \sigma_\eta^2; \quad cov(X_{sdt}, Z_{sdt}) = \theta\sigma_Z^2$$
$$var(\bar{X}_{st}) = cov(X_{st}, X_{sdt}) = \frac{1}{D}[\theta^2\sigma_Z^2 + \sigma_\mu^2] + \sigma_\eta^2$$
$$cov(\bar{X}_{st}, Z_{sdt}) = \frac{1}{D}\theta\sigma_Z^2$$

Thus,

$$E[\hat{\gamma}] = E[\frac{cov(X_{sdt}, V_{sdt})}{var(X_{sdt})}] = \beta_1 + \beta_2\frac{\theta\sigma_Z^2}{\theta^2\sigma_Z^2+\sigma_\mu^2+\sigma_\eta^2}$$

$$E[\hat{\delta}] = E[\frac{cov(\bar{X}_{st}, V_{sdt})}{var(\bar{X}_{st})}] = \beta_1 + \beta_2\frac{\theta\sigma_Z^2}{\theta^2\sigma_Z^2+\sigma_\mu^2+D\sigma_\eta^2}$$

Since $\beta_2 < 0$ and $\theta > 0$, the bias of both estimators is negative, proving part (i). Part (ii) follows directly by comparing the bias terms -- the numerators are identical, but the denominator in M2 is larger as long as the variance of the common shock η is greater than zero, and as long as D, the number of districts in the state, is greater than one. Part (iii) is *obvious by examining $E[\hat{\delta}]$.*

QED

Part (i) of Proposition 1 is straightforward. The spending coefficients in M1 and M2 are clearly biased downward due to omitted variable bias. Part (ii), on the other hand, is counter-intuitive, since M1 might seem to be the more plausible specification. As long as there is any common shock across spending in districts in a particular state, however, Proposition 1 demonstrates that the use of state means provides less biased estimates.[8]

Although M3 is preferred to either M1 or M2 from the perspective of consistency when district-level spending data is available, there are two reasons why Proposition 1 is nonetheless of interest. First, when only state-level spending data is available, M2 is the only specification that can be estimated. The available time series of state-level spending data is much longer than that for district-level spending (30 years vs. 8 years). Also, the state-level data are more comprehensive, covering almost all federal spending, while the available district-level data do not include procurement expenditures or wages of federal employees (including military employees). Second, Proposition 1 provides two informal specification tests of the model. If the model we have specified is correct, then (1) the spending coefficient should be larger in M2 than M1 (and both of these should be smaller than the coefficient in M3), and (2) the bias on the coefficient associated with federal spending in M2 should be smaller for states with a large number of districts.

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[8] Although the asymptotic bias is lower in M2 than M1, the variation in the right-hand side variable in M2 is less than M1, implying that the estimates of M2 will generally have larger standard errors than those of M1. Therefore, in terms of mean squared error, M2 may sometimes be less preferable than M1. Similarly, when the statewide shock is small, estimates from M1 or M2 might be preferable to M3 from a mean-squared error perspective.

In the next section we use district-level spending data to estimate versions of models M1-M3. The following section uses a longer time series of state-level data. Because district-level spending data is not available for the longer time series, however, only M2 can be estimated with this latter data set.

3. Estimates Using District-Level Spending Data

District-level data on federal outlays is available in a data set drawn from the Federal Assistance Awards Data System (FAADS) and compiled by Bickers and Stein (1991). The FAADS data set contains annual district-level outlays on a program-by-program basis for all federal domestic assistance programs, from 1983 to 1990. Examples of expenditures included in FAADS are social security and medicare, payments to agricultural producers, community development grants, and highway improvement funds. Excluded from FAADS are federal procurement expenditures, employee wages, and some insurance and loan programs. On average, the programs included in FAADS comprise 56 percent of the total federal budget, or $523 billion (in 1990 dollars). The advantage of the FAADS data is that spending is disaggregated to the district level; the major shortcoming of the data is the limited time span covered.

