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Lame Ducks and Divided Government: How Voters Control the Unaccountable

Mark Schelker

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Abstract

The ability of voters to use the available electoral instruments is crucial for the functioning of democracies. The paper shows that voters consider the institutional environment when making electoral decisions. Voters recognize that executives who face binding term limits (i.e., "lame ducks") have incentives to deviate from the preferences of voters because these politicians are not subject to reelection restrictions. This weakened accountability can be counterbalanced by an alternative mechanism known as divided government. By dividing government control between the executive and legislative branches, voters can force a lame duck to compromise on policies with an opposing legislature. Using a panel data analysis of the US states from 1975 to 2000, it is shown that the probability of divided government is 10-15 percent higher when governors are lame ducks. This effect remains robust and significant even after controlling for many relevant covariates. This result provides evidence of the considerable capacity of voters to process information and use alternative electoral instruments to control an otherwise unaccountable executive.

JEL-Code: D720.

Keywords: divided government, lame duck, term limit, accountability.

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1. Introduction

The ability of voters to use the available democratic instruments in an informed and coherent manner is crucial for the functioning of democracy. Skeptics of democratic institutions argue that the complexity of policy choices and the related cost of information overburden the capacity of citizens to make informed decisions. The aim of this paper is to study the ability of voters to process information and make coherent electoral decisions in a rather demanding situation: voters must consider the institutional environment when making electoral decisions.

Specifically, I test whether voters react systematically to the diluted accountability of a term-limited executive by dividing government control. Voters face a systematic control problem when a term-limited executive is in his last term in office. A so-called "lame duck" is not eligible to run for reelection and is thus not incentivized by reelection considerations. However, voters have an alternative mechanism available for controlling lame duck executives: They can divide government control by voting for the opposition party in legislative elections. Divided government is characterized by opposing party majorities in the executive and legislative branches. By dividing government power, voters can mitigate the control problem related to a lame duck executive by forcing the two branches of government to compromise on policy. Hence, the hypothesis is that voters anticipate the weakened incentives of a lame duck executive to pursue the agenda of voters rather than his private agenda and that they react by voting for divided government.

To test this hypothesis, I take advantage of two aspects of the political system in the United States. First, US state governors are frequently subject to binding term limits. Second, the separate election of the executive and legislative branches at the US state level allows the emergence of divided government control. In the empirical exercise, I attempt to determine whether there is a higher probability of divided government in situations in which a state governor is a lame duck. I find that lame ducks face a 10 to 15 percent higher probability of divided government.

In Section 2, I introduce the main theoretical arguments on which the empirical hypothesis is based. I review the relevant insight obtained from the literature pertaining to divided government and term limit legislation and formulate the testable hypothesis. In Section 3, I introduce the test case at the US state level and present the data and the empirical strategy. In Section 4, I provide empirical results showing that the probability of divided government is significantly higher when US state governors are lame ducks. This result is consistent with the

view that voters balance a weakened accountability mechanism by voting for a different party in the legislative branch. Section 5 summarizes and concludes the paper.

2. Divided Government: The Reaction of Voters to a Systematic Control Problem

To provide a foundation for the main argument of this paper, I combine two strands of the literature: 1) the electoral accountability of term-limited agents and 2) the causes and consequences of divided government.

2.1. Electoral accountability of term-limited executives

There has been much debate regarding the causes and consequences of term limit legislation (e.g., Carey, Niemi and Powell 2000). One major disadvantage of term limit legislation stems from the last period in office when the term limit is binding and the executive becomes a lame duck. Executives who care about maintaining a reputation for the purposes of being re-elected must introduce policy that is in accordance with voter preferences. Being ineligible to run for reelection eliminates this powerful incentive. In most political agency models, reelection incentives are the main channel through which to align the preferences of the office holder and the voters. The lack of accountability to voters increases an agent's incentives for opportunistic behavior, which could manifest in the forms of low levels of effort, activities that favor specific interests and legacy building, for example. By testing a political agency model, Besley and Case (1995) show that US state governors who are subject to a binding term limit implement systematically different fiscal policies than governors who are eligible for reelection. They suggest that governors eligible for reelection are concerned about reputation building and, hence, adjust economic policy choices according to this constraint, while lame ducks do not have such incentives. In states with binding term limits, they find fiscal cycles with higher taxes and expenditures in the last term when the governor is a Democrat. Johnson and Crain (2004) extend this analysis to investigate the influence of term limits on fiscal policy in a cross-country setting. They find higher expenditures and taxes and evidence for a fiscal cycle in which expenditures increase in lame duck terms and decrease in terms where an executive is eligible for reelection. Furthermore, List and Sturm (2006) explore a political agency model in which policy makers decide on primary and secondary policy issues and face binding term limits during the second period. They show that binding term limits even influence secondary policy issues, such as environmental policy. Secondary policy issues are often believed to be less important for reelection than primary issues because these policy issues concern only

smaller groups and because voters remain uninformed due to the multitude of secondary policy issues (List and Sturm 2006: 1249-50). In their empirical analysis, the authors show that incumbents implement environmental policies to attract votes if they are eligible for reelection, but they enact these policies much less frequently when a term limit is binding. This result again suggests that incumbents engage in systematically different behavior conditional on binding reelection constraints.¹

2.2. Causes and consequences of divided government

Divided government is a common phenomenon in presidential systems in which the executive and legislative branches are separately elected by voters. A prime example is the political system of the United States with its two main parties, the Republican and Democratic Parties. At the federal level, divided government was the dominant form of government in the US during the period from 1952 to 2010. Approximately 59 percent of all governments were divided in the sense that the Presidency and the US Congress - the Senate and/or the House of Representatives - were dominated by opposing party majorities.

There is an extensive body of research analyzing the causes and consequences of divided government. Fiorina (1992) and Alesina and Rosenthal (1995, 1996) analyze the causes of divided government and argue that the division of government control is the result of rational voter behavior. Voters at the center of the policy spectrum moderate policy by electing different parties into the branches of government.² Alesina and Rosenthal (1995, 1996) build a formal model that extends the standard spatial voting theory to include the separate election of the executive and legislative branches with the possibility of dividing government control. In their model, policy is viewed as a compromise between the executive and legislative branches. When both branches are held by one party - known as unified government - the party in power can implement its preferred policy. When the branches of government are dominated by different party majorities, the opposing parties in the different branches are forced to compromise on

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¹ In terms of explaining why term limits have been introduced, most contributions base their arguments on the well-documented incumbency advantage (e.g., Gelman and King 1990, 1991, Levitt and Wolfram 1997, Ansolabehere and Snyder 2002, 2004, and Hirano and Snyder 2009), which is reduced by introducing term limits. It has been argued that policy makers with more seniority can more effectively transfer resources to their electoral districts (e.g., Dick and Lott 1993, Buchanan and Congleton 1994, and Friedman and Wittman 1995), that incumbents exploit office benefits and take advantage of the higher television coverage (e.g., Ansolabehere, Snyder and Stewart 2000, Ansolabehere, Snowberg and Snyder 2006, and Prior 2006), and that incumbents are able to affect the salience of policy issues to their advantage (Hodler, Loertscher and Rohner 2010). Daniel and Lott (1997) show that the introduction of legislative term limits in California dramatically reduced campaign expenditures and increased electoral competition. They attribute these effects to the reduced returns to political careers, which causes new candidates to enter electoral races because campaign expenditures and incumbency advantages are lower.

² This idea is inspired by the well-documented phenomenon of split-ticket voting. For evidence of split-ticket voting, see, for example, Fiorina (1992) and Garand and Glaslock Lichtl (2000). An alternative model of split-ticket voting is provided by Chari, Jones and Marimon (1997).

policy. Voters whose positions fall between the preferred party positions take advantage of this legislative-executive interaction to moderate policy outcomes. Alesina and Rosenthal (1995) argue that divided government "[...] is not an undesired result of a cumbersome electoral process, nor is it the result of a lack of rationality or of well-defined preferences of the electorate. Divided government occurs because moderate voters like it, and they take advantage of "checks and balances" to achieve moderation. In dividing government, the voters force the parties to compromise: divided government is a remedy of political polarization" (Alesina and Rosenthal 1995: p. 44).

Policy moderation by means of divided government may not be advantageous if the different parties in the executive and legislative branches cannot compromise on policy. Divided government gives veto power to the opposing parties and allows for a potential gridlock of the policy-making process and obscured accountability. The alleged gridlock of the policy-making process has been discussed intensively (e.g., Cutler 1988, Sundquist 1988, McCubbins 1991, and Cox and McCubbins 1991). However, Mayhew (1991), whose contribution has sparked intensive scholarly debate, argues that in terms of "significant" legislative enactments, there is no evidence of policy stalemates in the United States. The significant body of subsequent research has remained controversial on the issue. It has been shown that the evaluation of the effect of divided government on legislative productivity depends heavily on the definition of "significant" enactments and on the definition of gridlock and additional factors, such as party polarization and within-party ideological heterogeneity (e.g., Binder 1999, Bowling and Ferguson 2001, Coleman 1999, Howell et al. 2000, Jones 2001, Krehbiel 1996, Rogers 2005, Saeki 2009).

