Allocating the US Federal Budget to the States: the Impact of the President

Valentino Larcinese, Leonzio Rizzo, Cecilia Testa

Statistical Appendix

1 Summary Statistics (Tables A1 and A2)

Table A1 reports average per capita federal outlays by state during the period 1982-2000 (expressed in real $ for the year 2000). Table A2 reports summary statistics of the variables used in the paper.

2 More on the swing-voter hypothesis (Table A3)

In the paper we reach the conclusion that swing states do not receive more federal funds, while states where the president obtains a larger share of votes tend to be rewarded. Our conclusion does not depend on the specific measure we use. In the paper we define a swing state in the following way:

- Define *swing_last* as a dummy equal to 1 if the state swung at the last presidential election. Let $i = 1, 2, 3, 4$ indicate the four previous presidential elections at each given time. Also, t indicates the years and $k = 1, ...48$ indicates a state; then

$$swing1_{kt} = \sum_{i=1}^{4} swing\_last_{kt}/4\,.$$

  In other words, *swing*1 (indicated in the table as *Long term swing 4 years average)* is the average of *swing_last* over the previous four elections.

In this Appendix we report regressions where two alternative measures have been used. In column 1 of Table A3 we report regressions where *swing_last* has been used instead of swing. In column 2 of table A3 we use instead a variable defined as follows:

- Let $i = 1, 2, ...N$ indicate at each given time all previous presidential elections since 1964. Also, t indicates the years and $k = 1, ...48$ indicates a state; then

$$swing2_{kt} = \sum_{i=1}^{N} swing\_last_{kt}/N\,.$$

In other words, *swing*2 (indicated in the table as *Long term swing since 1964)* is in this case the average of *swing_last* over all elections between 1964 and t.

The results in table A3 show that such variations make very little difference. Our results are robust to the use of such alternative variables and continue to support the idea that swing states do not have any statistically significant advantage in terms of the receipt of federal funds.

In the column 3 of Table A3 we report an additional specification of the swing-voter hypothesis. While we show that swing states do not receive more funds, it is still possible that the direction of the swing matters. In other terms, a greater allocation of funds could be expected for states that swing in the direction of the president as opposed to states that move away from him. Thus, in column 3 we introduce a dummy variable equal to 1 for states that swung in the direction of the president in the last election and an interaction term between this dummy and the swing variable. Both the dummy and the interaction turn out to be statistically insignificant. We conclude from this analysis that swing states do not receive more federal funds.

3 More on alignment (Table A4)

Table A4 reports further results on alignment discussed in note 20 in the paper.

4 Robustness (Table A5)

In Table A5 we report the results of our robustness check. From column 1 it is clear that all the results previously obtained on individual variables (or group of variables) are substantially confirmed by this check. In particular, the share of votes for the president and the party alignment between the president and the governors have a positive impact and are statistically significant at the 5% level. The alignment of the president with the majority of state delegates in the House is positive and significant at 10% level. As discussed in the paper, many reasons can induce a president to support friendly governors. To shed further light on this relationship, in column 2 we introduce a dummy equal to 1 if the state has a gubernatorial election in a given year and we also interact this dummy with the governor-president alignment variable. If the president supports the re-election prospects of friendly governors then the interaction term should be positive. This turns out to be the case: while the size and significance of all other variables are only marginally affected, presidents appear to support friendly governors particularly in their re-election years. This corroborates our findings about both the presidential pork-barrel and the privileged relationship with governors from the same party.