FAADS is composed of two general types of programs. First, there are a small number of large, broad-based, entitlement programs including social security, medicare, low-income housing payments, and veterans' retirement benefits. Such programs are characterized by a geographically diffuse distribution of benefits, and for that reason we refer to them as "low variation" programs. Second, there are a large number of smaller programs that target particular states, regions or constituencies, such as agricultural payments, urban mass-transit grants, environmental restoration funds, and a variety of specific education and research grants, which we call "high variation" programs.[9] Of the 956 programs included in FAADS, only 16 fall into the low variation category. However, these 16 programs account for over 75 percent of the total dollars. The ten largest programs in both the high and low variation categories are listed in Table 1, along with average yearly outlay per district.

The distinction between high and low variation programs is relevant to the analysis of this paper for two reasons. First, high variation programs are likely to be more discretionary than low variation programs and therefore more amenable to political manipulation by individual congressmen or small groups of congressmen in the short run. Second, it may be easier for incumbent congressmen to claim credit for the benefits coming to a district as a result of high variation programs (e.g. public works projects, farm subsidies), than is the case with entitlement programs such as social security.

A critical component of the theoretical model presented in the preceding section is the existence of common shocks across districts in a given state. Empirically, we uncover evidence of common shocks for both high and low variation programs. To identify the presence of such shocks, we first eliminate any systematic differences in federal spending across districts by demeaning federal spending by district. We also demean by year to

[9] More precisely, we classify programs as follows. First, we calculate the average number of inflation adjusted dollars allocated to each district over the period 1983-1990. We then compute coefficients of variation (c.v.'s) for each program based on district averages. We classify programs with c.v.'s below 2/3 as "low variation," and programs with c.v.'s above 2/3 as "high variation." The average c.v. in the low variation group is 0.45, compared to 7.0 for the high variation group. We experimented with other cut-points as well (c.v.=1/2, c.v.=1) and obtained results similar to those reported below.

eliminate changes in the year-to-year level of aggregate federal outlays. For this demeaned data, the mean within-state correlation in year-to-year spending changes across districts is .24 for high variation programs and .20 for low variation programs. Put differently, approximately 24 percent of the variation in a district's federal spending can be explained by a state-level common shock.[10,11]

In estimating the relationship between election outcomes and federal spending, it is important to control for other factors that influence elections, including a district's partisan composition, the congressional incumbency advantage (Gelman and King 1990), national political forces (Alesina and Rosenthal 1989), and the state of the economy (Tufte 1975, Erikson 1990). Therefore, the actual specifications estimated are variations on the following:

$$\text{DemVote}_{sdt} = (\lambda_t + \alpha X_{sdt} + \beta \%\Delta\text{Income}_{st})^* I_{sdt} + \nu_{sd} + \omega_t + \epsilon_{sdt} \qquad (3)$$

where DemVote is the share of the two-party vote going to the Democratic candidate, X is average per capita federal spending in the district (or in the state when M2 is estimated) in the election year and the year preceding the election, $\%\Delta$Income is the percent change in state per capita personal income, and I is an indicator variable equal to one if the Democratic candidate is the incumbent, -1 if the Republican is the incumbent, and zero otherwise. ν and

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[10] For high variation programs, the mean within-state correlation in small states (states with 14 or fewer districts) and large states are almost identical -- .23 and .24, respectively.

[11] Also, the mean correlations across districts in different states are .06 and .04, respectively. Since the data are demeaned by row and column, the row sums of the variances and covariances must all be zero. The row sums of the correlation coefficients reported here need not be zero, however.

ω are district-fixed effects and year dummies respectively. Because we include district-fixed effects in our specification, the parameters are identified using only within-district variation.

The Democratic vote share (rather than the incumbent's vote share) is used as the dependent variable in order to control for partisan differences across districts and yearly nationwide partisan swings.[12] By interacting federal spending and state economic growth rates with incumbency status, however, spending enters equation (3) in precisely the same manner specified in the theoretical model of the preceding section.

In applying equation (3) to the data, a few further decisions concerning the appropriate sample are required. First, as is standard in the literature, we exclude uncontested elections from our analysis. Uncontested elections create a problem since the true incumbent vote share is not observed.[13] Second, we drop all elections directly following a redistricting from our sample since the incumbency status in such districts is indeterminate. A third complication arises due to federal accounting procedures. For certain programs, all of a state's outlays are assigned to the state capital, regardless of where the money is actually spent. As a result the reported level of federal spending in districts that include state capitals is a very noisy measure of actual spending. In our sample, the average congressional district containing a state capital receives approximately twice the amount of

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[12] A Democrat who happens to win an election in a predominantly Republican district would not be expected to carry the same fraction of the vote as a Republican incumbent in the same district. The specification used here corrects for that factor.

