Divided government, polarization, and policy: Regression-discontinuity evidence from US states

Luca Repetto[1]

Uppsala University

Maximiliano Sosa Andrés[2]

Uppsala University

Abstract

In this paper we use data on US states and a regression-discontinuity design to study how divided government affects the polarization of the legislature, inter-branch conflict, and policy implementation. We document that republican legislators serving under a divided government have more conservative ideologies than those serving under a fully unified government. We find an opposite effects for Democrats. In terms of policy implementation, we find evidence of moderation: compared to unified republican governments, divided ones with a democratic chamber implement more liberal policies. Correspondingly, when Democrats lose unified control, policies become more conservative.

Keywords: Divided governments; polarization; policy liberalism; regression-discontinuity design; US state governments
JEL classification: H1, H7, R50

First Version: May 2021
This Version: September 2022

---

[1]Department of Economics, Uppsala University, SE-751 20 Uppsala, Sweden. Email: luca.repetto@nek.uu.se.
[2]Department of Economics, Uppsala University, SE-751 20 Uppsala, Sweden. Email: maximiliano.sosa_andres@nek.uu.se.

1. Introduction

Divided governments are common in the US, both at the federal and state level. For example, 8 of the last 10 US presidents faced an opposing Senate or House at some point during the term. At the state level, over the past 70 years, the control of the executive and at least one of the legislative branches has been split between Republicans and Democrats in over one-third of the time. Whether divided government is an undesirable outcome of the political system or not is still a subject of debate. On the one hand, divided government may increase conflict among parties, leading to polarization, lowered legislative productivity or even gridlock. On the other hand, it also creates incentives to reach across the aisle, hence improving intra-party cooperation, possibly facilitating the implementation of shared policies.

Empirical research has found somewhat mixed results. Some work suggests that divided government harms the correct functioning of the government, by lowering legislative productivity (e.g., Binder 2004; Kirkland and Phillips 2020), delaying budget approval (Klarner, Phillips and Muckler, 2012; Kirkland and Phillips, 2018) and reducing governments' ability to react to economic shocks (Alt and Lowry, 1994). Others, instead, challenge this view and find null or even positive effects, with divided governments being more likely to implement important legislation, such as welfare and civil service reforms (Mayhew, 2005; Bernecker, 2016; Ash, Morelli and Vannoni, 2020). One possible explanation for this apparent lack of consensus is that providing credible exogenous variation in divided control is challenging. In addition, previous evidence comes from a variety of empirical strategies, settings and outcomes, making comparisons difficult.

In this paper we set out to investigate whether this evidence can be reconciled by studying the effects of divided government on several aspects of the political process, using the same setting and a credible identification strategy. To this end, we implement a regression-discontinuity (RDD) design using US state-level data and estimate the effects of divided government on i) legislative polarization, ii) inter-branch conflict, and iii) implementation of actual policies. We also study whether the effect of divided government differs by party and document substantial heterogeneity between Republicans and Democrats.

Our identification strategy relies on a regression-discontinuity design with close elections. This method relies on the assumption that, when election outcomes are very close, whether one party gains full control of the government or, instead, loses one branch to the opposition is – at least in part – determined by chance (see, e.g., Lee 2008a; Lee and Lemieux 2010). As a result, governments resulting from these elections should be comparable in all respects except that some are divided and some are unified. To implement this method, we collect electoral information on all US state governments and legislators for the period 1950-2018, complemented with several measures of ideology, polarization, and policy liberalism scores drawn from previous studies (e.g., Shor and McCarty 2011; Grumbach 2018; Caughey and Warshaw 2015). Finally, we gather information on the number of vetoes issued by the governor during the term as a measure of inter-branch conflict.

After the elections, different configurations of government can arise – depending on whether

the same party wins all three elections (governor, house and senate), or not. Because the effects of divided government may differ, we will provide estimates separately for each configuration, as well as distinguishing by party. We show that standard regression-discontinuity techniques can be readily adapted to study heterogeneous effects in this setting and document substantial differences in the estimates across parties and types of divided government.

We start by studying the effect of divided government on the polarization of state legislatures. Our first result is that, compared to a fully unified government, in a divided government legislators' ideological stances are more extreme. Specifically, we find a sizeable effect for Republican state senators, who are substantially more conservative when their party loses control of the senate or the governor to the Democrats. We document a similar but smaller effect for Democratic senators, who hold more liberal positions, while there appears to be little evidence of an effect for house members of either party. These results contribute to the vast literature on the causes of political polarization in the US and elsewhere and lend support to previous work documenting that the observed secular increase in polarization is mainly due to Republicans shifting to the ideological right (McCarty, 2019). We provide additional evidence to this debate by showing that divided government affects polarization and may, therefore, be an important driver of this trend.

Then, we ask whether divided control makes clashes between the governor and the legislature more likely. Governors of either party facing a legislature fully controlled by the opposing party issue substantially more vetoes than in the unified case. No effect is found, instead, when the control of the legislature is split. These results are in line with previous evidence finding positive a association between divided government and inter-branch conflict (Herzik and Wiggins, 1989; Klarner and Karch, 2008), and provide additional causal evidence in favour of the hypothesis that divided government increases conflict among branches of government.

Finally, we consider the effects of divided control on actual policy implementation by estimating our regression-discontinuity model using several different measures of policy liberalism (Caughey and Warshaw, 2015; Grumbach, 2018). These scores measure how liberal (or conservative) the bills passed in each state are in each year and therefore are informative on whether implemented policies tend to converge towards the ideological middle when the government is divided. Irrespective of the measure used, we find that when Republicans face an opposing chamber or governor, the implemented policies are more liberal. Correspondingly, when Democrats give up one chamber or the governor to Republicans, policies are substantially more conservative.

Our results show that, under divided governments, legislators hold more ideologically extreme positions but, at the same time, implemented policies converge towards moderation. This convergence appears to be the consequence of institutional features – such as the possibility of a divided government and the governor's veto – that create incentives for intra-party cooperation. This evidence is thus consistent with models where divided government acts as an institutional "checks and balances" mechanism (Alesina and Rosenthal 1995, 1996, 2000). In these models, parties choose polarized platforms in anticipation of the fact they

3

must later cooperate. As a result, implemented policies will be relatively moderate. This mechanism may help reconcile the apparently contrasting results found in earlier empirical work, which find that, while divided governments may be more likely to have inter-branch conflict and a more cumbersome legislative process, they are often rather successful in implementing important, bipartisan reforms (see, e.g., Bernecker 2016 and Ash, Morelli and Vannoni 2020).

This paper also contributes to the literature studying political polarization in the US and elsewhere. Scholars debate on how much of the increase in polarization is due to replacement of moderate legislators with more extreme ones or, rather, to legislators become more conservative (or liberal) during their career (a phenomenon called *adaptation*, see Theriault 2006). McCarty (2019) shows that most of the political elite polarization observed at both at the national and state level is due to Republicans and Democrats representing similar districts in a different way (*divergence*). While he suggests changes in social and economic factors – especially inequality – are at play, others have emphasized other drivers, such as the role of party discipline (Canen, Kendall and Trebbi, 2021) and changes in the agenda (Lee, 2008*b*). Our results show that legislators can indeed alter their ideological positions during their careers in a way that leads to more polarized legislatures, and that divided government is an important driver of this change.

Our paper also relates to the vast literature in political science and political economy on the effects of divided governments. Previous studies, usually relying on non-causal methods, investigate how divided governments affect, e.g., the probability of a late budget approval (Klarner, Phillips and Muckler, 2012; Andersen, Lassen and Nielsen, 2012; Kirkland and Phillips, 2018), legislative productivity (Mayhew, 2005; Binder, 1999), policy (Alt and Lowry, 1994), and the likelihood of passing reforms (Bernecker, 2016). We provide causal evidence that divided governments are important drivers of polarization and increase conflict between the executive and the legislative branches. We also relate to earlier findings that voters sometimes seek "ideological balancing" by voting a President of a party other than the governor's (Erikson, Folke and Snyder Jr, 2015) or split tickets between the President and Congress to offset conflicting fiscal policies (Chari, Jones and Marimon, 1997). Our results lend some support to this hypothesis by showing that, compared to unified governments, divided governments implement less ideologically charged policies.

2. Institutional background and data

The US state governments

In US state governments, the executive power is held by the governor, directly elected, while two chambers exercise the legislative power: the house (or state assembly) and the senate.[1] State governments' main responsibilities are domestic, including taxation, local law enforcement, health care, education and infrastructure.

---

[1]The only exception is Nebraska, where the legislative branch consists of a unicameral non-partisan body. Given its non-partisanship, we exclude Nebraska from our analysis.

Governors hold significant power. Besides being in charge of the executive power, they prepare the state budget for approval by the state legislature. They can also veto bills approved by the legislature, either partially or entirely, which gives them some agenda-setting power. The total number of vetoes issued by a governor during office is, in part, due to institutional rules and conventions but is also a reflection of the conflict between branches of government.[2] Vetoes can be overridden by a qualified majority of the legislature, although legislative override rules vary by state (CSG, 2020).

Governors are elected for a period of four years, with the exception of Vermont and New Hampshire, where terms are limited to two years (Klarin, 2019). In all states but Virginia, governors can run for re-election after their first term, usually only once. Although third-party candidates sometimes run for office, in the vast majority of cases the elected governor is either a Democrat or a Republican. In fact, since 1940, only eight governors have been elected from a third party or identify as independent.[3]

The state legislature has legislative responsibilities at the state level comparable, to some extent, to those of the US Congress at the national level. Legislatures are separate, co-equal branches of government that function independently from the governor, and work as a system of checks and balances for the executive, while being in charge of the legislative process. Chambers are composed of representatives – each representing a local district – usually elected in single-district first-past-the-post elections.[4] Third party candidates are relatively common but rarely win any seat. Most houses hold elections every two years, while senates generally hold them every four.

Data and descriptive statistics

Our main dataset is a yearly panel of US states covering the years 1950-2018. Information on electoral results, including seat shares is gathered from the *State Partisan Balance Data* (Klarner, 2013). We update this source with information for recent years using data from the National Conference of State Legislatures and the Atlas of US Elections (Leip, 2022).

We construct indicators for each possible configurations of divided government, taking value one if a state has a divided government of a specific kind in a given year, and 0 otherwise. A government is defined to be divided if the control of the executive and at least one of the legislative branches is split among parties. From 1950 to 2018, 43 percent of state governments were divided, with all states experiencing at least one instance of divided governments in the sample. From the 1950s to the mid 2000s there was a positive trend, from about 30% to 55% at the end of the period, making divided government an increasingly likely

---

[2]As an example, in 2019 (under a divided government) the Republican governor of New Hampshire, Chris Sununu, issued 54 vetoes, more than 7 times the combined amount issued during his first 2 years of tenure under unified Republican government. His critics called the measures "childish" while Sununu defended his position as a "counterweight to Democratic extremists". See https://www.concordmonitor.com/Sununu-embraces-vetoes-in-first-year-of-divided-government-27147372

[3]We exclude these cases from our analysis.

[4]The exceptions are Arizona, Idaho, Maryland, New Jersey, North and South Dakota, Vermont, Washington and West Virginia, which use some form of multi-member district for some or all of their districts.

event. After the 2010 "Republican Wave" elections – where in one cycle 19 out of 88 chambers changed control – the trend was interrupted and the fraction of divided governments decreases and then rebounded recently.

Our main measures of state legislators' ideology and the polarization of the legislature are constructed using data from Shor and McCarty (2011), who combine roll-call voting records and answers to the National Political Awareness Test (NPAT) questionnaire to construct individual ideology scores for all state legislators. The scores are available for the period 1995-2018. Negative scores identify more liberal positions while positive ones identify more conservative ones. In our legislator-level analysis, we will use legislators' ideology scores as our dependent variable of interest. Since ideology scores are time-invariant for each legislator, identification of the effect of divided government on ideology relies on comparing legislators who served for a longer or shorter period under a divided government.

Following Hicks (2015), we measure polarization at the state legislature level as the distance, in each state and year, between the ideology of the median Democratic legislator and the median Republican legislator (again using Shor and McCarty 2011's measures), averaged across chambers. In Figure 1, we plot the evolution of this variable over time by divided government status. Polarization has been steadily rising over the past decades, with divided governments becoming somewhat more polarized than unified ones.