With regard to fiscal policy, the evidence suggests that divided governments are less able to respond to fiscal shocks (Alt and Lowry 1994 and Poterba 1994). Alt and Lowry (1994) provide evidence that divided governments at the US state level adjust less to deficit shocks. The estimates indicate that divided governments react less on the revenue, but comparatively more on the spending side. Using a different source of data and a slightly different time period, Poterba (1994) shows that unified governments adjust more quickly to deficit shocks and that their responses rely more heavily on changes in taxation.

2.3. How voters use divided government to control lame duck executives

I extend the notion that voters moderate policy by dividing government power by arguing that voters also use this mechanism to mitigate control problems. Due to the impaired accountability of lame duck executives, voters should anticipate the weakened incentives of a term-limited executive to pursue public rather than private interests. Given the evidence that lame ducks systematically implement different policies when they are not eligible for reelection, voters are able to react to mitigate these negative effects. Voters can use the electoral mechanism by voting for the opposing party in the legislative branch in an attempt to divide government control. Divided government constrains a lame duck executive because it forces him to compromise with the legislative branch on policy matters.

The decision to moderate policy by means of divided government depends on the relative cost of divided government. Voters must weigh the cost of potential policy gridlock against the cost of a lame duck wielding executive powers. If the expected costs of divided government are lower than the expected costs of having a lame duck, then voters will opt for policy moderation by dividing government control. Although the deviation from previous term politics of lame duck executives is well established, the cost of policy making under divided government seems less pronounced. If the cost of divided government is not very high, then we should expect a higher probability of divided government in situations in which an executive faces a binding term limit.

Hypothesis:

The probability of divided government is higher when an executive is a lame duck (ceteris paribus).

In the following empirical exercise, I show that voters use divided government to counterbalance the weakened accountability of term-limited executives.

3. Data and Empirical Strategy

I use data for the 48 US mainland states from 1975 to 2000. The US states are an ideal testing ground in which to assess the theoretical predictions. First, many US states have implemented executive term limits. Thirty-seven out of the 50 states feature binding executive term limits, many of which were introduced following voter initiatives. During the period of this study, an average of 26 percent of governors were lame ducks. Table 1 provides an overview of the term limit legislation in each state. Second, the executive and legislative branches are both directly elected by citizens; this method of direct election enables voters to divide government control. At the US state level, divided government occurred 50 percent of the time during the period from 1975 to 2000. In 63 percent of divided governments, the executive power was controlled by one party, and the majorities of both legislative chambers were controlled by the opposing party. In the remaining 37 percent of divided governments, the two legislative

chambers were held by different party majorities.

[Table 1 about here]

3.1. The data

The information pertaining to party majorities in the branches of government for the period from 1975 to 2000 was obtained from the work of Alt, Lassen and Rose (2006). These data include information regarding which party holds the executive and which party holds the majority in the two legislative chambers. Based on these data, I construct the main dependent variable, which is an indicator variable that takes the value 1 when there is any form of divided government control, whether this control is divided between the executive branch and both chambers of the legislature or the majorities are split in the legislative chambers. The bulk of the independent variables stem from the work of List and Sturm (2006). They provide information on state term limit legislation (see Table 1), term-limited governors (lame ducks), the electoral margin of incumbent governors relative to challengers, real per capita personal income, population size, and the fractions of the population who are young or aged. Information pertaining to the timing of legislative elections in each state was provided by Tim Storey from the National Conference of State Legislators (NCSL). Table 2 presents the yearly summary statistics of the main variables of interest. Appendix Tables A1 and A2 present summary statistics and data sources.

[Table 2 about here]

3.2. Empirical Strategy

The empirical approach is primarily based on difference-in-differences estimation, which is the standard method employed in studies using similar data (e.g., Besley and Case 1995, 2003, and List and Sturm 2006).

I estimate the following general specification:

$$y_{it} = \beta LAME DUCK_{it} + \zeta I_{it} + \lambda X_{it} + \mu_i + \tau_t + \varepsilon_{ij}$$

 y_{it} is a dummy variable capturing the form of government (1 if divided government, 0 if unified government) in state i in year t. LAME DUCK_{it} is a dummy variable that takes the value 1 if the executive is a lame duck, 0 otherwise. Furthermore, I_{it} is a vector that includes important institutional and political characteristics, and X_{it} is a vector of additional (e.g., economic, sociodemographic) controls. β is the parameter of interest, ζ and λ are parameter vectors, μ_i and τ_t are the state and year fixed effects, and ε_{ij} is the error term. The subscripts i = 1, ..., n and t = 1, ..., T

indicate the cross-section and year, respectively.

Because I have a binary dependent variable, a natural specification would be based on binomial estimators. However, the fixed effects logit and probit estimators encounter an incidental parameter problem that renders the maximum likelihood estimator inconsistent (e.g., Neyman and Scott 1948, Lancaster 2000, Greene 2008). Hence, the results are primarily based on linear probability models, but I provide all results from the respective logistic models in Table B1 of Appendix B. The estimates of a linear probability model using OLS are typically good approximations, simple to interpret, and widely used in economic research. When interpreting the size of the estimates, I rely on the more conservative and straightforward OLS coefficients.

I first present the random effects estimates and then add the state and year fixed effects. In the random effects models, I assume that the cross-section specific effects μ_i originate from a random draw and follow a normal distribution. Unlike a conventional linear random effects estimator, the random effects logit estimator does not depend on the assumption that the random effect is uncorrelated with the independent variables (Wooldridge 2002: 490). Thus, it is possible to obtain a consistent estimator of the variable of interest without any assumption pertaining to the relationship of the cross-section component to the independent variables. When comparing the estimates from the random effects and fixed effects specifications, it is also comforting that the linear estimates of the main variable of interest do not greatly depend on whether random or fixed effects specifications are estimated. Because basic difference-indifference estimates might ignore autocorrelation in US state data (Bertrand, Duflo and Mullainathan 2004), I adjust standard errors for clustering at the state level, which allows for arbitrary correlations of the errors within states.⁶

In addition to the main variable of interest, *LAME DUCK*, I include further important institutional control variables. I always control for the two main factors determining whether a governor can actually become a lame duck: 1) whether there is a *TERM LIMIT* and 2) a governor's *VOTE MARGIN* in the past election. With this specification, the relevant

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³ For details regarding the (in)consistency of the fixed effects logit estimators, see Greene (2002, 2008). In a simulation study, Greene (2002) shows that the estimation bias is affected by the size of t, the number of withingroup observations. Increasing t = 2 to t = 20 reduces the estimation bias from approximately 100 percent to approximately 6 percent. Coupé (2005) provides evidence of the favorable properties of the conditional fixed effects logit in comparison with the unconditional logit model with cross-section dummies. Hence, in the empirical exercise, we implement conditional logit estimators.

⁴ The estimates from logistic models produce equivalent results. When correlating the OLS and logit predicted values of the dependent variable (\hat{y}) , we typically find $corr(\hat{y}_{OLS}, \hat{y}_{logit}) > 0.99$.

⁵ When estimated significantly, the marginal effects of the logit estimators are close to the coefficients from the OLS specifications.

⁶ The results also remain robust to the inclusion of state-specific time trends (not reported).

determinants of the *LAME DUCK* variable are always included in the model, and the endogeneity of the variable of interest should not be our main concern. I expect the *LAME DUCK* coefficient to be positive. For the *TERM LIMIT* variable, I do not have an *a priori* hypothesis regarding the direction of the effect.

The variable measuring the *VOTE MARGIN* of an incumbent governor captures the popularity of an incumbent or candidate relative to the popularity of a challenger in the electoral race. Therefore, I expect that more popular candidates or incumbents with higher vote margins should face a lower probability of confronting an opposing party majority in the legislative branch. Moreover, *VOTE MARGIN* is also an important control variable from an alternative perspective. It should be an unbiased *ex ante* indicator of the predictability of the (re)election of a candidate. When faced with greater uncertainty regarding who will be holding the executive office, voters may find the task of moderating policy by means of divided government to be more difficult.⁷ In the extension of the empirical analysis, I also present regression results, including measures of gubernatorial job approval, which are more direct measures of gubernatorial popularity but are not available for all years in every state.

Moreover, I always control for differences in executive mandates across states. Most governors serve four-year terms, and only a few governors serve *SHORT TERMS* of two years. As shown in Table 2, a few states (for some part of the sample) limit governors to one term in office only (*ONE TERM LIMIT*). Hence, these governors are already lame ducks in the first period; thus, it is important to control for this peculiarity. Because not all states follow identical electoral systems and electoral rhythms, I always control for whether there are *GENERAL* or *MIDTERM ELECTIONS*. Furthermore, I use a standard set of control variables, including measures reflecting the economic situation, such as the real per capita *INCOME* and the *UNEMPLOYMENT* rate, and socio-demographic variables, such as the size of the *POPULATION*, and the fractions of the *AGED* (65+) and the *YOUNG* (5-17) populations, which may differ in their political preferences and behavior.

After the first set of regressions establishing the basic results, I present a series of regressions addressing important extensions and potential caveats: I repeat the empirical exercise focusing on particular sub-samples and add a direct measure of gubernatorial popularity

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⁷ Following Alesina and Rosenthal (1996), voters who want to moderate policy by dividing government control would want to hedge the legislative branch when there is greater uncertainty regarding who will be holding the executive office and further moderate the government in midterm elections by shifting even more legislative power to the opposition party. Because the vote margin of incumbent governors is generally relatively large, there is typically not a great amount of uncertainty regarding who will be holding the executive branch. To err on the side of safety, the indicator includes all possibilities of divided government, and the regressions control for years with general elections, in which the executive branch and all or some part of the legislative branch is eligible for election, and midterm (legislative) elections.

and further potentially important institutional, political, demographic and economic controls. More details will follow the basic results.