[13] Excluding uncontested elections introduces a possible sample selection bias. If the likelihood that an incumbent is uncontested is a positive function of federal spending in the district, then excluding uncontested elections should cause our results to understate the true benefit of federal spending to incumbents.

federal outlays as the average district that does not contain a state capital. We therefore exclude all congressional districts that contain all or part of a state capital within their boundaries, which eliminates seventy-five districts from the sample.[14] After dropping uncontested elections and elections directly following a redistricting, we are left with a total of 1,067 observations.

Summary statistics for the data used in estimating equation (3) are presented in Table 2.[15] Results of the estimation using the district-level data are presented in Table 3. Column 1 provides estimates of M1, which uses own-district spending as the regressor. Column 2 corresponds to M2, where state average spending is substituted for own-district spending. Column 3 contains the IV estimates using spending in other districts in the state as an instrument for own-district spending.

The main theoretical prediction is that the coefficient on federal spending should increase moving from column 1 to 3 as omitted variable bias is eliminated. In fact, that prediction is borne out by the point estimates in Table 3 for high variation spending. In column 1, the theoretically most biased estimates, an additional $100 per capita of high variation federal spending in a district translates into a 0.42 percent increase in the incumbent's vote share.[16] When state-level averages are used (column 2), the coefficient on

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[14] Exclusion of state capitals is not required for M2, which uses state average per capita spending. For comparability, however, we exclude state capitals in those regressions as well.

[15] In Table 2, federal outlays per capita for the districts in our sample do not match the state mean federal outlays per capita because districts overlapping with state capitals are excluded from the sample.

[16] The standard deviation in high variation spending in our sample is $242. The *within-district* standard deviation in such spending in our sample is $79. The within-district variation is probably a more accurate reflection of a politician's short-run ability to alter federal spending

high variation federal outlays is more than twice as large: an additional $100 per capita to a district increases the incumbent's vote share by 0.99 percent, and is statistically significant at the .05 level. The IV estimates in column 3, as predicted by the model, provide the largest spending coefficient: an additional $100 per capita in high variation spending in the district earns the incumbent over 2 percent of the vote, and remains significant at the .05 level. The IV estimate is approximately five times larger than the M1 estimate in column 1. Although the point estimates are somewhat imprecise due to the short time series, they are consistent with the presence of omitted variable bias.[17]

As expected, the impact of low variation spending is much less pronounced than that of high variation spending. In fact, the point estimates for low variation spending are small in magnitude and negative across all three specifications, implying that low variation spending has a negative impact on incumbent fortunes. One interpretation of this result is that the state income growth rate variable is only an imperfect control for local economic conditions. Spending on means-tested low variation programs such as supplemental security income, low-income housing assistance, and payments to low-income veterans, will tend to be an increasing function of local economic hardship, while the incumbent's vote share is a declining function of economic hardship. Thus, the negative coefficient on low variation

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to the district. Therefore, a $100 shift in such spending represents, a substantial, but not unreasonable, change in spending.

[17] In light of the imprecision of the estimates, we are encouraged by the apparent robustness of the results to a wide range of specifications. Similar results are obtained when one-year spending totals replace two-year spending totals, when total district outlays replace per capita values, and when the ratio of a district's spending to other districts is used rather than spending levels.

spending may reflect the omission of better measures of local economic conditions.

While the pattern of coefficients in Table 3 is consistent with our model, the pattern is also consistent with an alternative model in which it is difficult to target federal dollars to particular districts, but not so difficult to target larger areas such as states. That being the case, legislators might devote most of their effort to getting federal spending for the *state*, making it rational for voters to key on state-level federal spending when judging their representative's performance.[18] From our perspective, it is of little consequence which model better describes reality; the important point is that regardless of the precise mechanism, our estimates provide strong evidence that federal spending is positively related to election outcomes.

The other parameter estimates in Table 3 are reasonable. An additional percentage point of state economic growth in the election year yields an extra 0.45 to 0.63 percentage points of the popular vote for the incumbent. Those results are in line with Erikson (1990).

