The Journal of Private Enterprise 24(2), 2009, 75-86

Spatially Targeted Government Spending and Heterogeneous Constituent Cost Shares

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Abstract
The law of 1/*n* (Weingast, Shepsle, and Johnsen, *Journal of Political Economy*, 1981) posits a positive relationship between the size of an elected body and government spending because the taxpayers in each district bear only 1/*n*th of the total tax burden. Relying on variation in the number of seats in elective bodies, evidence supportive of the law of 1/*n* has been found at all levels of representative government. It is possible, however, that these findings suffer from endogeneity bias: Polities preferring larger government spending may also prefer to have more elected officials. In this paper, we propose an alternative test of the law of 1/*n*. In addition to postulating that larger elective bodies will have higher levels of government spending, the law of 1/*n* also implies that, ceteris paribus, there will be a negative relationship between locally targeted government spending and a jurisdiction's share of the taxation required to finance the spending. We test this prediction by examining the relationship between spatially targeted government spending and the tax burden across states. We find a negative relationship between local tax contributions to the common taxbase and locally targeted government spending for aggregate locally targeted spending and for six of eight subcategories. These findings are robust to the inclusion of other variables thought to influence the distribution of spending on parochial projects.

JEL Codes: D72, H11, H50
Keywords: Law of 1/*n*; Representative government; Public expenditure; Fiscal commons

* We thank the anonymous referees and participants at the 2003 Public Choice Society meetings for helpful suggestions.

I. Introduction

Political economists have long viewed fiscal policy in democracies as a common pool problem – a tragedy of the fiscal commons. Self-interested politicians seek to direct public resources from the common budgetary pool toward their constituents in order to enhance their political standing. A higher level of government spending, an overgrazing of the fiscal commons, is the result as logrolling politicians collude to support each other's projects. As noted by Tullock (1959), such overspending is facilitated by majority rule because party membership reduces the bargaining costs of logrolling and because the majority only bears a portion of the cost of public projects that benefit its interests. While the benefits of particular projects may be concentrated among a constituency, the tax costs are borne by the entire polity. Therefore, politicians may seek to approve local spending even where the total costs exceed the total benefits.

Weingast, Shepsle, and Johnsen (1981) applied the phenomenon of concentrated benefits funded by a dispersed tax burden to legislature size to develop the "law of $1/n$."[1] They hypothesized that the cost burden borne by constituents is a function of the number of geographically represented districts (n) in a legislature. Each district receives the full benefits of parochial spending, while bearing only $1/n$th of the cost. As the number of legislative districts increases, the district cost share falls; thus, there exists a positive correlation between the number of legislative districts and public spending. Assuming legislators logroll with fellow members to ensure passage of pet projects until the gains from trade are exhausted (a phenomenon known as universalism), spending will exceed the optimal level.

In recent years the law of $1/n$ has received strong empirical support. Relying on variation in the number of seats in elective bodies, evidence supportive of the law of $1/n$ has been found across U.S. states (Gilligan and Matsusaka, 1995 and 2001; Campbell, Finney, and Mitchell, 2007), across countries (Bradbury and Crain, 2001; Perotti and Kontopoulos, 2002), and across local government

[1] Bradbury and Crain (2001) examine the law of $1/n$ in a bicameral context. Chen and Malhotra (2007) and Primo and Snyder (2008) offer theoretical qualifications to Weingast, Shepsle, and Johnsen (1981). Our purpose in this paper is not to enter the theoretical debate but to propose a solution to an endogeneity problem present in previous empirical papers (see below).

units (Baqir, 2002; Bradbury and Stephenson, 2003; Schaltegger and Feld, 2009). However, these studies may suffer from an endogeneity problem between legislature or council size and government spending because preferences for greater government spending may also be correlated with a desire for a larger representative body. Indeed, citing this endogeneity critique, Petterson-Lidbom (2001) finds that exogenous, statutorially mandated increases in Swedish local council sizes are associated with lower government spending.

