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The Political Determinants of Federal Expenditure at the State Level

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Abstract. It has been shown that states with higher per capita senate representation have higher federal spending per capita (Atlas, C. M., Gilligan, T. A., Hendershott, R. J. and Zupan, M. A. (1995). *American Economic Review* 85: 624–629). With a more recent data sample, more highly disaggregated data and a different set of political control variables, we are able to confirm the main result of Atlas et al. that per capita senate representation is positively related to federal expenditure. This effect is strongest for procurement expenditures. By contrast, we do not find support for their result that spending increases with per capita representation in the House of Representatives. Several other political variables are found to be significant in a subset of the expenditure equations.

1. Introduction

Small U.S. states are overrepresented in the Senate and overweighted in the electoral college. Atlas et al. (1995) have drawn attention to the effect of the overrepresentation of small states in the Senate by showing that per capita federal expenditure is positively related to per capita representation in the Senate.[1] Our data cover a later period and are disaggregated into five spending categories compared to the three considered by Atlas et al. In addition, we consider a broader set of political control variables in our regression equation. We confirm the most important result of Atlas et al., which is that state-level federal expenditure is positively related to per capita senate representation for that state. The effect is strongest for procurement spending. By contrast, we find evidence against their result that per capita representation in the House is positively related to per capita federal expenditure.

We include a variety of other political control variables in our analysis, and several of these variables are significant in a subset of our expenditure equations. Electoral votes is another variable which is a function of state size. Electoral votes are negatively associated with spending in several categories, with coefficients indicating that the overall effect is large. This reinforces the small state effect stemming from Senate representation.

We find evidence that states that voted for the sitting president receive less spending per capita compared to states where the sitting president lost by a narrow margin. Some other political variables are found to be both statistically

and economically significant, but in each case, only for a subset of the spending equations.

States are overrepresented in the senate, because each state has two representatives, regardless of the size of its population. Our empirical analysis gives us insight into the following counterfactual: What would the distribution of federal funds look like, if representation in the senate were proportional to population? It is worth noting that the equal representation of the states in the senate was one of the compromises which permitted the adoption of the U.S. Constitution. In particular, small states favored equal representation, while large states favored representation based on population. In the constitutional compromise, one house of the legislature (the senate) was based on equal representation, while in the other (the house) representation was proportional to population.[2]

2. Previous Literature

Atlas et al. (1995) drew attention to the role of overrepresentation by small states as a determinant of federal expenditure. They run regressions on per capita net spending, which is spending minus taxes and on spending and taxation separately. The political variables, per capita representation in the House and Senate are significant in explaining net spending and expenditure, but not taxes. As a result, in this paper, we will focus solely on expenditure and will not present any regression results on the determinants of per capita taxation.[3] The Atlas et al. data set covers the period 1972–1990, while our data cover the period 1983–1999.

The effects of representation that Atlas et al. estimate are economically significant. They estimate that the difference between the representation of the smallest and largest state in the senate (Wyoming and California) leads to a difference of $1,148 in per capita net federal spending. The difference between highest and lowest per capita representation in the House (South Dakota and Montana) results in a difference of $303 in net federal spending per capita.

Atlas et al. (1997) provide a theoretical model which is consistent with the small state effect on expenditure. In their model, senators can allocate time to national policymaking or local benefit seeking. They show that senators from small states will allocate more time to local benefit seeking than will the senators from large states.[4]

An important predecessor to Atlas et al. (1995) is the work of Wright (1974). He analyzes the political determinants of New Deal spending. Among his findings are that per capita New Deal expenditure has a strong positive relationship with electoral votes per capita. Bear in mind that electoral votes per capita is simply senators per capita plus representatives per capita. Thus, Wright's specification imposes the restriction that both

of these variables have the same effect on expenditure. He also finds that New Deal spending is positively related to an index which reflects the productivity of expenditure. The index provides a measure of how likely it is that a given expenditure will cause the state to vote Democratic in the next election.

In the wake of Wright's paper, a large literature has emerged debating the relative importance of political verses economic variables as determinants of New Deal expenditure.[5] A recent paper by Wallis (1998) draws together a number of these papers into a common framework. One of the variables that Wallis finds to be significant is 1/population, which is, of course, perfectly correlated with senators per capita. Fleck (2001a) comments on the Wallis paper. He points out that if the spending equation is misspecified, then this may bias the coefficient on 1/population (and thus on senators per capita). In fact, when Fleck adds land area per capita to the spending equation, he finds that the coefficient on 1/population becomes negative and statistically insignificant.[6] In our regression analysis, we include a land area per capita variable.[7] Fleck's discussion of missing variables, and Wallis's reply (p. 307 and thereafter) both suggest potential problems in interpreting the coefficient on the senators per capita variable.

Following Wallis (1998: 159), suppose that the spending equation is

$$S_i = a + bP_i + cX_i + \varepsilon_i, \tag{1}$$

where S is federal spending in state i, P_i is population, X_i is a vector of other variables, ε_i is an error, and a and b are constants and c is a vector of constants. The per capita spending equation is

$$S_i/P_i = a/P_i + b + cX_i/P_i + \varepsilon_i/P_i. \tag{2}$$

Since each state has two senators, the effect of senate representation is reflected in the constant term in Equation (1). Any factor (including missing variables) which causes there to be a positive constant in the spending equation will cause there to be a positive estimated effect of senate representation on per capita spending. These factors might include scale effects in federal expenditure. If certain administrative activities involve increasing returns to scale at low levels of activity, then small states might require a larger per capita level of expenditure to obtain the same level of service as large states.

