Distributive Politics and Electoral Incentives: Evidence from Seven US State Legislatures

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We study the effect of electoral incentives on the allocation of public services across legislative districts. We develop a model in which elections encourage legislators to cater to parochial interests and thus aggravate the common pool problem. Using unique data from seven US states, we study how the amount of funding that a legislator channels to his district changes when he faces a term limit. We find that legislators bring less pork to their district when they cannot seek re-election. Consistent with the Law of 1/N, this last term reduction in funding is smaller in states with many legislative districts.
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Elections are widely perceived to serve a number of complementary functions. They aggregate preferences, help select better public officials, and provide incentives for politicians to act in the interest of the voters they represent (Persson and Tabellini 2000). Elections perform the latter function when the threat of not being re-elected serves as a motivation. How this works, both in theory and in practice, is fairly well understood in the context of politicians with executive power to make decisions unilaterally. Much less is known about how these incentives operate at the level of individual legislators elected to serve along side many other legislators in a legislative chamber. Do these incentives matter and if so, do they help promote socially desirable outcomes? This paper provides some answers to these questions.

We study the effect of re-election incentives on the allocation of district-specific public services when policy decisions are made by a group of legislators, each of whom is elected to represent the interest of a particular legislative district. This shift in emphasis has important implications for the nature of the electoral incentive effect because it brings to the forefront the conflict between what is desired by the voters of each district and what is optimal for the state as a whole; a conflict which is typically down-played in studies that focus on a single politician elected by all the voters of a state. The source of

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this (new) conflict is that the benefits of government spending can (partly) be targeted at particular groups of voters while the tax costs are spread more widely across the entire polity. This encourages individual legislators to bring pork-barrel spending home to their district and creates a common pool problem. The consequence is that total government spending tends to be too high from a social point of view (Weingast, Shepsle, and Johnsen 1981). The central message of our paper is that elections may acquire a more sinister role in a world of distributive politics: they may create additional incentives for legislators to cater to parochial interests in a way that magnifies rather than resolves the underlying common pool problem.

We now preview our study and its main results. We begin by building a theoretical model that embeds a political agency model with repeated elections, asymmetric information, and term limits within the canonical model of distributive politics. At the core of the model lies the common pool problem and the notion that legislators, who can serve for at most two terms in office, differ in their ability to bring back pork to the district that they represent. The model delivers two predictions that guide our empirical investigation. Firstly, it predicts that spending to a particular legislative district *falls* when the legislator representing it is up against the term limit compared to when he is not. We refer to this as the 'last-term effect'. This is a consequence of the incentives generated by elections to cater to parochial interests. In this way, elections may exacerbate the common pool problem and reduce social welfare. While the incentives of the governor of a US state whose constituency is the entire state may be such that total spending drifts up in the absence of re-election prospects (Besley and Case 1995), our model suggests that these incentives may work in the opposite direction in the context of distributive politics. Secondly, the model predicts that the absolute size of the 'last-term effect' is smaller in states with more districts. While re-election incentives, in general, aggravate the common pool problem, they do so to a lesser extent in states with many districts where the common pool problem is already large. Our test of this prediction can be interpreted as a new test of the Law of 1/N – stating that the common pool problem is more pronounced in larger legislatures – because it is a direct consequence of the fact that the overspending bias is larger in a bigger legislature, as suggested by this Law.

The main contribution of the paper is to test these predictions and thus provide new empirical evidence on the incentive effect of elections and the Law of 1/N. We have collected new data that span 600 legislative districts between 1992 and 2005 in seven US states (Arizona, Colorado, Louisiana, Missouri, Ohio, Oklahoma and South Dakota). The dataset contains information on the legislators elected to a state's lower chamber from each legislative district, and on the transfers from the state budget to these districts. The data on district-specific transfers (loosely referred to as pork-barrel spending) are unique and constructing these data can be seen as a major contribution of the paper. All the states in our sample have legislative term limits that cap how long individual state legislators can serve. These limits generate the exogenous variation in re-election prospects that we use to identify the incentive effect of elections and to test the Law of 1/N.

We find that transfers fall when legislators no longer face re-election prospects or put

the other way around that spending is inflated when legislators respond to electoral pressures. On average, total transfers fall by $14 per capita in a legislator's last term relative to transfers secured by the same legislator in earlier terms. This corresponds to a 3.5 percent fall in spending. This finding suggests that elections aggravate the common pool problem and, in the spirit of Maskin and Tirole (2004), that accountability to voters can reduce social welfare. We also find that the last term fall in spending is smaller in states with a larger legislature and interpret this as evidence of the Law of 1/N in operation.

The rest of the paper in organized as follows. In Section I, we discuss the related literature. In Section II, we develop the model and summarize the features that guide our empirical investigation. In Section III, we discuss the construction of the dataset, its limitations, and present some stylized facts. In Section IV, we lay out our estimation strategy and present the empirical results related to the 'last-term effect'. In Section V, we present the results of our test of the Law of 1/N. In Section VI, we discuss the importance of term limits as a vehicle for isolating electoral incentives and in Section VII, we look at party differences in the incentive effect of elections. In Section VIII, we conclude. The Appendix at the end contains key proofs and the online appendices contain some additional derivations and a detailed discussion of how the dataset is constructed.

I. Related Literature

This paper is directly related to three strands of the literature on the political economy of public spending. The first strand is the political agency literature on incentive effects of elections.[1] Empirically, a series of papers in this literature have looked for evidence of shirking among US congressmen when re-election incentives are weak, with somewhat contradictory results (see Lott and Davis 1992; Parker and Powers 2002; and Snyder and Ting 2003). The major challenge in this line of research is to find variation in electoral incentives that is exogenous to the politician's behavior. In their seminal paper, Besley and Case (1995) propose to use gubernatorial term limits in the US states to identify the impact of re-election incentives on state governors. When a governor enters his last allowed term, his policy choices no longer affect the re-election probability. This is in contrast to terms after which he can run for re-election. Using a within-state comparison of governors, Besley and Case (1995) show that governors who can no longer run for re-election allow state taxes to increase and state spending to drift up. List and Sturm (2006) also use gubernatorial term limits to demonstrate that state spending on more specific policies, such as environmental regulation, diverge more from the interests of voters when the governor can no longer run for re-election. Exploiting a unique dataset on local government corruption in Brazil, Ferraz and Finan (2011) show that mayors who cannot stand for re-election due to a term limit tend to be more corrupt. Finally, Dalle Nogare and Ricciuti (2011) study executive term limits in a sample 52 countries. They find that lame ducks in presidential systems tend to cut public spending during their last term.

These papers provide evidence of a disciplining effect of elections, consistent with the

[1] We relate our theoretical work to this literature in Section II.

suggestion of the political agency literature that elections improve voter welfare. The major difference between our analysis and these earlier studies is that we study how re-election incentives influence individual members of a legislature rather than the executive. This demands that we estimate the flow of money from the state budget to individual legislative districts within a state, rather than studying aggregate state spending and taxes or corruption. Moreover, the variation in re-election prospects in our work comes from legislative rather than executive term limits.[2]

There is another important distinction between our study and this existing empirical literature that should be stressed. Previous studies, in particular Besley and Case (1995), estimate the 'last-term effect' by relying in part on a comparison of politicians who survived for the maximum number of terms to those who did not. When elections help voters select certain kinds of politicians, such a design confounds incentive and selection effects of elections. The richness of our data allows us to identify the incentive effect of elections by comparing how the transfers to a particular legislative district change when its legislator is up against the term limit relative to previous terms served by that same legislator. This reduces significantly the possibility that selection effects or other unobserved factors contaminate the estimate.

The second strand of literature that this paper contributes to is the literature on distributive politics, started by Weingast, Shepsle, and Johnsen (1981). They demonstrate theoretically how the common pool problem emerges when the legislators' objective function ignores the cost of the tax imposed on other constituencies. We complement this theory by explicitly modelling the interaction between legislators and their voters. This allows us to show how elections provide incentives for overspending and magnify the underlying common pool problem. Our study also adds to previous empirical applications of the theory of distributive politics to US state legislatures (e.g., Crain 1999; Gilligan and Matsusaka 1995, 2001; Primo 2006, and Chen and Malhotra 2007). These papers analyze *aggregate* state spending in order to test the Law of 1/N: the prediction made by Weingast, Shepsle, and Johnsen (1981) that the extent of overspending is greater when there are more districts.[3] In contrast, we study transfers from the state budget to individual legislative districts. In this way, we attempt to measure pork-barrel spending directly. Although our research design does not allow for a direct test of the Law of 1/N, we explore the fact that the number of districts is systematically related to the incentive effect of elections to bring new evidence to bear on it.