Rather than relying on variation in the size of elective bodies as a proxy for the local cost of spatially targeted government spending, this paper examines the relationship between tax shares and locally targeted government spending obtained from the common taxbase.[2] A common pool taxbase implies that districts bearing a small share of the tax burden will have higher amounts of locally targeted projects because they bear lower fractions of the costs than do districts with large shares of the tax burden. Symbolically, instead of approving all projects up to the point at which MB = C, politicians will approve projects up to the point at which MB = T_iC, where MB is the marginal benefit of a project, T_i is state i's share of the project's cost C, $0 < T_i < 1$ and $\sum T_i = 1$. Hence, our paper builds upon the existing law of $1/n$ literature by explicitly recognizing that districts do not bear equal shares of the cost of providing locally targeted spending. Consequently, our paper provides a robustness check for the existing law of $1/n$ literature; if representatives respond to differences in local cost burdens in the allocation of parochial goods, there is more reason to think that the positive correlation between legislature size and government spending can be attributed to the law of $1/n$.

The paper is organized as follows. The next section describes our data and the empirical framework. Section III discusses the results, and Section IV concludes.

II. Data and Empirical Framework

We test the relationship between constituent cost burden and parochial spending using 2001 data on locally targeted government spending compiled by the organization Citizens Against Government

[2] DelRossi and Inman (1999), using a natural experiment, take a similar approach. Relying on changes in the local/federal cost sharing requirements in the Water Resources Development Act of 1996, they find that increases in the cost share are associated with a smaller demand by legislators for locally targeted projects.

Waste (CAGW). CAGW analyzes the federal government's budget and publishes an annual "Pig Book" listing what it deems to be wasteful spending projects contained in the federal budget. The items are earmarked for specific locations (e.g., the so-called bridges to nowhere in Alaska); general programs such as Medicare are not included. (Hence, another improvement of our paper over the existing literature is the use of spending that is targeted to specific localities rather than overall levels of spending in a jurisdiction.[3]) We use the spending items contained in the Pig Book, aggregated by state and by appropriations subcommittee bill, as our measure of locally targeted government spending.[4]

Using ordinary least squares (OLS) and seemingly unrelated regression (SUR), we estimate the amount of locally targeted government spending flowing to each state according to the following equation:

$$P_i = \alpha + \beta(T_i) + \boldsymbol{\lambda}\mathbf{X_i} + \varepsilon_I, \qquad (1)$$

where P_i is the natural log of each state's per capita spending on parochial projects. As will be evident below, we estimate the equation both for the total geographically targeted spending flowing to each state (via OLS) and for separately for 8 appropriations subcategories of spending earmarked for each state (via SUR).

Since we are working with state aggregates (as opposed to, say, congressional district aggregates) of government spending, our variable of interest is each state's share of the cost of this locally targeted government spending. We measure each state's share by its fraction of the total personal income taxes collected by the federal government T_i.[5] This share varies widely across states because of differences in state population and income. Wealthy and populous

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[3] Several think tanks compile data on aggregate federal money received by the states. For examples, see the Tax Foundation (*www.taxfoundation.org/taxdata/topic/92.html*) and the Northeast-Midwest Institute (*www.nemw.org/fundsrank.htm*).

[4] We thank Keri Anderson and John Coleman for exceptionally diligent research assistance on this part of the project.

[5] Our use of shares of the federal income tax implies that, at the margin, it is this tax that funds additional government spending. While we think this is the most reasonable assumption, future research might investigate the robustness of this paper's findings to measures of tax shares constructed using other federal taxes.

California and New York bear 15.1% and 8.3%, respectively, of the federal income tax. At the other extreme, states such as North Dakota (0.14%), Vermont (0.18%), and South Dakota and Wyoming (both 0.19%) bear virtually none of federal income tax burden. And West Virginia and Mississippi, both of which are represented by senators with strong reputations for delivering pork to their constituents,[6] bear 0.32% and 0.48%, respectively, of the federal income tax burden.

