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Research Note

Small States, Big Pork

William R. Hauk, Jr.[1] and Romain Wacziarg[2]

[1] *Economics Department, Moore School of Business, University of South Carolina, 1705 College St, Columbia, SC 29208 USA; hauk@moore.sc.edu; tel: (803) 777 6044.*
[2] *Stanford University, Graduate School of Business, 518 Memorial Way, Stanford CA 94305, wacziarg@gsb.stanford.edu, tel: (650) 723 6069.*

ABSTRACT

Using data on authorizations from the 2005 Highway Bill, we show that the legislative allocation of pork barrel spending by U.S. state (measured by the value of transportation earmarks per capita) greatly favors smaller states. We exploit the difference between two versions of the bill: the version that was passed by the House and the compromise version passed in conference committee. Our empirical results provide strong evidence in favor of theories of legislative malapportionment.

On 10 August 2005 President Bush signed a USD 286.4 billion transportation bill. The bill, a reauthorization of the Transportation Equity Act for the 21st Century (TEA-21), provides a renewable six-year plan to fund the nation's highway system. In total, USD 24.2 billion, or 8.4% of the bill's total spending, were earmarked for 6373 specific highway construction and improvement projects throughout the 50 states, the District of Columbia and U.S. territories. These earmarks, often referred to as pork barrel spending, constitute an ideal setting to analyze the incidence of small state overrepresentation in the U.S. Congress. In this paper we test the hypothesis that small states receive a disproportionate share of pork barrel spending, a central prediction of models of legislative malapportionment.

A major innovation of our approach, compared to existing work, is to analyze different versions of the bill as it progressed through the legislative process. This allows us to distinguish the effect of legislative malapportionment from the effect of increasing returns to the provision of local public goods. Both effects would lead small states to receive more spending per capita. However, if legislative malapportionment is at work, the small state

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effect should be more pronounced in the Senate version, since small states are overrepresented to a much greater extent in the Senate relative to the House of Representatives.[1] Consistent with this insight, we find that the effect of a state's population on per-capita transportation pork expenditures is large, negative and significant in the final version of the bill, after passage through the Senate and the conference committee. In contrast, the effect is small and statistically insignificant in the version passed by the House of Representatives, where the bill originated. These results are unchanged after holding constant a number of presumptive determinants of earmarked spending. Thus, this paper offers compelling empirical evidence supportive of models of legislative malapportionment, in the context of a single, well-defined legislative initiative.

THEORY AND EVIDENCE ON LEGISLATIVE MALAPPORTIONMENT

The idea that the overrepresentation of small states in the U.S. Senate should lead to the disproportionate allocation of public spending, trade protection, and other geographically targetable governmental activities to smaller states is neither new nor surprising. Formal models of this process, however, are relatively rare, as most models of legislative policy-making assume that constituencies of equal sizes are equally represented.[2] Departing from this assumption, Ansolabehere, Snyder, and Ting (2003) present a bargaining model in a bicameral legislature with malapportionment. With a supermajority rule in the malapportioned chamber (such as in the U.S. Senate), they predict that transfers across states disproportionately benefit smaller states. In a different legislative bargaining model, Knight (2004) notes that the advantage small states enjoy through over-representation in the Senate gives them stronger bargaining power in the appropriations process. Since their constituents will be paying a smaller share of tax revenues, small states are more interested in expanding government spending. Finally, Hauk (2005) presents a model explaining international trade protection in the context of a lobbying model with a malapportioned legislature. Again, the benefits of trade protection in this model are geographically targetable because the concentration of different industries differs across legislative districts.

On the empirical side, a number of studies identify a correlation between inequalities in representation and inequalities in the receipt of government benefits. In a study of federal government spending by state, Atlas, Gilligan, Hendershott, and Zupan (1995) observe that less-populated states tend to receive a greater share of federal funds than their share of the population. They argue that this discrepancy is the consequence of U.S.

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[1] Due to single-member House delegations from seven states, House representation is also characterized by some malapportionment, but obviously to a much smaller extent than the Senate, where every state receives two Senators irrespective of population.