4. Empirical Results

4.1. Baseline results

Table 3 presents the baseline results. Columns 1 to 3 report the regression results from the linear probability models estimated by OLS, and columns 4 to 6 report the logistic regression results. For both estimation methods, I begin with a random effects specification (columns 1 and 4), introduce state fixed effects (columns 2 and 5), and then add year fixed effects (columns 3 and 6). It is reassuring that the estimated coefficients of the main variable of interest, *LAME DUCK*, does not exhibit great variation, and Hausman tests cannot typically reject the null hypothesis of no systematic differences between the random and fixed effects specifications. When estimating the fixed effect logit models, five states are eliminated because they always feature unified government. These states are Georgia, Kentucky, Maryland, Minnesota and Nebraska.

[Table 3 about here]

I consistently find that *LAME DUCK* governors are associated with a significantly higher probability of divided government. This finding is in line with the theoretical prediction that the impaired accountability of a lame duck increases the inclination of voters to counterbalance this control problem by voting for divided government. In the linear regressions, the size of the effect suggests a 10.6 to 12.4 percent higher probability of divided government when a governor is a lame duck. In terms of the logistic regressions, the size of the calculated marginal effects is with 15 to 19 percent slightly higher but is often not precisely estimated. Given the theoretical reservations in estimations of fixed effects logit models and the related difficulties in estimating meaningful marginal effects, I rely on the more conservative linear estimates when interpreting the results. However, the estimated coefficients of both models are robust to specification changes. Because I condition on the systematic factors determining the *LAME DUCK* variable the existence of a *TERM LIMIT* and the *VOTE MARGIN* - the estimates of the variable of interest should be unlikely to suffer from reverse causality or simultaneity.

The TERM LIMIT and VOTE MARGIN variables are negative and statistically significant.

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⁸ When also including state-specific time trends, we find equivalent results for the main variable of interest, *LAME DUCK*. However, the estimated coefficient of the *TERM LIMIT* variable becomes insignificant. This result is not entirely surprising given that states do not repeatedly change their term limit legislation in the observed time period.

The negative effect of the *TERM LIMIT* coefficient indicates that term limits *per se* (net of lame duck effects) reduce the probability of divided government. If voters are informed and rational, this result could be consistent with the observed pattern in which a majority of voters seem to favor term limit legislation (Friedman and Wittman 1995 and Carey, Niemi and Powell 2000). If the *VOTE MARGIN* is an indicator of the popularity of an incumbent or a candidate in the previous election, I expect a negative correlation, which is confirmed by the data. I exercise caution when interpreting the estimated coefficients of the *TERM LIMIT* and *VOTE MARGIN* covariates because I cannot assertively eliminate the possibility of endogeneity.

Subsamples: Limiting the sample to election years and states with term limit legislation

In the next step of the analysis, I concentrate on specific sub-samples. First, I estimate the previous specifications but exclude all non-election years and only focus on years in which general or midterm elections were held. This method reduces the sample by approximately half (Table 4, columns 1-3). Second, I repeat the basic exercise, but I focus only on the sub-sample of states with term limit legislation (Table 4, columns 4-6). For the sake of brevity, all of the following tables contain only the results from the linear probability models, while the main results from the logistic regressions can be found in Table B1 of Appendix B.

One concern is that the full sample of years between 1975 and 2000 could yield biased estimates because non-election years are also included in the sample. The reason for the inclusion of all years in the baseline specification is primarily to maintain the panel balanced, because the states follow varying electoral rhythms. The estimates in columns 1 to 3 of Table 4 exclude all non-election years and replicate the specifications of Table 3. The estimates are consequently based on the subsample of years with either general or midterm elections. The estimated effect of the *LAME DUCK* variable is a 9.9 to 12 percent higher probability of divided government that is similar in size and significance to the baseline. The results of all further controls are qualitatively identical to the results in Table 3.

Next, I estimate the baseline specifications but focus only on the subset of states in which term limit legislation is enacted. A potential concern is that term limit states are, in some unobserved respects, different from non-term limit states and that this difference, for some reason, is not controlled for by the two term limit variables, *TERM LIMIT* and *ONE TERM LIMIT*. Columns 4 to 6 of Table 4 report the regressions on the sub-sample of states with term limit legislation and omit any observations in which lame ducks cannot occur. I consistently find positive and significant effects of the *LAME DUCK* variable, which indicate an 11 to 15 percent higher probability of divided government control when a governor is a lame duck. The

magnitude of the effect is slightly higher but still comparable in size to the estimates that include the full sample of states.

[Table 4 about here]

4.2. Extensions of the baseline model

As a first extension, I introduce the job approval ratings (*JAR*) of state governors. One concern is that the vote margin does not sufficiently capture gubernatorial popularity, which in turn could bias the estimates (Table 5). Second, I analyze whether more popular lame ducks, whom voters might perceive as credibly committed to their electoral platforms, face a lower probability of divided government (Table 6). Third, the *LAME DUCK* variable may merely reflect the greater competence of lame ducks because they have already been reelected in most cases and are in their second term. Fourth, I examine political factors more closely (Table 7): the party affiliation of the governor (*DEMOCRATIC GOVERNOR*) and measures of *POLITICAL PREFERENCES* and *POLITICAL HETEROGENEITY* might have a direct influence on the cost and occurrence of divided government.

Controlling for gubernatorial job approval ratings (JAR)

Because the vote margin is only a relative measure of popularity, a concern may be that this variable does not fully capture gubernatorial popularity and thus may result in omitted variable bias. Therefore, I include a direct measure of gubernatorial popularity in the regressions. There is no single job approval rating that regularly covers all of the states over the relevant time period. However, Niemi, Beyle, and Sigelman (2001) collect a data set that includes a great number of job approval ratings (*JAR*) across states. To my knowledge, this is the most comprehensive data set pertaining to gubernatorial job approval ratings at the state level. These authors construct two normalized indicators that capture the content of a multitude of different job approval ratings, which are typically scaled along similar but not equivalent scales. They collapse the responses into percent positive (*Positive JAR*) and percent negative (*Negative JAR*) categories. For example, when people are asked how they evaluate a governor's general job performance, they may have the options of 'excellent', 'good', 'fair' and 'poor'. In this case, the first two categories are grouped together. The measure in this study relies on standard job performance questions and includes job approval ratings that target citizens or voters generally, but not if specific subgroups, such as Republicans or Democrats, are asked

exclusively. This measure of gubernatorial job approval is available for all years in the sample but not necessarily for all states in all years. Moreover, not all measures are based on the same number of ratings per state and year. Some states have as many as 35 ratings in one year, whereas other states have no ratings or only a smaller number of ratings. In the subsequent empirical exercise, I use the mean of all job approval ratings per state and year.

Because the job approval measures are not available for every year in all of the states, the sample size is reduced to 635 observations and to 325 if I consider only election years. The results in Table 5 show that the inclusion of the measure of positive gubernatorial job approval (Positive JAR) does not affect the main result. This result is also obtained when Negative JAR is included individually or when both measures, Positive JAR and Negative JAR, are included jointly. If anything, the inclusion of JAR into the regression framework increases the size of the estimated coefficient. Because job approval ratings contain information that directly pertains to gubernatorial popularity, it is reassuring that these ratings are strongly correlated with the vote margins of gubernatorial elections. Due to the reduced sample size and the missing explanatory power of gubernatorial job approval ratings, I do not include this variable as a standard covariate in the baseline regression framework of Table 3.

[Table 5 about here]

Do more popular lame ducks have a lower probability of divided government?

If more popular governors are perceived by voters to be credibly committed to their electoral agenda even without reelection incentives, then popular lame ducks may face a lower probability of divided government. I estimate the interaction effects of governor popularity approximated by the VOTE MARGIN and job approval ratings (positive JAR) with the LAME DUCK indicator. Table 6 reports the results of both interaction effects.

[Table 6 about here]

Panel A of Table 6 presents the first series of regression results including the interaction term of LAME DUCK * VOTE MARGIN. Columns 1 and 2 report the estimates that include the full sample, whereas columns 3 and 4 restrict the sample to election years only. None of the estimated interaction effects are statistically significant. The influence of the LAME DUCK variable becomes slightly higher but is often not statistically significant. Although the coefficients are not statistically significant, let us examine the magnitude of a (uncertain)

⁹ We use the 'Question type': 01 and the 'Type of sample': 1-4, 10-11, 13, 16-17 and 20 from the data set by Niemi, Beyle and Siegelman (2001). The question category and sample type follow the coding used by Niemi, Beyle, and Sigelman (2010).

potential effect. To evaluate the size and plausibility of the interaction effect, I first consider the effect at the mean of the popularity measure (mean($VOTE\ MARGIN$) = 8.67) and compare it to the estimated baseline coefficient. With regard to the regressions that include state and year fixed effects (columns 3 and 6), the probability of divided government for a lame duck with a vote margin at the mean is calculated as $\beta_{LAME\ DUCK}$ + mean($VOTE\ MARGIN$) * $\beta_{INTERACTION}$ $TERM \approx 0.13$. Hence, a lame duck governor with a vote margin at the mean would have a 13 percent higher probability of divided government. This estimation is close to the baseline effect of approximately 12.4 percent. An increase of popularity by one standard deviation (std.dev.($VOTE\ MARGIN$) = 7.58) could reduce the probability of divided government by roughly 2.4 percentage points. Alternatively, a 1 percent higher vote margin could reduce the probability of divided government by approximately 0.3 percentage points.