Since the law of $1/n$ predicts that representatives whose constituents bear less of the federal tax burden are more likely to engage in logrolling for locally targeted projects (and vice versa), the predicted sign of β is negative. A cursory examination of parochial spending per capita for the states with the highest and lowest tax shares is presented in Table 1; the ten states with the lowest tax shares have spending per capita that is an order of magnitude larger than the ten states with the highest tax shares.

Table 1. Parochial Spending for the States with the Highest and Lowest Tax Shares

Ten Highest Tax Shares	*Parochial Spending Per Capita*	*Ten Lowest Tax Shares*	*Parochial Spending Per Capita*
CA	$15.31	WV	$123.49
NY	$11.84	ID	$42.00
TX	$11.51	DE	$29.27
FL	$15.79	NM	$95.36
IL	$12.33	AK	$760.84
NJ	$13.82	SD	$77.33
PA	$19.37	WY	$16.61
MA	$11.27	MT	$108.63
MI	$13.04	VT	$114.10
OH	$13.30	ND	$63.87
mean	$13.76	mean	$143.15

Of course, other factors might also affect the amount of locally targeted government spending received by each state. Vector $\mathbf{X}_i$ is

[6] For examples illustrating Mississippi Senator Lott's reputation, see *Tampa Tribune* (2002) and *Wall Street Journal* (2002). For examples of West Virginia Senator Byrd's reputation, see Novak (2001) and Clines (2002).

composed of several relevant control variables that may also affect the allocation of pork spending. These variables include membership on the relevant Senate appropriations (sub)committee, Senator seniority, and membership in the Senate's majority party. (Our focus on the Senate is consistent with our use of state-level data and with Gilligan and Matsusaka's (2001) finding that only the number of seats in the upper chamber affected government spending.) All of these factors are expected to have a positive relationship with the amount of parochial projects.

III. Results

Table 2 presents the results for the aggregate amount of parochial spending received by each state. The dependent variable is the natural log of total parochial spending per capita. The top row for each variable contains the estimated coefficient, and the second row contains t-statistics derived from White-corrected standard errors to control for heteroskedasticity.

Table 2. Regression Results for Aggregate Spending

Variable	*(1)*	*(2)*
TAXSHARE	-0.168*	-0.148*
	(-2.51)	(-2.42)
MEMSENATE		0.624*
		(3.10)
		[86.6%]
SENIORITY		0.056*
		(2.39)
$SENIORITY^2$		-0.0005*
		(-1.68)
MAJORITY		0.289
		(1.03)
		[33.5%]
Constant	3.694	2.200
	(19.13)	(5.19)
R^2	0.196	0.488
Observations	50	50

The dependent variable is state total parochial spending per capita. Parentheses contain t-statistics derived from White-corrected standard errors. * denotes statistical significance at the 10% level or better. In the cells for dummy variables, brackets contain percentage changes obtained per Halvorsen and Palmquist (1980).

Column 1 begins with the simple regression of the natural log of per capita locally targeted spending on each state's tax share and a constant. The results are highly consistent with the law of $1/n$'s prediction of a negative relationship between the tax share and locally targeted spending. A one percentage point increase in a state's tax share is estimated to reduce its parochial spending per capita by 16.8%.

In column 2 of Table 2, we repeat the estimation including the control variables of vector **X**. TAXSHARE remains significantly negative, but its magnitude is about two percentage points lower than the first regression. Turning to the control variables, MEMSENATE is a dummy variable taking a value of one if a state has a senator on the Senate Appropriations Committee; states represented on the committee are estimated to receive approximately 87% more parochial spending per capita than states without Senators on the committee.[7] (The source for appropriations committee membership and other variables in **Xi** is the *Almanac of American Politics*.)

SENIORITY is defined as the sum of the number of years of service by each state's two Senators; $SENIORITY^2$ is defined analogously. The positive coefficient on SENIORITY and the negative coefficient on $SENIORITY^2$ indicate that additional years of seniority have a positive, but diminishing, effect on obtaining additionally locally targeted spending for a state.