Figure 1
Evolution of polarization in US state legislatures by divided government status
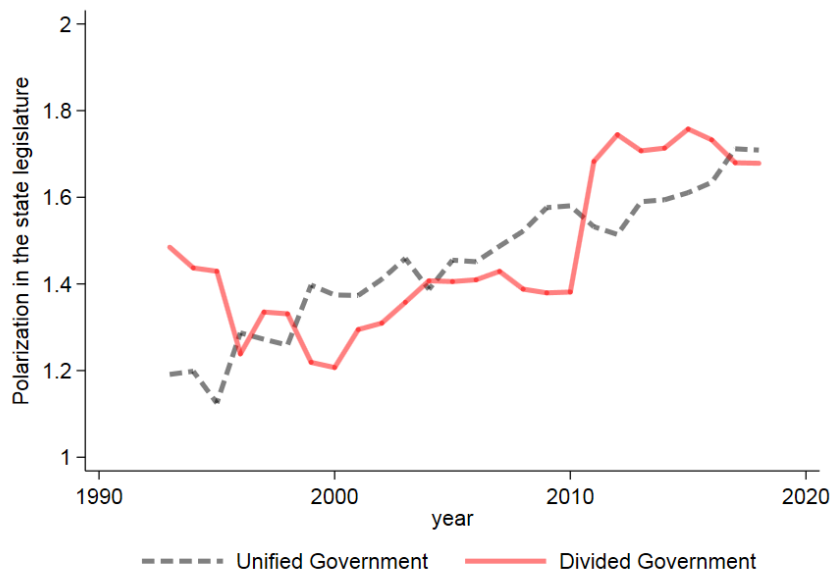
Notes: Evolution of polarization in US state legislature over time. Polarization is measured as the distance in party medians of Republican and Democratic legislators' ideology, averaged across chambers. Source: authors' calculations using data from Shor and McCarty (2011).

As an additional measure of legislative ideology, we use Berry et al. (2010) state legislature ideology scores. The scores are available for 1960-2017, a longer period than our main measure, and range from 0 (most conservative) to 100 (most liberal). The fact that they are only available at the state level and not for individual legislators prevents us from studying

the effect separately by party. Hence, we use them only for robustness analysis, in Section 5.

To estimate the effect on policy implementation, we use the state-level policy liberalism score constructed by Caughey and Warshaw (2015), as well as three alternative measures by Grumbach (2018). These scores use information on a variety of policies in different areas and summarize in a single index, for each state and year, how liberal or conservative the policies implemented were. The original scores, taking on negative values for liberal policies to positive values for conservative policies, are standardized to have mean zero and unit variance in each state.

To measure conflict between governor and legislature, we use information for the period 1970-2018 on the number of bills vetoed by the governor, collected from the Book of the States.[5] We also obtain additional variables on legislative productivity, available from by Hicks (2015) and Legiscan.

We provide descriptive statistics in Table 1, separately by the party of the governor and divided government status. Unified governments are the most common ones, with Democratic ones accounting for 33% of the legislative terms and Republican ones for 23%. Nonetheless, divided governments are common, both with Republican (24%) and Democratic (20%) governors. As expected, measures of ideology capture the large differences between Republican (having positive values) and Democratic (having negative values) representatives. Republicans also tend to be slightly more ideologically conservative when the government is unified. Democratic governors have much more liberal positions than their Republican counterparts, as measured by Berry et al. (2010)'s state government ideology score but, interestingly, the difference between the two parties reduces substantially when the governments are divided.

In terms of legislative activity, there are some differences across parties and divided government status. Legislatures with divided governments appear to approve less bills although the number of introduced bills is comparable or even greater than under a unified government. Republican governors tend to veto bills more often when the government is divided, although these average differences should be interpreted with caution because they are likely to be affected by the large variation across states in the number of vetoes.[6] In terms of policy liberalism, we can see that divided governments generally implement more moderate policies. The last panel of Table 1 reports information for individual legislators. Most are very experienced, with on average of over 10 years in office, and have served in a divided government at least once.

---

[5]We exclude partial or line vetoes as these are only possible in certain states.

[6]For the purpose of comparability across states, in the regression-discontinuity analysis that follows, we standardize all outcome variables by state by removing the mean and dividing by the standard deviation.

<div align="center">

TABLE 1

DESCRIPTIVE STATISTICS BY PARTY AND DIVIDED GOVERNMENT STATUS

</div>

	Unified D. governor	**Unified** R. governor	**Divided** D. governor	**Divided** R. governor
A. State and electoral charact.				
Population (x1000)	5624.40 (6469.80)	5650.66 (6003.62)	4983.76 (4739.67)	6334.49 (6952.45)
Income p.c. (x1000 USD)	20.19 (9.38)	24.88 (8.16)	23.32 (9.08)	23.07 (9.63)
Dem. vote margin (governor)	0.26 (0.27)	-0.17 (0.15)	0.14 (0.13)	-0.13 (0.13)
Dem. seat margin (senate)	0.56 (0.30)	-0.35 (0.20)	-0.18 (0.22)	0.26 (0.28)
Dem. seat margin (house)	0.53 (0.30)	-0.32 (0.20)	-0.13 (0.24)	0.25 (0.24)
B. Partisanship and polarization				
Dem. mean ideology (senate)	-0.82 (0.41)	-0.77 (0.34)	-0.83 (0.35)	-0.75 (0.42)
Rep. mean ideology (senate)	0.67 (0.37)	0.80 (0.23)	0.71 (0.30)	0.59 (0.34)
State govt. ideology	62.91 (5.96)	31.02 (7.52)	53.67 (7.14)	47.72 (6.45)
C. Policy				
Introduced bills	2447.53 (1885.42)	1559.17 (1319.65)	2003.90 (2561.54)	2785.45 (2830.19)
Enacted bills	512.25 (354.22)	558.86 (595.18)	400.82 (372.73)	494.36 (438.71)
Full vetoes	22.84 (42.65)	11.32 (33.76)	14.84 (28.79)	33.99 (62.39)
Policy liberalism score (std.)	0.25 (0.92)	-0.40 (0.99)	-0.12 (0.89)	0.07 (0.97)
Observations	1,043	712	643	754

Notes: Quantities are averages over all years, with sample restricted as specified in the column header. Standard deviations reported in parenthesis. The measures for senate Democrats and Republicans mean ideology is calculated as the mean of the ideology scores of senators by party affiliation and state, using Shor and McCarty (2011) scores. The measure ranges from -1 (most liberal) to 1 (most conservative). State government ideology ranges from 0 (most conservative) to 100 (most liberal) and is taken from Berry et al. (2010). Introduced bills measures the number of bills introduced for consideration by year and state, while enacted bills measures the number of bills approved by the legislature (Hicks, 2015). Full vetoes measures the number of bills approved by the legislature but vetoed by the governor. Policy liberalism score measures how liberal policies implemented in a given year are. The original score, taken from Caughey and Warshaw (2015), ranges from -1 (most liberal) to 1 (most conservative) has been standardized by state to have mean 0 and unit variance.

TABLE 1

	Unified D. governor	**Unified** R. governor	**Divided** D. governor	**Divided** R. governor
D. Individual legislators				
N. years in office	11.46	10.32	10.57	11.77
	(5.95)	(5.86)	(5.85)	(6.16)
First year in office	2001.06	2003.13	2001.80	1999.39
	(6.30)	(7.09)	(6.62)	(6.00)
Ever in a div.govt.	0.76	0.44	1.00	1.00
	(0.43)	(0.50)	(0.00)	(0.00)
First year in a div.govt.	2002.90	2002.84	2003.20	2000.31
	(6.69)	(5.71)	(6.58)	(6.46)
N. years in div.govt.	4.32	2.32	6.32	7.76
	(4.07)	(3.37)	(3.62)	(4.07)
Ideology Score	-0.28	0.27	0.05	-0.26
	(0.88)	(0.84)	(0.89)	(0.84)
Senator	0.26	0.27	0.24	0.27
	(0.44)	(0.44)	(0.43)	(0.44)
Observations	35,358	51,408	33,641	40,750

Notes: Quantities are averages over all legislators (house and senate) and years, with sample restricted as specified in the column header. Ideology score is the individual-level measure constructed by Shor and McCarty (2011). Standard deviations reported in parenthesis.

3. Empirical strategy: regression-discontinuity design

In a two-party system with a governor and two chambers, 8 electoral outcomes are possible. Two of these give rise to a unified government, either Republican, which we denote *RRR*, or Democratic, *DDD*, where the letters indicate control of governor, house, and senate respectively. All the remaining cases are divided governments, though they differ in which party controls the executive body and the two chambers. We estimate the effect of each configuration of divided government, separately for Republicans and Democrats. Starting from the unified Republican case, *RRR*, there are three possibilities: *RDR*, where the Republicans lose the house, *RRD*, where they lose the senate, and, finally, *DRR*, where they lose the governor. Similarly, three cases arise from the unified Democratic case.

Our empirical strategy relies on using close elections in a regression-discontinuity design and estimating the discontinuity separately in each of the six cases. In the first part of the analysis, we use data at the legislator level, indexed by l. Letting i denoting states and t years, we therefore estimate

$$Y_{ilt} = \alpha + \beta D_{it} + \gamma_1 V_{it} + \gamma_2 V_{it} D_{it} + u_{ilt}, \tag{1}$$

where Y_{ilt} is an outcome of interest, for instance a legislator's ideology. The indicator D_{it},

equal one when the government is divided, and the running variable V_{it}, the distance to a divided government, are defined appropriately in each case.[7]

Each discontinuity is estimated by fixing the electoral outcome in two government bodies, and define the running variable appropriately as the distance to a switch in the control of the third one (Wong, Steiner and Cook, 2013). The margin of victory in the gubernatorial election is defined in terms of vote share distance to a change in party control. Instead, we measure the margin of victory in the house and senate with the seat share distance. To make the running variable comparable across states with different chamber sizes, as well as across the different elections, we standardize it by dividing by each state's standard deviation (Cheng 2016, Cerqua and Pellegrini 2014). More details are available in Appendix C.

As an illustration, consider the case of estimating the effect of a unified Republican government losing the senate to the Democrats. There, we restrict the sample to legislatures where both the governor and the house are Republican, and define the running variable V_{it} as the seats share distance to Democratic control of the senate. Correspondingly, we define $D_{it} = 1$ when this distance is positive.[8]

This empirical strategy has some important advantages with respect to the ones previously used in studies on divided governments. To start, it simplifies the problem by reducing a three-dimensional regression-discontinuity design to six univariate ones, to which standard estimation and inference techniques can be applied (Lee and Lemieux, 2010). Additionally, we do not incur in the interpretation and consistency issues described in Wong, Steiner and Cook (2013) that arise when pooling different threshold and collapsing multi-dimensional running variables into one.[9] Finally, as we are interested in partisan differences in the effect of divided government, each discontinuity is of independent interest. Our approach has some potential limitations in that, by avoiding pooling, it requires a substantial amount of data, as estimation relies on having a sufficient number of elections close to each of the six thresholds. Also, the seats share distance may not always be a good measure of the effective distance to a majority change (Kirkland and Phillips, 2020; Fiva, Folke and Sørensen, 2018).[10]

3.1. Validation of the regression-discontinuity design

We perform conventional tests to assess the validity of our regression-discontinuity design. In our setting, the assumption that the running variable cannot be perfectly manipu-

---

[7]Because both the running variable and the divided government indicator only vary at the state-legislative term level, there is no index for the individual legislator. In the second part of our analysis we estimate a model analogous to eq. 1 but using state-level variables as outcomes.

[8]We exclude from the sample cases of ties in the seat share distribution, as there is no clear way of categorizing these as either divided or unified governments. Results are unaffected by considering seat ties in one government body as instances of divided government.

[9]As Wong, Steiner and Cook (2013) show, estimation of a single discontinuity by pooling thresholds can only be justified under the assumption of homogeneous treatment effects and when the running variables are in the same scale and metric. As we show in the following, there is substantial heterogeneity in the effects across parties, and the running variables for the gubernatorial and legislative elections are different in nature.

[10]An alternative approach would be to use Kirkland and Phillips (2018)'s simulation method that uses information on all district-level elections to construct a single running variable. We followed this route and show results in the robustness checks section 5, where we also discuss some limitations.

lated amounts to requiring that parties cannot affect their vote share so to perfectly locate at one side of the threshold. This assumption is likely to be satisfied when focusing on close elections, where the outcome is uncertain and partly determined by election-day events or by chance.[11] A violation of such assumption would result in observing relatively more observations at one side of the threshold. Reassuringly, we find no evidence in this regard. In figure D.1 in Appendix D, we show that the density of each of the six running variables used in our analysis do not jump discontinuously at each threshold.

To test these results formally we implement Cattaneo, Jansson and Ma (2018) tests of manipulation based on density discontinuity and, for all six of our running variables, we fail to reject the null of no discontinuity, which is evidence in favor of lack of manipulation. Finally, Tables D.1 and D.2 in Appendix D show balancing checks for the individual legislator-level database, whereas Tables D.3 and D.4 show balancing for set of state characteristics.

4. The effects of divided government on polarization and policy

4.1. Divided government affects legislators' ideology scores

We begin by estimating the effect of divided government on the polarization of the legislature using individual-level ideology scores for state representatives obtained from Shor and McCarty (2011). If divided government increases polarization – for instance because the party leaders that set the agenda in each chamber are from different parties – representatives who serve under periods where the government was divided should be more liberal (if Democrats) or conservative (if Republicans) than they would be if they served under a unified government.

We study the effect on ideology for senators and house representatives separately, and further split by party. Ideology scores are calculated using voting behavior over the entire career and are, thus, time-invariant for each legislator. For this reason, our estimates capture the impact on the overall individual ideology – measured over the entire career in office – of serving one additional term (2-4 years) under a divided government.[12] To put this number into perspective, it is useful to note that state legislators serve for about 11 years on average (see Table 1 above). In all of the analysis, we use a local linear specification with an optimal bandwidth chosen using Calonico, Cattaneo and Titiunik (2014)'s method throughout. Results using instead the local polynomial RD estimator proposed by Calonico et al. (2019) and bias-robust confidence intervals are available in Appendix D.