Estimates of the incumbency advantage are also consistent with previous research (Gelman and King 1990, Levitt and Wolfram 1994). Incumbency is worth between 5 and 9.5 percent of the congressional vote. Although the differences across columns are not statistically significant (at the conventional .05 level), it is interesting to note that the

[18] That alternative model has different predictions when the sample is divided by state size. In our model, the spending coefficient in M2 should be larger for large states; in the alternative model, M2 is consistent and therefore is independent of state size. When we divide our sample in half by state size, the point estimate for large states is more than twice as large as that for small states, although their equality cannot be rejected due to large standard errors. Our model also predicts that the coefficient from M3 will be identical across small and large states, while the alternative model predicts that M3 will be larger in small states than large states: Again dividing our sample in half by state size, the point estimates from M3 are slightly bigger in large states, but the differences are statistically insignificant.

estimated incumbency advantage falls as better controls for federal spending are introduced. This suggests that the ability to obtain federal spending for the district may be an important component of the incumbency advantage.

The coefficients on the year dummies reflect the performance of Democratic candidates relative to the year 1990, which is the omitted year. As would be expected, 1984 is estimated to be an exceptionally good year for House Republicans, who benefitted from the Reagan landslide over Mondale. The 1986 midterm elections were slightly better for Democrats than 1990, while there was little partisan swing between 1988 and 1990.

4. Estimates Using State-Level Spending Data

The availability of district-level spending data makes it possible to estimate all three of the specifications M1-M3. Although state-level spending data only allows estimation of M2, it has a number of advantages over the data used in the preceding section. First, the time series (available on an annual basis in the Statistical Abstract of the United States) is much longer, extending from 1962-1990. Second, the state-level data covers a broader range of spending categories, including intergovernmental grants, Department of Defense prime contract awards,[19] federal wages and salaries, and direct payments to individuals. Average outlays per capita across the four categories over the period 1962-1990 were $2,462, with approximately sixty percent of the total in the form of direct payments to individuals. The

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[19] DOD prime contract awards account for approximately 75 percent of total federal procurement. State-level data on total procurement spending is only available beginning in 1982.

remainder of the spending is split fairly evenly across the remaining three categories.[20] Direct payments includes social security, medicare, and retirement benefits for veterans and federal employees, and thus is similar in composition to the "low variation" spending category of the previous section (but somewhat broader). The intergovernmental grants category most closely approximates "high variation" spending; approximately 80 percent of the high variation outlays in FAADS represent grants to state governments, local governments, public agencies, and schools and universities.

The specification employed for analyzing the longer time series is identical to equation 3, except that we allow the incumbency advantage to vary by decade. Uncontested elections and elections directly following redistricting are once again excluded from the analysis. Districts containing state capitals are included, however, since the federal accounting practice that necessitated their exclusion in the district-level spending equations are not relevant here. Removing state capitals has little effect on the estimates.

Because of the long time series, two further data considerations arise. First, in computing district-fixed effects, districts are treated as new districts each time redistricting occurs. Second, since the partisan affiliation of a district is likely to shift over time, any district that exists for a period of more than ten years without redistricting is treated as multiple districts, i.e. is allowed to have different intercepts for each ten year period.

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[20] These averages disguise a number of important trends. The overall level of federal outlays per capita in the four categories more than doubled in real terms between 1960 and 1990. Spending growth is concentrated in intergovernmental grants, which more than quadrupled (from a low base of $87 per capita), and direct payments to individuals, which increased from $514 per capita in 1960 to $2,122 per capita in 1990. Federal wages per capita actually declined over this period.

Table 4 presents regression estimates for the 1962-1990 time series. Column 1 provides results for the full sample. Columns 2 and 3 separate small and large states, with large states defined as those states with 15 or more Congressional districts. Columns 4 and 5 allow the spending coefficients to vary across the first and second halves of the sample, using 1976 as the breaking point.[21] Because only state-level federal spending data is available, all of the specifications in Table 4 are examples of model M2, and thus are comparable to column 2 of Table 3.