[2] While the theoretical literature on malapportionment and pork is not very developed, this issue relates to the broader literature on the determinants of Congressional spending.(e.g. Levitt and Snyder 1997). The question of whether governments target spending to maximize vote share in swing states, for instance, is addressed theoretically by Dixit and Londregan (1996) and empirically by Dahlberg and Johansson (2002), among others.

Senate malapportionment. A simple finding that smaller states spend more per capita is not, however, definitive evidence in favor of models of legislative malapportionment. Such an effect could stem from the fact that public goods, by their very nature as non-rival goods, involve increasing returns to scale: whether a bridge serves 50 people, as an Alaskan bridge funded in the recent highway bill does, or several million, like the Brooklyn Bridge, their costs remain commensurate, or at least less than proportional to the population served.[3]

In a more direct test of legislative malapportionment, Ansolabehere, Gerber, and Snyder (2002) use state and county-level data on government spending, noting that in the aftermath of several Supreme Court decisions on apportionment that forced more equal representation in state legislatures, spending and revenue transfers tended to flow more equally across constituencies. Knight (2004) analyzes state-level data on earmarked projects across several years and projects and finds a small-state bias in earmarks in bills that were initiated by the Senate. Using similar data from a taxpayer watchdog group, Herron and Shotts (2003) provide evidence that the U.S. Senate provides more projects considered to be "pork" to smaller states. Their results are robust to the inclusion of a number of covariates capturing different state characteristics. Hauk (2005) shows that industry-specific international trade protection is biased towards industries that are disproportionately concentrated in small states, due to malapportionment.

This paper marks an advance on the existing empirical literature by considering a pork-laden highway bill and analyzing data on the small-state bias in earmarked projects for both the House and conference committee versions of the bill. We are therefore able to tell apart theories of legislative malapportionment from other theories predicting a small state bias, such as those based on increasing returns to the provision of public goods.

EARMARKS DATA FROM THE 2005 HIGHWAY BILL

The Transportation Bill was passed as a six-year authorization to fund highway projects in 1991. Reauthorized in 1997, the Transportation Equity Act for the 21st Century (TEA-21) expired in 2003.[4] In April 2004 the U.S. House of Representatives passed a reauthorization of TEA-21 as H.R. 3550, the "Transportation Equity Act: A Legacy for Users (TEA-LU)". The bill was introduced by Don Young, Republican of Alaska and Chairman of the House Transportation and Infrastructure Committee.[5] TEA-LU

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[3] See Alesina and Wacziarg (1998) for a detailed discussion of this point, and accompanying cross-country evidence. They note: "To the extent that public goods are of a non-rival nature, increasing returns stem from the fact that, while the required level of provision is independent of population size (or grows less than proportionately to it in the case of partial non-rivalry), the cost of public goods can be spread over a larger pool of taxpayers in larger countries".

[4] For a historical discussion of pork barrel politics in the context of transportation legislation up to 1991, see Evans (2004), chapter 4.

[5] Don Young's name will be immortalized with the renaming of Knik Arm Bridge in Anchorage to "Don Young's Way". Among the most egregious pork barrel projects in the 2005 Highway Bill is

contained about USD 11 billion in earmarked projects, but in July 2004 the bill died in conference committee over disagreements between the House and Senate conferees over the extent of total spending and over formulas to divide the non-earmarked funding among states. Don Young reintroduced the bill in the House as H.R. 3 in February 2005, and the House passed it on 10 March 2005 by a vote of 417–9.

H.R. 3 was more successful that its predecessor. The Senate adopted a version of the bill in May 2005, by a vote of 89–11. The bill then made its way to conference committee, where conferees from the House and Senate agreed on a single version in late July. While we have limited information on how the conferees were selected in this specific case, we note that all three members of Alaska's congressional delegation were conferees. As we will show below, Alaska happens to have a relatively small population and also received a lot of earmark dollars per capita. The "Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2005" (SAFETEA) became law on 10 August 2005. By the time it became law, the total amount allocated to earmarked projects was more than doubled, to USD 24.2 billion.[6]

In this paper we use the earmarks data compiled by the taxpayer watchdog group Taxpayers for Common Sense (TCS). TCS has been monitoring earmarks in the successive versions of the bill, starting with H.R. 3550. The group painstakingly compiled a comprehensive database of earmarks in three successive version of the bill: the 2004 House version (H.R. 3550), the 2005 House version (H.R. 3) and the final version adopted by Congress. These earmarks have been aggregated at the state level, i.e. we observe aggregate spending per state, as well as the number of earmarks per state.[7]

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the Gravina Bridge, connecting an island of 50 inhabitants to mainland Alaska. According to the watchdog group Taxpayers for Common Sense, "this bridge will be nearly as long as the Golden Gate Bridge and taller than the Brooklyn Bridge" (http://www.taxpayer.net/Transportation/gravinabridge.htm).