In column 3 we add a number of further controls that previous studies have identified as determinants of the federal budget allocation. We consider the role of committee membership, focussing on the most influential committees in the budget process. We use as explanatory variables the number of members by state in the Appropriation, Budget, Ways and Means, and Rules committees of the House. We also include the electoral turnout in presidential elections and a dummy variable for having a democratic president. To take into account overrepresentation we follow Atlas et al. (1995) and introduce the number of senators per capita. We find that having a democratic president substantially increases overall spending (more than 1000 $ yearly per capita). We do not find any evidence that turnout has any impact on the allocation process, while overrepresentation is positive and significant. Finally, we find that states with more members in the Ways and Means committee receive more federal spending (around 76 $ per capita per member). This confirms the results that Alvarez and Saving (1997) obtain in their cross-section study. On the other hand, we do not find any evidence that other prestige committees have an impact on the distribution of federal funds[1]. Concerning our main variables of interest, we find that the gain from electing a majority of delegates in the House who are on the president's side amounts to almost 100 $ per capita. Again, we find that the party alignment between the president and the governor, as well as the share of presidential votes in the last election, positively affect federal expenditure. The magnitude of the governor-president alignment variable is virtually insensitive to the change in specification and, also in this case, we find that substantially more funds are received by friendly governors during their re-election year.

5 Multicollinearity (Tables A6-A8)

Most of the explanatory variables used in the regressions could be correlated and therefore generate large standard errors. It is therefore important to verify whether the low significance of some variables, and especially of the closeness and swing variables, is due to multicollinearity. For this purpose we use the variance inflation factor[2] which, for a variable x_j is given by:

$$VIF(x_j) = \frac{1}{1 - R_j^2}$$

where R_j^2 is the square of the multiple correlation coefficient that results when x_j is regressed against all the other explanatory variables.

[1] These findings seem consistent with the existing literature, which tends to show that the effect of committees can usually be found on very specific spending programs rather than on large aggregates.

[2] Chatterjee, S., A. S. Hadi and B. Price. 2000. Regression Analysis by Example. 3d ed. New York: John Wiley & Sons.

The variance of any b_j coefficient in a multiple regression is:

$$Var\left[b_j\right] = \frac{\sigma^2}{\left(1 - R_j^2\right) S_{x_j x_j}}$$

where σ^2 is the square of the random disturbance and $S_{x_j x_j}$ is the variance of the x_j variable. The bigger R_j^2 and therefore $VIF(x_j) = (\frac{1}{(1-R_j^2)})$, the greater is $Var\left[b_j\right]$, for a given level of $\frac{\sigma^2}{S_{x_j x_j}}$. An informal rule of thumb applied by most analysts (Chatterjee, Hadi and Price, 2000) is that a variance inflation factor in excess of 20 may be evidence of multicollinearity.

In column 1 of table A6 we report the VIF relative to the regressions of table 1. In column 1 (which refers to column1 of Table 1) the variance inflation factor turns out to be 8.78 for the share of the presidential vote and and 7.12 for the closeness of the last presidential election. This means that the collinearity of these two variables with the other predictors is acceptable and does not significantly inflate the estimation of their standard errors. In the second column of table A6 (which refers to column 2 in Table 1) we obtain a VIF of 2.97 for the presidential share and of 2.13 for the swing variable. Hence, again, we can exclude that the low significance of the swing variable is due to multicollinearity. The only variable for which we detect a potential multicollinearity problem is the number of presidential electoral votes per capita with a $VIF = 41.02$ which means that the standard error of this coefficient is highly inflated. Therefore, we should use caution in stating that the coefficient of this variable is not significant as it appears in the regression of column 2. In column 1 the number of electoral votes per capita is significant at the 10% level, again indicating that one should not underestimate the relevance of such variable.

In Table A7 we report the results referred to Table 2 in the paper. In this case all variables display a VIF which is well below the threshold we established and therefore we can conclude that multicollinerarity is not a problem in these specifications.

Table A8 (which refers to the robustness estimations reported above in Table A5) is potentially the most problematic, since we include a number of indicators of alignment that are probably correlated. However, it appears from the VIFs that multicollinearity should not play a big role in inflating the standard errors of such variables. Once again, instead, we find that multicollinearity is a problem for the overrepresentation variables, namely the number of senators per capita and the number of electoral votes per capita. In the case of senators per capita this is not sufficient to render the estimation insignificant (the coefficient is in fact significat at the 5% level). In the case of electoral votes per capita we get an insignificant coefficient but this results should be clearly interpreted with some caution. Nevertheless, overrepresentation represents only a control factor for our regressions and the important point is that our variables of interest do not appear to suffer from a multicollinearity problem.