The third strand of literature that our paper contributes to is the literature on the importance of distributive politics at the state level in the USA (e.g., Chen and Malhotra 2007; Thompson 1986; and the survey by Goodman 2007). Ansolabehere, Gerber, and Snyder (2002) study the effects of court-ordered redistricting on the allocations of state funding to counties and show that a county gets significantly more funding when it has more representatives in the state legislature (in per capita terms).[4] Gosling (1985) stud-

[2] Ansolabehere and Snyder (2004) also use these term limits to estimate the effect of incumbency on re-election chances.

[3] For a critical evaluation of the evidence on the Law of 1/N, see Primo and Snyder (2008).

[4] See also Ansolabehere and Snyder (2008: chapter 9) for an illuminating discussion of the Baker vesus Carr case

ies the budget process in Wisconsin and shows that state legislators are both willing and able to influence the spatial allocation of state spending, and documents the mechanisms through which they achieve this:[5]

> 'Local assistance items are 'bread and butter' of legislators' most informed and politically active constituents. And since each legislator represents at least one municipality, county, or school district, each has an interest in how local assistance proposals affect his jurisdiction. (...) Bureaucrats are permitted to contribute a good proportion of the budget, but when the budgetary decisions involve the 'big ticket items', especially those affecting local governments back home, the legislative actors disproportionately shape the final outcome'. (Gosling, 1985: p. 477).

We contribute to this literature by showing that state legislators respond to electoral incentives in a way that is consistent with distributive politics being important.

II. The Model

The theoretical literature on the incentive effect of elections and term limits primarily focuses on situations with a single politician with executive power, such as a governor or a head of state.[6] The question addressed is how and to what extent elections can resolve the conflict between voters at large and their (one) elected representative. Yet, fiscal decisions are mostly made collectively by many legislators and often in an environment where distributive politics is important. This creates an additional conflict of interest between what is optimal for the state as a whole and what is optimal for voters in each district. This, in turn, has implications for the welfare consequences of the incentive effect of elections.

Our theoretical approach stresses three salient features of collective decision making in a stylized state legislature which we believe are important for understanding the interaction among electoral incentives, term limits, and distributive politics. First, we follow the literature on distributive politics, initiated by the seminal work of Weingast, Shepsle, and Johnsen (1981), and assume that state spending is geographically targeted while the

in Tennessee. The evidence presented in court showed how much legislators used the additional power they had under malapportionment to skew spending towards their districts.

[5] By tracking the state budget from the initial draft through to the final version, Gosling (1985) quantifies the relative influence of the major political players (various state agencies, the executive's state budget office, and the state legislature) on the final budget allocation. The analysis shows that state legislators play a critical role in determining the allocation of transfers to local government units (municipalities, school districts, counties etc.) through relevant legislation drafted in committees and amended on the floor. In contrast, their influence on other, less geographically targeted spending items, is less pronounced.

[6] See, e.g., Ferejohn (1986), Reed (1994), Besley and Case (1995) or Aidt and Magris (2006). An exception, however, is Bernhardt, Dubey, and Hughson (2004). They study the effect of term limits on the re-election rule in a political agency model with many legislators and distributive politics. Distributive politics is modeled as a zero sum game where more senior legislators can bring more pork-barrel home to their district at the expense of more junior legislators. While this formulation captures experience effects, it does not address the common pool problem underlying the standard conception of distributive politics and which forms the core of our model. Persson and Tabellini (2000: chapter 10) in their comparison of presidential and parliamentarian forms of government also combine elements of electoral accountability with distributive politics but do not consider asymmetric information which is an indispensable component of our approach.

tax cost is shared amongst all districts. This creates the common pool problem and the tendency for overspending that is at the core of our model. We add to this a conflict of interest between voters in a district and the legislator who represents them. The conflict arises because legislators differ in their ability to 'bring home the pork'. The second central feature of the model, then, is that voters use elections as an ex post selection device to weed out legislators unable to deliver sufficient pork. Term limits hamper this endeavor simply because elections cannot provide incentives for legislators who cannot seek re-election. This creates the 'last-term effect' that encapsulates the impact of electoral incentives on the allocation of state funds. The third feature of the model regards the organization of the legislature. There are two main theoretical approaches to modeling this: the norm of universalism (e.g., Weingast, Shepsle, and Johnsen 1981; Shepsle and Weingast 1981; Primo and Snyder 2008; and Brooks, Phillips, and Sinitsyn 2011) and legislative bargaining (e.g., Baron and Ferejohn 1989; Baron 1991; and Battaglini and Coate 2007). Since the details of the legislative bargaining process cannot readily be built into our empirical specification, the legislative bargaining model, despite its theoretical appeal, is less useful for our purposes. For this reason, we assume that legislators can influence the spending allocation to their district, but only if they exert (costly) effort. We interpret this as a reduced form representation of a more complex legislative process where effort is required to get into the right committees, to build coalitions with other legislators, to influence the leadership of the House etc., all of which eventually affect how successful a legislator is at bringing home the pork.

A. The Economic and Political Structure

We consider a state with N legislative districts, indexed $k = 1, ..., N$, each populated by a continuum of citizens with measure 1. The time horizon of the polity is infinity and indexed by $t = 0, 1, 2, ...$ All citizens live forever, and, for simplicity, they do not discount the future. They receive the same per-period income y. This is spent within the period on a private good or on paying taxes. Public services can be targeted at the district level. We denoted the services delivered to district k by p_k and refer to them as pork-barrel. Pork-barrel spending is financed by a uniform lump sum tax τ collected from all districts to balance the state budget, i.e., $\tau = \frac{1}{N}\sum_{k=1}^{N} p_k$. We require that $\tau \leq y$ and, for simplicity, impose a cap on district spending at $p_k \leq y$. The utility function of a voter living in district k is $u(p_k) = y + v(p_k) - \tau$, where $v(p_k)$ is strictly concave and increasing in p_k. The most-preferred spending level for voters in district k is

$$p^V = \arg\max_{p_k} y + v(p_k) - \frac{p_k}{N} - \frac{\sum_{j\neq k} p_j}{N}. \tag{1}$$

From a state welfare perspective, the optimal per-district level of spending reflects the tax externality and is determined by maximizing a utilitarian social welfare function:

$$p^E = \arg\max_{p_k} y + v(p_k) - p_k + \sum_{j\neq k}(y + v(p_j) - p_j). \tag{2}$$

It is clear that $p^V > p^E$. This is the underlying common pool problem: voters in each district want more pork-barrel for their district than what is efficient for the state as a whole because they only internalize a fraction $1/N$ of the tax cost.

Every period each district elects one legislator to the state legislature using the majority rule. The legislator serves his district and he wants to bring pork back to it, but must exert costly effort to do so.[7] The amount of pork that a legislator brings back is an increasing, concave function of e_k, the effort he exerts, i.e., $p_k = f(e_k)$ with $f' > 0$ and $f'' < 0$. Legislators are different and for some it is less costly to secure pork than for others. There are two types of legislators, $T \in \{L, H\}$, referred to as effective (L) and ineffective (H) legislators. The type-specific effort cost function is $C^T(e_k) = a^T C(e_k)$, where $C' > 0$, $C'' \geq 0$ and $a^H > a^L$. Type is private information to each legislator and is, for simplicity, an unchanging attribute. The probability that a randomly chosen citizen from a given district is of type L is δ. Citizens get ego-rents from being in office. The ego-rent associated with serving term τ is $M_\tau > 0$.[8] A legislator who is out of office gets utility as any other citizen-voter. The per-period payoff of a legislator of type T elected to serve district k for term τ is

$$U^T(p_k) = u(p_k) + M_\tau - a^T c(p_k), \tag{3}$$

where we define $c(p_k) \equiv C(f^{-1}(p_k))$ with $c' > 0$ and $c'' \geq 0$. This formulation allows us to study the behavior of a legislator *as if* he picks p_k directly rather than indirectly through his effort choice.

The state has a term limit policy. It stipulates that a given legislator can at most serve two consecutive terms and only once. We refer to legislators serving their first term as *first-term* legislators and legislators who serve their second term as *last-term* legislators. The timing of events within a period is:

1) All newly elected first-term legislators learn their type. The legislature meets and the legislators decide simultaneously how much effort to exert to secure services for their district. Voters observe the pork-barrel delivered to their district and the tax bill.

2) An election is held in each district. First-term legislators run again against a randomly chosen challenger. Last-term legislators cannot run again and a new legislator is elected at random.

B. Analysis and Results

All legislators are willing to work for their district even if they do not face a re-election prospect because they care directly about the public services delivered. How hard a

[7] For simplicity, we refer to legislators as males. In reality, of course, many of them are women.