This suggests that some care needs to be taken in interpreting the coefficient on senators per capita in Equation (2). We address this issue by breaking down spending into five different components, where we have different prior expectations about the effect of politics on spending in each category. Thus, we expect procurement to be subject to greater political pressures than retirement

spending.[8] Atlas et al. (1995) examine spending across three categories, defense, entitlement and all other spending (all per capita) and find that senate representation has significant effects on defense and all other spending. We generally find that the effect of senate representation is greater for categories in which we believe, a priori, that the distribution of spending across states is more subject to political pressure.

Lee (1998) uses the Bickers and Stein (1991) data on domestic outlays from 1983–1990, to analyze the effect of senate representation on federal spending. These data cover about 56% of total federal outlays, but do not include procurement or defense expenditure. Lee divides spending into three categories: redistributive, discretionary distributive and nondiscretionary distributive. The last category includes funding which is determined by formulas which are themselves a product of the political process.[9] It is only for this last category of expenditure that Lee finds a significant positive effect of senate representation on per capita state-level spending. In contrast to Lee, we look at a longer time period (1983–1999) and a broader range of federal expenditure which includes procurement spending. By analyzing a longer time period, we are able to include state fixed effects in our regressions, which Lee is unable to do.

Levitt and Snyder (1995) show that congressional districts with large numbers of Democratic voters receive more spending.[10] Their district-level data cover a period of unbroken Democratic control of the House of Representatives. Our state-level data cover a period of time when control of both the House and the Senate changed hands at least once. We include variables to account for each state's representation in the majority party in the House and Senate. We also include several variables to account for presidential influence in spending.

In a departure from the prior literature, Levitt and Poterba (1999) analyze the effects of political variables on state-level economic growth. They find several political variables to be positively associated with state-level growth. These variables include seniority in the House, but not the Senate. They find weak evidence of a relationship between House committee membership and economic growth. In their spending equations, they find no systematic relationship between either seniority or committee membership and federal spending.[11] This is in line with previous findings in the literature. As a result, we do not include these variables in our empirical analysis.[12] On the other hand, to allow for the possibility that leadership positions might matter for spending, we do include dummy variables for the senate majority and senate minority leaders.

Knight (2003) provides a recent analysis of the small state effect in federal spending. We will discuss how our results relate to that of Knight in the conclusion.

3. The Empirical Model

Table 1 contains a description of all variables used in this paper. Table 2 contains descriptive statistics for each of these variables.

3.1. *Dependent Variables*

Our dependent variable is per capita federal expenditure by state from the years 1983–1999. All spending figures are in 1998 dollars. The expenditure data are from the Bureau of the Census and are divided into five categories: Procurement, wages and salaries, retirement and disability, grants and other direct payments. These data cover all federal outlays except for interest payments on the debt.[13] The category "other direct payments" is dominated by payments to individuals, other than retirement and disability. These would include Medicare, unemployment insurance, AFDC/TANF, food stamps and housing subsidies. Many, but not all, of the programs in this category are redistributive in nature. The grants category includes formula grants and project grants. Lee's discussion of federal surface transportation spending suggests a strong role for senate representation in this category, through the effect on formula grant expenditure (Lee, 2000). The empirical work of Lee (1998) also suggests a strong role of senate representation in this category.

A priori, we expect that grants and procurement are the spending categories which will be most sensitive to our political variables. Our expectations for grants are informed by the previous work of Lee (1998, 2000). Procurement spending would seem to be particularly sensitive to political factors, as evidenced by numerous anecdotes of intervention by congressional representatives to prevent the Pentagon from killing a weapons project produced in his or her district. Retirement and disability and other direct payments should be least sensitive to our political variables, since they are mainly determined by eligibility factors such as age and income. We expect wages and salaries to be intermediate in the degree to which political variables affect the per capita spending figures. Clearly politics plays a major role in the initial decision about where to locate federal projects and administrative offices which will generate wage and salary payments to federal employees. Because many of these location decisions have a high degree of permanence, much of the political influence may be absorbed by the state fixed effects parameters which are included in our analysis.

If the estimated spending effect (in percentage terms) of senate representation is no larger in the categories where we expect senate politics to matter than in the categories where we believe it is not very important, then this would be evidence that the estimated effect is spurious. On the other hand, if we find large effects in the categories where we expect it to matter, then this is