In Tables 2 through 4, we show regression-discontinuity estimates comparing the effect on legislators' ideology of different types of divided government. Corresponding RD plots are available in Figures D.3-D.5 in the Appendix.[13] As column 1 of Table 2 indicates, comparing

---

[11]For a thorough discussion and empirical assessment of the validity of regression-discontinuity designs in this and other contexts, see Eggers et al. (2015).

[12]Regression-discontinuity plots showing the effect on years served for each configuration are reported in Figure D.2 in the Appendix.

[13]We also considered second and third-order polynomials, with (unreported) results qualitatively unchanged. Results using local linear regression with other bandwidth choices are discussed in Section 5.

a fully unified Democratic government to one where Democrats barely lost the senate to Republicans shows a positive and large effect on Republican senators' ideology scores, who are substantially more conservative. Specifically, Republican senators have an ideology score 60% of their baseline score higher compared to those serving under unified Democratic governments.[14] Instead, we find no effect for Democratic senators (column 2). When a unified Republican government loses the senate to Democrats (columns 3-4), we observe similarly large effects, with Republican senators being more conservative while Democrats appearing more liberal. Taken together, these results indicate that divided government has a large impact on the polarization of the senate, in large part because of Republicans moving to the right of the ideological spectrum. These results are in line with previous descriptive work on the determinants of polarization (Shor and McCarty 2011; McCarty 2019).

In Table 3, we provide similar estimation results for the house. The estimated coefficients are much smaller than the ones for the senate, and, throughout, imprecisely estimated. In sum, we find very little evidence that divided governments increases polarization in the house.

Results in Tables 2 and 3 show that divided government impacts the ideology of both Republican and Democratic senators who, by moving towards their ideological poles, increase the polarization of the legislature as a whole. The large effects detected in the senate also suggest that it is in the senate, more than the house, where ideology matters the most. To the best of our knowledge, this is the first causal evidence of the impact of divided government on polarization.

---

[14]The large magnitude of this estimate appears to be driven, at least in part, by the particular bandwidth chosen by the Calonico, Cattaneo and Titiunik (2014)'s criterion. Results for other reasonable bandwidth choices, available in Figure D.6 in the Appendix, suggest that a range from 0.15-0.3 could be more appropriate.

TABLE 2

EFFECT OF DIVIDED GOVERNMENT (LOSING THE SENATE) ON SENATORS' IDEOLOGY SCORE

	DDD → DDR		RRR → RRD	
	(1)	(2)	(3)	(4)
	Ideology Score	Ideology Score	Ideology Score	Ideology Score
DDR	0.435**	0.161		
	(0.188)	(0.162)		
RRD			0.600***	-0.327**
			(0.113)	(0.157)
Party	Republicans	Democrats	Republicans	Democrats
Bandwidth	0.31	0.44	0.27	0.31
Mean of dep.var.	0.67	-0.91	0.75	-0.91
R2	0.12	0.05	0.25	0.04
Obs.	1114	1914	787	1007

Notes: Regression-discontinuity estimates of the effect of losing the senate on individual state senators' ideology scores (more positive scores indicates more conservative ideology). Columns 1 and 2 compare unified Democratic governments to divided governments where Republicans won the senate, for Republican (col. 1) and Democratic (col. 2) senators respectively. Similarly, columns 3 and 4 compare unified Republican governments to divided governments where Democrats won the senate. Local linear regressions with bandwidth chosen using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth. Bandwidth measured in standard deviations. Cluster-robust standard errors at the state level in parentheses. Standard errors for optimal bandwidth selection clustered at the state level.

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

TABLE 3
Effect of divided government (losing the house) on house representatives' ideology score

	DDD → DRD		RRR → RDR	
	(1)	(2)	(3)	(4)
	Ideology Score	Ideology Score	Ideology Score	Ideology Score
DRD	-0.014	-0.240		
	(0.117)	(0.190)		
RDR			0.171	0.042
			(0.155)	(0.215)
Party	Republicans	Democrats	Republicans	Democrats
Bandwidth	0.71	0.66	0.43	0.28
Mean of dep.var.	0.79	-0.75	0.83	-0.81
R2	0.01	0.04	0.02	0.01
Obs.	5543	6386	5795	3328

Notes: Regression-discontinuity estimates of the effect of losing the house on individual state house representatives' ideology scores (more positive scores indicates more conservative ideology). Columns 1 and 2 compare unified Democratic governments to divided governments where Republicans won the house, for Republican (col. 1) and Democratic (col. 2) house representatives respectively. Similarly, columns 3 and 4 compare unified Republican governments to divided governments where Democrats won the house. Local linear regressions with bandwidth chosen using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth. Bandwidth measured in standard deviations. Cluster-robust standard errors at the state level in parentheses. Standard errors for optimal bandwidth selection clustered at the state level.
$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Our results for the senate are strong but not surprising. Senators represent larger and more heterogeneous districts than house representatives, and previous research has shown that polarization in the senate is positively associated with preference heterogeneity of the district (McCarty et al., 2019). Our stronger results for Republicans are in line with earlier work by Shor and McCarty (2011), who show most of the polarization is due to the Republicans moving to more conservative positions are responsible for a large part of the increase in polarization (see also McCarty 2019).

Finally, in Table 4, we show the impact on legislators' ideology (pooling senate and house representatives together) of losing the governorship to the other party. In columns 1 and 2, we show that a comparison of a unified Democratic to a divided government with a Republican governor shows no appreciable difference on ideology scores. However, comparing a unified Republican government to one where Democrats win the governorship, Republican legislators have much more conservative ideology scores, with an effect of about one-quarter of their sample mean. This is further evidence that the increase in polarization is mainly

a consequence of large ideological movements of the Republican party to the right.[15] We will investigate further the impact of having an opposing legislative branch on inter-branch conflict and implemented policies in the following section.

TABLE 4

EFFECT OF DIVIDED GOVERNMENT (LOSING THE GOVERNOR) ON HOUSE AND SENATE REPRESENTATIVES' IDEOLOGY SCORE

	DDD → RDD		RRR → DRR	
	(1) Ideology Score	(2) Ideology Score	(3) Ideology Score	(4) Ideology Score
RDD	0.041	-0.211		
	(0.092)	(0.158)		
DRR			0.218**	-0.038
			(0.103)	(0.089)
Party	Republicans	Democrats	Republicans	Democrats
Bandwidth	0.41	0.43	0.34	0.45
Mean of dep.var.	0.68	-0.71	0.81	-0.85
R2	0.01	0.01	0.04	0.00
Obs.	9953	20254	14223	11046

Notes: Regression-discontinuity estimates of the effect of unified governments losing the governorship on house and senate representatives' ideology scores (more positive scores indicates more conservative ideology). Columns 1 and 2 compare unified Democratic governments to divided governments where Republicans won the governorship, for Republican (col. 1) and Democratic (col. 2) legislators respectively. Similarly, columns 3 and 4 compare unified Republican governments to divided governments where Democrats won the governorship. Local linear regressions with bandwidth chosen using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth. Bandwidth measured in standard deviations. Cluster-robust standard errors at the state level in parentheses. Standard errors for optimal bandwidth selection clustered at the state level.
***$p < 0.01$,** $p < 0.05$,* $p < 0.1$

4.2. Effects on inter-branch conflict

Results in the previous section show that divided control increases polarization of the legislature. Taking more extreme ideological stances might reflect an increased willingness by parties to enter conflict, or it could simply be a way to start negotiations from a vantage point. One institutional feature that acts as a "checks and balances" mechanism for the legislature and discourages the approval of ideologically charged bills is the veto power of the governor. Knowing that they may face a veto, legislators may be more likely to present

---

[15]An alternative to using legislator-level data would be to use state-level measures of ideology. We show that this approach yields broadly similar results in Figure B.1 in the Appendix, where we find that a change from unified Republican to divided government by change in governorship makes legislators more liberal, while changing from unified Democratic to divided government moves ideological scores to the right.

and approve bills that have been previously agreed upon with the governor's party.[16] As a consequence, whether divided control increases or decreases the likelihood of inter-branch conflict is, at least in theory, unclear. To shed some light on this question, we estimate our baseline regression-discontinuity model using, as outcome, the number of vetoes issued by the governor in each state and year standardized to have mean zero and unit variance in each state. Again, in this and the next section we estimate the model using local linear regression and bandwidth chosen by Calonico, Cattaneo and Titiunik (2014), and report results using Calonico et al. (2019)'s estimator in the Appendix. For the sake of space and readability, we display results using coefficient plots with 90 and 95% confidence intervals throughout.

Figure 2 shows that, compared to a fully unified government, governors (either Republican or Democrat) facing a unified opposing legislature use their veto power substantially more. In these cases, one party holds full control of the legislative branch, hence it is in a better position to pass bills that are ideologically bolder and closer to party positions. The estimated effects are large and equal to one standard deviation for both Republican and Democratic governors. We find no effect, instead, in split legislature cases, i.e., when only one chamber is controlled by the opposition. This result may reflect the fact that in split legislatures one chamber has preferences aligned to the governor's and may be unwilling to pass bills that may create conflict, fostering bipartisan cooperation (Trubowitz and Mellow 2005, Harbridge 2015). Our results that conflict increases only under split control of the executive and legislative branches – with no effect of having a divided legislature – are in line with previous empirical evidence (see, e.g. Klarner and Karch 2008).

---

[16]Governors' willingness to veto bills may also be affected by other strategic considerations and has been linked to several factors, such as the strength of the electoral mandate, party affiliation, or experience (Klarner and Karch, 2008).

FIGURE 2
EFFECT OF DIVIDED GOVERNMENT ON BILLS VETOED BY THE GOVERNOR
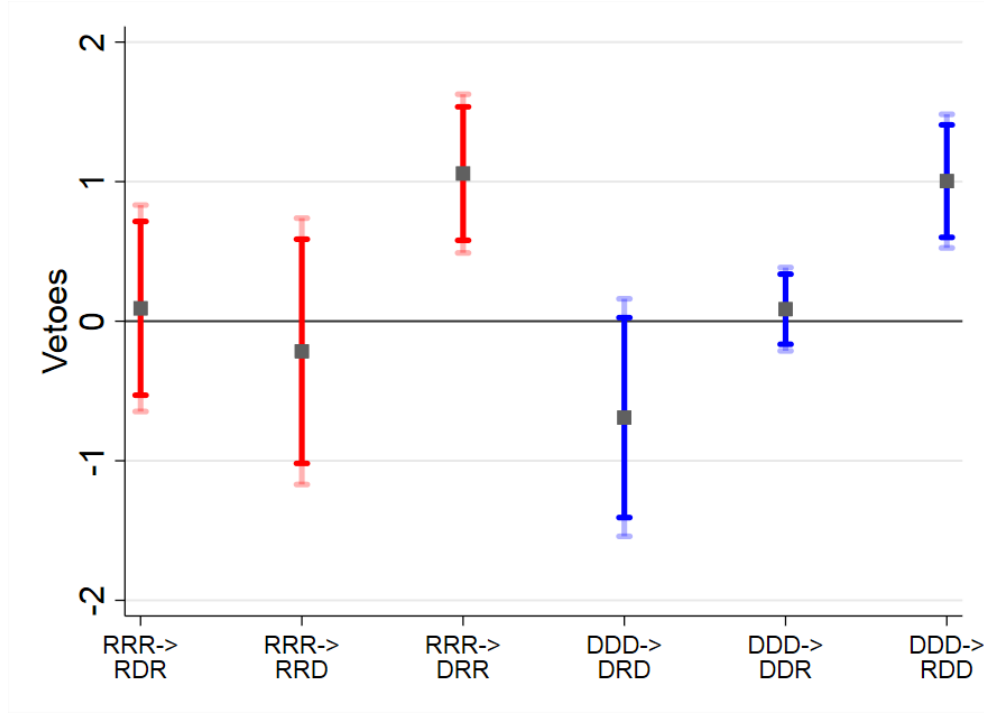
Notes: Regression-discontinuity estimates of the effect of going from unified to divided government on the (standardized) number of bills vetoed by the governor in a given year. Each coefficient corresponds to a different configuration of divided government. S.e. are clustered at the state level. Point estimates are shown together with 90% and 95% confidence intervals. Local linear regressions using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth. Bandwidth measured in standard deviations. Standard errors for optimal bandwidth selection clustered at the state level.

These results relate to previous literature on the relationship between divided government and vetoes. For instance, Klarner and Karch (2008) show that partisan alignment of the legislature and electoral cycles correlates with veto activity, finding that divided government slightly increases the number of vetoes by a governor, albeit marginally. Similarly, Herzik and Wiggins (1989) find that divided government is associated with more veto overrides.

4.3. Effects on policy implementation

Our findings in the previous sections suggest that divided government might hamper the correct functioning of the government and legislative production. However, it is not *ex-ante* clear whether higher polarization or inter-branch conflict may affect which policies are ultimately implemented.