[8] Since effort is costly, a randomly selected citizen may prefer not to stand for election and let someone else do the heavy lifting. We assume that the ego-rents are sufficiently large to rule this out. An online appendix details sufficient conditions.

given legislator will work depends, however, on his type. The most-preferred pork-barrel spending for a legislator of type T is:

$$p^T = \arg\max_{p_k} y + v(p_k) - \frac{p_k}{N} - \frac{\sum_{j \neq k} p_j}{N} - a^T c(p_k) \text{ for } T \in \{L, H\}. \tag{4}$$

More effective legislators put in more effort and, as a consequence, $p^L > p^H$. Since effort is costly, even p^L is less than what the voters of the district really want ($p^L < p^V$). Under the assumption that $a^H N c'(p^E) < N - 1$, the efficient level of spending, p^E, is lower than p^H and we can rank the spending levels as follows: $p^E < p^H < p^L < p^V$.

Last-term legislators cannot run again due to the term limit and they exert the minimum effort needed to bring home p^L or p^H. Voters prefer more pork-barrel spending to their district to less (up to p^V) and know that $p^L > p^H$. They will, therefore, use the power of the ballot box to get rid of first-term legislators of type H. We use Perfect Bayesian Equilibrium (PBE) to characterize outcomes of the legislative process in the presence of elections. A PBE consists of an effort choice (and an associated amount of pork-barrel spending) – one for each type of first-term legislator – voters' re-election strategy, and a set of Bayes-consistent beliefs held by voters in the district, such that

1) first-term legislators of each type exert an optimal amount of effort given the voters' re-election strategy in their district and the choices of the other legislators;

2) the voters' re-election strategy is optimal given the voters' beliefs about the type of the district's incumbent and the incumbent's strategy;

3) voters' beliefs are whenever possible updated according to Bayes rule.

Two types of PBE can potentially emerge: pooling equilibria and separating equilibria. Pooling equilibria in which all types of first-term legislators select the same effort level can, however, be ruled out.[9] In a separating equilibrium, first-term legislators of different types must be willing to differentiate their pork-barrel spending to such an extent that voters can deduce their type and re-elect those whose type is revealed to be L. First-term legislators of type H will therefore never be re-elected and so they put in the minimum effort needed to deliver p^H during their first (and only) term. To get re-elected, first-term legislators of type L may, on the other hand, have to exert extra effort to bring home more pork ($\widetilde{p}_k^L$) than p^L. To enable voters to distinguish between the two types, a first-term legislator of type H must not be willing to mimic a legislator of type L by delivering $\widetilde{p}_k^L$.

[9] The reason is that if all first-term legislators deliver more pork than p^H, as they would in a pooling equilibrium, then voters prefer to have a first-term legislator in the seat each period and will never re-elect anyone. This eliminates the incentive of first-term legislators of type H to do anything but exerting the minimum effort and deliver p^H to their district.

This requires that $\widetilde{p}_k^L$ satisfies:[10]

$$(5)\quad v(\widetilde{p}_k^L) - \frac{\widetilde{p}_k^L}{N} - a^H c(\widetilde{p}_k^L) \leq (1-\delta)\left(v(p^H) - \frac{p^H}{N}\right) + \delta\left(v(\widetilde{p}_k^L) - \frac{\widetilde{p}_k^L}{N}\right) - M_2.$$

At the same time, it must be better for legislators of type L to put in the extra effort needed to deliver $\widetilde{p}_k^L$ in order to get re-elected rather than to forgo re-election and simply deliver p^L. This requires that $\widetilde{p}_k^L$ satisfies:

$$(6)\quad v(\widetilde{p}_k^L) - \frac{\widetilde{p}_k^L}{N} - a^L c(\widetilde{p}_k^L) \geq (1-\delta)\left(v(p^H) - \frac{p^H}{N}\right) + \delta\left(v(\widetilde{p}_k^L) - \frac{\widetilde{p}_k^L}{N}\right) - M_2.$$

We denote the (largest) spending levels such that equations (5) and (6) are satisfied with equality by $\widehat{p}^H$ and $\widehat{p}^L$, respectively. A comparison of equations (5) and (6) shows that $\widehat{p}^L > \widehat{p}^H$ because it is cheaper for legislators of type L to exert effort than it is for legislators of type H ($a^H > a^L$). However, precisely because effort is costly, legislators are only willing to exert more than the minimum amount of effort in the quest for re-election if the second-term ego-rent, M_2, is sufficiently large. A sufficient condition that ensures $\widehat{p}^H > p^L$ is that

$$(7)\qquad M_2 > M_S \equiv a^H c(p^L) + (1-\delta)\left[(v(p^H) - \frac{p^H}{N}) - (v\left(p^L\right) - \frac{p^L}{N})\right].$$

Under this assumption, any $\widetilde{p}_k^L \in \left[\widehat{p}^H, \widehat{p}^L\right]$ is a candidate strategy for legislators of type L in a separating equilibrium and involves 'overspending'. By eliminating weakly dominated strategies, we can focus on the equilibrium that is least costly to legislators of type L, i.e., the one in which they deliver $\widetilde{p}_k^L = \widehat{p}^H$.

Based on this, voters deduce that a legislator who delivers $\widetilde{p}_k^L$ is of type L and one that delivers p^H is of type H. However, if first-term legislators are expected to over-spend ($\widehat{p}^H > p^L$), voters have an incentive to vote against incumbents of type L after the fact if it is sufficiently likely that the next first-term legislator is also of type L. In that way, they hope to get more pork, but, of course, legislators foresee this and no one will overspend. To guarantee that voters want to re-elect first-term legislators of type L if they deliver $\widehat{p}^H$, we assume that effective legislators are rare in the following sense:

$$(8)\qquad \gamma < \frac{\left(v(p^L) - \frac{p^L}{N}\right) - \left(v(p^H) - \frac{p^H}{N}\right)}{\left(v(\widehat{p}^H) - \frac{\widehat{p}^H}{N}\right) - \left(v(p^H) - \frac{p^H}{N}\right)} \equiv \overline{\gamma} < 1.$$

We can summarize this as the following proposition.

[10] Details of this and subsequent derivations are collected in the Mathematical Appendix which also contains the proofs of the propositions stated below.

PROPOSITION 1: *(Signalling equilibrium) For $M_2 > M_S$ and $\gamma < \overline{\gamma}$, a unique undominated separating equilibrium in pure strategies exists and is supported by the following strategies and beliefs:*

1) *First-term legislators of type L exert the effort level that delivers $\widehat{p}^H > p^L$ in their first term. First-term legislators of type H exert the effort level that delivers p^H in their first term.*

2) *Voters of district k re-elect their first-term legislator if and only if $p_k = \widehat{p}^H$.*

3) *The posterior belief of voters of district k that the first-term legislator of their district is of type L is* 1 *if they observe $\widehat{p}^H$ and* 0 *if they observe p^H.*

4) *Last-term legislators of type T exert the effort level that delivers p^T for $T \in \{H, L\}$.*

In the signalling equilibrium, first-term legislators of type L put in extra effort to bring home additional pork in order to signal their commitment to the district they represent.[11]

C. *The 'Last-term Effect'*

The main empirical prediction of the model concerns the impact of electoral incentives on district-level spending over the life-cycle of a legislator. Last-term legislators face no re-election prospects, as they, by definition, have to step down, but first-term legislators do. The difference between what a legislator does in his first and last term, therefore, captures the effect of electoral incentives. Since only legislators of type L get re-elected to the term limit, this 'last-term effect' is $\Phi_k = \widehat{p}^H - p^L$ and we have:

PROPOSITION 2: *(The 'last-term effect') The amount of spending allocated to a particular legislative district is smaller when the legislator representing that district is in his last term compared to when he is not, i.e., $\Phi_k > 0$ for $M_2 > M_S$.*

The 'last-term effect' arises because a binding term limit eliminates the need for effective legislators to put in extra effort to show commitment to their voters. It is important to stress that it isolates the incentive effect of elections from any selection effects. It does so because it is based on a comparison between what happens over the life-cycle of a particular legislator of fixed type.

We note that the legislators whom we study empirically can serve for more than two terms before they reach the term limit, in contrast to the model where they can only serve for two. If we allow for more than two terms in the model as it stands, legislators of type H will separate in the first term and there would be no upwards bias in spending during subsequent terms. The 'last-term effect' prediction of Proposition 2 is, however, robust to allowing for more than two terms as long as one also acknowledges that type

[11] If $M_2 \leq M_S$, then first-term legislators of type L can reveal their type by exerting the minimum amount of effort and deliver p^L and there is no need to overspend.

may not be permanent (Rogoff 1990) or that type cannot be deduced perfectly from observed spending levels (Bernhardt, Dubey, and Hughson 2004). The point is that voters in this more general environment are unable to deduce the true type of the legislator for sure after the first term and that legislators, therefore, have to continue overspending throughout their legislative carries till they reach the term limit.[12]

D. The Common Pool Problem and the Law of 1/N

In the absence of re-election prospects, all legislators exert the minimum amount of effort to deliver, depending on their type, p^L or p^H to their district. This is, in general, inefficient from the point of view of the state because the tax cost falling on other districts is not internalized. We refer to this as the *underlying* common pool problem. As suggested by the Law of 1/N, this underlying problem becomes more serious, in the sense that gap between p^E and p^L or p^H increases when the number of districts (N) increases, i.e., $\frac{\partial p^T}{\partial N} > 0$ for $T \in \{H, L\}$. This is well-known. What is new and interesting in Proposition 2 is the fact that electoral incentives magnify the tendency for overspending. This is because the desire to gain re-election, in the signalling equilibrium, forces first-term legislators of type L to exert extra effort so as to bring more pork back to their district than they otherwise would have brought ($\widehat{p}^H > p^L$). For a given number of legislative districts, the underlying common pool problem is, therefore, exaggerated by first-term legislators of type L vowing to get re-elected.