Table 1. Definition of Variables

Independent variables	
Demographic	
INCOMES	State personal income estimates. In 1998 dollars.[a]
ELDERLY	Percent of population 65 years old and over.[b]
LANDAREA	Square miles of land area in state per capita.
Political	
ELECTORAL	State electoral vote counts from 1980 and 1990 census.[b]
SENATE	Per capita Senate representation.[c]
HOUSE	Per capita House representation.
GOVP	Governor in same party of sitting president (1 = same party, 0 otherwise).
HOUSEP	Percentage of house delegation in same party as sitting president.
SENATEP	Number of Senators in same party as president.
HMAJOR	Percentage of House delegation in majority party.
SMAJOR	Number of Senators in majority party.
VOTE	Sitting president won state in last election (1 = sitting president won state, 0 otherwise).[d]
MARGIN	Absolute value of margin of victory in most recent presidential election.
MAJLEADER	Senate majority leader (1 = state has senate majority leader, 0 otherwise)
MINLEADER	Senate minority leader (1 = state has senate minority leader, 0 otherwise)
Dependent variables	
SPENDING	Federal per capita expenditure by state from 1983 through 1999. In 1998 dollars.[e]
RETIREMENT	Federal employee retirement and disability benefits, social security payments, selected veterans programs.
OTHER	Direct payments to individuals other than for retirement and disability.
WAGES	Salaries to Department of Defense, Office of Personnel Management, Postal Service, and the Coast Guard.
GRANTS	Fellowships, scholarships, research grants, training grants, evaluations grants, survey grants, and others.
PROCUREMENT	All federal government procurement contracts excluding amounts for procurement in foreign countries.

[a] U.S. Department of Commerce Department of Economic Analysis Regional Accounts Data.
[b] Data from U.S. Census Bureau.
[c] Data from *Congressional Quarterly's Guide to U.S. Elections*.
[d] Data from *America at the Polls 1960–2000*.
[e] Data from U.S. Census Consolidated Federal Funds Report.

Table 2. Summary descriptive statistics for years 1983 through 1999

	Mean	Standard deviation	Minimum	Maximum
POPULATION	5,078,096	5,550,174	453,690	33,499,204
INCOMES	23,242.800	3,877.440	14,098.840	38,688.530
ELECTORAL	10.697	9.251	3.000	54.000
ELDERLY	0.122	0.021	0.028	0.185
SENATE	1.036	1.040	0.060	4.448
LANDAREA	70,747.54	85,172.90	1,044.90	571,951.30
HOUSE	1.760	0.208	1.079	2.501
GOVP	0.398	0.489	0.000	1.000
HOUSEP	0.445	0.282	0.000	1.000
SENATEP	0.995	0.760	0.000	2.000
HMAJOR	0.540	0.284	0.000	1.000
SMAJOR	1.053	0.759	0.000	2.000
VOTE	0.782	0.412	0.000	1.000
MARGIN	0.139	0.103	0.002	0.522
MAJLEADER	0.020	0.140	0.000	1.000
MINLEADER	0.020	0.140	0.000	1.000
SPENDING	5,231.76	984.415	3,502.000	8,825.000
RETIREMENT	1,729.360	238.424	777.751	2,545.14
OTHER	978.216	344.762	244.086	2,541.770
WAGES	749.744	469.312	261.014	3,126.670
GRANTS	870.075	296.272	401.041	3,005.64
PROCUREMENT	810.064	587.799	154.720	3,812.500

Table 3. Federal expenditures by category for year 1999

	SPENDING	RETIREMENT	OTHER	WAGES	GRANTS	PROCUREMENT
1999 federal expenditures[a]	1,451	505	332	157	276	179
Per capita ($)	5212.20	1816.84	1193.41	565.01	992.29	644.65
% of total spending	100	34.86	22.90	10.84	19.04	12.37

[a]For year 1999 expressed in billions of 1998 dollars.

consistent with the hypothesis that the overrepresentation of the small states leads to higher per capita spending in those states.

Table 3 shows, for 1999, the per capita values for total spending and for spending in each of our five categories. In addition, each category's percentage of total expenditure is displayed in this table.

3.2. *Independent Political Variables*

Following the lead of Atlas et al., we include variables which reflect per capita representation in the senate (SENATE) and house (HOUSE). Each of these variables is scaled so that we have senators and representatives per million population. We are also interested in how other political variables affect per capita federal spending at the statewide level. Presumably, variables relating to both the Congress and to the presidency might influence per capita federal spending.[14] Our congressional variables include the percentage of the house delegation in the House majority party (HMAJOR) the number of senators in the senate majority party (SMAJOR). We also have dummy variables for senate majority leader (MAJLEADER) and senate minority leader (MINLEADER). All the independent variables listed thus far are lagged by one year to account for lag in the budget cycle. (The 1982 Congress sets the 1983 budget, etc.)

The presidential variables include the percentage of the house delegation in the party of the president (HOUSEP), the number of senators in the party of the president (SENATEP) and a dummy variable indicating whether the state's governor is affiliated with the party of the president (GOVP = 1 if governor is the same party as the president). These variables are also lagged by one year. We also include the number of the state's electoral votes (ELECTORAL), the absolute value of the margin of victory in the state in the most recent presidential election (MARGIN) and a dummy variable which indicates if the sitting president won the state in the last election (VOTE = 1 if sitting president won the state). We interact the VOTE and MARGIN variables to form the variable MARVOTE. If the president acts to increase spending in states where the last election was close, then MARGIN will have a negative coefficient, and if presidents attempt to reward states which voted for them, then the VOTE dummy variable should have a positive coefficient. The MARVOTE variable will allow us to distinguish the effect of MARGIN in states the president won by a narrow margin from those where the president lost by a narrow margin. The other political variables are all expected to have a positive sign, assuming they reflect channels through which federal spending is determined.