Table A1: Average real percapita federal outlays by state during 1982-2000
2000 real US Dollars percapita

State	*Average federal outlays percapita*
Virginia	$7,636.12
Maryland	$7,428.26
New Mexico	$7,279.27
North Dakota	$6,182.13
Missouri	$6,176.43
Massachusets	$6,112.77
Connecticut	$5,912.66
Montana	$5,512.15
Rhode Island	$5,493.86
Whashington	$5,482.99
South Dakota	$5,430.08
Maine	$5,345.58
Alabama	$5,339.52
Mississippi	$5,324.57
Colorado	$5,277.46
Florida	$5,238.06
California	$5,210.48
New York	$5,108.39
Kansas	$5,107.32
Pennsylvania	$5,074.75
Wyoming	$5,065.97
West Virginia	$5,016.49
Tennessee	$5,002.15
Arizona	$4,992.98
Oklahoma	$4,861.50
Nebraska	$4,836.17
South Carolina	$4,815.52
Kentucky	$4,810.72
Luoisiana	$4,748.89
Arkansas	$4,713.85
Idaho	$4,682.08
New Jersey	$4,670.97
Nevada	$4,585.21
Georgia	$4,564.36
Iowa	$4,564.12
Delaware	$4,477.32
Utah	$4,475.27
Ohio	$4,442.29
Vermont	$4,430.62
Texas	$4,403.46
New Hampshire	$4,371.64
Oregon	$4,320.66
Minnesota	$4,316.81
Illinois	$4,183.07
North Carolina	$4,137.82
Indiana	$4,057.55
Michigan	$4,030.17
Wisconsin	$3,942.40

Table A2: Summary Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
Federal Expenditure per Capita*	912	5066.518	983.5352	3005.729	8824.92
Alignment Governor-President	960	0.40625	0.4913883	0	1
Alignment Governor-House	960	0.5979167	0.4905742	0	1
Alignment Governor-Senate	960	0.5208333	0.4998262	0	1
Alignment between Governor and the majority of state delegates to House	960	0.421875	0.4941162	0	1
Alignment between Governor and the two senators**	960	0.284375	0.4513514	0	1
Alignment between President and the two senators**	960	0.2645833	0.441341	0	1
Alignment between President and the majority of state delegates to House	960	0.5333333	0.4991477	0	1
Alignment between the majority of state delegates to House and House majority	960	0.5916667	0.4917816	0	1
Alignment between the two senators and the Senate majority	960	0.3291667	0.4701555	0	1
Appropriation	960	1.734375	1.430804	0	8
Ways & Means	960	0.5104167	0.7362899	0	4
Budget	960	0.8104167	1.107137	0	6
Rules	960	0.3177083	0.6161698	0	3
Closeness in Past Presid. Election	960	0.1377484	0.1058159	0.0015169	0.5220283
Share of Votes for President	960	0.5121536	0.0898193	0.2465447	0.7450179
State Elect. Votes per Capita	960	2.714539	1.024855	1.527064	6.616543
Senators per Capita	960	0.9661192	0.9851338	0.0588056	4.411028
Swing	912	0.3723246	0.2042428	0	1
Democratic President	960	0.4	0.4901533	0	1
Gubernatorial election year	960	0.2625	0.4402222	0	1
Turnout	960	61.02875	6.571284	46.1	75.6
Income per Capita*	960	22954.47	4292.623	13796.28	41446.37
Unemployment	960	6.074167	2.200156	2.2	18
Total Population	960	5217.995	5497.381	453.409	34010.38
Share of population aged above 65	960	0.1239534	0.0199277	0.0468377	0.3663689
Share of Population aged 5-17	960	0.1910132	0.0226012	0.0233483	0.6194438

Notes. *Federal Expenditure and Income are expressed in real value (year 2000).