Another interesting feature of the model is the interaction between the Law of 1/N and the 'last-term effect'. In particular, we may ask if an increase in the number of districts (N) magnifies or dampens the 'last-term effect' ($\Phi_k(N) \equiv \widehat{p}^H(N) - p^L(N)$). The answer is not straightforward. On the one hand, p^L is increasing in N. This unambiguously dampens the 'last-term effect'. On the other hand, the need to inflate first-term spending to get re-elected ($\widehat{p}^H$) is also affected. Recall that the *least* extra pork a legislator of type L must bring home to get re-elected is defined by the *most* extra pork ($\widehat{p}^H$) a legislator of type H would ever be willing to bring home to get re-elected, i.e., $\widehat{p}^H$ is defined by

$$(9)\quad v(\widehat{p}^H) - \frac{\widehat{p}^H}{N} - a^H c(\widehat{p}^H) = (1-\delta)\left(v(p^H) - \frac{p^H}{N}\right) + \delta\left(v(\widehat{p}^H) - \frac{\widehat{p}^H}{N}\right) - M_2.$$

An increase in N has two effects on $\widehat{p}^H$ which work in opposite directions. First, an increase in N reduces the cost for legislators of type H to pretend to be of type L. This is because there are more districts to share the tax cost of the extra spending required and, as a consequence, the left-hand side of equation (9) is larger for a given $\widehat{p}^H$. This, ceteris paribus, makes legislators of type H more eager to mimic and thus $\widehat{p}^H$ increases. Second, the expected payoff as an ordinary voter, represented by the right hand side of equation (9), also increases in N and for the same reason: there are more districts to

[12] An appendix that demonstrates this formally in a three term model with evolving types is available upon request.

share the tax cost. This reduces the incentive to mimic and thus $\widehat{p}^H$ decreases. The next proposition shows that the first effect dominates under a (mild) sufficient condition.

PROPOSITION 3: *(Interaction between the Law of 1/N and the 'last-term effect'). Assume that* $v''' = c''' = 0$. *The 'last-term effect' is smaller in states with more legislative districts, i.e.,* $\frac{\partial \Phi_k}{\partial N} < 0$ *for* $M_2 > M_S$.

Hence, although electoral pressures magnify the underlying common pool problem in general, they do so less in states where the common pool problem is already large, i.e., where the number of districts is large.[13] Proposition 3 delivers the second testable prediction of the model that we take to the data. In fact, one way to look at the Proposition is that it suggests a new test of the Law of 1/N.

III. Data

Our data span seven state Houses of Representatives (Arizona, Colorado, Louisiana, Missouri, Ohio, Oklahoma, and South Dakota) during 1993-2004.[14] All of these states have legislative term limits, which is a primary reason for focussing on them.[15] The dataset combines two main pieces of information for each legislative district.[16] First, we estimate the amount of money the district receives from the state budget. Second, we record who represents the district in the legislature and whether this legislator can run for re-election under the state's term limit laws.

The information about the legislators, summarized in Table 1, is constructed on the basis of the State Elections Database by Carsey et al. (2008), complemented by a variety of other sources. Our dataset covers 1,574 legislators, representing approximately 600 legislative districts. The length of service varies from 1 year to 35 years, with an average of just over 9 years. Using information on state term limit laws (also summarized in Table 1), we calculate the year after which each legislator can no longer stand for re-election. In our sample, 330 legislators serve for the maximum number of terms, stepping down due to the term limit.

<Table 1: State Houses of Representatives and term limits in the seven states>

The second piece of information for each district – the amount of pork-barrel spending received – is not directly observed. To estimate pork-barrel spending, we use US Census Bureau data on transfers to local government units, and match these units to

[13] A sufficient condition for this is that the *rate* at which the marginal benefit of spending falls and the *rate* at which the marginal effort cost increases do not vary with the level of spending, i.e., $v''(.)$ and $c''(.)$ are constant over the relevant range from p^H to $\widehat{p}^H$. This condition is sufficient; that is, the proposition holds even if v''' and c''' are different from zero, as long as they are not extremely large in absolute value.

[14] These states represent three out of four regions of the USA: Midwest, South and West, and contain 12 percent of the US population. For Louisiana the data cover 1992-2005.

[15] Of the fifteen states that currently have legislative term limits, the remaining eight are not in our sample because data on geographical boundaries of their legislative districts were not available or because the term limits were not binding during the sample period.

[16] The details of how we constructed the dataset are available as an online appendix.

the legislative districts in which they are located. The local government units are counties, municipalities, school districts and special districts (water districts, library districts, housing development agencies etc.).[17] The data sources are the State and Local Government Finance (SLGF) database and the Public Elementary–Secondary Education Finance (PESEF) database.

To match local government units to legislative districts, we input the geographical boundary data provided by the US Census Bureau Topologically Integrated Geographic Encoding and Referencing System (TIGER) into custom-written software that calculates the area overlap between each local government unit and each legislative district.[18] We define the total transfer from the state budget to a legislative district as the sum of the transfers received by the local government units located within it. When a local government unit straddles two or more legislative districts, we attribute the transfer to each legislative district according to the share of the unit's area that lies in each district.

This approach allows us to estimate the amount of pork-barrel spending received by about 600 legislative districts across the seven states for 12 years.[19] Yet, we must recognize that it is a noisy estimate. There are several sources of measurement error with implications for our analysis. First, roughly one quarter of all state spending net of administrative costs is channelled through local government units. The remainder, spent on state procurement directly from the private sector or from non-governmental organizations, is not captured by our data. To the extent that this spending also delivers benefits to specific legislative districts, our estimate understates the true amount of pork-barrel. At the same time, Gosling (1985) argues that state legislators predominately use spending that goes through local government units to 'bring home the pork'. This reassures us that the portion of pork that we do capture is politically salient.

Second, our estimate of pork may include spending that accrues to a district regardless of the effort exerted by the legislator representing it and which should not, therefore, be considered pork-barrel. Here, we make two observations. Firstly, if our estimate includes a lot of such services, it will be harder for us to find evidence of a 'last-term effect'. Secondly, we can distinguish between categories of transfers over which individual legislators are likely to have no or little influence (such as school transfers based on a pre-set formula) and categories where such influence is a priori more plausible. We expect to find an effect of re-election incentives amongst items in the latter category but not necessarily so amongst the items in the former. This provides a reality check on the

[17] We exclude townships from our analysis because we do not have the data on their geographical boundaries. The share of state transfers allocated through townships is negligible.

[18] State legislative boundaries were redrawn following the decennial Census in year 2000. We account for this by generating two sets of matches, with old and new legislative boundaries, and then use the appropriate match.

[19] We are not aware of other work that does this on a similar scale. The closest predecessor is Ansolabehere and Snyder (2006), which also draws upon SLGF data, but focuses on transfers to counties without allocating these to individual legislative districts. Our approach, in contrast, generates information on the geographical allocation of spending across legislative districts and does this for a broader range of transfers, including significant transfers to school districts. Thompson (1986) and Thompson and Moncrief (1988) also study allocation of pork-barrel spending across legislative districts in North Carolina. Although their analysis confirms that distributive politics is important, their sample is too small to make statistical inferences based on it.

reliability of our estimate of pork.

Third, our matching procedure itself introduces two additional sources of measurement error. Firstly, it presumes that the geographical boundaries of a local government unit (say, a county or a school district) define the citizens who benefit from the state spending channeled through that unit. In many instances (e.g., for spending on schools within a school district) this approximates reality closely, but in others (e.g., for spending on roads) the presumption is more doubtful. Secondly, we assume that the benefits of the services funded by state transfers are spread evenly across the geographical area which receives them. Violations of these two assumptions may lead us to attribute either too much or too little pork to a particular legislative district.

Importantly, we emphasize that the noise in our estimate of district-specific pork is most unlikely to be a source of bias in our test of the 'last-term effect' and the Law of 1/N. As we discuss in Section IV, we use term limits to generate variation in re-election incentives for individual legislators. The timing of when they become binding for a particular legislator is exogenous with respect to that legislator's past performance. It is, therefore, unlikely that the error with which we measure pork-barrel spending is correlated with whether the legislator, who represents the receiving district and who serves the maximum allowed term, is in his last term or not.