[6] An interesting issue arising in the 2005 Transportation Bill is the possible role of a veto threat from the President. The White House initially indicated that a bill providing more than USD 256 billion would be vetoed. It then increased this limit to USD 283 billion, and ended up signing the USD 286 billion bill. This suggests the veto threat was not very credible, particularly since this White House was not known for its willingness to veto spending bills. Moreover, the veto threat pertained only to the overall amount of spending in the bill, not to the earmarked amount or its allocation across states. Third, the bill passed with such overwhelming margins in the House and Senate that a veto-override might have been a realistic possibility. Thus, the presidential veto threat played virtually no role in the cross-state allocation of earmarks. For a discussion of the effect of the presidential veto on pork spending and its cross-jurisdictional allocation in a more general context, see McCarty (2000).

[7] The data are available at http://www.taxpayer.net/Transportation/safetealu/states.htm (we used the version posted on 12 August 2005). We do not observe earmarks from the Senate version of the bill, as there were none in that version. Therefore, all the Senate earmarks were added in conference. One possible explanation for the fact that the Senate version did not include any earmarks is that Senators are reluctant to go on the record as favoring specific projects in their home states, since that might draw the ire of constituents in areas not receiving any earmarks. Instead, introducing Senate-favored earmarks in conference committee makes it hard for voters to tell whether they originated from House members (with narrow constituencies) or Senators (with statewide constituencies). Empirical tests of this hypothesis could exploit the fact that there is variation in the degree of homogeneity of House districts: in districts that include both urban and rural interests, for instance, House members should be less willing to go on record as favoring earmarks benefiting a specific

Our data have several advantages over those previously used. First, transportation earmarks are the quintessential example of a geographically targetable form of public expenditure.[8] Past studies have often used broader categories of spending (such as total public spending per state) that are less easily targetable by members of Congress (for instance, entitlements are harder to target geographically). Second, we observe all earmarks included in the bill, i.e. we do not select a specific category of earmarks in our analysis, limiting the potential for subjective judgement calls as to what constitutes pork barrel spending. Third, we observe several versions of the same bill, so we can separately analyze the determinants of state per capita spending in the different versions. Past studies, in contrast, did not exploit these differences.[9] Thus, the 2005 Transportation Bill provides an ideal setting in which to test theories of legislative malapportionment.

EMPIRICAL RESULTS

Our econometric specification is the following:

$$\log G_i = \beta_0 + \beta_1 \log S_i + \beta_2' X_i + \varepsilon_i \quad (1)$$

where G_i is earmarked spending per capita in USD at the state level, S_i is state population from the 2000 Census, and X_i is a vector of control variables, further detailed below. We use various series for G_i, corresponding to the three observed versions of the bill. Equation 1 is estimated using ordinary least squares with robust standard errors, to correct for the possible incidence of heteroskedasticity in ε_i. In Equation 1 the proper interpretation of β_1 is the percentage increase in per capita pork barrel spending resulting from a 1% increase in state population.

Table 1 presents some summary statistics for the main variables in our analysis. Unsurprisingly, Alaska is the biggest recipient of per capita earmarks no matter which version of the bill is considered (the final version earmarks USD 1508.704 of spending per capita for Alaskan projects). In the final version, Arizona is the smallest recipient, with only USD 23.177 per capita. Table 2 presents correlations for the main variables. Per capita earmarks are highly correlated across the three versions of the bill: the correlation is 99.6% between the 2004 and 2005 House versions, but lower at 87.8% between the House and conference versions in 2005. Moreover, the correlation between earmarks per capita and state population is negative but small for the House version (−13%), but

segment of their electorate, relative to Representatives from more homogeneous districts. Such a test is beyond the scope of this short paper.