To investigate this issue, we study the impact of divided control on the actual content of the policies implemented by state governments. Specifically, we use four different state-level measures of how liberal (or conservative) the implemented policies are on average. To start, we consider the state policy liberalism score proposed by Caughey and Warshaw (2015). This score is constructed using a large data set of policies from different areas and takes on positive values for states that implemented mostly liberal-leaning policies over a

given year, and negative values for conservative states.[17] Then, we use as outcomes three additional measures developed by Grumbach (2018): the first one is an extension of Caughey and Warshaw (2015)'s measure which includes a wider range of policies. The other two are "substantive scales", indices that count the number of a state's liberal policies minus the number of conservative policies in each year.[18]

Figure 3 plots regression-discontinuity estimates of the effect of each divided government configuration on the four measures of policy liberalism, together with 90% and 95% confidence intervals. Irrespective of the measure used, we observe large effects of divided control on policy implementation. In particular, when Republicans gain control of one chamber or the governor at the expense of Democrats, implemented policies become more conservative. These effects are sizeable and mostly in the order of magnitude of 0.5-1 standard deviations. Correspondingly, we find that when Democrats obtain control of a branch, more liberal policies are implemented.

Taken together with our findings on polarization from the previous section, these results suggest that the large differences in legislators' ideology do not translate to the implementation of extreme policies. On the contrary, when one chamber (or the governor) is controlled by the other party, approved bills are much closer ideologically to the ideal points of the opposition party than they would be if the government control were unified. This result lends indirect support to the view that voters who seek divided control of the government may do so as a way to induce a greater balance of power between parties. This balance should then lead to the approval of more moderate, middle-ground policies.

5. Additional specifications and robustness checks

5.1. Bandwidth selection

Because regression-discontinuity designs typically use locally linear estimators – which only consider observations within a certain bandwidth around the threshold – bandwidth choice is crucial. In all our baseline specifications, we use the optimal bandwidth proposed by Calonico, Cattaneo and Titiunik (2014) and calculated using Stata 17 with the package *rdbwselect*. However, it is informative to estimate the model using a range of different bandwidth around the optimal one to assess the sensitivity of the results to bandwidth choices.

In Figure D.6 in the Appendix, we re-estimate the model of Table 2 several times, each with a different bandwidth. Panels A and B replicate Columns 1 and 2 of Table 2, where we estimate the impact of shifting from unified Democratic to divided government by change in senate control over ideology scores. In panels C and D, instead, we replicate columns 3 and 4 of Table 2. In all four panels we observe that results are fairly stable across a considerable interval of bandwidths around the optimal ones (represented as dashed vertical

---

[17]All measures used in this sections are standardized to have mean zero and unit variance to facilitate comparisons across states and the interpretation of the coefficients of interest. An alternative to account for intra-state differences would be to include state fixed effects. This approach leads to very similar results (not reported).

[18]These two measures differ in the way policies are weighted in the construction of the index (see Grumbach 2018 for more details).

FIGURE 3

EFFECT OF DIVIDED GOVERNMENT ON POLICY LIBERALISM SCORES
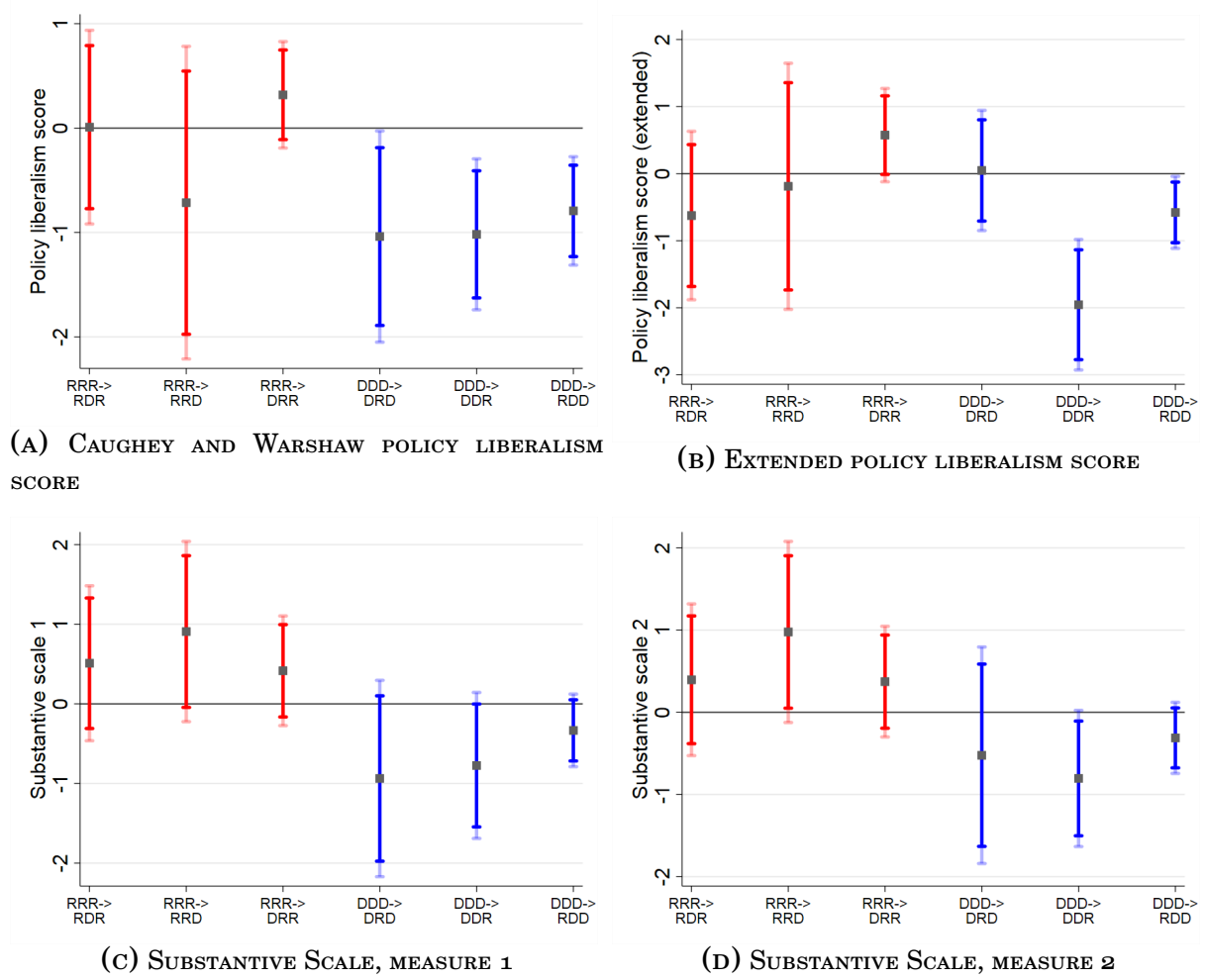
(A) CAUGHEY AND WARSHAW POLICY LIBERALISM SCORE

(B) EXTENDED POLICY LIBERALISM SCORE

(C) SUBSTANTIVE SCALE, MEASURE 1

(D) SUBSTANTIVE SCALE, MEASURE 2

Notes: Regression-discontinuity estimates of the effect of going from unified to divided government on implemented policies. Each coefficient corresponds to a different configuration of divided government. The outcome variables are, in panel A, Caughey and Warshaw (2015) policy liberalism score *pollib_median*; in panel B, Grumbach (2018)' extended policy liberalism score; in panels C and D, two different measures of policy liberalism based on the sum the state's liberal policies minus its conservative policies in a given year. These measures are taken from Grumbach (2018) and differ in how policies are weighted. All four measures are standardized by state. S.e. are clustered at the state level. Point estimates are shown together with 90% and 95% confidence intervals. Local linear regressions using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth. Bandwidth measured in standard deviations. Standard errors for optimal bandwidth selection clustered at the state level.

lines), reassuring us about the robustness of our results. Results are analogous in Figures D.7 and D.8, where we study the robustness of Table 3 and 4's results.

To check the sensitivity of our state-level results to bandwidth selection, we show results using a fixed bandwidth of 0.5 for all specifications in Figure D.9. Results are robust to this alternative choice of bandwidth and qualitatively similar to our main estimates.

Finally, we replicate the entire analysis using Calonico et al. (2019)'s local polynomial estimator with robust confidence intervals as an alternative estimation method. Results, available in Appendix D, are in line with our baseline estimates, both in terms of precision and of magnitude. Results on policy liberalism are sometimes more imprecise, with bias-corrected confidence intervals slightly larger than the baseline ones.

5.2. Alternative running variable

In our main specification, we estimate the effect by party and for each chamber, separately. An alternative approach would be to define only one running variable, which measures the distance to any type of divided government, and estimate a standard univariate regression-discontinuity design.

Along these lines, Kirkland and Phillips (2018) suggest constructing a single running variable to measure the distance from any divided government using simulations that incorporate electoral shocks to district-level and gubernatorial election results. As a robustness test, we estimate the effect of divided government using a regression-discontinuity model and Kirkland and Phillips (2018)'s running variable instead of ours. A more detailed discussion of this method and estimation results are available in Table A.1 in the Appendix. We find qualitatively similar results to those in section 4.1. As expected, a change from unified to divided government increases polarization of the state legislatures using both Hicks (2015)'s and Shor and McCarty (2011)'s polarization measures, although in the latter case, the precision of the estimate is low.

6. Conclusions

In this paper we provide evidence that divided government is an important driver of political polarization, and it affects both conflict among branches of government and the type of policies implemented by US state governments. Our findings contribute to the debate on the causes of polarization – and its consequences – in the US and elsewhere. Although there is now a fairly general consensus that political elites have become increasing polarized over the last forty years (McCarty, 2019; Akkerman, 2015), there is less agreement on what are the drivers of this phenomenon. To the best of our knowledge, this is the first paper to provide causal evidence on the impact of divided government on polarization.

The effects of divided control are not limited to ideological positions of legislators, but translate directly into actual policy implementation. The threat of obstructionism from the opposition appears to induce legislators from either party to reach common ground before a bill is approved. Theoretically, in presence of moderating institutions – such as the possibility of divided governments, or governors' veto power – parties trying to approve policies closer to

their ideal point have incentives to adopt more extreme ideological positions than in a purely presidential regime. However, the policies implemented in equilibrium may end up being moderate (Alesina and Rosenthal, 2000). We provide evidence that this is indeed the case in US states, where under divided governments legislators polarize more but implemented policies tend towards the ideological middle.

Additional research is needed to investigate whether these effects are also present in countries other than the US. Also, while our results suggest that divided governments are an important driver of polarization, they cannot by themselves explain the rise in polarization observed in the US in the last decades. We believe that investigating other determinants of polarization and whether its rise will have long-lasting effects on policy outcomes is particularly relevant for future research.

References

Akkerman, Tjitske. 2015. "Immigration policy and electoral competition in Western Europe: A fine-grained analysis of party positions over the past two decades." *Party Politics*, 21(1): 54–67.

Alesina, Alberto, and Howard Rosenthal. 1995. *Partisan Politics, Divided Government and the Economy.* Cambridge University Press.

Alesina, Alberto, and Howard Rosenthal. 1996. "A theory of divided government." *Econometrica: journal of the Econometric Society*, 1311–1341.

Alesina, Alberto, and Howard Rosenthal. 2000. "Polarized platforms and moderate policies with checks and balances." *Journal of Public Economics*, 75(1): 1–20.

Alt, James E., and Robert C. Lowry. 1994. "Divided Government, Fiscal Institutions, and Budget Deficits: Evidence from the States." *The American Political Science Review*, 88(4): 811–828.

Andersen, Asger Lau, David Dreyer Lassen, and Lasse Holbøll Westh Nielsen. 2012. "Late budgets." *American Economic Journal: Economic Policy*, 4(4): 1–40.

Ash, Elliott, Massimo Morelli, and Matia Vannoni. 2020. "Divided government, delegation, and civil service reform." *Political Science Research and Methods*, 1–15.

Bernecker, Andreas. 2016. "Divided we reform? Evidence from US welfare policies." *Journal of Public Economics*, 142(4): 24–38.

Berry, William D., Richard C Fording, Evan J. Ringquist, Russell L. Hanson, and Carl Klarner. 2010. "Measuring Citizen and Government Ideology in the American States: A Re-appraisal." *State Politics and Policy Quarterly*, 2(10): 117–135.

Binder, Sarah A. 1999. "The dynamics of legislative gridlock, 1947–96." *American Political Science Review*, 93(3): 519–533.

Binder, Sarah A. 2004. *Stalemate: Causes and consequences of legislative gridlock.* Brookings Institution Press.

Calonico, Sebastian, Matias D Cattaneo, and Rocio Titiunik. 2014. "Robust nonparametric confidence intervals for regression-discontinuity designs." *Econometrica*, 82(6): 2295–2326.

Calonico, Sebastian, Matias D Cattaneo, Max H Farrell, and Rocio Titiunik. 2019. "Regression discontinuity designs using covariates." *Review of Economics and Statistics*, 101(3): 442–451.

Canen, Nathan J, Chad Kendall, and Francesco Trebbi. 2021. "Political Parties as Drivers of US Polarization: 1927-2018." National Bureau of Economic Research.

Cattaneo, Matias D., Michael Jansson, and Xinwei Ma. 2018. "Manipulation testing based on density discontinuity." *The Stata Journal*, 18(1): 234 261.