Table 2 reports summary statistics for the estimates of the transfers to legislative districts in each of the seven states. On average, a district receives $400 per capita (in 1984 dollars) from the state budget, but there is significant variation across states, and large variation within states across legislative districts.[20] The real value of the transfers, averaged across all districts and states, rose steadily over the course of the sample period, from $303 per capita in 1993 to $421 per capita in 2004.

<Table 2: Total transfers from the state budget to legislative districts>

Table 3 shows the breakdown of transfers from the state budget to legislative districts by the purpose for which they are intended making a distinction between two main categories of transfers. 'Non-discretionary transfers' collects those transfers that are allocated according to some pre-specified formula or rule. This includes all transfers to the school districts that in the PESEF database are classified as following a formula[21], welfare payments, such as unemployment benefits, and transfers to utilities. The category, 'discretionary transfers', collects those transfers, which, as far as we can tell, are not allocated according to fixed rules. This includes non-formula education spending, spending on highways, health, transport subsidies, housing, and local government support.[22] The coefficient of variation for discretionary transfers is twice as high as for the non-discretionary ones. This is consistent with the notion that the latter are in fact subject to more rigid rules. From Table 3, we observe that 83 percent of all state spending on elementary and secondary education is channelled through the school districts and

[20] We deflate all transfer data by the annual consumer price index published by Bureau of Labour Statistics (using their base of 1982-84).

[21] For information on the use of school formula in the US states, see Verstegen and Jordan (2009).

[22] We experimented with allocating utilities to either group, and our results remain unaffected by this.

can, therefore, be geographically attributed using our matching approach. For the other categories, such as spending on welfare, the bulk of state spending cannot be attributed to particular legislative districts.

<Table 3: Breakdown of transfers to legislative districts by transfer type>

Table 4 decomposes the average transfers to a legislative district according to whether the legislator serving the district was re-elected all the way to the term limit or not. We observe that, on average, those who serve for the maximum allowed number of terms bring more pork back than those who are voted out or step down before the term limit becomes binding. Both for total and discretionary transfers per capita these differences are statistically significant. This is consistent with our theoretical framework which predicts that legislators who make it to the term limit do so because they are able to bring more pork back to their districts than those who do not.

<Table 4: Breakdown of transfers by length of service>

IV. A Test of the 'Last-term Effect'

To examine the prediction regarding the 'last-term effect', we estimate the following equation

$$y_{ijt} = \gamma\,(last\ term)_{ijt} + \alpha_i + \nu_{jt} + \varepsilon_{ijt}, \tag{10}$$

where i denotes a legislator, j a state, and t a year. The variable y_{ijt} denotes the estimate of the (real) per capita transfer to the district of legislator i from the state budget in state j in year t. The variable *last term* is a dummy variable equal to one if a legislator is in his last allowed term under the state's term limit laws and zero otherwise. α_i is a legislator fixed effect, ν_{ji} is a state-specific year effect, and ε_{ijt} is an error term. Our model predicts that $\gamma < 0$.

[Figure 1 to appear here]

To explain how we propose to identify the effect of electoral incentives on pork-barrel spending, it is useful to consider a simple example, illustrated in Figure 1, with two districts A and B in a state that allows a maximum of four two year terms. In the period between 1991 and 2003, district A first elects Stanley, who serves for two terms, and then loses to Blanche. Blanche is re-elected subsequently every time until she reaches the maximum of four two year terms and is forced to step down in 2003. In district B, representative Mitch is first elected in 1991 and is re-elected every time until he has served the maximum of four two year terms and is forced to step down in 1999. He is replaced by Stella in 1999, who is re-elected once, and then decides not to stand for election in 2003. In this example, the *last term* variable is equal to one in district A in 2001 and 2002 (during Blanche's last two years in office) and in district B in 1997 and 1998 (during Mitch's last two years in office). It is equal to zero in all other cases.

The most naive estimate of the 'last-term effect' is the difference between $E(y_{ijt}|last\ term = 1)$ and $E(y_{ijt}|last\ term = 0)$. This involves a comparison across districts. Clearly, different demographic, economic, and political characteristics may cause voters in different districts to prefer or need different levels of spending. Moreover, these characteristics are often correlated with the nature of politics in the district and may, therefore, affect the probability that a legislator 'survives' to the term limit. For this reason, it is difficult, if not impossible, to obtain an unbiased estimate of the 'last-term effect' from between-district comparisons of this sort. District fixed effects partly address this problem by limiting inference to within-district differences. This is the approach suggested by Besley and Case (1995).[23]

Basing inference solely on within-district variation eliminates some important sources of bias, but not all. For example, in Figure 1 a within-district comparison includes the comparison of the state transfers that Stanley brings to those that Blanche brings to district A. This contaminates the estimate of the 'last-term effect' because Blanche, who survives for the maximum allowed number of terms, and Stanley, who is voted out after the first term, are likely to be systematically different in their capacity to secure funds for the district. This, in turn, makes it impossible to identify the incentive effect of elections separately from the selection effect.[24]

The richness of our data, however, allows for a different and, we argue, more appropriate identification strategy. Since we have a decent number of observations for each term limited legislator (up to 12 years), we can identify the effect of electoral incentives by using only within-legislator variation. This is achieved by including legislator fixed effects (α_i) in equation (10). By doing so, the last term served by a legislator is only compared to the earlier terms of that *same* legislator, i.e., returning to the example of Figure 1, the transfers that Blanche secured in 2001 and 2002 are compared to the transfers she herself secured district A between 1995 and 2000. This addresses the selection problem head on without inviting systematic biases from differences across districts, legislators, or cohorts. Moreover, Proposition 2 concerns precisely such a comparison. In addition to legislator fixed effects, we also take into account that all the districts in a state are affected by common (fiscal) shocks or trends. We do this by controlling for state-specific year effects (ν_{jt}) in all our estimations.

There are two additional issues that deserve comment before we discuss the estimation results. Firstly, the fact that term limits were introduced during the sample period might raise concerns that the decision to adopt these limits could have been driven by the same unobserved factors that drove budget allocations. Within our research design with legislator fixed and state-specific year effects this would be a problem if the timing of when the term limit becomes binding for individual legislators is (conditionally) cor-

[23] To be precise, the state fixed effects used by Besley and Case (1995) play the same role as district fixed effects in our context.

[24] Ferraz and Finan (2011) propose to compare legislators who make it to the term limit but at different points in time as a way around this selection problem. This solution works well if systematic cohort effects can be ruled out and if there are many term-limited legislators per district. In our setting, cohort effects are likely to be important and there are too few term-limited legislators per district. This makes this solution unsuitable for our purposes.

related with the legislative choices made by those particular legislators. We do not think this is likely to be the case. Secondly, learning-by-doing or experience effects, which make legislators more effective at securing pork the longer they serve, may bias our estimate of the 'last-term effect'. We cannot rule experience effects out with our design, but we stress that they work against finding a negative 'last-term effect', i.e., they bias the estimate of γ in equation (10) towards zero.

Table 5 reports our estimates of the incentive effect of elections.[25] The first column reports the result for total per capita transfers to each legislative district. The transfer falls during a legislator's last term relative to previous terms served by that same legislator, and this effect is significant at the five percent level. The fall is $14 per capita which corresponds to a 3.5 percent fall in the average district. The second column reports the results for education spending alone. As noted above, transfers to primary and secondary education are targeted at well-defined geographical areas (school districts) and constitute the largest component of those state transfers that we are able to allocate to legislative districts using our geographical matching approach. We observe a statistically significant fall in education transfers in the last term of a legislator in the order of $10 per capita.

In columns 3 and 4, we report the results for discretionary and non-discretionary transfers separately. Conceptually, we conjecture that the 'last-term effect' is present only for spending items over which we can reasonably assume that legislators have (some) discretion as opposed to items which are based on pre-specified formulas. In line with this conjecture, we find that discretionary transfers fall in a legislator's last term (column 3), while the effect is insignificant for non-discretionary transfers (column 4). The magnitude of the effect for discretionary transfers is about $10 per capita.

Overall, these estimates show that electoral incentives induce a tendency for higher pork-barrel spending early in a legislator's career when pressures from the electorate are still important. Pork-barrel spending falls when electoral incentives disappear. This suggests that electoral incentives, by encouraging legislators to cater to district interests, may have a socially harmful effect because they amplify the underlying common pool problem.

[Table 5: Test of the 'last-term effect': The results]

V. A New Test of the Law of 1/N

The Law of 1/N – stating that the common pool problem is more pronounced in larger legislatures – has been subject to intense empirical scrutiny. Most investigations center on finding a (positive) relationship between the number of districts (or the size of the decision making body more generally) and total spending. The evidence from across US states, US cities, and cross-national samples of countries is broadly supportive of the Law.[26] However, a major challenge with such tests is that it is difficult to find sufficient

[25] Some districts are represented by more than one legislator. In these cases, we matched each legislator with the total transfer to the district. For this reason, we cluster all standard errors at the district-year level.