MAJORITY is a dummy variable taking on a value of unity for states in which both senators are members of the majority (Republican for the time considered by this paper) party. The estimated coefficient is large (implying a one-third increase in local appropriations for states with both senators in the majority) but not statistically significant; hence, it appears that parochial spending projects and logrolling are not exclusively the domain of the majority party. A note of caution is warranted: Since our analysis is based on a single cross-section, it is impossible to separate any effect of party ideology from any effect associated with being in the majority party regardless of party ideology. As a robustness check, we also experimented with a three-way classification, which included both a dummy taking a value of one for states having both senators in the

[7] As noted by Halvorsen and Palmquist (1980), in a semilog specification one must transform the coefficients on dummy variables to obtain percentage changes. Results of the transformation are reported in brackets in Table 2.

majority party and a second dummy taking a value of one if a state had a senator in each party. (Having both senators as members of the minority party was the omitted category.) The results were similar to those obtained using only the two-way classification implied by MAJORITY.

In Table 3, we consider locally targeted spending disaggregated to the subcommittee (appropriations bill) level. We focus on the eight

Table 3. Regression Results for Appropriations Subcategories

		Panel A		
Variable	Agriculture	Commerce	Energy	Interior
TAXSHARE	-0.23*	-0.10	-0.10	-0.18*
	(-3.49)	(-1.19)	(-1.39)	(-2.85)
Constant	-0.22	0.44	0.91	0.74
	(-1.03)	(1.53)	(3.77)	(3.72)
R^2	0.20	0.03	0.04	0.14
Observations	46	49	48	49
		Panel B		
Variable	Agriculture	Commerce	Energy	Interior
TAXSHARE	-0.23*	-0.05	-0.07	-0.15*
	(-3.83)	(-0.67)	(-0.98)	(-2.69)
MEMSENATE	0.73*	0.99*	0.57	0.73*
	(2.32)	(1.99)	(1.59)	(2.88)
	[108%]	[169%]	[77%]	[108%]
SENIORITY	0.03	0.03	0.07*	0.03
	(1.01)	(0.61)	(1.82)	(1.05)
$SENIORITY^2$	-0.0003	-0.0001	-0.0006	-0.0003
	(-0.76)	(-0.17)	(-1.18)	(-0.64)
MAJORITY	0.34	1.09*	-0.09	0.30
	(0.99)	(2.34)	(-0.24)	(0.95)
Constant	-1.06	-0.87	-0.49	-0.25
	(-1.76)	(-1.09)	(-0.74)	(-0.45)
R^2	0.34	0.23	0.25	0.33
Observations	46	49	48	49

The dependent variable is state parochial spending per capita in the indicated appropriations subcategory. Parentheses contain t-statistics derived from White-corrected standard errors. * denotes statistical significance at the 10% level or better. Brackets contain percentage changes obtained per Halvorsen and Palmquist (1980).

subcategories of spending having nonzero values for 45 or more states. Other subcategories (e.g., Foreign Operations) have nonzero values for very few states. Since errors across subcommittees might be correlated, estimation is via SUR. Note that the presence of a few states having no parochial projects in certain subcategories causes the equations for these subcategories to be based on less than 50

Table 3 (continued)

		Panel A		
Variable	Labor	Mil. Con.	Transport.	VAHUD
TAXSHARE	-0.13*	-0.15*	-0.17*	-0.14*
	(-2.89)	(-2.76)	(-3.63)	(-2.99)
Constant	1.18	1.92	1.97	1.52
	(8.15)	(10.77)	(13.11)	(10.23)
R^2	0.14	0.14	0.20	0.15
Observations.	50	47	50	50
		Panel B		
Variable	Labor	Mil. Con.	Transport.	VAHUD
TAXSHARE	-0.14*	-0.11*	-0.16*	-0.12*
	(-3.23)	(-2.28)	(-3.54)	(-2.81)
MEMSENATE	0.48*	0.59*	0.36*	0.39*
	(3.15)	(1.92)	(2.02)	(2.35)
	[62%]	[80%]	[43%]	[48%]
SENIORITY	0.05*	0.07*	0.06*	0.06*
	(2.37)	(2.50)	(2.52)	(2.65)
$SENIORITY^2$	-0.0005*	-0.0005	-0.0007*	-0.0006*
	(-1.77)	(-1.37)	(-2.26)	(-1.89)
MAJORITY	-0.02	0.47*	0.39	0.23
	(-0.09)	(1.73)	(1.55)	(0.94)
Constant	0.15	0.29	0.77	0.22
	(0.36)	(0.60)	(1.78)	(0.53)
R^2	0.33	0.39	0.32	0.34
Observations	50	47	50	50