We use the electoral votes based on the 1980 census until the 1991 budget year and the electoral votes based on the 1990 census thereafter. Note that electoral votes serve as another scale variable, which we include because small states are overrepresented in the electoral college. If the coefficient is negative then larger states receive less spending on a per capita basis. Electoral votes are highly correlated with population, while senators per capita is proportional to 1/population. Electoral votes have a $-.56$ correlation with senators per capita. Another problem with the ELECTORAL variable is that only one census intervenes in our sample, so we only have two observations for each state. As a robustness check, we present results without ELECTORAL and another set

of results where POPULATION replaces ELECTORAL. The estimated effect of senators per capita is robust to these alternative specifications.

3.3. *Independent Control Variables*

We include real state per capita income as an explanatory variable. To the extent that federal expenditure is redistributive in nature, this variable will have a negative coefficient. We also include the percentage of a state's population which is elderly (65 years and over). This is obviously an important variable for explaining federal retirement spending and spending on the Medicare program. Because it has been shown to be important in previous work, we also include land area per capita as a control variable. This variable is the inverse of population density. Among other things, this variable may help control for scale effects if, for example, it is less expensive to service more densely populated states. We run fixed effects regressions which includes both state and year dummies.[15] The state-level dummies will help us control for factors, such as proximity to Washington, DC, which do not vary over time.

4. Results

The first set of regression results is presented in Table 4.[16] The SENATE variable is generally statistically significant at the 1% level, with the exceptions of the PROCUREMENT equation, where it is significant at the 5% level, and the OTHER equation, where it is not significant at conventional levels. As discussed earlier, there is some difficulty in interpreting the coefficient on SENATE, since a missing variable in the spending equation which causes the intercept to be positive will lead to a positive coefficient on SENATE in the per capita spending equation. Thus we have an estimate with strong statistical significance in the retirement spending equation, where we would not expect senate representation to play much of a role.[17] The coefficient implies than an increase in one senator per million population will raise per capita retirement spending by $120. This represents 6.6% of retirement spending per capita in 1999. Note that the other political variables either are insignificant in the retirement spending equation, or have coefficient estimates which are small in magnitude.

Since it is unlikely that senate representation is playing a large role in retirement spending, we would expect to see a larger effect, in percentage terms, of senate representation in spending categories which are more political in nature. If we do not find this, then it will seriously call into question the proposition that the SENATE variable is reflecting political factors. Procurement is a clear example where senate representation has a statistically significant effect which is of a much larger magnitude than the estimated effect on retirement spending. The coefficient estimate implies that increasing

Table 4. Partial regression results for per capita federal expenditures by category[a]

	SPENDING	RETIREMENT	OTHER	WAGES	GRANTS	PROCUREMENT
Intercept	7080.90***	1163.88***	455.79*	1853.68***	421.49***	1659.42***
	(12.09)	(16.88)	(1.94)	(12.70)	(2.90)	(3.82)
INCOMES	−0.153***	−0.012***	−0.023***	−0.005	−0.012***	−0.057***
	(−9.70)	(−6.95)	(−3.78)	(−1.38)	(−3.17)	(−4.87)
ELECTORAL	−55.94***	−9.69***	−2.54	−14.05***	−3.54	−24.20***
	(−5.51)	(−8.11)	(−0.63)	(−5.56)	(−1.41)	(−3.21)
ELDERLY	7169.97**	7440.42***	5570.53***	−7326.75***	2639.55***	4186.66
	(2.09)	(18.40)	(4.05)	(−8.56)	(3.10)	(1.64)
SENATE	962.20***	119.78***	81.77	173.16***	108.39***	247.55**
	(6.03)	(6.38)	(1.28)	(4.35)	(2.74)	(2.09)
LANDAREA	586.27	71.64	804.76	−1244.32***	−968.22***	2369.05**
	(0.43)	(0.44)	(1.47)	(−3.65)	(−2.85)	(2.33)
HOUSE	−100.59	−2.14	−57.03	11.78	37.70	−103.03
	(−0.97)	(−0.18)	(−1.37)	(0.46)	(1.47)	(−1.34)
GOVP	41.72*	4.30	9.13	−16.50***	0.87	38.99**
	(1.72)	(1.51)	(0.94)	(−2.73)	(0.14)	(2.16)
HOUSEP	70.42	6.39	1.24	2.59	44.77***	0.53
	(1.51)	(1.16)	(0.07)	(0.22)	(3.86)	(0.00)
SENATEP	14.60	−0.76	4.82	−3.28	15.06***	−5.27
	(0.77)	(−0.34)	(0.63)	(−0.69)	(3.20)	(−0.37)
HMAJOR	29.96	−1.10	53.71***	−43.59***	24.68**	−9.00
	(0.74)	(−0.23)	(3.33)	(−4.34)	(2.47)	(−0.30)
SMAJOR	−0.10	0.73	6.72	−8.44*	5.70	1.65
	(−0.01)	(0.31)	(0.83)	(−1.69)	(1.14)	(0.11)
VOTE	−236.69***	−11.40**	−65.21***	−1.20	−16.68	−108.36***
	(−4.82)	(−1.97)	(−3.32)	(−0.10)	(−1.37)	(−2.97)
MARGIN	−2332.49***	−37.59	−774.72***	−396.79***	113.43	−688.10*
	(−4.46)	(−0.61)	(−3.70)	(−3.05)	(0.88)	(−1.77)
MARVOTE	2290.86***	−27.75	1090.59***	419.18***	20.93	568.74
	(4.49)	(−0.46)	(5.33)	(3.30)	(0.17)	(1.50)
MAJLEADER	107.18	4.32	50.65	−19.12	4.44	78.63
	(1.27)	(0.44)	(1.50)	(−0.91)	(0.21)	(1.26)
MINLEADER	43.81	12.70	11.48	−42.41*	23.37	27.11
	(0.46)	(1.14)	(0.30)	(−1.80)	(1.00)	(0.39)
Adjusted R^2	0.915	0.979	0.888	0.976	0.942	0.868