In Panel B of Table 6, I present the results using job approval ratings, which are more direct measures of governor popularity than the vote margins. Compared with the full sample, the estimated coefficients of the *LAME DUCK* variable and the interaction term in the subsample are both larger and, in some specifications, statistically significant. Let us again illustrate the size of the estimated effects based on the specifications by including state and year fixed effects (columns 3 and 6). First, consider the statistically significant estimates from the regressions that include only election years. When evaluated at the mean of the job approval measure (mean($Positive\ JAR$) = 53.08), lame ducks are associated with a 14.2 percent higher probability of divided government. However, the effect based on the full sample is with 13.6 percent somewhat lower. An increase in the gubernatorial job approval rating by one standard deviation (std. dev.($Positive\ JAR$) = 14.05) reduces the probability of divided government by approximately 6.9 to 12.6 percentage points.

Overall, these results seem to indicate that more popular lame ducks actually have a slightly lower probability of facing divided government, but a governor's popularity cannot compensate for the baseline effect of being a lame duck. However, the coefficients are often not precisely estimated.

Controlling for political experience and competence

In the following discussion, I account for further institutional and political factors. The first concern is that lame duck governors are more experienced and pre-selected executives. This concern relates to Alt, Bueno de Mesquita and Rose (2011), who argue that lame ducks are

¹⁰ In the subsample of election years, the mean($VOTE\ MARGIN$) = 8.51 and the std. dev.($VOTE\ MARGIN$) = 7.60.

In the full sample, the mean(positive JAR) = 52.37 and the std. dev.(positive JAR) = 13.78.

typically more competent governors, because they have been reelected and elections weed out incompetent incumbents. The authors use term limits to disentangle accountability from competence effects. They identify accountability effects by comparing reelection-eligible vs. reelection-ineligible incumbents and competence effects by comparing new vs. reelected incumbents. The electoral process at the end of the first period allows the selection of competent and worthy candidates, and below-average candidates are weeded out. An incumbent is reelected if he is more competent than the challenger in expectation. Voters benefit from the increased competence of an incumbent because of the experience the governor has accumulated in his previous term. In the second period (when the term limit is binding), voters have the advantage of a higher-quality candidate as a result of the previous screening, but the candidate has no incentives to exert effort. Hence, voters face a competent (selection effect) but potentially lazy (moral hazard) lame duck incumbent.

So far, my theory only suggested the moral hazard part due to the missing accountability of a term-limited executive without reelection incentives. However, on average, lame ducks may also be of higher quality than newly elected governors who stem from a random draw of the population of candidates. To identify the influence of the missing accountability (moral hazard) I control for competence effects in the empirical exercise. I compare lame ducks to experienced governors in states without term limits.

For the sake of brevity, I present only fixed effects regressions, but the lack of inclusion of state and year effects does not produce qualitatively different results. Columns 1 and 2 of Table 7 contain the regressions controlling for governors who are not term limited and do not serve their first term (*NO LIMIT TERM>1*). This approach should clarify the concern that any effect may be merely a result of a competence effect reflecting political experience. The estimated coefficient of the *LAME DUCK* variable is statistically significant and almost identical in size compared to the baseline in Table 3. The coefficient of the variable capturing the competence effect (*NO LIMIT TERM>1*) is not statistically different from zero.¹²

[Table 7 about here]

Institutional and political factors

As has been argued previously, the decision of voters to moderate policy by means of divided government depends on the relative cost of potential policy gridlock versus the cost of a

¹² We also controlled for the general effects of gubernatorial experience (which does not account for the relevant comparison group) by including the number of terms in office. The inclusion of such a measure has no explanatory power and does not affect any of the results.

lame duck wielding executive powers. Voters have to weigh these costs to make electoral decisions. The cost of divided government is likely to depend on the distance between the policy preferences of the leading parties. If party positions are very polarized, moderate voters may feel a greater need for moderation by dividing government control. Alternatively, the cost of divided government may increase because it becomes more difficult for the different parties in government to compromise and agree on policy. This difficulty may result in a higher probability of gridlock. Hence, the cost of policy moderation by means of divided government is likely to be related to political preference heterogeneity and party polarization. Political heterogeneity could influence the main result if, for example, the less heterogeneous states reelect term-limited executives more often in their lame duck terms and simultaneously have a higher probability of divided government due to the lower cost of policy gridlock.

When constructing measures of political preferences and heterogeneity, one faces the problem that there is no standard measure of preferences at the state level. As an approximation, I use the first dimension of the DW-Nominate scores proposed by McCarty, Poole and Rosenthal (2006). These scores measure the liberal-conservative attitudes from all of the rollcall votes of the state delegates in Federal Congress. This approach has been applied by numerous authors, such as Hanssen (2004), Alt, Lassen and Rose (2006) and Garand (2010). Typically, measures of political polarization represent the absolute difference between the scores of Democratic and Republican delegates. When calculating such a measure at the state level, one faces the problem that some states do not have delegates of both parties in one or both chambers of Congress. This problem causes the appropriate calculation of a polarization measure according to the mean (median) distance of party representatives to be impossible without further assumptions. Moreover, it seems that greater political preference heterogeneity, whether within a party or across parties, would generally lead to a more difficult decisionmaking process (e.g., Jones 2001 or Saeki 2009). Therefore, I use the mean and standard deviation of the DW-Nominate score as measures of POLITICAL PREFERENCES and POLITICAL HETEROGENEITY, respectively. 14 I do not have an ex ante hypothesis about the direction of the estimated effect of the political preference measure because I have no theory regarding the influence of political ideology (liberal or conservative) on divided government control. The hypothesis pertaining to the effect of political heterogeneity is ambiguous. Greater

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¹³ For more information regarding party polarization in the US, see Poole and Rosenthal (1991, 1997), McCarty, Poole and Rosenthal (2006) and Garand (2010)

¹⁴ We construct equivalent measures using adjusted ADA scores (Anderson and Habel 2009), which measure the liberal-conservative attitudes of the members of Federal Congress according to selected roll-call votes by interest groups (Groseclose, Levitt, and Snyder 1999). The results are entirely robust to the use of ADA scores rather than the more encompassing DW-nominate scores that include all roll-call votes.

political heterogeneity and polarization could lead to a higher probability of divided government because more voters may feel the need for moderation. However, the potential for policy gridlock as a result of divided governments depends on the heterogeneity of policy preferences and political polarization. More heterogeneous and polarized political preferences are associated with greater potential for policy gridlock and thus greater costs of divided government control. I do not have an *a priori* expectation regarding the direction of the *net* effect.

In columns 3 and 4 of Table 7, I add the measures of *POLITICAL PREFERENCES* and *POLITICAL HETEROGENEITY*. Again, the inclusion of these two variables does not affect the main result. Although I do not find a significant effect for the measure of political preferences, which is the mean of the DW-Nominate score obtained by McCarty, Poole and Rosenthal (2006), I find that political heterogeneity, as measured by the standard deviation of the same variable, has a positive and significant effect on divided government. This positive net effect could indicate that the policy moderation motive of voters is stronger than the negative effects from the expected cost of divided government as a result of the increased potential for policy gridlock.

I continue the empirical exercise by controlling for the governor's party affiliation (*DEMOCRATIC GOVERNOR*). I do not have an *a priori* hypothesis pertaining to the effect of this control variable, but I want to ensure that the variable of interest does not capture some unobserved party effect.

Columns 5 and 6 of Table 7 control for the party affiliation of a governor and include a dummy variable that takes the value of 1 if there is a *DEMOCRATIC GOVERNOR*. The gubernatorial party affiliation directly influences the probability of divided government, whereas the estimates of the effect of lame duck governors are unaffected and remain robust. Democratic governors face a 29 percent lower probability of facing an opposing majority in the legislature. This effect is likely to be an artifact of the partisan history of the US. The dominant role of the Democratic Party in southern states from the 1900s to the 1960s was eroded by the civil rights movement (e.g., Besley, Persson and Sturm 2010). However, it took some time for the Republicans to establish their contemporary party strength in the states. The negative effect of the party affiliation variable is likely to mirror this strengthening of the Republicans who, over time, began capturing more and more seats in state legislatives.¹⁵

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 $^{^{\}rm 15}$ We would like to thank Jim Alt for alerting us to this fact.

4.3. Robustness: Demographic and economic factors

In this section, I add potentially important sets of covariates to the baseline specifications. I include demographic and economic covariates consisting of the population *DENSITY*, the fraction of the *AFRO-AMERICAN* population, the fraction of the population holding a *HIGH SCHOOL* diploma, and *INCOME* and *UNEMPLOYMENT GROWTH*. The population, demographic and education measures reflect different dimensions of heterogeneity in the population that may translate into different electoral behavior. The economic variables and their growth rates may affect voter behavior at the ballot if they consider the current economic situation and the economic development during the previous period when making electoral decisions.