The dependent variable is state parochial spending per capita in the indicated appropriations subcategory. Parentheses contain t-statistics derived from White-corrected standard errors. * denotes statistical significance at the 10% level or better. Brackets contain percentage changes obtained per Halvorsen and Palmquist (1980).

observations since the log of zero is undefined. Panel A contains results for the simple regression of public spending per capita on TAXSHARE, and Panel B contains results after including the control variables.

As with the results in Table 2, the results in Table 3 suggest a strong negative relationship between TAXSHARE and parochial spending. In Panel A, the estimated reduction in public spending associated with a one percentage point increase in a state's tax share ranges from 10% to 23%, and the estimated coefficients are significantly different from zero in six of the eight categories. As indicated by the results in Panel B, the negative relationship between TAXSHARE and government spending is robust to the inclusion of the control variables. The estimated reduction in public spending associated with a one percentage point increase in a state's tax share ranges from 5% to 23%, and the estimated coefficients remain significant for all subcategories except for Commerce and Energy.

Turning to the covariates included in Panel B's specification, the increase in subcategory spending associated with having a Senator on the relevant appropriations subcommittee ranges from about 40% (Transportation) to more than double (Commerce). Not only is the estimated effect of having a Senator on an appropriations subcommittee large, it is also statistically significant in seven of eight categories and nearly so ($p=0.11$) in the eighth subcategory (Energy). The results for SENIORITY and SENIORITY^2 are similar, though a bit weaker, that those reported in Table 2. In most, but not all, categories, seniority is estimated to increase locally targeted spending but at a decreasing rate. As for MAJORITY, no clear effect is found. (Hence, for brevity, we omit the Halvorsen and Palmquist (1980) transformation of the coefficients on MAJORITY from the table.) There is a statistically significant relationship between MAJORITY and public spending in only two of the eight subcategories. This finding suggests that parochial spending and logrolling are not different across parties, but, as noted above, our data do not permit us to attribute the results to ideology or to majority party status per se.

Finally, since the foregoing analysis focuses exclusively on Senate determinants of parochial spending and ignored the role of House appropriators, we also estimated the model including a dummy (MEMHOUSE) taking a value of one if a state has a member on the relevant House appropriations committee or subcommittee. The

results are omitted for brevity, but MEMHOUSE displays no clear pattern of sign or significance, and its inclusion has little effect on TAXSHARE or other regressors. This absence of a clear relationship between MEMHOUSE and parochial spending is not surprising since we are working with state level data rather than congressional district level data; as noted above, it is also consistent with Gilligan and Matsusaka (2001).

IV. Conclusion

Weingast, Shepsle, and Johnsen (1981) implies that politicians should respond predictably to changes in the price of allocating public resources from a common pool taxbase. As the constituent-specific cost burden falls, the quantity of parochial spending ought to rise. Several previous studies have found indirect support for this hypothesis by examining the relationship between government spending and the size of governmental bodies such as councils or legislatures. Yet, such studies are potentially flawed by an endogeneity arising from the possibility that underlying political preferences favor both larger government and more elected representatives. This paper provides a direct test of the cost burden hypothesis using constituent tax shares and locally targeted spending. Consistent with the cost burden hypothesis, we find tax shares to be negatively related to the amount of locally targeted government spending.

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