[8] We are not claiming that they are perfectly targetable. For instance, a bridge built in New York state could benefit residents of New Jersey traveling to New York, and some transportation dollars could be spent on out-of-state suppliers and contractors. We are claiming that transportation expenditures are *more* easily targeted geographically than most other types of public expenditures.

[9] Moreover, since we are relying on differences in the bill between different chambers, we can rule out Electoral College effects: since Electoral College votes are the sum of House and Senate membership, most existing studies cannot differentiate between the effects of legislative representation and Electoral College weight.

Table 1. Summary statistics for the main variables (51 observations)

Variable	Mean	Std. Dev.	Min	Max
Earmarks per capita, House version 2004	52.252	120.964	0.000 (SD)	889.309 (AK)
Earmarks per capita, House version 2005	62.785	148.018	14.226 (DE)	1087.754 (AK)
Earmarks per capita, Conference version 2005	158.805	219.904	23.177 (AZ)	1508.704 (AK)
Population, 2000 census, thousands	5811.969	6559.095	509.294 (WY)	36,132.147 (CA)
State personal income per capita, 2005	32,340.350	5207.890	24,650.000 (MS)	51,803.000 (DC)

Table 2. Correlations among the main variables (51 observations)

	Earmarks per capita, House version 2004	Earmarks per capita, House version 2005	Earmarks per capita, Conference version 2005	Population, 2000 census, thousands
Earmarks per capita, House version 2005	0.996*	1.000		
Earmarks per capita, Conference version 2005	0.876*	0.878*	1.000	
Population, 2000 census, thousands	−0.121	−0.130	−0.318*	1.000
State personal income per capita, 2005	0.100	0.109	0.039	0.101

* Denotes statistical significance at the 5% level.

larger in magnitude (−31.8%) when considering the conference version. This is preliminary evidence in favor of a legislative malapportionment effect in the allocation of pork barrel spending across states.

Table 3 presents results from estimating Equation 1 using earmarks data from the House versions of the bill. Column 1 presents the simplest specification, without con-

trols. Our main coefficient of interest, on the log of population, is negative but statistically insignificant. The subsequent columns add control variables sequentially. We first add controls representing a state's transportation spending requirement, in column 2. On the one hand, states that already have a lot of infrastructure might need less incremental spending. On the other hand, maintenance and upkeep expenditures might imply a positive effect of installed infrastructure. To control for the density of installed infrastructure, we include the total mileage of open highways divided by the state's surface area.[10] The coefficient on this variable comes out positive and highly significant. Geographically large states may also require more transportation spending per capita. This hypothesis is borne out, as the log of land area bears a positive and significant sign – a 1% increase in state area is associated with a 0.328% increase in per capita spending.

Next, we control for the log of a state's per capita personal income, obtained from the U.S. Bureau of Economic Analysis (column 3). The coefficient on this variable turns out to be statistically indistinguishable from zero. We also hypothesize that states with a large Republican congressional representation might be at an advantage in the allocation of pork barrel spending, since the Republican Party controlled both houses of Congress as well as the Presidency. We worry that if Republican representatives tend to be elected predominantly from smaller states, our estimated size effect may capture in part a majority party effect. Thus, we control for the share of Republicans in the state's House delegation, as well as the number of Republican Senators in a state's Senatorial delegation (column 4). Contrary to our expectations, the proportion of Republicans in the House representation of a state is *negatively* related to state per capita earmarks (as expected, the number of Republican Senators is unrelated to spending in the version of the bill initiated by the House). Thus, Republican House representation is associated with pork barrel spending restraint when it comes to the 2005 Highway Bill, although the effect is small in magnitude: a one standard deviation increase in the share of Republicans in the state House delegation is associated with a 0.132 point increase in the log of pork per capita, which represents only 3.709% of the mean of this variable. While one should not over-interpret such a small estimated effect, it is interesting to note that majority status does not seem to confer a special ability (or desire) to direct pork disproportionately to the majority party's constituents.[11] In column 5 we add the proportion of a state's House delegation that is on the House Transportation Committee, hypothesizing that strong representation of a state on this committee might be positively associated with

[10] The data on highway length per state in 2003 are from the U.S. Department of Transportation. Our results are not sensitive to including variables based on alternative measures of installed roadway infrastructure by unit of land area.