**These variables take value equal to 1 when both senators are of the same political colour of, respectively, t
the Governor and the Presiden

Table A3: More on Swing Bias
Dependent variable: *real percapita federal outlays, 1982-2000*

	(1)	(2)	(3)
Dependent Variable	*fedexp*	*fedexp*	fedexp
Share of vote for the incumbent president	1154.21	1078.26	1169.77
	(2.66)**	(2.29)**	(2.65)**
Long term Swing (4 years)			-16.51
			(0.09)
Swing_last	26.7636		
	(0.57)		
Long term Swing (since 1964)		-147.04	
		(1.02)	
State where the President won			-113.55
			(0.91)
State where the President Won x Long term Swing			-140.90
			(0.66)
Electoral votes percapita	370.24	360.82	302.01
	(1.70)*	(1.62)	(1.41)
Observations	864	864	864
R-squared	0.9348	0.9351	0.9369

OLS regressions; Robust t statistics in parentheses (* significant at 10%; ** significant at 5%; *** significant at 1%)
In all regressions the following controls are included: income, unemployment, population, percentage of aged, percentage of children, state fixed effects, year fixed effects, constant term.

Table A4: More on Alignment
Dependent variable: *real percapita federal outlays, 1982-2000*

	(2)	(3)	(4)
Dependent Variable	fedexp	fedexp	fedexp
Alignment between Governor and the majority of state delegates in the House	-39.4412		
	(0.99)		
Alignment between Governor and the two state senators	-74.9903		
	(1.39)		
Alignment between President and the two state senators		15.6720	
		(0.27)	
Alignment between President and the majority of state delegates in the House		175.688	
		(3.13)***	
Alignment between the majority of state delegates in the House and the House majority			-154.624
			(2.61)**
Alignment between the two senators of the state and the Senate majority			-5.9300
			(0.14)
Observations	864	864	864
R-squared	0.9271	0.9302	0.9292

OLS regressions; Robust t statistics in parentheses (* significant at 10%; ** significant at 5%; *** significant at 1%)
In all regressions the following controls are included: income, unemployment, population, percentage of aged, percentage of children, state fixed effects, year fixed effects, constant term. The alignment variables are dummies equal to one when partizan alignment occurs and zero otherwise. Detailed definitions of all variables are reported in the online statistical appendix.

Table 5: Robustness Check
Dependent variable: *real percapita federal outlays by program, 1982-2000*

	(1)	(2)	(2)
Dependent Variable	*fedexp*		*fedexp*
Allignment Governor-President	130.328 (2.59)**	118.372 (2.39)**	126.028 (2.71)***
Alignment Governor-House	79.655 (1.21)	82.446 (1.25)	103.506 (1.62)
Alignment Governor-Senate	15.453 (0.36)	15.604 (0.36)	-6.824 (0.16)
Alignment between President and the majority of state delegates in the House	84.470 (1.75)*	-83.894 (1.74)*	95.214 (1.97)*
Share of vote for the incumbent president	931.566 (2.28)**	927.714 (2.27)**	846.2 (2.23)**
Electoral votes percapita	338.140 (1.42)	339.285 (1.41)	-83.451 (0.38)
Year of gubernatorial election		-29.110 (1.44)	-33.372 (1.70)*
Alignement Governor-President x Year of gubernatorial election		61.575 (2.23)**	63.519 (2.31)**
Appropriation			18.831 (0.53)
Ways & Means			76.618 (2.28)**
Budget			-18.715 (0.85)
Rules			36.231 (0.63)
Senators percapita			1,235.774 (2.67)**
Democratic President			1,012.155 (10.56)***
Turnout			6.736 (0.69)
Observations	864	864	864
R-squared	0.9367	0.9369	0.9413

OLS regressions; Robust t statistics in parentheses (* significant at 10%; ** significant at 5%, *** significant at 1%)
In all regressions the following controls are included: income, unemployment, population, percentage of aged, percentage of children, state fixed effects, year fixed effects, constant term. The alignment variables are dummies equal to one when partizan alignment occurs and zero otherwise. Detailed definitions of all variables are reported in the online statistical appendix.