[Table 8 about here]

The models in columns 1 and 2 of Table 8 contain estimates that control for further sources of political heterogeneity, such as population *DENSITY*, the fraction of the *AFRO-AMERICAN* population¹⁶, and the fraction of the population holding a *HIGH SCHOOL* diploma. Columns 3 and 4 include the growth rates of the main economic variables: the real per capita *INCOME GROWTH* rate and the *UNEMPLOYMENT GROWTH* rate. Only *INCOME GROWTH* is significantly correlated with the dependent variable. All other covariates show no significant effect on the probability of divided government when I control for within-state clustering of the standard errors. None of the additional covariates affect the main result that lame duck governors face an approximately 10 to 15 percent higher probability of divided government.

4.4. Alternative dependent variable: The legislative seat share of a governor's party

The underlying mechanism leading to divided government is based on seats in the legislature. For example, if the seat share of a governor's party remains below 50 percent in the legislative chambers, then divided government occurs. If the hypothesis is correct and lame ducks face a higher probability of divided government, then the effect should also be observable in legislative seat shares. According to this logic, the party of a lame duck governor should suffer from seat losses in the legislature. I replicate the previous model specifications of Tables 3 to 8 on the seat shares of the incumbent governor's party in the legislature rather than divided government. The regression results are reported in Table B2 of Appendix B.

I find consistent evidence that the party of a lame duck is associated with a 3.6 to 4.5 percent loss in seat shares. The estimated *LAME DUCK* coefficient is usually statistically

¹⁶ The estimates of the size of the Afro-American population stem from the SPPQ (2005) database and are not available for the years 1995 and 1996; thus, the sample size was reduced.

significant. In situations in which the coefficient is not significant, the coefficient is very similar in size compared to the more precisely estimated coefficients. The estimated *LAME DUCK* coefficient becomes small and insignificant (columns 3 and 4) only when I estimate the baseline model including job approval ratings (*Positive JAR*). However, when conditioning on the interaction term of *LAME DUCK* and *Positive JAR* (columns 6 and 8), the size of the *LAME DUCK* effect evaluated at the mean of the job approval measure is again comparable in size to the remaining estimates. Hence, the expected underlying dynamics in the legislative party seat shares are present in the data and are additional evidence for the consistency of the main estimates.¹⁷

4.5. Discussion

The results document a clear pattern. I find a strong, robust and statistically significant positive effect of lame duck governors on the probability of divided government. The estimated effect is robust to changes in the empirical specifications, whether these changes involve the estimation method (linear vs. logistic) or the inclusion of state and year fixed effects, state-specific time trends (not reported), or additional control variables. The interpretation of the coefficient is that lame ducks face a 10 to 15 percent higher probability of confronting an opposing party majority in the legislative branch (i.e., divided government). Moreover, estimates regarding legislative seat shares, which are the underlying mechanisms leading to divided government, provide additional evidence for the consistency of the main results. The overall empirical picture is consistent with the hypothesis in which informed voters systematically use the electoral process to impose divided government as a reaction to the control problem emerging from the impaired accountability of a lame duck governor. Voters seem to realize that governors are not incentivized by the electoral mechanism to serve the interests of voters. Furthermore, they seem to realize that the electoral process provides them with an instrument with which to control an otherwise unaccountable executive.

Interestingly, I also find a robust negative correlation between term limit legislation and divided government. This negative effect is evidence that term limits reduce the need for voters to moderate policy by dividing government control. Several interpretations of the coefficient are possible. First, the influence of term limits is net of last-period-effects (lame duck). This is compared to the average effect of governors without term limits, which also includes the last-

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¹⁷ The main hypothesis is based on a requirement of two opposing veto players to compromise over policy in the two branches of government. This situation is achieved by divided government. Hence, the veto power leading to policy moderation is a discontinuous function of the distribution of seats in the legislature. Therefore, we consider the results using legislative seat shares mainly as additional but not primary evidence.

period-effects of governors anticipating retirement or expecting to be voted out of office. From this perspective, I cannot conclusively interpret the coefficient. Second, the negative effect could originate from voter preferences. Based on the literature pertaining to term limits, several interpretations could apply. For example, term limits eliminate incumbency advantages after a few periods in office, and the lack of such advantages increases electoral competition (e.g., Daniel and Lott 1997). Alternatively, term limits enable voters to exchange long term incumbents while keeping the same party in the executive. This ability may suit the interests of voters if incumbents tend to accumulate power over time and increasingly shirk or become corrupt with longer tenure. Moreover, voters may favor term limits because they are able to selectively mitigate the negative accountability effects in the final round - the lame duck period by imposing divided government control. Without term limits, voters remain uncertain regarding which term is a governor's final term, in which reelection incentives do not apply. Hence, they could be inclined to hedge against the possibility of a final-round governor. I attempt to address this possible inclination by controlling for the number of terms in office, but the results remain unchanged. Therefore, to evaluate the cost and benefits of term limit legislation, researchers must account for institutional factors that may mitigate the negative consequences of the expected last-period-effects. There may be other reasonable interpretations of the negative effect of term limits, but I cannot discriminate between these possible interpretations. Therefore, I do not provide any specific interpretation of this coefficient.

Other factors, such as the vote margin, a governor's party affiliation, the heterogeneity of political preferences, population size and income growth, seem to affect the probability of divided government. Higher vote margins, which reflect an incumbent's or a candidate's popularity relative to the challenger at the time of the election, are associated with lower probabilities of divided government. Furthermore, Democratic governors have a significantly lower probability of facing an opposing legislative majority than Republican governors do. This probability is likely to be a historical artifact innate to the political developments in the US. In addition, political heterogeneity translates into a higher probability of divided government; this finding is in line with the existing literature. I may interpret the positive coefficient of the population variable by recalling that a larger population is typically more heterogeneous. Interestingly, the estimated coefficient becomes insignificant when I include direct measures of heterogeneity, such as population density and the percentage of the population that is Afro-American. However, the effects of these covariates are not estimated precisely. Economic circumstances, especially the changes in the economic situation as measured by real per capita income growth, have a statistically significant influence. Positive income growth is correlated

with a lower probability of divided government.

5. Conclusions

The ability of voters to make informed and coherent decisions is a pre-condition for functioning democracies. Economists typically assume that voters are capable of making informed decisions. I study the capacity of voters to process information and make informed decisions in a rather demanding environment. I focus on an electoral situation in which an incumbent executive is facing a binding term limit. Such lame duck executives cannot be incentivized by the electoral process because they cannot run for reelection due to term limit legislation. I analyze whether voters consider this impaired accountability of the incumbent executive and use divided government as an alternative electoral instruments to counterbalance the weakened accountability of a lame duck. In a presidential system in which the executive and legislative branches are elected directly, voters can divide government control to moderate policy outcomes. Divided government forces the opposing party majorities in both branches of government to compromise on policy. I estimate whether voters use divided government to control otherwise unaccountable lame duck governors in the US states. The hypothesis predicts that lame duck governors have a higher probability of being confronted with an opposing party majority in the legislature than that of governors with intact reelection incentives.

I test my hypothesis using US state data from 1975 to 2000. The majority of US state governors are subject to term limit legislation. Furthermore, the US system allows voters to directly elect the members of both the legislative and executive branches. This system regularly leads to divided government control. These two features of the US system provide an ideal testing ground for my hypothesis. Consistent with the theoretical arguments, I find that lame duck governors face an approximately 10 to 15 percent higher probability of divided government. This effect remains robust to various model extensions and specification changes. I extend the empirical model to account for a series of potentially important factors. I restrict the sample to include only election years or only states with term limit legislation. In addition, I control for gubernatorial popularity by including opinion polls; for political and institutional factors, such as gubernatorial experience and the party affiliation of the governor; for political preferences and preference heterogeneity; and for further demographic and economic factors. The estimated effect of lame duck governors remains statistically significant and is also robust to changes in model specifications, whether these changes involve the inclusion of state and year fixed effects, state-specific time trends, or the estimation method. I estimate linear probability models and logistic models, which account for the binary nature of the dependent variable, and I find equivalent results. When focusing on the legislative seat share of a party, which is the underlying mechanism leading to divided government, I find consistent results. The party of a lame duck governor is associated with an average loss in its legislative seat share of approximately 3.6 to 4.5 percent.

The results strongly suggest that voters are able to consider institutional factors that influence their ability to incentivize public officials. Voters systematically use divided government to control executives who do not have reelection incentives. This result provides evidence of the considerable capacity of voters to process complex information.