[11] A similar observation, referring to pre-1991 earmarks in various pork-laden bills, appears in Evans (2004). For instance, on p. 226, she states "In nearly every case (. . .), projects were distributed in a bipartisan manner. . . . Leaders give to members of their own party to hold their loyalty through various challenges on the floor. They also give to members of the other party, who might be won by pork barrel benefits away from support for their own party's position if it is in opposition to the bill". The fact that the 2005 Highway Bill was passed with such overwhelming margins is an indication that party affiliation may not have mattered much for the allocation of highway funds, including earmarked funds. Why the majority party does not seem to receive a disproportionate share of earmarks, however, remains unknown, and beyond the scope of this paper.

Table 3. Determinants of earmarks per capita in the House versions of the Transportation Bill (dependent variable: total value of earmarks per capita, in USD, per state)

	(1)	(2)	(3)	(4)	(5)	(6)
	2005 House version	2005 House version	2005 House version	2005 House version	2005 House version	2004 House version
Log of population, 2005	−0.112	−0.160	−0.182	−0.194	−0.097	−0.101
	(0.119)	(0.132)	(0.145)	(0.149)	(0.058)	(0.067)
Open highway miles/land area in km^2		6.844	6.172	6.181	0.480	2.745
		(2.124)	(1.580)	(1.423)	(1.578)	(1.528)
Log of land area, km^2		0.328	0.355	0.404	0.162	0.232
		(0.174)	(0.188)	(0.178)	(0.065)	(0.076)
Log state personal income per capita, 2004			0.839	0.846	0.236	−0.270
			(0.975)	(1.143)	(0.456)	(0.530)
Percent Republicans in House delegation (109th Congress)				−0.556	−0.427	−0.115
				(0.250)	(0.196)	(0.184)
Number of Republican Senators (109th Congress)				0.002	−0.032	−0.112
				(0.099)	(0.065)	(0.063)
Share of state representatives on House Transportation Committee					2.149	1.793
					(0.596)	(0.615)
Constant	5.410	2.096	−6.563	−6.715	0.695	4.957
	(1.867)	(1.072)	(10.212)	(11.919)	(4.607)	(5.363)
Observations	51	51	51	51	51	50*
Adjusted *R*-squared	0.02	0.26	0.27	0.31	0.71	0.64

Robust standard errors in parentheses.

* South Dakota was dropped when taking logarithms because that state had zero earmarks per capita in the 2004 House version.

that state's earmarks per capita. This is indeed the case, as the estimated coefficient is positive and highly significant statistically. Moreover, this variable adds greatly to the explanatory power of our model, as adding it to the regression raises the adjusted R^2 from 0.31 to 0.71.

As a final check, we considered earmarked spending per capita in the unsuccessful 2004 version of the Transportation Bill as a dependent variable (column 6). Unsurprisingly, given the high correlation between this variable and its 2005 counterpart, the results are not greatly affected. No matter which specification is considered, the coefficient on the log of population remains negative but insignificant and small in magnitude.

We now turn to the determinants of earmarked spending per capita in the final version of the bill – the version that came out of conference committee and became law. The bill has now been the subject of a compromise with the Senate, where representation is malapportioned. Table 4 presents the results. We proceed as before, including controls sequentially. The estimated coefficient on the log of population is again negative, but it is now highly significant statistically and it is about six times larger than in the House version, irrespective of the specification: the malapportionment effect has appeared. Our estimates suggest that a 1% increase in a state's population is associated with a 0.595 percentage point decrease in pork barrel spending per capita, in the baseline specification of column 5. This is an economically large effect. The effect is estimated with great precision, as the t-statistic always exceeds 7 across specifications. Moreover, the log of population alone can explain 63% of the variation in the dependent variable (column 1), whereas this number was essentially zero in Table 3.