Caughey, Devin, and Christopher Warshaw. 2015. "The Dynamics of State Policy Liberalism, 1936-2014." *American Journal of Political Science*, 4(60): 899–913.

Cerqua, Augusto, and Guido Pellegrini. 2014. "Do subsidies to private capital boost firms growth? A multiple regression discontinuity design approach." *Journal of Public Economics*, 19: 114 – 126.

Chari, V. V., Larry E. Jones, and Ramon Marimon. 1997. "The Economics of Split-Ticket Voting in Representative Democracies." *American Economic Review*, 87(5): 957–976.

Cheng, Yishuang Alden. 2016. "Regression Discontinuity Design with Multiple Assignment Variable." *Unpublished manuscript*.

CSG. 2020. *The Book of the States.* The Council of State Governments.

Eggers, Andrew C, Anthony Fowler, Jens Hainmueller, Andrew B. Hall, and James M. Snyder Jr. 2015. "On the validity of the regression discontinuity design for estimating electoral effects: New evidence from over 40,000 close races." *American Journal of Political Science*, 59(1): 259–274.

Erikson, Robert S, Olle Folke, and James M. Snyder Jr. 2015. "A gubernatorial helping hand? How governors affect presidential elections." *The Journal of Politics*, 77(2): 491–504.

Fiva, Jon H, Olle Folke, and Rune J Sørensen. 2018. "The power of parties: evidence from close municipal elections in Norway." *The Scandinavian Journal of Economics*, 120(1): 3–30.

Grumbach, Jacob M. 2018. "From backwaters to major policymakers: policy polarization in the states, 1970–2014." *Perspectives on Politics*, 16(2): 416–435.

Harbridge, Laurel. 2015. *Is bipartisanship dead?: Policy agreement and agenda-setting in the House of Representatives.* Cambridge University Press.

Herzik, Eric B, and Charles W Wiggins. 1989. "Governors vs. legislatures: Vetoes, overrides, and policy making in the American states." *Policy Studies Journal*, 17(4): 841–862.

Hicks, William D. 2015. "Partisan Competition and the Efficiency of Lawmaking in American State Legislatures, 1991-2009." *American Politics Research*, 43(5): 743–770.

Kirkland, Patricia A., and Justin H. Phillips. 2018. "Is Divided Government a Cause of Legislative Delay?" *Quarterly Journal of Political Science*, 13: 173–206.

Kirkland, Patricia A., and Justin H. Phillips. 2020. "A Regression Discontinuity Design for Studying Divided Government." *State Politics & Policy Quarterly*.

Klarin, Jonas. 2019. "Term Length and Public Finances: The Case of U.S. Governors." *Upssala University - Department of Economics Working Paper*, 5.

Klarner, Carl E. 2013. "State Partisan Balance Data, 1937 - 2011." *Harvard Dataverse*.

Klarner, Carl E., and Andrew Karch. 2008. "Why Do Governors Issue Vetoes? The Impact of Individual and Institutional Influences." *Political Research Quarterly*, 61(4): 574–584.

Klarner, Carl E, Justin H Phillips, and Matt Muckler. 2012. "Overcoming fiscal gridlock: Institutions and budget bargaining." *The Journal of Politics*, 74(4): 992–1009.

Lee, David S. 2008*a*. "Randomized experiments from non-random selection in US House elections." *Journal of Econometrics*, 142(2): 675–697.

Lee, David S, and Thomas Lemieux. 2010. "Regression discontinuity designs in economics." *Journal of economic literature*, 48(2): 281–355.

Lee, Frances E. 2008*b*. "Agreeing to disagree: Agenda content and senate partisanship, 1981–2004." *Legislative Studies Quarterly*, 33(2): 199–222.

Leip, David. 2022. "Atlas of US Elections."

Mayhew, David R. 2005. *Divided we govern: Party control, lawmaking and investigations, 1946-2002.* Yale university press.

McCarty, Nolan. 2019. *Polarization: What everyone needs to know®.* Oxford University Press.

McCarty, Nolan, Jonathan Rodden, Boris Shor, Chris Tausanovitch, and Christopher Warshaw. 2019. "Geography, Uncertainty and Polarization." *Political Science Research and Methods*, 7(4): 775–794.

McCrary, Justin. 2008. "Manipulation of the running variable in the regression discontinuity design: A density test." *Journal of econometrics*, 142(2): 698–714.

Shor, Boris, and Nolan McCarty. 2011. "The Ideological Mapping of American Legislatures." *American Political Science Review*, 105(3): 530–551.

Theriault, Sean M. 2006. "Party polarization in the US Congress: Member replacement and member adaptation." *Party Politics*, 12(4): 483–503.

Trubowitz, Peter, and Nicole Mellow. 2005. ""Going bipartisan": politics by other means." *Political Science Quarterly*, 120(3): 433–453.

Wong, Vivian C., Peter M. Steiner, and Thomas D. Cook. 2013. "Analyzing Regression-Discontinuity Designs With Multiple Assignment Variables: A Comparative Study of Four Estimation Methods." *Journal of Educational and Behavioral Statistics*, 38(2): 107–141.

Appendix

A. Results on ideology and polarization using Kirkland and Phillips (2018)

As an alternative to our main specification, in this section we use the running variable proposed by Kirkland and Phillips (2018) and available in the paper's replication package. This running variable is constructed by drawing state-level and district-level electoral shocks from a uniform distribution and measuring the smallest state-level vote share shock that would lead to a divided government.

In Table A.1, we report result from estimating a regression-discontinuity model in which we include the running variable, an indicator for a divided government, and the interaction of the two. The model is then estimated by OLS using only observations within the Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth.

Because Kirkland and Phillips (2018)'s running variable is constructed as the distance from *any* type of divided government, we cannot replicate our main analysis by party and by type of divided government. Instead, results in Table A.1 should be interpreted as the effect of going to a unified government to a divided government of any type. As measures of polarization, we use, in column 1, Hicks (2015)'s measure *polar*, which uses Shor and Mc-Carty (2011)'s ideology scores and is defined as the distance between the median Democratic legislator and the median Republican legislator, averaged across the chambers. Instead, in column 2, the outcome is the absolute value of the distance between the ideological medians scores of Democratic and Republican state senators.

TABLE A.1

EFFECT OF DIVIDED GOVERNMENT ON ALL LEGISLATORS' INDIVIDUAL IDEOLOGY SCORES

	(1) Hicks	(2) Shor and McCarty
Divided Government	0.285**	0.138
	(0.118)	(0.152)
Bandwidth	0.06	0.05
Mean of dep.var.	1.40	1.51
R2	0.03	0.01
Obs.	234	140

Notes: Regression-discontinuity estimates, using Kirkland and Phillips (2018)'s running variable, of the effect of divided government on state-level polarization. In column 1, the outcome is Hicks 2015's measure *polar*, which uses Shor and McCarty (2011)'s ideology scores and is defined as the distance between the median Democratic legislator and the median Republican legislator, averaged across the chambers. In column 2, the outcome is the absolute value of the distance between the ideological medians scores of Democratic and Republican state senators. The measure was developed by Shor and McCarty (2011). The bandwidth is chosen using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth and a triangular kernel. Bandwidth measured in electoral margins as in Kirkland and Phillips (2018) . Robust standard errors in parentheses. Local linear regressions. Standard errors for optimal bandwidth selection clustered at the state level.
$^{***}p < 0.01,^{**}p < 0.05,^{*}p < 0.1$

Results show that a divided government increases polarization of the legislatures by

about 10-20%, depending on the measure used. These estimates are in line, in terms of sign, with our baseline results in Tables 2-4, in which we also find a positive effect of divided government on polarization. Howerve, as our results in Section 4 shows, there is considerable heterogeneity along both party and type of divided government, with large effects in some cases and negligible ones in others. These differences highlight the advantages of analyzing each case separately.

B. Results on ideology and polarization using state-level measures

As a complement to our legislator-level analysis presented in Section 4, we here use state-level data. As an alternative to Shor and McCarty (2011)'s legislator ideology measures we use above, we consider Berry et al. (2010) state legislature ideology scores. The advantage of these scores is that they should be unaffected by agenda changes at the state level. The disadvantage is that the scores are constructed considering the ideology of national representatives by state, and therefore only capture local legislators ideology indirectly. Another advantage of Berry et al. (2010) scores is their time-span availability, as we gain about 30 years of data in comparison to Shor and McCarty (2011)'s scores. Positive values of this score indicates a more liberal ideology.

Results in Figure B.1 are consistent with those in Table 4 and show that a change from unified Democratic to divided government via a change in governorship control shifts ideology scores to the right by more than one standard deviation. Conversely, a change from unified Republican has the opposite sign and similar magnitude. Nonetheless, and differently from our baseline results, we do not find the same effect for changes in control of the chambers, suggesting perhaps that individual-level scores are better suited at measuring ideology changes in this setting.

C. Details on the construction of the running variable

The running variable V_{it} is defined, for each of the 6 possible cases of divided government, as the distance to a change in the majority that leads to a divided government. When we study the effect of losing the house or the senate, the running variable is constructed as the seats share difference between the opposition party and 50%. For instance, when estimating the effect of a Republican unified government losing the senate, the running variable is defined as the difference between the senate seats share of the Democrats and 50%. Here, observations with negative values of V are legislatures where the Republican control all three bodies, whereas cases where V is positive correspond to divided governments with the Democrats controlling the senate only. Correspondingly, when we study the effect of losing (or winning) the governorship, the running variable is defined using the vote share distance to losing (winning) the election.

As a final step, we standardize the running variable by dividing it by its standard deviation, calculated for each state across all elections. The standardization is performed in order to mitigate the issue that vote or seats share differences of similar magnitude might have very different impacts in different states. For instance, in states where there are frequent

FIGURE B.1

EFFECT OF DIVIDED GOVERNMENT ON STATE GOVERNMENT IDEOLOGY
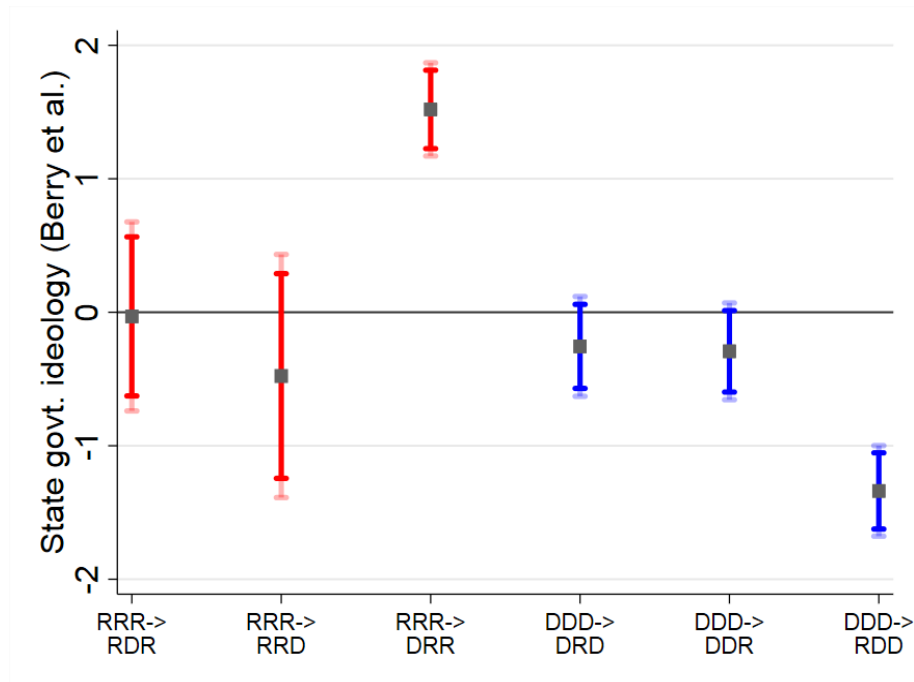
Notes: Regression-discontinuity estimates of the effect of going from unified to divided government on state government ideology, using measure by Berry et al. (2010). Each coefficient corresponds to a different case. S.e. are clustered at the state level. Local linear regressions using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth. Bandwidth measured in standard deviations. Standard errors for optimal bandwidth selection clustered at the state level.

swings in support from Republicans to Democrats, a running variable value of, say, 5%, can be considered a close election. Instead, the same value should be considered as a clear victory of one party over the other in states where races are more contested and decided over a few percentage points. We do not remove the mean so to preserve the sign, so that positive values of the running variable always correspond to cases of divided governments and vice versa, negative cases correspond to unified ones.

D. Additional results

TABLE D.1
BALANCING CHECKS 1 - INDIVIDUAL-LEVEL DATASET

	DDD → DRD			DDD → DDR			DDD → RDD		
	$\hat{\beta}$	se($\hat{\beta}$)	N	$\hat{\beta}$	se($\hat{\beta}$)	N	$\hat{\beta}$	se($\hat{\beta}$)	N
Years served	-3.96	1.38	4,771	2.01	1.87	9,159	0.62	0.49	47,470
First year in off.	-0.49	2.77	15,259	2.99	2.61	11,496	1.22	1.36	36,640
Served in both ch.	0.00	0.01	8,001	0.02	0.03	12,337	-0.04	0.02	44,518
Republican	-0.00	0.03	10,722	0.11	0.03	8,175	-0.02	0.02	39,532
Senator	0.04	0.06	16,068	-0.03	0.04	13,421	-0.05	0.02	22,424

Notes: Regression-discontinuity estimates of the discontinuity in the covariate specified in the each row. Years served is the number of years in office over the entire career. First year in office is a variable recording the first calendar year in office of each legislator. Served in both chambers is an indicator for having being elected in both chambers over the entire career. Republican is an indicator for the representative being a Republican, while Senator is an indicator for being a member of the state senate. Data at the individual legislator level. Standard errors clustered at the state level. Local linear regressions using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth. Bandwidth measured in standard deviations. Standard errors for optimal bandwidth selection clustered at the state level.