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Appendix A

Table A1: Summary statistics (1975-2000)

Variable	Mean	Std. dev.	Min	Max
Divided government	0.50	0.50	0	1
Lame duck	0.26	0.44	0	1
Term limit	0.62	0.49	0	1
Vote margin	8.67	7.58	0	50
One term limit	0.06	0.25	0	1
Short term	0.07	0.25	0	1
General election	0.26	0.44	0	1
Midterm election	0.24	0.42	0	1
Real per capita income	13,430.59	2,517.99	7,811.56	24,137.61
Unemployment	6.21	2.15	2.20	18
State population	5.08e+06	5.32e+06	380,477	3.40e+07
Aged (65+) (%)	12.09	1.92	7.46	18.77
Young (5-17) (%)	19.99	2.28	7.07	26.87
Positive JAR (%)	52.37	13.87	13.00	82.50
Negative JAR (%)	40.07	14.93	6.00	84.00
No Limit Term>1	0.18	0.38	0	1
Democratic Governor	0.56	0.50	0	1
Political preferences	-0.01	0.21	-0.49	0.6
Political heterogeneity	0.29	0.11	0.02	0.56
Population density	162.44	228.03	0.65	1,118.73
Afro-Americans (%)	9.51	9.28	0.16	36.88
High School diploma (%)	76.64	5.80	64.3	91.8
Income growth (%)	1.68	2.66	-15.72	18.21
Unemployment growth (%)	0.47	20.14	-45.05	116.07

Table A2: Variable description

Variable	Description
Divided government	Divided government control: 1 (divided branch or divided legislature), unified government control: 0. Source: Alt, Lassen and Rose (2006)
Lame duck	Governor is a lame duck: 1, 0 otherwise. Source: List and Sturm (2006)
Term limit	State with gubernatorial term limit: 1, 0 otherwise. For details see Table 1. Source: List and Sturm (2006)
Vote margin	Vote margin measured as the percentage share of governor in vote of top two candidate - 50. Source: List and Sturm (2006)
One term limit	States limiting governors to one term in office: 1, 0 otherwise. Source: List and Sturm (2006)
Short term (2 yrs)	States have 2 year governor terms: 1, 0 otherwise (4 year terms). Source: List and Sturm (2006)
R.p.c. Income	Real per capita personal income in 1982-1984 dollars. Source: List and Sturm (2006)
Unemployment	Unemployment rate (%). Source: SPPQ (2005)
State population	Yearly state population. Source: List and Sturm (2006)
Aged (65+) (%)	Percent share of population over 65 years of age. Source: List and Sturm (2006)
Young (5-17) (%)	Percent share of population between 5 and 17 years of age. Source: List and Sturm (2006)
General election	General elections year (executive and legislative): 1, 0 otherwise. Source. List and Sturm (2006)
Midterm election	Legislative midterm election year: 1, 0 otherwise. Source: National Conference of State Legislators (NCSL)
Positive JAR (%)	Percent positive job approval ratings (JAR). Source: Own calculation based on Niemi, Beyle, Siegelman (2001, 2010)
Negative JAR (%)	Percent negative job approval ratings (JAR). Source: Own calculation based on Niemi, Beyle, Siegelman (2001, 2010)
No Limit Term>1	Governor does not face binding term limit and is not serving his first term: 1, 0 otherwise. Source: Own calculation
Democratic Governor	Governor is a democrat: 1, 0 otherwise. Source: Besley, Persson and Sturm (2010)
Political preferences	Measure of political preferences on a liberal-conservative scale from roll-call votes of members of the 94 th to 106 th US Congress. State <i>mean</i> of the first dimension of DW-Nominate score of state representatives (House and Senate) in federal Congress. Negative values for Democrats, positive values for Republicans. Source: Own calculation based on McCarty, Poole and Rosenthal (2006)
Political heterogeneity	Measure of political preferences on a liberal-conservative scale from roll-call votes of members of the 94 th to 106 th US Congress. State <i>standard deviation</i> of the first dimension of DW-Nominate scores for state representatives (House and Senate) in the federal Congress. Source: Own calculation based on McCarty, Poole and Rosenthal (2006)
Population density	Population density: Number of people per sq. mile. Source: Alt, Lassen and Rose (2006)
Afro-Americans (%)	Percent of Afro-American state population. Estimates based on "Current Population Reports/Statistical Abstract of the United States". Not available for 1995/1996. Source: SPPQ (2005)
High School diploma (%)	Percent of population holding a High School diploma. Source: SPPQ (2005)
Income growth (%)	Percent income growth. Source: Own calculation
Unemployment growth (%	Percent unemployment growth. Source: Own calculation

Appendix B

Table B1: Summary of logistic regression results

	Dependent Variable: Divided Government								
	(1)	(2)	(3)	(4)	(5)	(6)			
Table 4: Subsamples	El	ection years or	ıly	States with	term limit leg	islation only			
Lame duck	0.488*	0.522**	0.673**	0.742***	0.851**	1.011***			
	(0.285)	(0.250)	(0.287)	(0.228)	(0.331)	(0.383)			
State FE	no ¹⁾	yes	yes	no ¹⁾	yes	yes			
Year FE	no	no	yes	no	no	yes			
Observations ²⁾	595	532	532	754	641	641			
Table 5: JAR controls		Full Sample		El	ection years o	nly			
Lame duck	0.651**	0.753**	0.955**	0.700*	0.984**	1.135			
	(0.312)	(0.382)	(0.451)	(0.423)	(0.434)	(0.000)			
State FE	no ¹⁾	yes	yes	no ¹⁾	yes	yes			
Year FE	no	no	yes	no	no	yes			
Observations ²⁾	623	516	516	319	249	249			
Table 6: Interaction	lame	duck * vote m	argin	lame	lame duck * job app				
Lame duck	0.904***	0.872	1.001	2.296**	2.036	2.838			
	(0.324)	(0.602)	(0.639)	(1.016)	(1.773)	(1.728)			
Interaction term	-0.029	-0.025	-0.024	-0.030*	-0.024	-0.035			
	(0.025)	(0.046)	(0.045)	(0.018)	(0.029)	(0.029)			
State FE	no ¹⁾	yes	yes	no ¹⁾	yes	yes			
Year FE	no	no	yes	no	no	yes			
Observations ^{2), 3)}	1,214	1,086	1,086	635	527	527			
Table 7: Add. controls	No limit	t term>1	Pol. pref	./heterog.	Democrat	ic governor			
Lame duck	0.639**	0.764**	0.583**	0.710**	0.570*	0.709**			
	(0.275)	(0.300)	(0.257)	(0.291)	(0.335)	(0.352)			
State FE	yes	yes	yes	yes	yes	yes			
Year FE	no	yes	no	yes	no	yes			
Observations ^{2), 3)}	1,086	1,086	1,086	1,086	1,070	1,070			
Table 8: Add. controls	Demograph	ic, education	GDP/uner	npl. growth					
Lame duck	0.620**	0.738**	0.640**	0.750**					
	(0.287)	(0.312)	(0.275)	(0.295)					
State FE	yes	yes	yes	yes					
Year FE	no	yes	no	yes					
Observations ^{2), 3)}	1,000	1,000	1,043	1,043					

Notes: Regression results are based on conditional logit estimator. Specification of control variables are equivalent to the results reported in the respective Tables 4 to 8 in the main text. Standard errors are adjusted to within state clustering and reported in parentheses. Significance level: * 0.05<p<0.1, ** 0.01<p<0.05, *** p<0.01.

1) Random effects logit estimator

Source: Own calculations

²⁾ No. of observations differ between random and fixed effects: When estimating fixed effects logit states without variation in the dependent variable have to be dropped.

³⁾ Data availability of additional control variables can reduce the number of observations

The estimated coefficients of the control variables are qualitatively equivalent to the linear regression results reported in Tables 3 to 8.

Table B2: Lame ducks and legislative seat shares - Summary of regression results (Part I)

Dependent variable: Legislative seat share of governors' party

SPECIFICATIONS ACCORDING TO REFERENCED TABLES	Baseline: Full sample (Table 3)	Baseline: election years only(Table 4)	Gubernatorial job approval ratings (Table 5)	Gubernatorial job approval ratings: election years (Table 5)	Interaction effects: Full sample (Table 6)	Interaction effects: Full sample (Table 6)	Interaction effects: election years (Table 6)	Interaction effects: election years (Table 6)
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lame duck	-0.040* (0.021)	-0.040* (0.020)	-0.020 (0.024)	-0.007 (0.022)	-0.054* (0.031)	-0.055 (0.075)	-0.042 (0.030)	-0.047 (0.080)
Term limit	0.083 (0.065)	0.077 (0.058)	0.038 (0.046)	0.048 (0.044)	0.082 (0.065)	0.037 (0.046)	0.077 (0.058)	0.045 (0.044)
Vote margin	0.009*** (0.002)	0.009*** (0.001)	0.007*** (0.002)	0.005*** (0.001)	0.009*** (0.002)	0.007*** (0.002)	0.009*** (0.002)	0.005*** (0.001)
Positive JAR	(0.002)	(0.001)	-0.002* (0.001)	-0.002* (0.001)	(0.002)	-0.002* (0.001)	(0.002)	-0.002* (0.001)
Lame duck*vote margin			(0.001)	(0.001)	0.001 (0.002)	(0.001)	0.000 (0.002)	(0.001)
Lame duck*pos. JAR						0.001 (0.001)		0.001 (0.001)
Standard controls	yes	yes	yes	yes	yes	yes	yes	yes
State FE	yes	yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,198	587	626	320	1,198	626	587	320
R-squared Number of States	0.228 48	0.236 48	0.310 48	0.317 48	0.228 48	0.311 48	0.236 48	0.317 48

Notes: Linear fixed effects models. Standard errors are adjusted to within state clustering and reported in parentheses. Standard controls: Short term, One term limit, General election, Midterm election, R.p.c. income, Unemployment, Population, Aged (65+), Young (5-17). Significance level: * 0.05<p<0.1, ** 0.01<p<0.05, *** p<0.01. Source: Own calculations

Table B2: Lame ducks and legislative seat shares - Summary of regression results (Part II)