As expected, the effect of the number of Republican senators in each state's delegation becomes larger in magnitude than in Table 3, and is now significant at the 5% level (column 5). Thus, a larger Republican senatorial delegation seems associated with less pork barrel spending, although the effect of the share of Republicans in the House delegation becomes statistically insignificant. The effect of the installed highway density also becomes insignificant in Table 4. Coefficients on other control variables are in line with those found using the House version (a positive effect of the log of land area and an effect of log personal income per capita that is statistically indistinguishable from zero). In column 5 we include two variables reflecting the composition of the conference committee: the share of a state's representatives that are on the conference committee, and the number of a state's Senators on the conference committee. Both variables come out statistically significant, and their inclusion raises the explanatory power of the regression. However, they only marginally impact the coefficient on the log of population, which falls from 0.655 to 0.595. Thus, we find only weak evidence that small states derive their ability to attract disproportionate earmarks through strong representation on the conference committee, the Alaskan example notwithstanding.[12]

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[12] Further, including in our regressions the share of a state's representation on the House transportation committee and the number of Senators on the Senate Transportation Committee did not change the results. The first variable, which is highly correlated with conference committee representation, was positively related to earmarks per capita, while the second variable was insignificant.

Table 4. Determinants of earmarks per capita in the Conference version of the 2005 Transportation Bill (dependent variable: total value of earmarks per capita, in USD, per state)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	2005 Conference version	2005 Conference version	2005 Conference version	2005 Conference version	2005 Conference version	Excluding Alaska	Excluding Arizona
Log of population, 2005	−0.585	−0.628	−0.644	−0.655	−0.595	−0.564	−0.590
	(0.081)	(0.084)	(0.088)	(0.086)	(0.044)	(0.048)	(0.044)
Open highway miles/land area in km^2		1.935	1.444	1.883	1.540	1.915	1.833
		(1.434)	(1.350)	(1.294)	(1.208)	(1.210)	(1.181)
Log of land area, km^2		0.164	0.184	0.245	0.229	0.197	0.238
		(0.106)	(0.110)	(0.115)	(0.063)	(0.063)	(0.064)
Log state personal income per capita, 2004			0.613	0.284	0.259	−0.110	0.177
			(0.612)	(0.667)	(0.385)	(0.456)	(0.382)
Percent Republicans in House delegation (109th Congress)				−0.329	−0.183	−0.230	−0.177
				(0.206)	(0.165)	(0.157)	(0.164)
Number of Republican Senators (109th Congress)				−0.146	−0.133	−0.154	−0.120
				(0.085)	(0.063)	(0.061)	(0.060)
Share of state in Conference Committee					0.507	0.241	0.440
					(0.224)	(0.261)	(0.221)
Number of Senators on Conference Committee					0.416	0.369	0.395
					(0.080)	(0.087)	(0.078)
Constant	13.513	12.191	5.863	9.059	8.207	12.012	8.882
	(1.248)	(1.409)	(6.345)	(6.835)	(3.870)	(4.604)	(3.873)
Observations	51	51	51	51	51	50	50
Adjusted R-squared	0.63	0.65	0.65	0.69	0.83	0.79	0.86

Robust standard errors in parentheses.

As a final robustness check on our findings, we carried out an outlier analysis. Plotting the residuals from the regression in column 4 of Table 4, two apparent outliers are revealed: Alaska's earmarked spending is vastly underpredicted by the model and Arizona's is somewhat overpredicted. The Alaska case is particularly interesting because the entire Alaskan congressional delegation was part of the conference committee, and Alaska is a small state in terms of its population. Excluding each of these states from the sample, however, hardly changes the results at all (columns 6 and 7 of Table 4). In fact, excluding Arizona slightly raises the coefficient on log population. Excluding Alaska reduces it slightly, although the precision of the estimate is raised. At any rate, the Alaskan example is a basket case of the effects of legislative malapportionment.

CONCLUSION

In this paper we presented a simple empirical test of theories of legislative malapportionment. Using data from the 2005 Highway Bill, we showed that earmarked spending on transportation infrastructure projects is disproportionately allocated to smaller states. However, this effect only appears after the bill made its way through the Senate and Conference Committee, and is not apparent in the House version of the legislation. This provides direct evidence that legislative malapportionment is primarily responsible for the small state bias in pork barrel spending.

Future research should seek to generalize our findings to other types of geographically targetable expenditures and policies. Using data on different versions of the same legislation as it makes its way in the legislative process is a promising way to identify the effects of institutional rules on public policy.

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