[a]The t-statistics are presented in parentheses. All regressions include state and time fixed effects. The complete estimation results are available from the authors.
*,**,***denote significance at the 10, 5, and 1% levels, respectively.

senate representation by one per million population raises procurement expenditure by $248 per capita. While this would be a very large increase in senate representation, this represents 38% of per capita procurement spending in 1999. The coefficient implies that doubling the population of a state from

2 to 4 million would cut procurement spending by $124 per capita, or 19% of the total average per capita.

There are a few things to note about the size of this estimated coefficient. First, an increase in representation of 1 senator per million population is large. Increasing population from 1 million to 2 million will reduce senate representation from two per million to one per million. Reducing representation from one per million to zero requires, of course, that population rise to infinity. Second, to the extent that there are missing variables in the spending equation or scale effects in expenditure, the coefficient estimate may be too large relative to the true effect. Still, we find it strongly encouraging that we find a large effect in a category where we expect politics to matter a priori.

The coefficient on GOVP is significant at the 5% level in the procurement equation and indicates that having a governor of the same party as the president increases procurement spending by $39 per capita. On the other hand the VOTE variable (significant at the 1% level) indicates that states which vote for the president receive $108 less per capita in procurement spending. MARGIN is significant at the 10% level, and MARVOTE is not quite significant at the 10% level. Taken together, the point estimates of these coefficients imply that states where the president lost narrowly receive more spending than either states where the president won, or states where he lost by a large margin.[18] In particular, a 50/50 state where president loses receives almost $138 more in per capita procurement spending than a state where the president loses 60/40. The other political variables (except ELECTORAL discussed later) generally do not have a statistically significant effect on procurement spending, and have point estimates which indicate a relatively small effect on spending.

Our a priori expectation was that GRANTS category would be highly sensitive to political variables, and SENATE is significant in this category at the 1% level. The point estimate implies that one more senator per million population leads to an increase of about $108 in per capita spending. This represents 10.9% of spending in this category. This is larger than the estimated 6.6% increase in retirement spending that would be caused by the same increase in representation. This finding is in line with the findings of Lee (1998, 2000). Some of the presidential variables are significant in this category, and this may reflect the role of executive agencies in awarding project grants. The estimated coefficients suggest that the spending effects of these variables are not very large. The coefficient on HOUSEP indicates that going from 0 to 100% of the house delegation being the same party of the president increases per capita grants by $45. This is about 4.5% of per capita spending in this category. The SENATEP variable indicates that each senator that is in the president's party is worth about $15 in per capita grants spending.

A priori, we expected political influence to be moderately important in the WAGES regression. The SENATE variable is significant at the 1% level and implies that increasing the number of senators by one per million population increases wages and salary expenditures by $173 per capita. This represents about 31% of total per capita wage and salary expenditure. Thus, the estimated effect is quite large. If there are scale effects in setting up federal administrative offices, then this may be an overestimate of the effect of senate representation. Note, however, that in percentage terms, this is a much larger effect than we observe in retirement spending, where we do not believe that senate representation plays a true role.

VOTE has a point estimate very near zero. Some other political variables are statistically significant, but have perverse signs. The percentage of the house delegation (significant at the 1% level) in the majority party is estimated to have a negative effect on wage and salary expenditure as is the number of senators in the majority party (significant at the 10% level). Similarly, having the governor share the party with the president (significant at the 5% level) is estimated to cost the state $16.5 in per capita wage and salary expenditure. Finally, the home state of the senate minority leader (significant at the 10% level) is estimated to received $42 less in per capita wages and salary spending.

The category OTHER contains many redistributive spending programs. A priori, we do not expect our political variables to have a very strong influence in predicting these expenditures. The SENATE variable is not statistically significant and has a relatively small point estimate; an increase of one senator per million population raises OTHER spending by 6.9%. This is similar to the estimated effect on retirement spending.

The HMAJOR variable (significant at the 1% level) indicates that moving from 0% of the house delegation in the majority party to 100% increases federal payments to individuals by almost $54 per capita, which is about 4.5% of total per capita spending in this category. The MARGIN variable is significant at the 1% level, and implies that a state the president loses by 60/40 vote in the last election receives $155 less in per capita OTHER spending compared to a state the president lost with a 50/50 vote. The VOTE variable has a perverse sign which implies that states which voted for the president receive $65 less in per capita spending in the OTHER category.

The total effects of our variables across all categories may by found in the SPENDING equation. In this equation, SENATE is strongly significant. The coefficient indicates that an increase in representation by one senator per million raises spending by $962 per capita, which is 18% of 1999 per capita spending in this category. It is likely that this overestimates the true effect of representation because of the missing variables problem. The only other variables which are statistically significant are presidential variables. The GOVP variable (significant at 10%) indicates that having the governor share the same

party as the president results in a $42 increase in per capita expenditure. The VOTE (significant at the 1% level) has a negative sign indicating that states which voted for the sitting president receive $237 less per capita in federal spending.