Dependent variable: Legislative seat share of governors' party

	pendent variable. Le	gisiative seat sita	ic of governors	party	
SPECIFICATIONS ACCORDING TO REFERENCED TABLES	Political experience and expertise: election years (Table 7)	Political preferences and heterogeneity: election years (Table 7)	Party affiliation: election years (Table 7)	Additional demographic factors: election years (Table 8)	Additional economic factors: election years (Table 8)
VARIABLES	(9)	(10)	(11)	(12)	(13)
Lame duck	-0.043** (0.021)	-0.036* (0.020)	-0.041** (0.020)	-0.045* (0.023)	-0.039* (0.020)
Term limit	0.063 (0.059)	0.068 (0.055)	0.138** (0.059)	0.061 (0.045)	0.078 (0.059)
Vote margin	0.009*** (0.001)	0.009*** (0.001)	0.007*** (0.001)	0.010*** (0.002)	0.009*** (0.001)
No limit term>1	-0.027 (0.019)	,	. ,	, ,	, ,
Political preferences		-0.008 (0.100)			
Political heterogeneity		-0.245* (0.142)			
Democratic governor			0.146*** (0.038)		
Population density			(0.000)	-0.002 (0.001)	
Afro-Americans				0.001 (0.017)	
High school				-0.015 (0.013)	
Income growth Unemployment growth				()	0.005 (0.003) 0.000
					(0.001)
Standard controls	yes	yes	yes	yes	yes
State FE Year FE	yes yes	yes yes	yes yes	yes yes	yes yes
	587	587	-	541	583
Observations R-squared	0.238	0.244	587 0.360	0.264	0.239
Number of States	48	48	48	48	48

Notes: Linear fixed effects models. Standard errors are adjusted to within state clustering and reported in parentheses. Standard controls: Short term, One term limit, General election, Midterm election, R.p.c. income, Unemployment, Population, Aged (65+), Young (5-17). Significance level: *0.05 , <math>**0.01 , <math>****p < 0.01. Source: Own calculations

Table 1: Governor term limits in the US States

Term limits for governors by state (1975-2000)

States with no term limits:

CT, ID^a, IL, IA, MA^b, MN, NH, NY, ND, TX, VT, WA^c, WI

States limiting governors to one term in office:

VA

States limiting governors to two terms in office

AL, DE, FL, LA, MD, ME, MO, NE, NJ, NV, OH, OK, OR, PA, SD, WV

State law changed from no term limit to a three-term limit:

AZ (1992), AR (1992), CA (1990), CO (1990), MI (1992), MT (1992), RI (1994), WY (1992)

State law changed from a one-term limit to a two-term limit:

GA (1976), KY (1992), NM (1991), MS (1986), NC (1977), SC (1980), TN (1978)

Notes: The year in brackets is the year in which the term limit legislation changed.

- a. A two-term limit was passed in 1994, but repealed in 2002 by the Idaho State Legislature
- b. Term limits were enacted in 1994 but were declared unconstitutional by the Massachusetts Supreme Court in 1997
- Enacted a two-term limit in 1992, which was declared unconstitutional by the Washington Supreme Court in 1998

Source: List and Sturm (2006)

Table 2: Divided government, term limits, lame ducks and electoral margin (1975-2000)

Year	Divided Government		Term 1	Term Limit		Lame Duck		Vote Margin	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	
1975	0.38	0.49	0.54	0.50	0.29	0.46	9.09	8.87	
1976	0.38	0.49	0.54	0.50	0.33	0.48	9.58	10.32	
1977	0.38	0.49	0.54	0.50	0.31	0.47	9.81	10.25	
1978	0.38	0.49	0.54	0.50	0.31	0.47	9.92	10.33	
1979	0.46	0.50	0.54	0.50	0.19	0.39	8.80	8.82	
1980	0.48	0.50	0.54	0.50	0.17	0.38	7.85	6.45	
1981	0.50	0.51	0.54	0.50	0.23	0.42	7.80	6.67	
1982	0.50	0.51	0.54	0.50	0.21	0.41	7.59	6.79	
1983	0.42	0.50	0.54	0.50	0.38	0.49	8.07	6.30	
1984	0.40	0.49	0.54	0.50	0.38	0.49	8.09	6.26	
1985	0.52	0.50	0.54	0.50	0.31	0.47	7.92	6.00	
1986	0.52	0.50	0.54	0.50	0.33	0.48	8.38	6.13	
1987	0.58	0.50	0.54	0.50	0.19	0.39	8.03	7.32	
1988	0.58	0.50	0.54	0.50	0.17	0.38	8.23	7.46	
1989	0.60	0.49	0.54	0.50	0.19	0.39	8.16	7.09	
1990	0.58	0.50	0.58	0.50	0.17	0.38	7.87	6.96	
1991	0.52	0.50	0.58	0.50	0.25	0.44	8.37	6.85	
1992	0.58	0.50	0.71	0.46	0.23	0.42	8.50	6.84	
1993	0.52	0.50	0.71	0.46	0.17	0.38	8.71	6.89	
1994	0.52	0.50	0.79	0.41	0.17	0.38	8.64	6.86	
1995	0.50	0.51	0.79	0.41	0.21	0.41	8.80	7.27	
1996	0.50	0.51	0.79	0.41	0.23	0.42	8.65	7.27	
1997	0.58	0.50	0.79	0.41	0.27	0.45	9.12	7.99	
1998	0.58	0.50	0.77	0.42	0.29	0.46	8.91	7.92	
1999	0.52	0.50	0.75	0.44	0.40	0.49	10.10	7.74	
2000	0.50	0.51	0.75	0.44	0.42	0.50	10.55	8.01	
Γotal	0.50	0.50	0.62	0.49	0.26	0.44	8.67	7.58	

Table 3: Main results

	RE	FE	FE	RE	FE	FE
_	OLS	OLS	OLS	LOGIT	LOGIT	LOGIT
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lame duck	0.106**	0.106**	0.124**	0.620***	0.626**	0.765***
	(0.044)	(0.045)	(0.049)	(0.210)	(0.267)	(0.295)
Term limit	-0.231**	-0.323**	-0.302**	-1.372***	-1.849**	-1.827**
	(0.101)	(0.135)	(0.143)	(0.292)	(0.834)	(0.872)
Vote margin	-0.014***	-0.014***	-0.013***	-0.089***	-0.091***	-0.090***
_	(0.003)	(0.003)	(0.003)	(0.012)	(0.021)	(0.021)
Short term	-0.190*	-0.162	-0.193	-1.257**	-1.165	-1.315*
	(0.100)	(0.129)	(0.132)	(0.497)	(0.714)	(0.730)
One term limit	-0.246*	-0.388	-0.385	-1.371**	-2.151	-2.173
	(0.142)	(0.278)	(0.286)	(0.642)	(1.509)	(1.576)
General election	0.016	0.016	0.024*	0.083	0.091	0.135*
	(0.013)	(0.014)	(0.013)	(0.169)	(0.075)	(0.069)
Midterm election	-0.018*	-0.017	-0.003	-0.095	-0.089	-0.021
	(0.011)	(0.011)	(0.013)	(0.172)	(0.063)	(0.072)
R.p.c. income	4.11e-06	-9.13e-06	1.99e-05	4.61e-05	-4.33e-06	1.27e-04
	(1.85e-05)	(2.97e-05)	(4.86e-05)	(6.72e-05)	(1.76e-04)	(2.86e-04)
Unemployment	-0.022*	-0.024	-0.028	-0.113**	-0.122	-0.157
	(0.012)	(0.014)	(0.021)	(0.050)	(0.079)	(0.118)
Population	8.41e-09	7.00e-08***	7.40e-08***	6.34e-08	3.69e-07***	3.90e-07***
	(5.14e-09)	(2.35e-08)	(2.27e-08)	(4.06e-08)	(1.28e-07)	(1.27e-07)
Aged (65+)	-2.220	0.946	1.264	-10.275	-0.031	-3.328
	(2.137)	(4.187)	(5.764)	(9.779)	(23.048)	(32.956)
Young (5-17)	-3.142*	-2.173	-1.273	-16.447***	-12.637	-8.348
	(1.718)	(1.904)	(3.241)	(5.883)	(11.149)	(16.780)
State FE	no	yes	yes	no	yes	yes
Year FE	no	no	yes	no	no	yes
Observations	1,214	1,214	1,214	1,214	1,086	1,086
(pseudo) R-squared	0.115	0.104	0.117		0.114	0.127
Number of States	48	48	48	48	43	43

Notes: Standard errors are adjusted to within state clustering and reported in parentheses. Significance level: * 0.05 , ** <math>0.01 , *** <math>p < 0.01. Source: Own calculations