TABLE D.2
BALANCING CHECKS 2 - INDIVIDUAL-LEVEL DATASET

	RRR → RDR			RRR → RRD			RRR → DRR		
	$\hat{\beta}$	se($\hat{\beta}$)	N	$\hat{\beta}$	se($\hat{\beta}$)	N	$\hat{\beta}$	se($\hat{\beta}$)	N
Years served	-0.22	1.11	6,355	-0.74	1.59	8,911	-0.17	0.59	37,989
First year in off.	0.87	3.66	4,875	-1.38	2.18	16,810	-1.08	1.17	42,360
Served in both ch.	-0.06	0.07	4,875	-0.01	0.08	7,082	0.00	0.02	34,582
Republican	-0.02	0.01	6,355	0.03	0.01	13,253	0.05	0.02	43,766
Senator	0.02	0.03	6,355	-0.23	0.04	5,331	0.03	0.02	37,989

Notes: Regression-discontinuity estimates of the discontinuity in the covariate specified in the each row. Years served is the number of years in office over the entire career. First year in office is a variable recording the first calendar year in office of each legislator. Served in both chambers is an indicator for having being elected in both chambers over the entire career. Republican is an indicator for the representative being a Republican, while Senator is an indicator for being a member of the state senate. Data at the individual legislator level. Standard errors clustered at the state level. Local linear regressions using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth. Bandwidth measured in standard deviations. Standard errors for optimal bandwidth selection clustered at the state level.

FIGURE D.1
FREQUENCY DISTRIBUTION OF THE RUNNING VARIABLE IN EACH OF THE SIX DIVIDED GOVERNMENT
CASES.

(A) RRR→RDR

(B) RRR→RRD

(C) RRR→DRR

(D) DDD→DRD

(E) DDD→DDR

(F) DDD→RDD
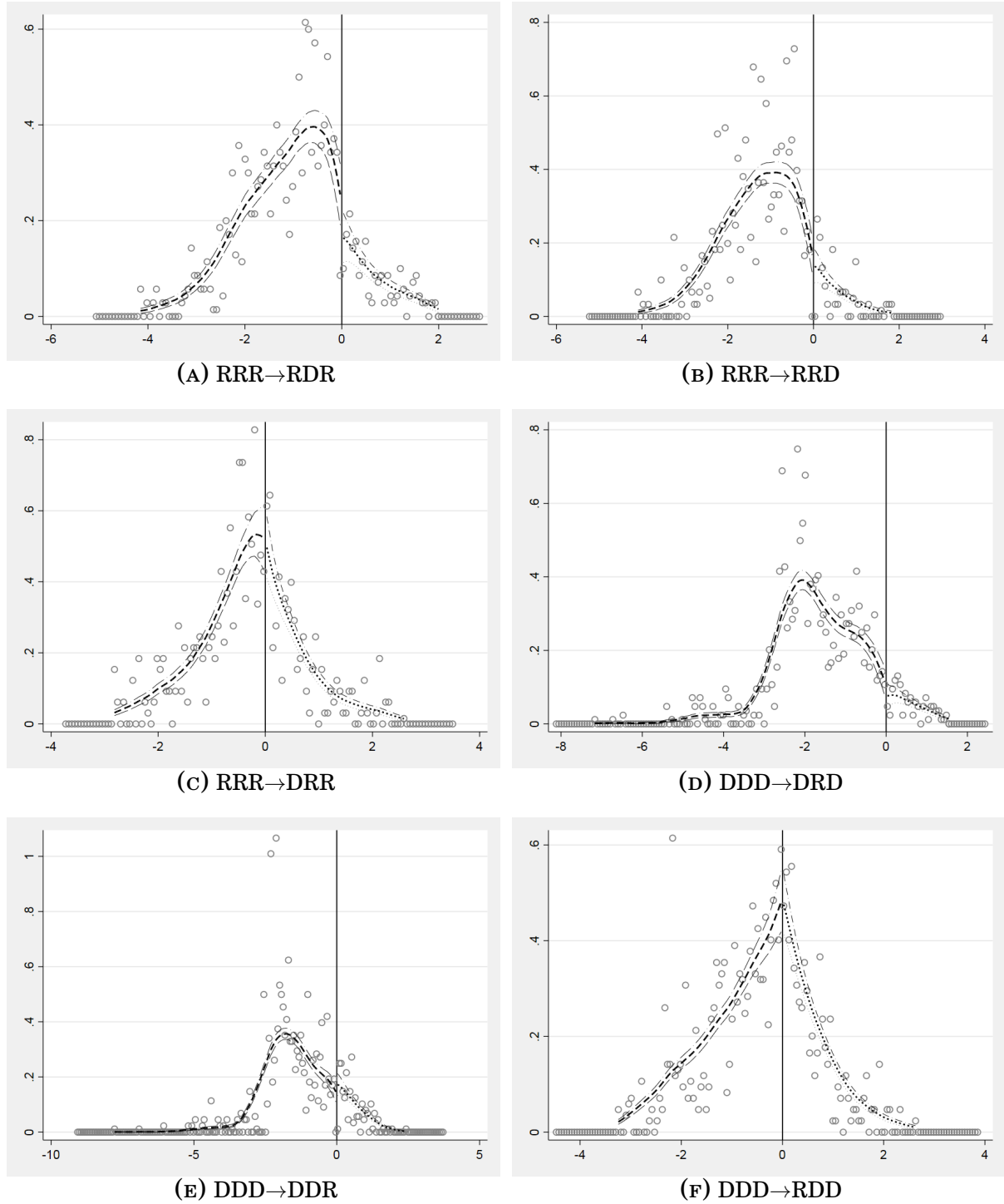
Notes: Plots of the (log) frequency distribution of the running variable, appropriately defined as the distance to a divided government in each of the six configurations. Each running variable is standardized so to have a standard deviation of one. Bandwidth measured in standard deviations. The lines are nonparametric fits with 95% confidence interval obtained using the `DCDensity` command in Stata 17. McCrary (2008)'s test fail to reject the null of no discontinuity at the 10% confidence level in all cases.

EFFECT ON THE YEARS SERVED IN OFFICE UNDER A DIVIDED GOVERNMENT, ALL LEGISLATORS

(A) RRR–>RDR

(B) RRR–>RRD

(C) RRR–>DRR

(D) DDD–>DRD

(E) DDD–>DDR

(F) DDD–>RDD
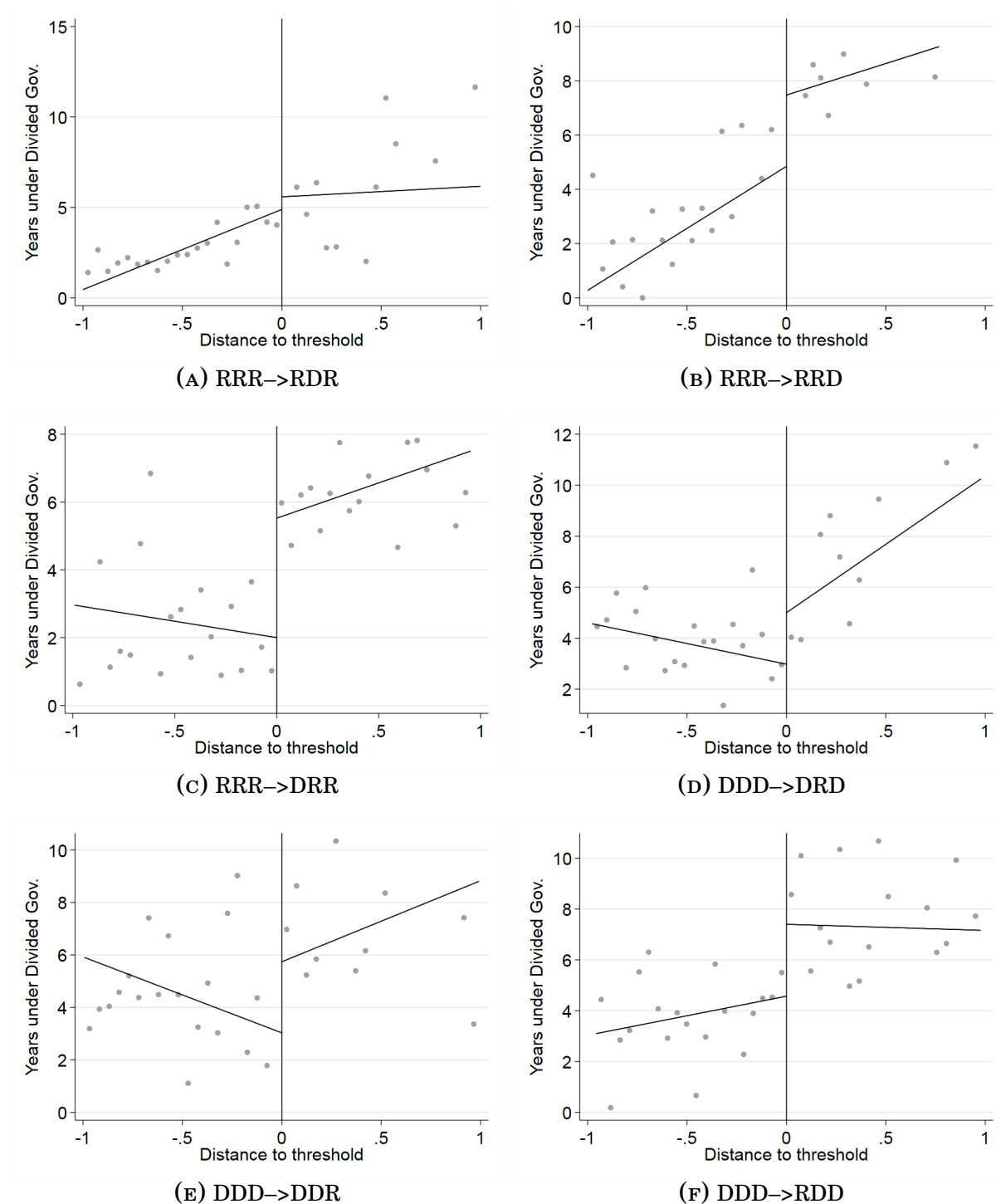
Notes: Regression-discontinuity plots of the effect on the number of years in office under a divided government of moving from a unified government to each type of divided government. Binned scatter plots with bin size 0.1 of a standard deviation of the running variable. Local linear regression lines overlaid. Standard errors for optimal bandwidth selection clustered at the state level.

FIGURE D.3
EFFECT OF DIVIDED GOVERNMENT ON INDIVIDUAL IDEOLOGY SCORES - SENATE
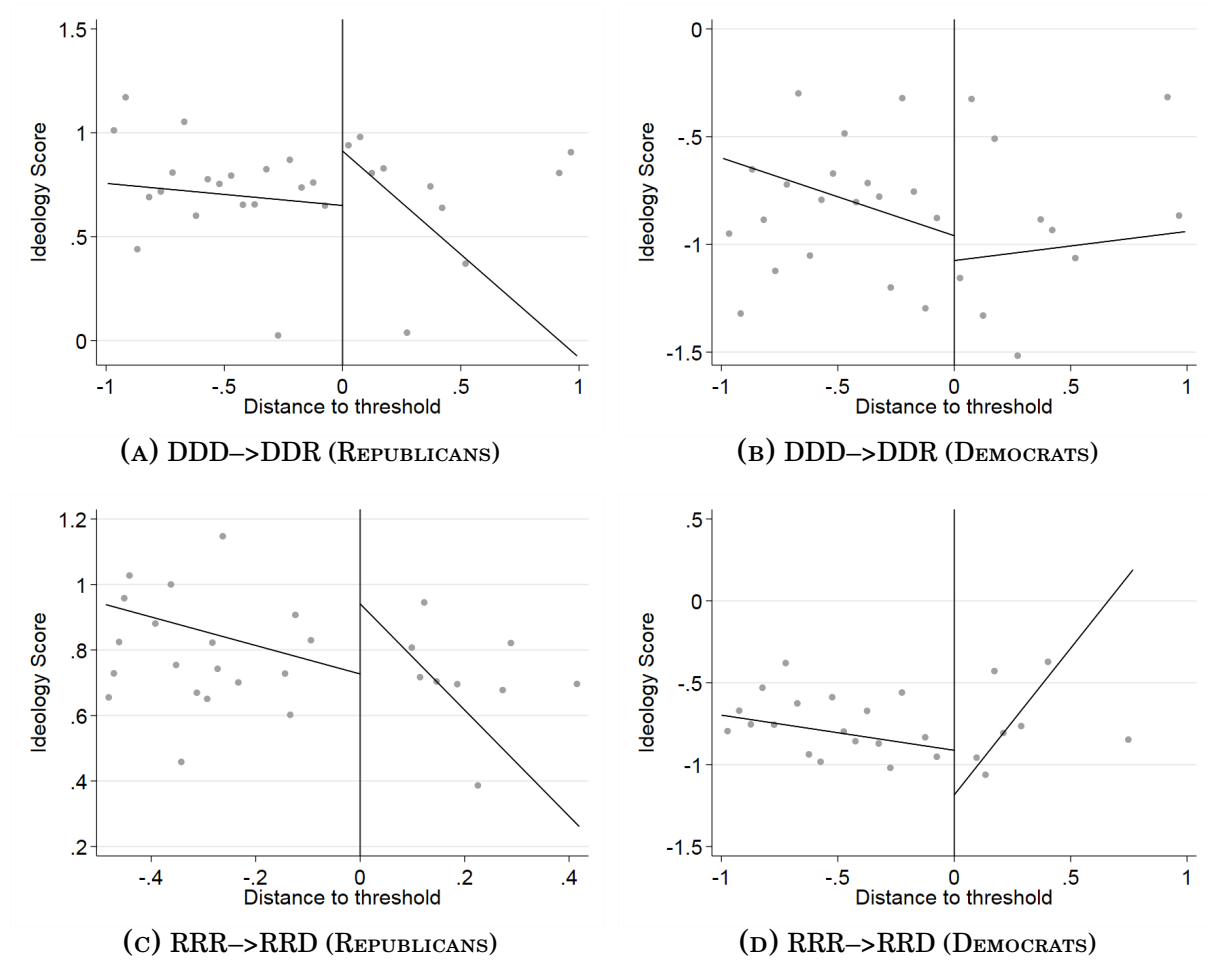
(A) DDD–>DDR (REPUBLICANS)