The MARGIN variable (significant at 1%) indicates that toss-up states which the president lost in the last election receive $466 more in per capita spending than states the president lost by a 60/40 margin. The coefficient on MARVOTE is opposite in sign and approximately equal in magnitude to the coefficient on MARGIN. This indicates that spending in states where the president won in the last election is largely independent of the margin of victory. Taken together, the VOTE, MARGIN and MARVOTE variables indicate that all states where the president won, and all states where the president lost by more than 10 percentage points have negative spending effects, while states where the president lost by less than 10 percentage points have positive spending effects.

Among the nonpolitical variables we find the expected signs. Per capita income is negatively related to federal spending, while the percent elderly is positively related. The coefficient on INCOME implies a rather large effect. If per capita income rises by $1000, then federal spending falls by $153 dollars per capita. This indicates the federal spending is strongly redistributive in its nature. LANDAREA is not significant in the overall spending equation, but is strongly significant in three of the subcategories. It has a positive estimated effect in the PROCUREMENT equation and a negative estimated effect in WAGES and GRANTS.

The ELECTORAL variable is strongly significant in the total spending equation and is significant at the 1% level in three of the five individual categories as well. The total effect it implies in the spending equation is rather large. The coefficient implies that going from 3 electoral votes to 54 (i.e., from the smallest state to the largest) is estimated to reduce spending by over $2800 per capita. This appears to be an implausibly large effect. Note that the largest negative effect of ELECTORAL occurs in procurement spending. A weakness of this variable is that there are only two different observations for each state, because only one census intervenes in our sample.

In Table 5 we show the results when the ELECTORAL variable is omitted. The effect of senate representation is largely robust to this change, as are the VOTE and MARGIN variables. The point estimate on senate is slightly larger in the spending equation, while the point estimates on VOTE, MARGIN and MARVOTE are slightly smaller in magnitude. In addition, the HOUSE variable has become significant at the 10% level with a negative coefficient (though one which is fairly small in magnitude). This contrasts quite sharply with the Atlas et al. result that HOUSE has a significant positive coefficient.

In Table 6, we add POPULATION (in millions) to the right-hand side of our regressions. This variable is highly correlated with ELECTORAL, but

Table 5. Partial regression results for per capita federal expenditures by category without ELECTORAL[a]

	SPENDING	RETIREMENT	OTHER	WAGES	GRANTS	PROCUREMENT
Intercept	5883.75***	956.43***	401.32*	1552.94***	345.64**	1141.38***
	(10.62)	(14.34)	(1.84)	(11.24)	(2.56)	(2.81)
INCOMES	−0.131***	−0.009***	−0.022***	0.0001	−0.011***	−0.047***
	(−8.42)	(−4.86)	(−3.75)	(0.03)	(−2.90)	(−4.17)
ELDERLY	10804***	8070.11***	5735.86***	−6413.94***	2869.76***	5759.04**
	(3.15)	(19.53)	(4.25)	(−7.49)	(3.43)	(2.29)
SENATE	1098.21***	143.35***	87.95	207.33***	117.01***	306.40***
	(6.84)	(7.42)	(1.39)	(5.18)	(2.99)	(2.60)
LANDAREA	−257.98	−74.66	766.34	−1456.41***	−1021.71***	2003.71**
	(−0.19)	(−0.45)	(1.41)	(−4.21)	(−3.03)	(1.97)
HOUSE	−194.36*	−18.39	−61.30	−11.77	31.76	−143.60*
	(−1.86)	(−1.47)	(−1.50)	(−0.45)	(1.25)	(−1.88)
GOVP	29.31	2.15	8.56	−19.61***	0.08	33.62*
	(1.19)	(0.73)	(0.89)	(−3.20)	(0.01)	(1.86)
HOUSEP	45.44	2.06	0.10	−3.68	43.19***	−10.75
	(0.96)	(0.36)	(0.01)	(−0.31)	(3.74)	(−0.31)
SENATEP	13.62	−0.93	4.77	−3.53	14.99***	−5.69
	(0.70)	(−0.40)	(0.63)	(−0.73)	(3.18)	(−0.40)
HMAJOR	24.92	−1.97	53.48***	−44.85***	24.37**	−11.18
	(0.61)	(−0.40)	(3.32)	(−4.38)	(2.44)	(−0.37)
SMAJOR	−1.74	0.45	6.64	−8.85*	5.60	0.95
	(−0.08)	(0.18)	(0.83)	(−1.73)	(1.12)	(0.06)
VOTE	−218.39***	−8.22	−64.38***	3.39	−15.52	−100.44***
	(−4.38)	(−1.37)	(−3.28)	(0.27)	(−1.28)	(−2.74)
MARGIN	−1955.80***	27.68	−757.58***	−302.16**	137.29	−525.10
	(−3.70)	(0.44)	(−3.65)	(−2.30)	(1.07)	(−1.36)
MARVOTE	2053.11***	−68.95	1079.78***	359.45***	5.86	465.86
	(3.96)	(−1.11)	(5.30)	(2.78)	(0.05)	(1.23)
MAJLEADER	114.68	5.62	50.99	−17.24	4.92	81.87
	(1.34)	(0.54)	(1.51)	(−0.81)	(0.24)	(1.30)
MINLEADER	66.58	16.65	12.51	−36.69	24.81	36.96
	(0.69)	(1.44)	(0.33)	(−1.53)	(1.06)	(0.52)
Adjusted R^2	0.911	0.978	0.888	0.975	0.942	0.866