Table 4: Subsamples: Election years, States with term limit legislation

	Subs	ample: Election	years	Subsample: St	tates with term li	imit legislation
	RE	FE	FE	RE	FE	FE
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Lame duck	0.097**	0.099**	0.120**	0.109**	0.133**	0.153**
	(0.042)	(0.046)	(0.051)	(0.048)	(0.052)	(0.057)
Term limit	-0.197**	-0.288**	-0.262*			
	(0.087)	(0.126)	(0.133)			
Vote margin	-0.014***	-0.014***	-0.014***	-0.014***	-0.015***	-0.015***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Short term	-0.192**	-0.131	-0.184	-0.195*	-0.194	-0.187
	(0.088)	(0.141)	(0.160)	(0.107)	(0.135)	(0.125)
One term limit	-0.229**	-0.387	-0.377	-0.614***	-0.841***	-0.820***
	(0.114)	(0.253)	(0.281)	(0.078)	(0.085)	(0.110)
General election				0.026	0.028*	0.031*
				(0.016)	(0.016)	(0.016)
Midterm election	-0.033	-0.033	-0.035	-0.013	-0.008	-0.010
	(0.021)	(0.022)	(0.029)	(0.012)	(0.012)	(0.015)
R.p.c. income	1.01e-05	-5.92e-06	2.42e-05	-1.43e-05	-7.60e-05**	-1.25e-04*
1	(1.63e-05)	(3.00e-05)	(4.71e-05)	(2.25e-05)	(2.99e-05)	(6.29e-05)
Unemployment	-0.012	-0.016	-0.025	-0.030*	-0.048***	-0.057**
r y	(0.014)	(0.016)	(0.022)	(0.016)	(0.015)	(0.024)
Population	3.96e-09	7.16e-08***	7.33e-08***	8.81e-09	5.83e-08	5.72e-08
· F	(4.81e-09)	(2.25e-08)	(2.21e-08)	(5.68e-09)	(3.67e-08)	(3.83e-08)
Aged (65+)	-2.691	2.289	1.910	-1.271	7.370	3.156
8()	(1.964)	(4.607)	(6.118)	(2.682)	(5.455)	(7.640)
Young (5-17)	-3.211	-1.828	-0.787	-3.766	-2.753	-1.825
104118 (6-17)	(1.994)	(2.351)	(4.120)	(2.354)	(2.477)	(2.852)
State FE	no	yes	yes	no	yes	yes
Year FE	no	no	yes	no	no	yes
Observations	595	595	595	754	754	754
R-squared	0.123	0.097	0.121	0.090	0.112	0.135
Number of States	48	48	48	38	38	38

Notes: Linear probability models estimated by OLS. Standard errors are adjusted to within state clustering and reported in parentheses. Significance level: *0.05 , <math>**0.01 , <math>***p < 0.01. Source: Own calculations

Table 5: Gubernatorial job approval ratings

		Full Sample			Subsample: Election years			
	RE	FE	FE	RE	FE	FE		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)		
Lame duck	0.111*	0.113*	0.131**	0.131*	0.146**	0.152**		
	(0.061)	(0.060)	(0.062)	(0.070)	(0.069)	(0.068)		
Term limit	-0.202**	-0.342***	-0.286**	-0.192**	-0.376***	-0.275**		
	(0.095)	(0.123)	(0.123)	(0.090)	(0.135)	(0.123)		
Vote margin	-0.010**	-0.011**	-0.011**	-0.009**	-0.009**	-0.008		
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)		
Positive JAR	0.004	0.004	0.004	0.003	0.003	0.003		
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)		
Standard controls	yes	yes	yes	yes	yes	yes		
State FE	no	yes	yes	no	yes	yes		
Year FE	no	no	yes	no	no	yes		
Observations	635	635	635	325	325	325		
R-squared	0.109	0.118	0.182	0.116	0.108	0.204		
Number of States	48	48	48	48	48	48		

Notes: Linear probability models estimated by OLS. Standard errors are adjusted to within state clustering and reported in parentheses. Standard controls: Short term, One term limit, General election, Midterm election, R.p.c. income, Unemployment, Population, Aged (65+), Young (5-17). Significance level: *0.05 , <math>**0.01 , <math>***p < 0.01. Source: Own calculations

Table 6: Interaction effect of lame duck governors and governor popularity

	RE	FE	FE	RE	FE	FE
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)

PANEL A: Interaction lame duck * vote margin

	Full sample			Subsample: election years			
Lame duck	0.140	0.141	0.160*	0.129	0.136	0.160	
	(0.086)	(0.089)	(0.093)	(0.086)	(0.091)	(0.097)	
Term limit	-0.232**	-0.324**	-0.302**	-0.198**	-0.290**	-0.264*	
	(0.101)	(0.135)	(0.143)	(0.088)	(0.127)	(0.133)	
Vote margin	-0.013***	-0.012***	-0.012***	-0.013***	-0.013***	-0.012***	
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	
Lame duck * vote margin	-0.003	-0.003	-0.003	-0.002	-0.003	-0.003	
	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	
Standard controls	yes	ves	yes	yes	yes	yes	
State FE	no	yes	yes	no	yes	yes	
Year FE	no	no	yes	no	no	yes	
Observations	1,214	1,214	1,214	595	595	595	
R-squared	0.115	0.104	0.117	0.125	0.101	0.125	
Number of States	48	48	48	48	48	48	

PANEL B: Interaction lame duck * job approval rating

	Full sample			Subsample: election years			
Lame duck	0.405	0.339	0.398	0.579**	0.567*	0.620**	
	(0.265)	(0.273)	(0.267)	(0.278)	(0.312)	(0.295)	
Term limit	-0.201**	-0.336***	-0.277**	-0.187**	-0.357**	-0.248*	
	(0.092)	(0.122)	(0.124)	(0.088)	(0.137)	(0.128)	
Vote margin	-0.009**	-0.010**	-0.010**	-0.008*	-0.008*	-0.007	
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	
Positive JAR	0.005*	0.004*	0.005*	0.005*	0.005	0.005	
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	
Lame duck *	-0.005	-0.004	-0.005	-0.008*	-0.008	-0.009*	
positive JAR	(0.004)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	
Standard controls	yes	yes	yes	yes	yes	yes	
State FE	no	yes	yes	no	yes	yes	
Year FE	no	no	yes	no	no	yes	
Observations	635	635	635	325	325	325	
R-squared	0.114	0.120	0.186	0.124	0.117	0.214	
Number of States	48	48	48	48	48	48	

Notes: Linear probability models estimated by OLS. Standard errors are adjusted to within state clustering and reported in parentheses. Standard controls: Short term, One term limit, General election, Midterm election, R.p.c. income, Unemployment, Population, Aged (65+), Young (5-17). Significance level: * 0.05<p<0.1, ** 0.01<p<0.05, *** p<0.01. Source: Own calculations

Table 7: Institutional and political controls

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
T 1 1	0.10644	0.100**	0.000**	0.11144	0.007*	0.11044
Lame duck	0.106**	0.122**	0.098**	0.111**	0.097*	0.112**
	(0.047)	(0.050)	(0.045)	(0.048)	(0.051)	(0.053)
Term limit	-0.323**	-0.312**	-0.295**	-0.265*	-0.444***	-0.428***
	(0.141)	(0.148)	(0.130)	(0.138)	(0.150)	(0.157)
Vote margin	-0.014***	-0.013***	-0.013***	-0.012***	-0.011***	-0.011***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
No limit term>1	0.000	-0.020				
	(0.055)	(0.055)				
Political preferences	()	(*****)	-0.056	0.040		
			(0.265)	(0.258)		
Political heterogeneity			0.719**	0.798**		
			(0.304)	(0.312)		
Democratic governor			, ,	, ,	-0.276**	-0.287***
C					(0.106)	(0.104)
Standard controls	yes	yes	yes	yes	yes	yes
State FE	yes	yes	yes	yes	yes	yes
Year FE	no	yes	no	yes	no	yes
T VIII I E	no	<i>y</i> c s	110	<i>y</i> c s	110	<i>y</i> c 5
Observations	1,214	1,214	1,214	1,214	1,198	1,198
R-squared	0.104	0.117	0.114	0.129	0.178	0.192
Number of States	48	48	48	48	48	48

Notes: Linear probability models estimated by OLS. Standard errors are adjusted to within state clustering and reported in parentheses. Standard controls: Short term, One term limit, General election, Midterm election, R.p.c. income, Unemployment, Population, Aged (65+), Young (5-17). Significance level: *0.05 , <math>***0.01 , <math>****p < 0.01. Source: Own calculations

Table 8: Socio-demographic and economic controls

VARIABLES	(1)	(2)	(3)	(4)
Lame duck	0.100**	0.117**	0.112**	0.124**
	(0.048)	(0.051)	(0.046)	(0.049)
Term limit	-0.292**	-0.287**	-0.323**	-0.300**
	(0.117)	(0.123)	(0.138)	(0.147)
Vote margin	-0.014***	-0.014***	-0.014***	-0.014***
	(0.003)	(0.003)	(0.003)	(0.003)
Population density	0.001	0.001		,
1	(0.003)	(0.003)		
Afro-Americans	-0.008	-0.008		
	(0.038)	(0.039)		
High school	-0.008	0.013		
C	(0.007)	(0.028)		
Income growth	, ,		-0.004	-0.010*
•			(0.006)	(0.005)
Unemployment growth			0.001	0.001
1 3 0			(0.001)	(0.001)
Standard controls	yes	yes	yes	yes
State FE	yes	yes	yes	yes
Year FE	no	yes	no	yes
Observations	1,118	1,118	1,167	1,167
R-squared	0.107	0.118	0.105	0.118
Number of States	48	48	48	48

Notes: Linear probability models estimated by OLS. Standard errors are adjusted to within state clustering and reported in parentheses. Standard controls: Short term, One term limit, General election, Midterm election, R.p.c. income, Unemployment, Population, Aged (65+), Young (5-17). Significance level: *0.05 , <math>**0.01 , <math>***p < 0.01. Source: Own calculations