(B) DDD–>DDR (DEMOCRATS)

(C) RRR–>RRD (REPUBLICANS)

(D) RRR–>RRD (DEMOCRATS)

Notes: Reduced form estimates of the effect of unified governments losing the senate on individual state legislators' ideology scores. Panel A and B restrict the sample to terms with Democratic governor and house, and estimate the effect of losing the senate on the ideology of Republican (A) and Democratic (B) senators separately. Analogously, panels C and D restrict the sample to terms with a Republican governor and House and estimate the effect of losing the senate.

Figure D.4

Effect of Divided Government on Individual Ideology Scores - house
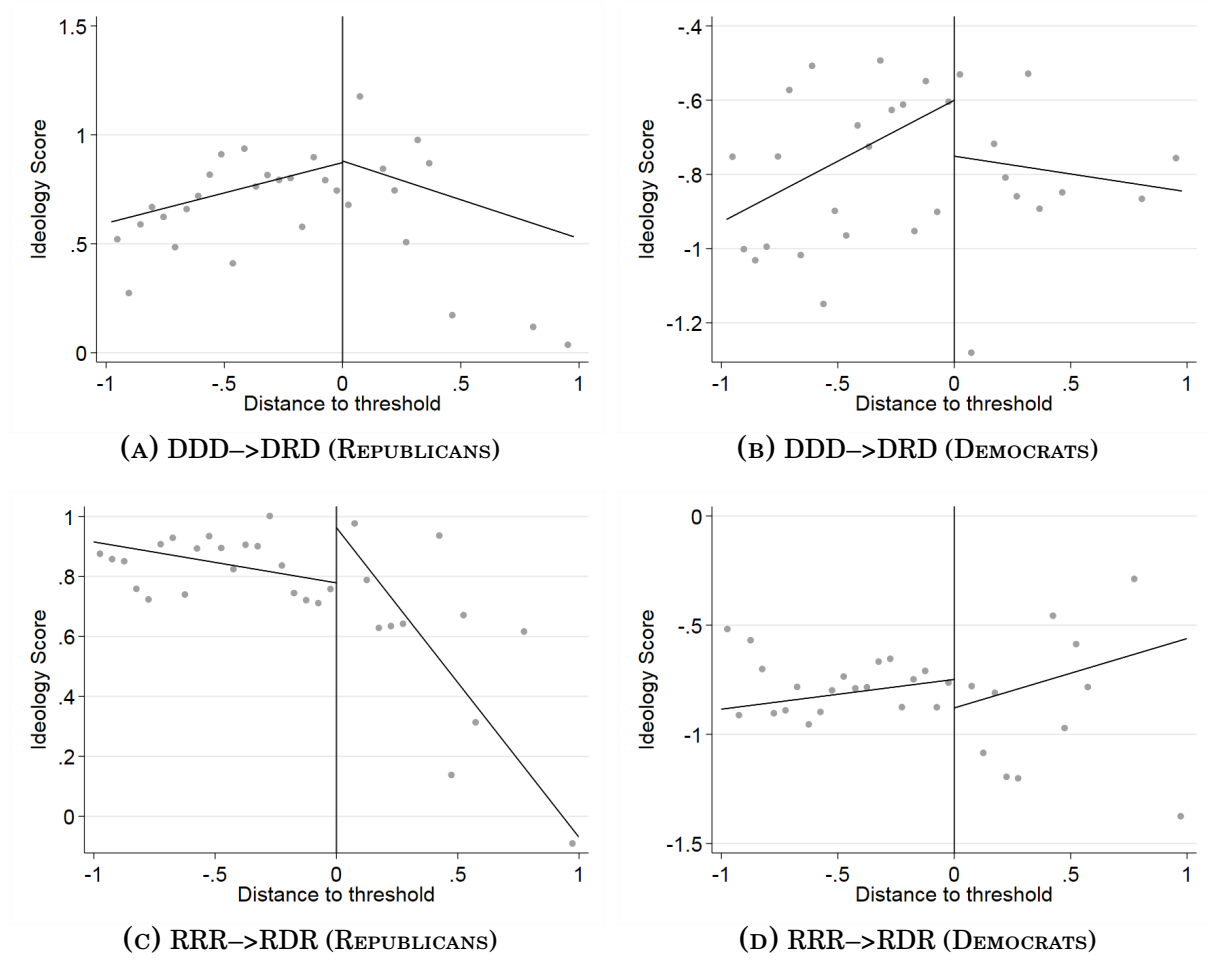
(A) DDD–>DRD (Republicans)

(B) DDD–>DRD (Democrats)
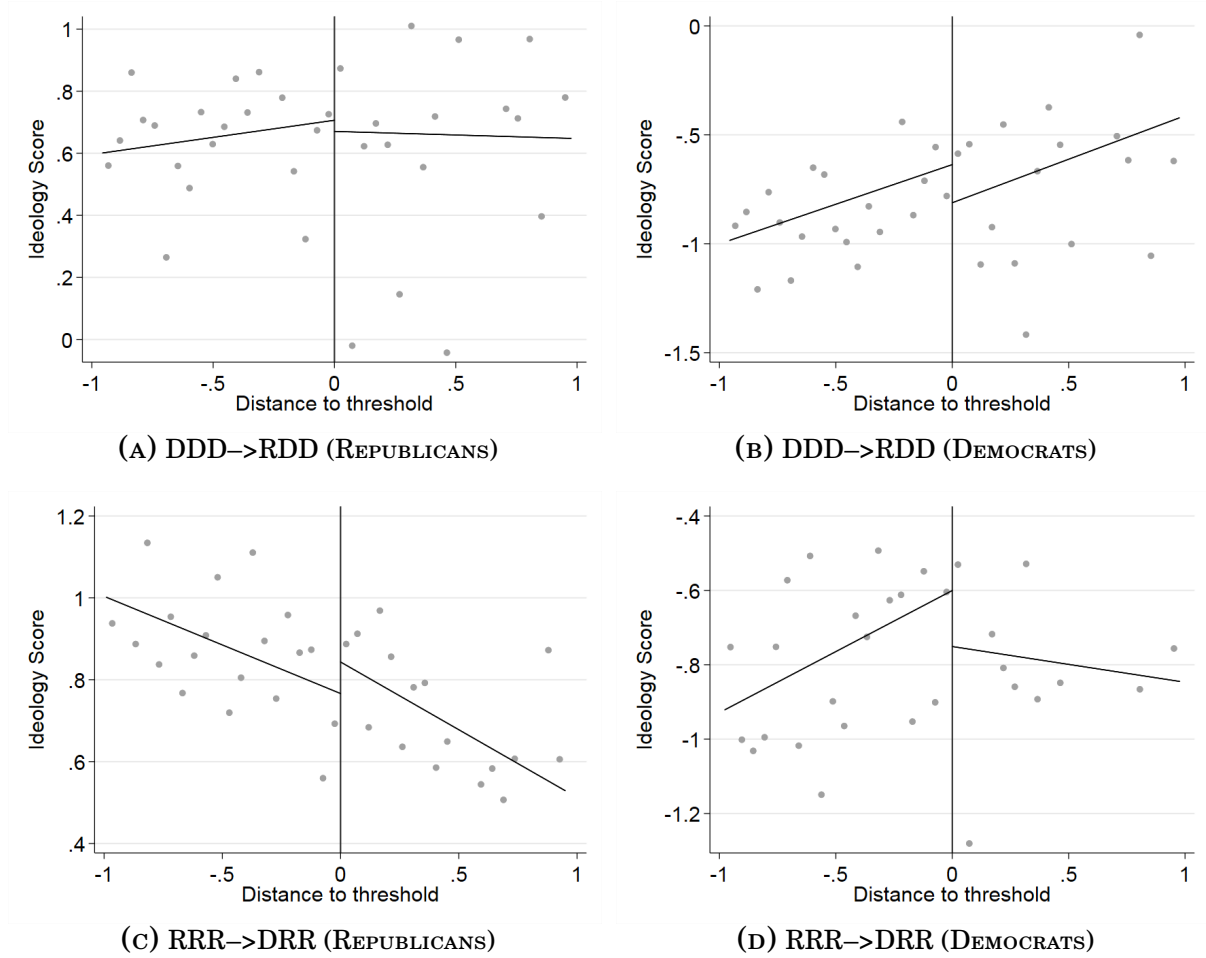
(C) RRR–>RDR (Republicans)

(D) RRR–>RDR (Democrats)

Notes: Reduced form estimates of the effect of unified governments losing the house on individual state legislators' ideology scores. Panel A and B restrict the sample to terms with Democratic governor and senate, and estimate the effect of losing the house on the ideology of Republican (A) and Democratic (B) representatives separately. Analogously, panels C and D restrict the sample to terms with a Republican governor and Senate and estimate the effect of losing the house.

Figure D.5

Effect of Divided Government on Individual Ideology Scores - Governor

(A) DDD–>RDD (Republicans)

(B) DDD–>RDD (Democrats)

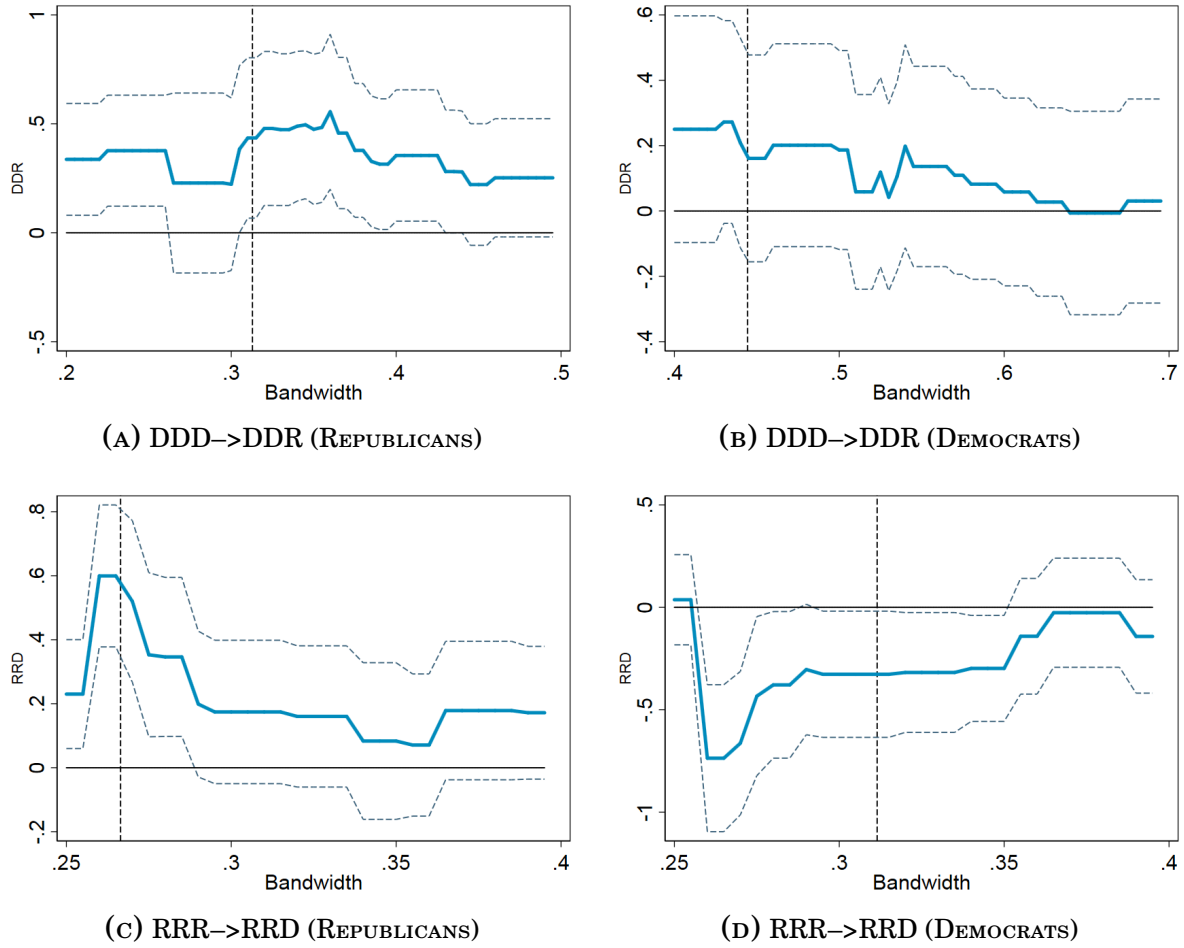**(C) RRR–>DRR (Republicans)**

(D) RRR–>DRR (Democrats)

Notes: Reduced form estimates of the effect of unified governments losing the governorship on individual state legislators' ideology scores. Panel A and B restrict the sample to terms with Democratic legislature, and estimate the effect of losing the Governorship on the ideology of Republican (A) and Democratic (B) legislators separately. Analogously, panels C and D restrict the sample to terms with a Republican legislature and estimate the effect of losing the Governorship.