Table A6: VIF relative to the coefficients of the regressions in table 1

Variable	*(1)*	*(2)*
electoral votes per capita	41.91	41.02
share of votes for the president	8.76	2.97
closeness	7.27	
swing		2.13

Table A7: VIF relative to the coefficients of the regressions in table 2

Variable	*(1)*	*(2)*
Alignment Governor-President	3.59	3.69
Alignment Governor-House	4.03	4.62
Alignment Governor-Senate	1.67	1.75
Alignment between the Governor and the majority of state delegates to the House		2.03
Alignment between the Governor and two state senators		1.96
Alignment between the President and the majority of state delegates in the House		14.13
Alignment between the President and the two state senators		1.63
Alignment between the majority of state delegates in the House and the House majority		13.70
Alignment between the two senators of the State and the Senate majority		1.60

Table A8: VIF relative to the coefficients of the regressions in table A5

Variable	*(1)*	*(2)*	*(3)*
Alignment Governor-President	3.61	3.84	3.91
Alignment Governor-House	4.05	4.06	4.14
Alignment Governor-Senate	1.68	1.68	1.73
Alignement between the President and a majority of state delegates to the House	2.35	2.35	2.54
Share of votes for the incumbent President	3.27	3.27	3.38
Electoral votes per capita	43.98	43.99	112.13
Year of gubernatorial election		2.61	2.62
Alignement Governor-President x Year of gubernatorial election		2.39	2.40
Appropriation			9.46
Ways & Means			3.90
Budget			3.74
Rules			3.79
Senators per capita			477.91
Democratic President			17.17
Turnout			10.19

List of variables: Definitions and Sources

From the Statistical Abstract of the US and the Bureau of Statistics

Federal expenditure: real federal expenditure by state (year 2000 constant USD per capita).
Income: real income (year 2000 constant USD per capita).
Population: state population divided by 1000.
Turnout: total percentage of voting population in the last presidential election.
Percentage of Aged: share of the population over 65 years old by state.
Percentage of Children: share of the population between 5 and 17 years old by state.
Unemployment: unemployment rate.
Democratic president: dummy variable equal to 1 when the President is democratic, and zero when the President is republican.
Governor election year: dummy variable equal to 1 during a governor election year and zero otherwise.

Authors' elaboration on data from the Statistical Abstract of the United States

Closeness: distance in the percentage of vote (by state) between the winner of the presidential race and the runner up.
Share of vote for the incumbent president: share of votes for the current President in the last presidential elections.
Last election swing: dummy equal to 1 if the state swung at the last presidential election.
Swing: moving average of "Last election swing" over the four previous presidential elections at each given time.
Long term swing: average of "Last election swing" from 1964 to the last election.
Alignment Governor-President: dummy variable equal to one when the party affiliation of the governor is the same as that of the President, and zero otherwise.
Alignment Governor-House: dummy variable equal to one when the party affiliation of the governor is the same as that of the majority of the House, and zero otherwise.
Alignment Governor-Senate: dummy variable equal to one when the party affiliation of the governor is the same as that of the majority of the Senate, and zero otherwise.
Senators percapita: 2000/Population.
Electoral votes percapita: (1000×Electoral votes)/Population
Alignment between the governor and the two state senators: dummy variable equal to one when the governor is from the same party of both senators in the state, and zero otherwise.
Alignment between the Governor and the majority of state delegates in the House: dummy variable equal to one when the governor is from the same party as the majority of state delegates in the House, and zero otherwise.
Alignment between the President and the two state senators: dummy variable equal to 1 if both senators from a state are of the same party of the President.

Alignment between the President and the majority of state delegates in the House: dummy variable equal to 1 if a majority of state delegates in the House are of the same party of the President.
Alignment between the majority of state delegates in the House and the House majority: dummy variable equal to 1 if a majority of state delegates to the House are in the majority party in the House.
Alignment between the two senators of the state and the Senate majority: dummy variable equal to 1 if a majority of state delegates to the Senate are in the majority party in the Senate.

From the Official Congressional Directory and from Nelson and Bensen (1993).

Appropriation: number of members in the House appropriation committee by state.
Budget: number of members in the House Budget committee by state.
Rules: number of members in the House Rules committee by state.
Ways & Means: number of members in the Ways and Means committee by state.