The results of Table 4 once again the confirm that federal spending has a positive effect on incumbents' electoral fortunes, except when that spending takes the form of transfers. Looking first at the full sample (column 1), an additional $100 per capita in federal grants is worth .89 percentage points of the popular vote to the incumbent and is highly statistically significant. Given that the grants category most closely approximates "high variation" spending in the FAADS data, it is reassuring to note that the coefficients obtained across the two data sets are very similar in magnitude (.0089 using the state-level data vs. .0099 using the district-level spending in Table 3). Federal wages and DOD prime contract awards also carry positive, but somewhat smaller, coefficients.[22] Both estimates are statistically significant at the .05 level. One reason for a smaller coefficient on DOD

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[21] Those cutoffs (15 districts as a large state, and 1976 as a breaking point) were chosen to roughly balance the number of observations across groupings. Other choices for the cutoffs yield very similar results.

[22] If all non-transfer spending is constrained to carry the same coefficient, an additional $100 per capita of expenditures is worth .40 percentage points of the vote to the incumbent (with a standard error=.05). That coefficient is lower than a simple average of the point estimates on the three types of spending since DOD spending accounts for a disproportionate amount of the variation in district spending.

prime contracts is that extensive sub-contracting makes prime contract awards a noisy measure of where federal dollars are actually spent. As was the case with the FAADS data, transfer spending carries a small and statistically insignificant coefficient.

The coefficient on state economic growth is smaller than in the preceding section, but it continues to be positive and is statistically significant at the .01 level. As expected, the incumbency advantage increases over time from somewhat less than 5 percent in the 1960s to almost 9 percent in the 1980s.

The model presented in Section 2 predicts that omitted variable bias will be a declining function of state size when state-mean spending data proxies for spending in the district. To test this hypothesis, we divide our sample into small and large states in columns 2 and 3 of Table 4. The results are consistent with the prediction of the model. For all three non-transfer spending categories, the point estimates for large states are approximately twice the magnitude of those for small states.[23] Transfer spending continues to have little impact on electoral outcomes.

A number of scholars argue that the importance of constituency service and service-oriented congressional campaigns has grown over time. For example, Calvert and Ferejohn (1983) find a decline in the effect of presidential coattails on congressional elections over the period 1956-1980, while Parker (1986) notes a steady increase in service indicators such as

[23] As the number of districts goes to infinity, M2 should provide consistent estimates. If we further restrict our definition of large states to include only states with 20 or more congressional districts, we obtain a coefficient on grants equal to .0179 (with a standard error=.0069). That estimate is very similar to the estimate from the IV regression on high variation spending using the district-level data (.0209, with SE=.0091), which will also be consistent if there are no spillovers across districts.

the number of days congressmen spend in their constituency. Congressional staffs, and mailings increased steadily during the 1960s and 1970s, and campaign spending increased sharply during the 1970s and early 1980s. Fiorina (1981) suggests that voter awareness of congressmen's activities may have increased over this period, partly due to more communication, and this in turn provides increased incentives for congressmen to perform for their constituents.

To test this hypothesis, we allow the spending coefficients to differ across the first and second halves of our time period, using 1976 as the breakpoint. The other coefficients of the model, such as district-fixed effects, are constrained to be constant across the time periods. As shown in columns 4 and 5 of Table 4, there is some support for those predictions. In the earlier period, additional grants provide a large benefit to incumbents, but neither federal wages nor DOD prime contracts has a statistically significant coefficient. In the latter period, the situation is reversed. Grants carry a smaller coefficient (although the null hypothesis of equality of the coefficients on grants across columns 4 and 5 cannot be rejected at the .05 significance level), while the effects of federal wages and DOD prime contracts are much higher. For both wages and contracts, the coefficients in columns 4 and 5 differ significantly from one another at the .05 level. If all non-transfer spending is constrained to have the same coefficient, an additional $100 per capita is worth .09 (standard error=.13) percentage points to the incumbent in the early period, and .46 (SE=.09) percentage points in the latter period.

We also investigated several models in which the electoral benefits of additional federal expenditures is allowed to vary by political party. One simple hypothesis is that voters reward Democratic incumbents more than Republicans, because as members of the majority party Democrats can more credibly claim credit for obtaining extra funds for their districts. One might also expect different types of expenditures to have different effects, due to differences in preferences for different types of expenditures by the parties' primary supporters. For example, Democratic incumbents might benefit more than Republicans from additional transfers or grants, while Republican candidates might be rewarded more for extra defense expenditures. We found no systematic evidence for these hypotheses in our data, however -- the differences between the parties are uniformly small and statistically insignificant.[24]

5. Conclusion

The results above provide strong evidence that increased federal spending in congressional districts helps incumbents win votes. This is especially true for the more discretionary, high variation spending programs (mostly federal grants), where our estimates imply that an additional $100 per-capita earns the incumbent approximately 2% more of the vote.