[26] See e.g., Gilligan and Matsuska (1995), Bradbury and Cain (2001), Baqir (2002), Bradbury and Stephenson (2003), and Primo (2006). Chen and Malhotra (2007) demonstrate how the effect is conditional on the level at which spending

exogenous variation in the size of the legislature to have confidence in the results (see Pettersson-Lidbom 2011). Another limitation of these tests is their focus on aggregate spending, despite the fact that the underlying theory of distributive politics is concerned with how pork-barrel spending is allocated to particular geographically designated constituencies. The implication of the Law of 1/N for aggregate spending is a by-product of this process. Accordingly, tests that look at aggregate spending do not shed much light on whether the underlying mechanism through which total spending is inflated is, in fact, consistent with the distributive politics model. Doing so requires data on the amount of pork that flows to particular districts.

Our data allow us to study such flows and to conduct a new test of the Law of 1/N that explores the interaction between electoral incentives, the geographical distribution of pork-barrel spending, and the size of the legislature. The test is based on Proposition 3 which suggests that the 'last-term effect' is smaller in absolute size in states with larger legislatures. To test this prediction, we explore the variation in the size of Houses of Representatives in our sample, from Arizona with 30 districts to Missouri with 163 districts (see Table 1). We augment the baseline specification from equation (10) with an interaction term between *last term* and the number of legislative districts (*number of districts*) and test if the coefficient on this interaction term is positive or not. This test is not plagued by the same problems of endogeneity as the tests that use cross-state variation in the number of districts to estimate the effect on total state spending. The identification comes from the interaction between a fixed number of districts within each state and individual legislatures being up against the term limit. As long as the (historical) choice of number of districts is not correlated with some unobservable variable that is also correlated with whether a particular legislator is up against the term limit, the estimate of the impact of the number of districts on the size of the 'last-term effect' is unbiased.[27]

The results reported in Table 6 show that the 'last-term effect' is smaller (less negative) for larger legislatures. The coefficient on the interaction term is positive and statistically significant at the ten percent level in the specification with total transfers per capita and at the five percent level in the specification with discretionary transfers alone.[28] Once again, we find no effect for non-discretionary transfers. This is consistent with Proposition 3 and provides strong, albeit indirect, evidence in support of the Law of 1/N. To get a sense of the quantitative importance of House size on electoral incentives, we note that the 'last-term effect' on discretionary transfers is equal to $21 per capita in the smallest of the states, Arizona. In Ohio with a medium sized House of Representatives, the effect is approximately $9 per capita, while in Missouri, with the largest number of districts, it

can be targeted. Pettersson-Lidbom (2011) finds evidence that contradicts the Law. He uses a discontinuity design and data from Swedish and Finnish municipalities to estimate the causal effect of an increase in council size on total spending and finds that it is negative.

[27] Brooks, Phillips, and Sinitsyn (2011) also propose an indirect test of the Law of 1/N. They study a sample of US cities and make use of the fact that block grants from the federal government provide exogenous variation in city revenues. They use this to study the effect of council size on the responsiveness to extra revenues. They find indirect evidence of the Law of 1/N in that larger city councils tend to spend a larger fraction of these block grants.

[28] We have experimented with a number of alternative definitions of House size, including the number of legislators, and with using district size instead of number of districts. Qualitatively, the results are unchanged.

is almost zero.

[Table 6. The number of districts and the 'last-term effect']

VI. The 'Last-term Effect' Without Term Limits

Our various tests focus on legislators who serve their last term because they are up against a binding term limit and are forced to step down. These are only a subset of all legislators who are in their last term, as revealed ex post. Some legislators are in their last term because they decided to step down early while others tried to get re-elected and failed. While the former can be expected to behave as if they were up against a binding term limit, the latter cannot. This implies that the 'last-term effect' should be weaker for the entire universe of 'last-term' legislators than for the subset we focus on. We investigate this conjecture in two ways.

First, we estimate the 'last term effect' for seven state Houses of Representatives that do not have term limits (Alabama, Iowa, Illinois, Kansas, North Dakota, New Mexico, and Tennessee).[29] Table 7 reports the results of estimating equation (10) with the independent variable *last term, ex post* which takes the value of one if the legislator is in his last term as revealed ex post. Although the point estimates, both for total transfers (column 1) and for discretionary transfers (column 2), are negative, neither are statistically significant. Second, we estimate the effect of the last term among the legislators who step down *before* they are forced to do so under the term limit laws of the states with term limits in the main sample. In this case, the independent variable *last term, ex post* takes the value of one during the last term served by a legislator but we limit the sample to the legislators who do not serve the maximum allowed number of terms. The results, reported in columns 3 and 4 of Table 7, again, show that there is no statistically significant 'last-term effect' among these legislators.

These (non) findings illustrate the importance of using an exogenous source of variation in re-election prospects, such as term limits, to estimate the impact of electoral incentives on the behavior of legislators. The point is not only that this variation is exogenous with respect of the legislative history of individual legislators, but also that incentives change steeply at the point in time when the term limit binds and the reason for stepping down is unambiguous.

[Table 7. A 'last-term effect' without term limits]

VII. The Role of Political Parties

A body of empirical work documents cross-party differences in the incentive effect of elections with regard to US state governors and US senators (see, e.g., Besley and Case 1995; and Knight 2005). To investigate whether such differences also exist at the level of individual state legislators, we decompose the average 'last-term effect' identified above

[29] We choose seven states without term limits that border the states in our sample. See the online data appendix for details.

between Democrats and Republicans. The results, which are detailed in an online appendix, shows that the 'last-term effect' is only significant among Democrats. According to our estimate they bring about $17 per capita less to their district when they serve their last term.[30] As before, the 'last-term effect' is associated with discretionary transfers only. This is consistent with previous empirical by Besley and Case (1995) which find that among US state governors that the 'last-term effect' is associated with Democrats only.

VIII. Conclusion

Most rational choice models of politics are predicated on the assumption that electoral incentives matter for the behavior of politicians. This paper contributes fresh empirical evidence that this basic assumption also applies at the level of individual state legislators. It studies the role of electoral incentives in a context with many legislators each representing their own constituency. This is in contrast to much of the existing literature which focuses on the relationship between a single politician with executive powers and his electorate, and which shows that electoral incentives typically improve welfare by alleviating the agency problem between politicians and their voters. We argue that in the context of distributive politics, electoral incentives acquire a different and somewhat darker role. They do so by inducing politicians to pursue parochial interests and thus potentially aggravating the underlying common pool problem.

Exploring a rich, new dataset with information on the flows of state funding to about 600 legislative districts in seven US states, we find evidence that legislators bring less pork back to their district when they can no longer run for re-election. The magnitude of this 'last-term effect' is a 3.5 percent fall in the total per capita transfer to the district during the legislator's last term. Put the other way around, this shows that re-election incentives encourage legislators to bring extra pork-barrel spending to their district.

The theoretical literature on legislative bargaining in the tradition of Baron and Ferejohn (1989) suggests that some legislators may be in a better position to bring pork-barrel to their districts than others.[31] We abstract from such differences and our estimate of the 'last-term effect' is an average effect of electoral incentives on pork-barrel spending across all term-limited legislators. An important task for future research is to unpack this average and to study the role of asymmetries in the power that legislators hold over the budget allocation and the mechanisms through which such powers get bestowed. Another important avenue for future research is to provide a theoretical foundation for why the effect of electoral incentives varies across political parties.[32]

The richness of our data allows us to provide a new test of the Law of 1/N. Most existing tests focus on the relationship between the number of districts (or seats) and

[30] On average in our sample, Democrats deliver $410 per capita to their districts, whilst Republicans deliver $390 per capita (in 1984 dollars).

[31] Knight (2005) provides evidence on this from the US Congress and political scientists studying state budget processes (e.g., Thompson 1986; Gosling 1985; Crain and Muris 1995; and Ansolobehere and Snyder 2006) also report evidence consistent with this logic.

[32] For existing theories, see Alesina and Spear (1988) or Dhami (2003).

total spending of the polity under consideration. Our theoretical model predicts that the 'last-term effect' should be weaker in states with more districts. We find strong evidence that this is also true empirically. This adds additional credence to the empirical relevance of the Law of 1/N.

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MATHEMATICAL APPENDIX

Proof of Proposition 1.