[a]The t-statistics are presented in parentheses. All regressions include state and time fixed effects. The complete estimation results are available from the authors.
*,**,***denote significance at the 10, 5, and 1% levels, respectively.

unlike ELECTORAL, it varies year by year in each state. Like ELECTORAL, POPULATION is a scale variable, though it does not have the same obvious political interpretation. A negative sign on POPULATION implies that states with high populations receive less in per capita federal expenditure than do states with low populations. The SENATE variable is robust to the inclusion of this additional scale variable. The POPULATION variable is statistically

Table 6. Partial regression results for per capita federal expenditures by category with POPULATION[a]

	SPENDING	RETIREMENT	OTHER	WAGES	GRANTS	PROCUREMENT
Intercept	7827.85***	1365.77***	229.46	1921.82***	477.40***	2048.49***
	(13.82)	(22.85)	(0.98)	(13.03)	(3.30)	(4.78)
INCOMES	−0.147***	−0.012***	−0.021***	−0.002	−0.012***	−0.055***
	(−9.91)	(−7.99)	(−3.49)	(−0.79)	(−3.18)	(−4.90)
POPULATION	−212.73***	−44.79***	18.80**	−40.36***	−14.41**	−99.26***
	(−9.26)	(−18.47)	(1.98)	(−6.89)	(−2.45)	(−5.71)
ELDERLY	2076.09	6232.45***	6507.36***	−8069.92***	2278.28***	1686.83
	(0.61)	(17.40)	(4.64)	(−9.32)	(2.62)	(0.66)
SENATE	1117.08***	147.32***	86.29	210.91***	118.29***	315.20***
	(7.33)	(9.16)	(1.37)	(5.42)	(3.03)	(2.73)
LANDAREA	−285.36	−80.42	768.76	−1461.61***	−1023.57***	1990.94**
	(−0.22)	(−0.58)	(1.41)	(−4.36)	(−3.04)	(2.00)
HOUSE	−104.69	0.48	−69.23*	5.23	37.84	−101.76
	(−1.05)	(0.05)	(−1.69)	(0.21)	(1.49)	(−1.35)
GOVP	46.84**	5.84**	7.01	−16.29***	1.27	41.80**
	(2.00)	(2.36)	(0.72)	(−2.73)	(0.21)	(2.36)
HOUSEP	85.87*	10.57**	−3.46	3.99	45.93***	8.11
	(1.90)	(2.21)	(−0.19)	(0.35)	(3.97)	(0.24)
SENATEP	21.27	0.67	4.10	−2.08	15.51***	−2.13
	(1.16)	(0.35)	(0.54)	(−0.44)	(3.30)	(−0.15)
HMAJOR	49.98	3.29	51.27***	−40.10***	26.06***	0.50
	(1.28)	(0.80)	(3.18)	(−4.02)	(2.61)	(0.02)
SMAJOR	2.98	1.45	6.23	−7.96	5.92	3.15
	(0.15)	(0.71)	(0.78)	(−1.60)	(1.19)	(0.21)
VOTE	−270.53***	−19.20***	−59.77***	−6.49	−19.06	−124.77***
	(−5.67)	(−3.81)	(−3.03)	(−0.53)	(−1.56)	(−3.45)
MARGIN	−2975.17***	−186.95***	−667.47***	−495.58***	68.21	−1000.73**
	(−5.80)	(−3.45)	(−3.15)	(−3.79)	(0.52)	(−2.58)
MARVOTE	2911.60***	111.80**	1003.89***	522.35***	64.04	866.42**
	(5.82)	(2.12)	(4.85)	(4.09)	(0.50)	(2.29)
MAJLEADER	90.51	0.53	53.13	−21.82	3.28	70.60
	(1.11)	(0.06)	(1.58)	(−1.05)	(0.16)	(1.14)
MINLEADER	10.65	4.87	17.46	−47.30**	21.02	10.87
	(0.12)	(0.50)	(0.46)	(−2.02)	(0.90)	(0.16)
Adjusted R^2	0.920	0.984	0.889	0.977	0.942	0.872

[a]The t-statistics are presented in parentheses. All regressions include state and time fixed effects. The complete estimation results are available from the authors.
*,**,***denote significance at the 10, 5, and 1% levels, respectively.

significant in all equations and has a negative sign in four out of five of the spending categories. The magnitude of the coefficient on POPULATION in the SPENDING equation indicates a large negative effect of increased population on per capita expenditure. In particular, a 1 million increase in population is estimated to cause a $213 decrease in per capita federal spending. As

with ELECTORAL, the largest negative effect of POPULATION occurs in procurement spending.

Whether we focus on electoral votes, senators per capita or population, our results strongly support a small state effect in federal expenditure. It is plausible that some of this results from scale effects in the production of government services which make it more expensive to provide government services in low population states. To the extent that scale effects are manifested in program administration, these effects would tend to be strongest in the WAGES category. It is less clear what role scale effects would play in other spending categories.

It would be very surprising if a significant portion of the SENATE spending effect could not be attributed to the overrepresentation of small states in the U.S. senate. As shown in Tables 4, 5 and 6, the size effect on expenditure is strongest for procurement, a category generally believed to be subject to a high degree of political pressure. This is true whether size is measured by senators per capita, population or number of electoral votes.