It is interesting to put this estimate in terms of the cost of "buying" votes. If an additional $100 per-capita produces 2% more votes, this means one vote costs about $14,000 (the average district population is about 500,000 and the average number of votes cast is about 175,000). Assuming that one additional federal job in a district costs about $70,000, each job is worth four votes to the incumbent.

[24] A complete set of regression results is available from the authors on request.

Are these electoral benefits large enough to justify a theory of budgetary politics based on individualistic, constituency-oriented, dollar-maximizing congressmen? Although this is too broad of a question for us to answer conclusively, a few back-of-the-envelope calculations are suggestive. The standard deviation of high variation spending across districts is just under $250, so a change of one standard deviation means an extra 5% of the vote. Over the past two decades, about 10% of all elections involving House incumbents have been won with less than 55% of the vote. Given that only about 5% of House incumbents have been defeated over the past two decades, 10% represents a very large change in an incumbent's reelection rate. When put in the context of a congressional career, the importance of the electoral effect grows even larger. For example, over the last two decades, 27% of all incumbents were involved in at least one election in which they obtained 45-55% of the vote -- in these races, a change in federal outlays might plausibly have affected the election outcome. Mathematically, a decrease in the one-shot reelection rate from .95 to .85 means a decrease from 20 to 6.67 in the expected number of terms served (ignoring retirements), and a decrease from .60 to .20 in the probability of surviving 10 terms (approximately the mean number of terms until a member becomes a committee chair).

While the estimated effect of increased federal grants is large and important, the electoral benefits of other types of spending, especially transfers, are less evident. Our results therefore suggest the need to differentiate between types of expenditures. For example, political party considerations might be especially important in explaining the development and allocation of certain transfer programs, but less so for sets of small, geographically concentrated programs..

Finally, our findings suggest that a congressman's effort is an important determinant of federal dollars going to his or her district. If this were not the case, then the various models we estimate should yield similar results. However, the coefficient from the instrumental variables model is five times larger than the basic OLS estimate. This finding suggests an explanation for some results in earlier studies, which find weak or insignificant relationships between a representative's seniority and the amount of federal dollars flowing into the district. Senior congressmen tend to hold safe seats, and therefore will tend to exert less effort on behalf of the district. Consequently, the observed correlation between seniority and federal outlays may be weak even if more senior representatives do have more influence over the allocation of spending than junior representatives. The true relationship between seniority and influence may be obscured by an omitted variable problem very similar to that faced in this paper.

Table 1: Largest Programs Included in FAADS

Low Variation Programs: Program	Annual Average Dollars Per District (in Millions)	C.V.	High Variation Programs: Program	Annual Average Dollars Per District (in Millions)	C.V.
Social Security (Retirement Insur.)	367	0.28	Highway Planning and Construction	36	3.65
Medicare (Hospital Insur.)	135	0.30	Food Stamps	29	3.84
Social Security (Survivors Insur.)	107	0.22	Family Support Payments to States	15	1.52
Medicare (Supplem. Med. Insur.)	77	0.36	Feed Grain Production Stabilization	11	3.12
Medical Assistance Program	74	0.62	Maintenance Assistance Payments	10	1.25
Social Security (Disability Insur.)	52	0.29	Local Education Grants (Educ. Deprived)	9	4.01
Supplemental Security Income	25	0.60	National School Lunch Program	8	3.68
Veterans Compensation for Service	22	0.42	Pell Grant Program	8	0.76
Social Insur. for Railroad Workers	17	0.65	Job Training Partnership Act	7	3.66
Lower Income Housing Assistance	11	0.60	Social Services Block Grant	7	4.12

Notes: Dollar values are average annual federal outlay per district over the period 1984-1990 for each program (in 1990 dollars). The cutoff between high and low variation programs is a coefficient of variation equal to .67. All data taken from FAADS, compiled by Bickers and Stein (1992).