Notation. Let Σ^{-k} be the set of all possible configurations of the legislature consisting of the $N-1$ legislators other than legislator k with elements σ'. Let $E_{\sigma'}\left[\tau_k(\sigma', p^*_{-k})\right]$ be the per-period expected tax cost falling on district k as a consequence of the pork-barrel delivered to the $N-1$ other districts, where $\tau_k(.)$ represents the actual tax cost as a function of σ' and the equilibrium strategies of the $N-1$ other legislators, collected in the vector p^*_{-k}. Let $V(T) \equiv v(p^T) - \frac{1}{N}p^T - a^T c(p^T)$ be the per-period maximized utility of a legislator of type T *excluding* the tax bill associated with the spending plans in the other districts, τ_k, and his own income y. Let W_{kt} be the continuation utility for a citizen-voter in district k of having a randomly selected first-term legislator in seat k starting at time t *inclusive* of the expected tax bill associated with the spending plans in the $N-1$ other districts. We notice that

$$\text{(A1)}\quad W_{kt+1} - W_{kt+2} = y + \delta\left(v(\widetilde{p}^L_k) - \frac{\widetilde{p}^L_k}{N}\right) + (1-\delta)\left(v(p^H) - \frac{p^H}{N}\right) - E_{\sigma'}\left[\tau_k(.)\right],$$

where $\widetilde{p}^L_k$ is the candidate equilibrium strategy of a first-term legislator of type L. Finally, let the candidate equilibrium strategy for a first-term of a legislator of type H be p^H, and those for a last-term legislator of type T be p^T.

Equilibria. The candidate equilibrium strategies for last-term legislators are optimal for the two types of legislators since there is no re-election concern. Consider the first-term legislator in district k. Fix the proposed equilibrium strategies of the $N-1$ other legislators and the proposed re-election strategy of the voters of that district ('re-elect if $p_k = \widetilde{p}^L$ and not re-elect if $p_k = p^H$'). Firstly, suppose the first-term legislator is of type H. If he seeks re-election by mimicking the equilibrium strategy of first-term legislators of type L ($\widetilde{p}^L_k$), then his payoff is

$$\text{(A2)}\quad 2y + v(\widetilde{p}^L_k) - \frac{\widetilde{p}^L_k}{N} - a^H c(\widetilde{p}^L_k) - \tau_k(.) + M_1 + M_2 + V(H) - E_{\sigma'}\left[\tau_k(.)\right] + W_{kt+2}.$$

If, on the other hand, he plays his proposed first-term equilibrium strategy p^H, then he gets:

$$\text{(A3)}\qquad y + v(p^H) - \frac{p^H}{N} - a^H c(p^H) - \tau_k(.) + M_1 + W_{kt+1}.$$

Using equation (A1) to rearrange these two equations yields equation (5). Denote the largest value of $\widetilde{p}^L_k$ at which this constraint binds by $\widehat{p}^H$. This is the same for all districts because p^H is independent of k. This condition will always be satisfied if it holds for $\widetilde{p}^L_k = p^H$. Assume that M_2 is sufficiently large so that $\widehat{p}^H > p^H$.

Secondly, consider a first-term legislator of type L. If he plays the proposed equilib-

rium strategy, $\widetilde{p}_k^L$, to get re-elected, then he gets

$$\text{(A4)}\quad 2y + v(\widetilde{p}_k^L) - \frac{\widetilde{p}_k^L}{N} - a^L c(\widetilde{p}_k^L) - \tau_k(.) + M_1 + M_2 + V(L) - E_{\sigma'}[\tau_k(.)] + W_{kt+2}.$$

If, on the other hand, he deviates and delivers p^L, then he is not re-elected and gets

$$\text{(A5)}\qquad y + V(L) - \tau_k(.) + M_1 + W_{kt+1}.$$

Using equation (A1) to rearrange these two equations yields equation (6). We denote the largest value of $\widetilde{p}_k^L$ at which this constraint binds by $\widehat{p}^L$ which is the same for all districts. We assume that M_2 is sufficiently large so that $\widehat{p}^L > p^L$. A comparison of inequalities (6) and (5) shows that $\widehat{p}^L > \widehat{p}^H$ since $v(\widetilde{p}_k^L) - \frac{\widetilde{p}_k^L}{N} - a^T c(\widetilde{p}_k^L)$ is decreasing in $\widetilde{p}_k^L$ for $\widetilde{p}_k^L \geq p^L$ for all T. As a consequence, all $\widetilde{p}_k^L \in \left[\widehat{p}^H, \widehat{p}^L\right]$ will generate separation. Given that, Bayes rule requires that the voters of district k believe that their incumbent is of type L if $p_k = \widetilde{p}_k^L$ and of type H if $p_k = p^H$. We need a condition that ensures that $p^L < \widehat{p}^H$, so that all these separating strategies require overspending. Evaluating condition (5) at $\widetilde{p}_k^L = p^L$, we get the condition $M_2 > M_S$ where M_S is defined by equation (7). Notice that this condition implies that $\widehat{p}^L > p^L$ and $\widehat{p}^H > p^H$.

We need to check that it is a best response for voters in district k to re-elect if $p_k = \widetilde{p}_k^L$ and not to re-elect if $p_k = p^H$ rather than deviating and selecting a random first-term legislator. The former yields $y + v(p^L) - \frac{p^L}{N} - E_{\sigma'}\left[\tau_k(\sigma', p_{-k}^*)\right] + W_{kt+1}$ while the later yields simply W_{kt+2}. The candidate strategy for voters is a best response to all $\widetilde{p}_k^L \in \left[\widehat{p}^H, \widehat{p}^L\right]$ if $\gamma < \overline{\gamma}$ where $\overline{\gamma}$ is defined by equation (8).

Equilibrium Refinements. A weakly dominated strategy is one that yields a lower overall payoff to a legislator than his equilibrium payoff irrespective of how he privately thinks voters will revise their beliefs after such a deviation. All p_k in $\left[\widehat{p}^H, \widehat{p}^L\right]$ are weakly dominated for type H. It is, therefore, reasonable to suppose that voters, should they observe a deviation within this range, would conclude that the legislator behind the deviation could not have been of type H. Given that, a first-term legislator of type L can pick the separating spending level that is least costly, $\widehat{p}^H$, and get re-elected. This is the unique undominated separating equilibrium. An additional restriction on out-of-equilibrium beliefs is needed. It says that any deviation to a $p_k \notin \left[\widehat{p}^H, \widehat{p}^L\right]$ must in the eyes of voters have been generated by type H.

Screening. If $M_2 \leq M_S$ then $\widehat{p}^H < p^L$ and legislators of type L can get re-elected by delivering p^L and no signalling is required.

Proof of Proposition 3. We want to evaluate the sign of $\frac{d\widehat{p}^H}{dN} - \frac{dp^L}{dN}$. We note that $\frac{dp^L}{dN} = -\frac{1}{D_1}$ where $D_1 = N^2(v''(p^L) - a_L c''(p^L)$. Total differentiation of equation (9) yields

$$\text{(A6)}\qquad \frac{d\widehat{p}^H}{dN} = \frac{a^H c'(p^H)\frac{dp^H}{dN} + \frac{1}{N^2}(p^H - \widehat{p}^H)}{D_2}.$$

The denominator

$$D_2 = v'(\widehat{p}^H) - v'(p^H) + a^H c'(p^H) - a^H c'(\widehat{p}^H) - \frac{\delta a^H c'(\widehat{p}^H)}{1-\delta} \tag{A7}$$

is negative because $\widehat{p}^H > p^H$. The first term of the nominator is positive, while the second term is negative. It follows that

$$\frac{d\widehat{p}^H}{dN} - \frac{dp^L}{dN} = \frac{1}{D_2 D_1}\left[a^H c'(p^H)\frac{dp^H}{dN}D_1 + \frac{1}{N^2}(p^H - \widehat{p}^H)D_1 + D_2\right]. \tag{A8}$$

A sufficient condition for this to be negative is that $\frac{1}{N^2}(p^H - \widehat{p}^H)D_1 + D_2 \leq 0$. Expanding this expression using the definitions of D_1 and D_2 gives

$$\begin{aligned} & -(\widehat{p}^H - p^H)(v''(p^L) - a^L c''(p^L)) + \\ & v'(\widehat{p}^H) - v'(p^H) + a^H c'(p^H) - a^H c'(\widehat{p}^H) - \frac{\delta a^H c'(\widehat{p}^H)}{1-\delta} \\ = \quad & \\ & -(\widehat{p}^H - p^H)v''(p^L) + \left(v'(\widehat{p}^H) - v'(p^H)\right) \\ & +a^H\left((\widehat{p}^H - p^H)c''(p^L) - \left(c'(\widehat{p}^H) - c'(p^H)\right)\right) \\ & -\frac{\delta a^H c'(\widehat{p}^H)}{1-\delta} + (\widehat{p}^H - p^H)\left(a^L - a^H\right)c''(p^L). \end{aligned} \tag{A9}$$

Under the assumption that the $v''' = 0$ and $c''' = 0$, this reduces to

$$-\frac{\delta a^H c'(\widehat{p}^H)}{1-\delta} + (\widehat{p}^H - p^H)\left(a^L - a^H\right)c''(p^L) < 0 \tag{A10}$$

and we conclude that a sufficient condition for $\frac{d\widehat{p}^H}{dN} - \frac{dp^L}{dN} < 0$ is that $v''' = 0$ and $c''' = 0$.