5. Conclusion

We have used several political variables in an attempt to explain federal spending at the state level. Consistent with Atlas et al., we find that representation in the senate is positively related to per capita spending. While we have noted some problems associated with interpreting the coefficient on this variable, we find the strongest effect in a spending category, procurement, where we expect political factors to play a large role. The next largest effect of senate representation is found in the wages and salaries spending category. Again, this is a category where we would expect politics to play at least a moderately important role. Senate representation also has an effect on grants spending, which is in line with the previous work of Lee (1998, 2000).[19] The effects of senate representation on expenditure are much smaller for retirement spending and the category OTHER. For these categories we would not expect, a priori, that senate representation would play an important role for spending.

Taken together, these results strongly suggest, but do not prove, that the regressions for procurement, grants and wages and salaries are picking up a political effect from senate representation. However, the coefficients may reflect other factors, such as scale effects in spending or missing variables; so some caution is warranted in interpreting the implied magnitude of the spending effect.

Knight (2003) provides additional evidence on the question of whether or not the small state effect derives from representation in the senate. He contrasts the effect of senate representation on aggregate federal expenditure with its effect on earmarked project spending. Earmarked spending is often referred to as pork barrel spending, and so this is clearly a highly politicized

category. He finds larger effects of senate representation on the earmarked projects and finds the largest effect on earmarks originating in the senate. As with our results on procurement spending, it appears that more highly politicized categories of spending are subject to a larger small state effect. This supports the idea that senate representation is important in driving this empirical finding.

In contrast to Atlas et al., we do not find a positive relationship between house representation per capita and spending per capita. Several previous studies have used an electoral votes per capita variable (e.g., Wright 1974; Anderson & Tollison 1991). This implicitly places a restriction on the model that senators per capita and representatives per capita have the same effect on spending. Our results suggest that these variables be entered separately in a regression equation.

The small states do appear to enjoy an advantage in the distribution of federal funds stemming from their overrepresentation in the U.S. Senate. Because this overrepresentation is embedded in the constitution, the small state advantage in obtaining federal funds is likely to persist into the indefinite future.

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Notes

1. One important predecessor to their work is Bennett and Mayberry (1979) who also point out the importance of per capita representation. Bennett and Mayberry have a more narrow focus, as their study looks only at grants spending.
2. This compromise also reflected two different impulses. One was the democratic impulse, reflected in the institution of the house. The second impulse reflected the idea that states were sovereign and that therefore each should have equal representation, as reflected by the senate. See the discussion in *The Federalist No. 62*.
3. Clearly, taxes are determined in a political process, but in taxation the issue is transfers between income groups rather than between regions. Once per capita income is controlled for, political variables have a negligible effect in the equation explaining per capita taxation.
4. Also see the theoretical model developed by Knight (2003).
5. In addition to the papers mentioned later, other contributions to this literature include Arrington (1969, 1970), Reading (1973), Anderson and Tollison (1991) and Couch and Shughart (1998).
6. This is motivated in part by the fact that land area may play a role in formula spending (Fleck 2001a: 299).

7. Bennett and Mayberry (1979) also include a land area variable.
8. This is not to say that Social Security spending is nonpolitical, but rather that it is about transfers between generations and between income groups, not between regions of the country.
9. Lee (2000) illustrates this point by providing an interesting analysis of coalition building in federal transportation spending. This analysis clearly illustrates the advantages small states receive in this process.
10. They also use the Bickers and Stein data.
11. They also find that having competitive races at either the level of the House district or in the previous presidential election increases growth, but again they find no systematic relationship with spending. We include one competitiveness variable, the margin in the previous presidential election, and do find a spending effect, but only in states where the president lost.
12. Also notable is the work of Fleck (1999, 2001b) who uses county-level data to focus on the role of turnout in the determination of New Deal spending. Fleck (2001b) distinguishes between the role of loyal and swing voters, and finds that their influence depends on whether the primary or the general election is more important in their district.
13. In addition, the location of certain defense procurements is classified, procurements under $25,000 are not allocated by location in the data set and judicial and legislative branch procurements are not included.
14. Much of the literature on the New Deal has emphasized the role of the president.
15. The results of a Hausman test indicate that fixed effects, rather than random effects, is the appropriate empirical model.
16. For all of our regressions we tested for autocorrelation using the Durbin–Watson test and for heteroscedasticity using the Lagrange multiplier test. The hypotheses that the residuals are serially uncorrelated and homoscedastic are never rejected. In addition, our results are not very sensitive to the exclusion of outliers.
17. The retirement category is dominated by social security spending, but does also include retirement income of federal workers. To the extent that the small state effect increases (on a per capita basis) the number of federal employees in a state, and assuming most of these workers retire in the same state, this could explain the significance of the senate variable in the retirement spending category.
18. The positive coefficient on MARVOTE largely offsets the negative coefficient on margin, so that for states where the president won, margin is unimportant in determining spending. While the margin in these states does not matter, the coefficient on VOTE indicates that these states receive less spending overall.
19. The SENATE effect on grants spending is sensitive to the inclusion of land area per capita. When this variable is dropped, SENATE is no longer statistically significant in the GRANTS equation. By contrast, dropping land area per capita makes senate spending more significant in the procurement equation.

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