Table 2: Summary Statistics for District-Level Spending Data, 1983-1990

Variable	Mean	Standard Deviation	Minimum	Maximum
Federal Outlays Per Capita (Districts)				
•High Variation	247	242	10	2,987
•Low Variation	1,527	409	499	3,570
Federal Outlays Per Capita (State Means)				
•High Variation	486	99	280	1,058
•Low Variation	1,524	319	699	2,735
%Δ State Per Capita Personal Income	.025	.019	-.034	.063
Democratic Share of the two-party vote	.531	.187	.12	.97
Incumbent Share of the two-party vote	.670	.093	.33	.97

Notes: Federal spending data drawn from FAADS data base compiled by Bickers and Stein (1991). High variation spending is defined as those programs with coefficients of variation across congressional districts of greater than .67. Spending data is for all districts in our sample, and therefore excludes districts with state capitals, contested elections, and elections directly following a redistricting. Consequently, outlays per capita for those districts do not match the values for the state means. All dollar values in 1990 dollars.

Table 3: Effects of Federal Spending on Election Outcome Using District-Level Data

Variable	(1) M1 (own-district spending)	(2) M2 (state-average spending)	(3) M3 (IV using other districts in state)
Federal Spending Per Capita (x 100)			
High Variation	.0042	.0099	.0209
	(.0021)	(.0048)	(.0091)
Low Variation	-.0020	-.0030	-.0022
	(.0011)	(.0014)	(.0011)
State Economic Growth	.450	.487	.631
	(.161)	(.170)	(.194)
Incumbency Advantage	.095	.071	.050
	(.018)	(.021)	(.034)
Year Dummies			
1988	-.002	-.002	.001
	(.005)	(.005)	(.006)
1986	.014	.014	.016
	(.006)	(.005)	(.006)
1984	-.027	-.025	-.027
	(.007)	(.006)	(.006)
Adjusted R^2	0.907	0.904	—
N	1,067	1,067	1,067

Notes: Dependent variable is democratic percentage of the two-party congressional vote. Spending, economic growth variables are interacted with the party of the incumbent so that the coefficient represents the impact on the *incumbent's* vote share. Estimates based on district-level data for 1984-1990, excluding districts that overlap with state capitals. Uncontested elections and elections directly following a redistricting are also excluded, leaving 1,067 observations. District-fixed effects are included in all regressions. White heteroskedasticity-consistent standard errors in parentheses in columns 1 and 2. Average spending in all other districts in the state is used as the instrument for district spending in column 3.

Table 4: Effects of Federal Spending on Election Outcomes using State-Level Spending Data

Variable	All Districts (1)	Small States (2)	Large States (3)	1962-1976 (4)	1977-1990 (5)
Federal Spending Per Capita: (x 100)					
Grants	.0089	.0062	.0127	.0157	.0055
	(.0020)	(.0025)	(.0035)	(.0041)	(.0029)
Federal Wages	.0053	.0043	.0089	-.0002	.0118
	(.0021)	(.0025)	(.0052)	(.0026)	(.0047)
DOD	.0028	.0022	.0038	.0008	.0044
	(.0007)	(.0008)	(.0014)	(.0010)	(.0009)
Transfers	-.0011	-.0019	-.0003	-.0018	-.0011
	(.0005)	(.0008)	(.0009)	(.0009)	(.0011)
State Economic Growth	.108	.176	-.022	.072	
	(.047)	(.064)	(.068)	(.060)	
Incumbency Advantage					
1980-1990	.084	.088	.077	.086	
	(.004)	(.006)	(.005)	(.004)	
1970-1978	.068	.071	.064	.069	
	(.003)	(.005)	(.005)	(.003)	
1962-1968	.047	.048	.047	.048	
	(.004)	(.005)	(.005)	(.004)	
Adjusted R^2	.883	.841	.915	.883	
F-test of All Non-Transfer Federal Expenditures?	<.01	<.01	<.01	<.01	
Number of Observations	3,766	2,023	1,743	3,766	

Notes: Dependent variable is democratic percentage of the two-party congressional vote. District-fixed effects and year dummies included in all regressions. Spending and economic growth variables are interacted with the party of the incumbent so that the coefficient represents the impact on the *incumbent's* vote share. Estimates based on district-level election data for 1962-1990. Uncontested elections and elections directly following a redistricting are excluded. White heteroskedasticity-consistent standard errors in parentheses. Small states are defined as states with 14 districts or less. The values for all non-spending coefficients are constrained to be equal across columns 4 and 5.

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