Table 1. State Houses of Representatives and term limits in the seven states

State	Number of legislators	Number of districts	Democrats, share of total	Year of first election under TL	Maximum allowed service under TL (years)	Term limited legislators	Average service before TL	Average service after TL
Arizona	174	30	0.37	1992	8	28	7.7	5.6
Colorado	175	65	0.41	1990	8	41	8.5	6.4
Louisiana	210	105	0.74	1995	12	49	15.1	n/a
Missouri	396	163	0.53	1994	8	87	10.9	8.9[a]
Ohio	236	99	0.42	1992	8	67	12.3	6.6
Oklahoma	184	101	0.60	1992	12	28	13.6	n/a
South Dakota	199	35	0.32	1992	8	30	8.3	5.8
Entire sample	1,574	598	0.51			330	11.7	6.3

Notes: TL is 'term limit'
[a]This is greater than 8 due to provisions for special elections in Missouri.
Source: Authors' calculations and National Conference of State Legislatures (2009)

Table 2. Total transfers from the state budget to legislative districts

State	Per capita 1984 US$ Mean	Standard deviation	*N*	Share of transfers in total state spending per capita
Arizona	557	473	720	0.36
Colorado	426	365	780	0.28
Louisiana	384	387	1,470	0.21
Missouri	347	164	1,956	0.23
Ohio	498	177	1,188	0.28
Oklahoma	398	220	1,212	0.26
South Dakota	261	160	840	0.17
Total	400	294	8,166	0.26

Notes: *N* is equal to the number of districts times the number of years, except for Arizona and South Dakota, where each district has two representatives and so *N* is two times the number of districts times the number of years. The sample period is 1993-2004, except for Louisiana where it is 1992-2005.
Source: Authors' calculations.

Table 3. Breakdown of transfers to legislative districts by transfer type

Per capita 1984 US$

Type	Mean	Standard deviation	Min[a]	Max	Share of transfers in total state spending on this activity
Discretionary transfers, total	142	128	2	2,023	
Education, non-formula	70	70	0	686	0.83[b]
Local government support	20	50	0	749	1
Highways	21	26	0	368	0.14
Health	8	21	0	259	0.07
Housing	1	8	0	441	0.21
Transit	1	2	0	94	n/a
Other	21	41	0	1,341	n/a
Non-discretionary transfers, total	258	206	0	1,968	
Education, formula	234	175	0	1,740	0.83[b]
Welfare	24	73	0	1,226	0.07
Utilities	0.6	4	0	91	n/a

Notes: N = 8,166. [a] zero transfers were received in several districts in Oklahoma in 1993.
[b] share of all primary and secondary education transfers in total state spending on primary and secondary education. (separate data on total formula spending are not available)
Source: Authors' calculations.

Table 4. Breakdown of transfers by length of service

Per capita 1984 US$

	Mean	Standard deviation	N[a]	Number of legislators[b]
Total transfers				
Re-elected to term limit	404***	275	3,042	330
Not re-elected to term limit	375	295	3,274	765
Discretionary transfers				
Re-elected to term limit	144***	116	3,042	330
Not re-elected to term limit	131	131	3,274	765

Notes: *** significantly different from the 'not re-elected' group at 1 percent level.
[a] N is the number of legislator-years.
[b] For a further 479 legislators, we do not know whether they served to the term limit or not, and thus we drop them from the comparison. These are the legislators who (i) are in office in the last year of our sample and (ii) are not yet in their last allowed term in that year.
Source: Authors' calculations.

Table 5. Test of the 'last-term effect': The main results

	(1)	(2)	(3)	(4)
	Transfers per capita, 1984 US$			
	Total	Education	Discretionary	Non-discretionary
Last term	-14.4**	-9.8**	-9.5**	-5.0
	(6.6)	(4.2)	(4.2)	(4.2)
N	8,166	8,166	8,166	8,166

Notes: Estimates include legislator fixed effects and state-specific year effects. Robust standard errors in parentheses, clustered at the district-year level. *N* is the number of observations.
*** significant at 1 percent level, ** significant at 5 percent level, * significant at 10 percent level

Table 6. The number of districts and the 'last-term effect'

	(1)	(2)	(3)
	Transfers per capita, 1984 US$		
	Total	Discretionary	Non-discretionary
Last term	-38.2**	-26.5***	-11.7
	(17.3)	(9.3)	(9.7)
Last term*Number of districts	0.26*	0.18**	0.07
	(0.14)	(0.08)	(0.08)
N	8,166	8,166	8,166

Notes: See Table 5.

Table 7. The 'last-term effect' without term limits

	States without term limits		States with term limits	
	All legislators		Legislators who leave before TL binds	
	(1)	(2)	(3)	(4)
	Transfers per capita, 1984 US$			
	Total	Discretionary	Total	Discretionary
Last term, ex-post	-1.7	-0.2	-6.2	-6.0
	(2.9)	(2.4)	(7.4)	(4.0)
N	7,154	7,154	3,265	3,265

Notes: See Table 5. TL is 'term limit'.

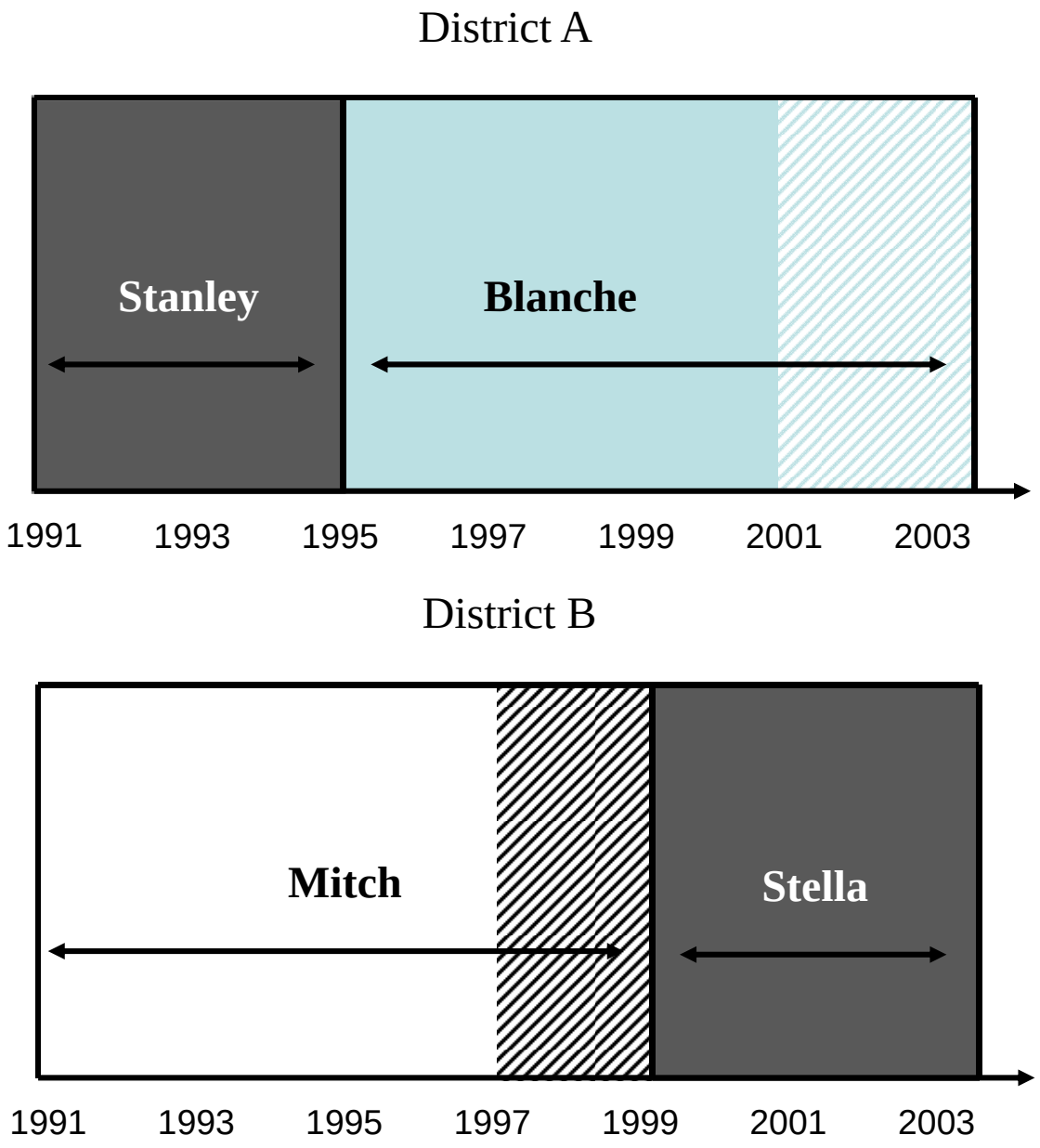

Figure 1: Identification example