FIGURE D.6

EFFECT OF DIVIDED GOVERNMENT ON INDIVIDUAL IDEOLOGY SCORES - SENATE

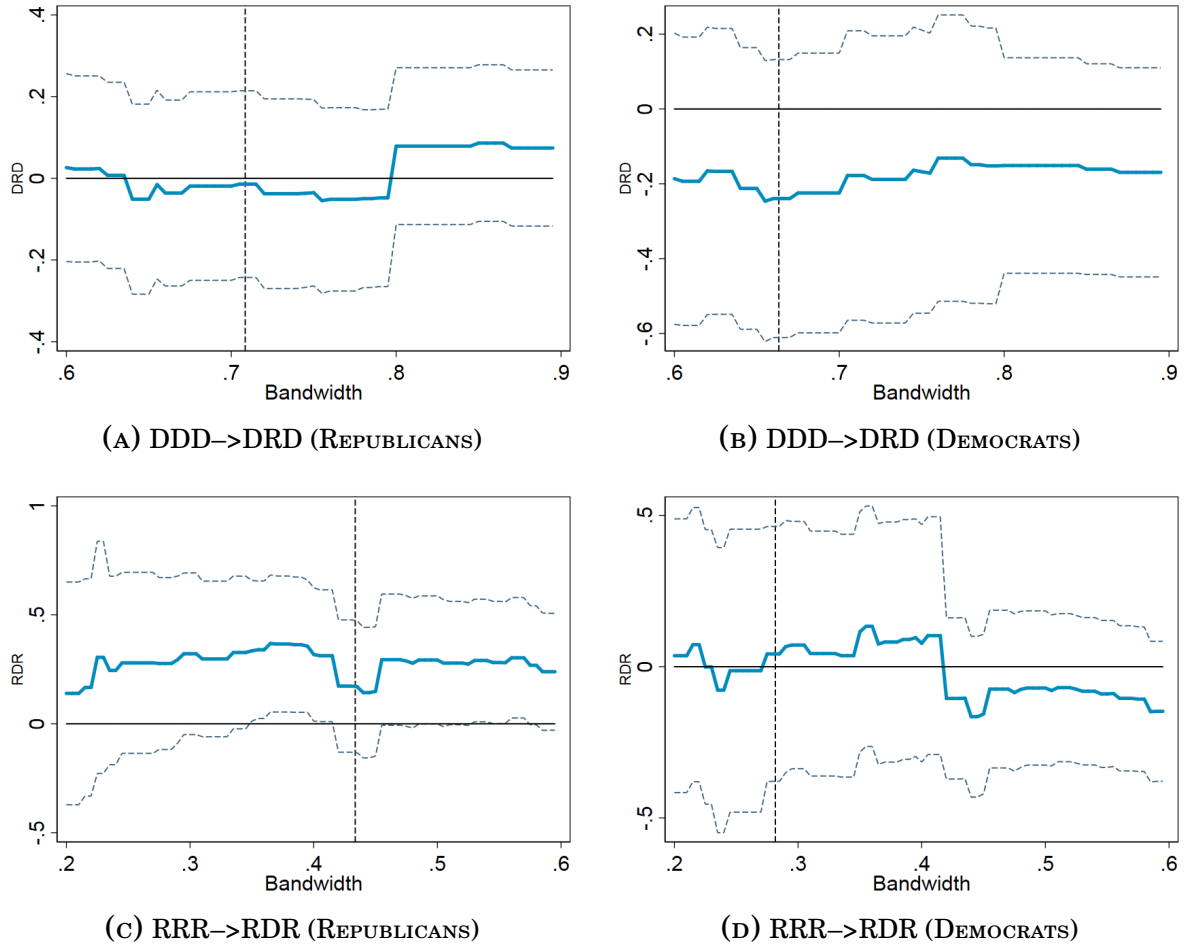

(A) DDD–>DDR (REPUBLICANS)

(B) DDD–>DDR (DEMOCRATS)

(C) RRR–>RRD (REPUBLICANS)

(D) RRR–>RRD (DEMOCRATS)

Notes: Regression-discontinuity estimates of the effect of unified governments losing the senate on individual state legislators' ideology scores (as in Table 2 above). Panel A and B restrict the sample to terms with Democratic governor and house, and estimate the effect of losing the senate on the ideology of Republican (A) and Democratic (B) senators separately. Analogously, panels C and D restrict the sample to terms with a Republican governor and House and estimate the effect of losing the senate. Local average treatment effects for different bandwidths (as specified in the horizontal axis) and 95% confidence interval with cluster-robust standard errors. Optimal bandwidth in dotted line. Bandwidth measured in standard deviations.

FIGURE D.7
EFFECT OF DIVIDED GOVERNMENT ON INDIVIDUAL IDEOLOGY SCORES - HOUSE

(A) DDD–>DRD (REPUBLICANS)

(B) DDD–>DRD (DEMOCRATS)
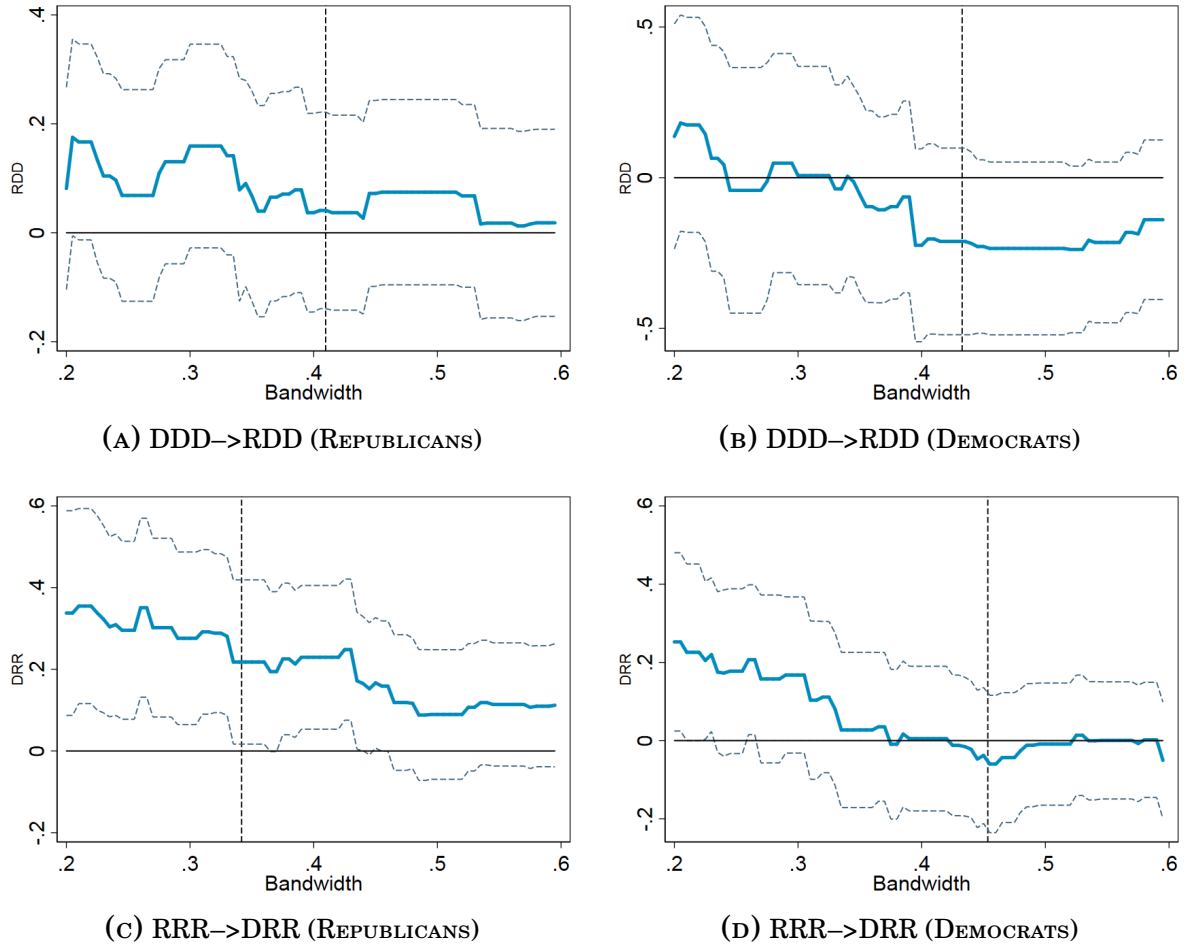
(C) RRR–>RDR (REPUBLICANS)

(D) RRR–>RDR (DEMOCRATS)

Notes: Regression-discontinuity estimates of the effect of unified governments losing the house on individual state legislators' ideology scores (as in Table 3 above). Panel A and B restrict the sample to terms with Democratic governor and senate, and estimate the effect of losing the house on the ideology of Republican (A) and Democratic (B) representatives separately. Analogously, panels C and D restrict the sample to terms with a Republican governor and Senate and estimate the effect of losing the house. Local average treatment effects for different bandwidths and 95% confidence interval with cluster-robust standard errors. Optimal bandwidth in dotted line. Bandwidth measured in standard deviations.

FIGURE D.8

EFFECT OF DIVIDED GOVERNMENT ON INDIVIDUAL IDEOLOGY SCORES - GOVERNOR

(A) DDD–>RDD (REPUBLICANS)

(B) DDD–>RDD (DEMOCRATS)

(C) RRR–>DRR (REPUBLICANS)

(D) RRR–>DRR (DEMOCRATS)

Notes: Regression-discontinuity estimates of the effect of unified governments losing the governorship on individual state legislators' ideology scores (as in Table 4 above). Panel A and B restrict the sample to terms with Democratic legislature, and estimate the effect of losing the Governorship on the ideology of Republican (A) and Democratic (B) legislators separately. Analogously, panels C and D restrict the sample to terms with a Republican legislature and estimate the effect of losing the Governorship. Local average treatment effects for different bandwidths and 95% confidence interval with cluster-robust standard errors. Optimal bandwidth in dotted line. Bandwidth measured in standard deviations.

TABLE D.3
BALANCING CHECKS 1 - STATE-LEVEL DATASET

	DDD → DRD			DDD → DDR			DDD → RDD		
	$\hat{\beta}$	se($\hat{\beta}$)	N	$\hat{\beta}$	se($\hat{\beta}$)	N	$\hat{\beta}$	se($\hat{\beta}$)	N
Population	848.34	1,413.19	104	601.14	1,964.81	141	2,267.08	885.71	416
Elect year	17.70	7.69	70	-6.00	6.87	183	1.25	2.17	630
Income	-7.63	4.74	77	-1.70	4.42	110	-5.05	1.87	272
Elect S	-0.11	0.22	146	0.02	0.19	187	-0.01	0.07	743
Elect H	0.01	0.20	160	0.05	0.17	208	0.02	0.06	887
North	-0.03	0.20	126	-0.24	0.21	138	0.15	0.05	851
South	0.04	0.23	136	0.22	0.13	192	0.01	0.07	746
Midwest	-0.03	0.16	136	-0.00	0.11	228	-0.05	0.05	714
West	0.13	0.22	136	-0.12	0.18	200	-0.06	0.05	989

Notes: Regression-discontinuity estimates of the discontinuity in each of the covariate specified in the each row. Data at the state-year level. Population is in thousand inhabitants, whereas income is in thousands of USD per capita. *Elect S* and *Elect H* are indicators for the state having a senate or house election in a given year. The last four variables are indicators for the state belonging to a given region. Standard errors clustered at the state-year level. Local linear regressions using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth. Bandwidth measured in standard deviations. Standard errors for optimal bandwidth selection clustered at the state level.
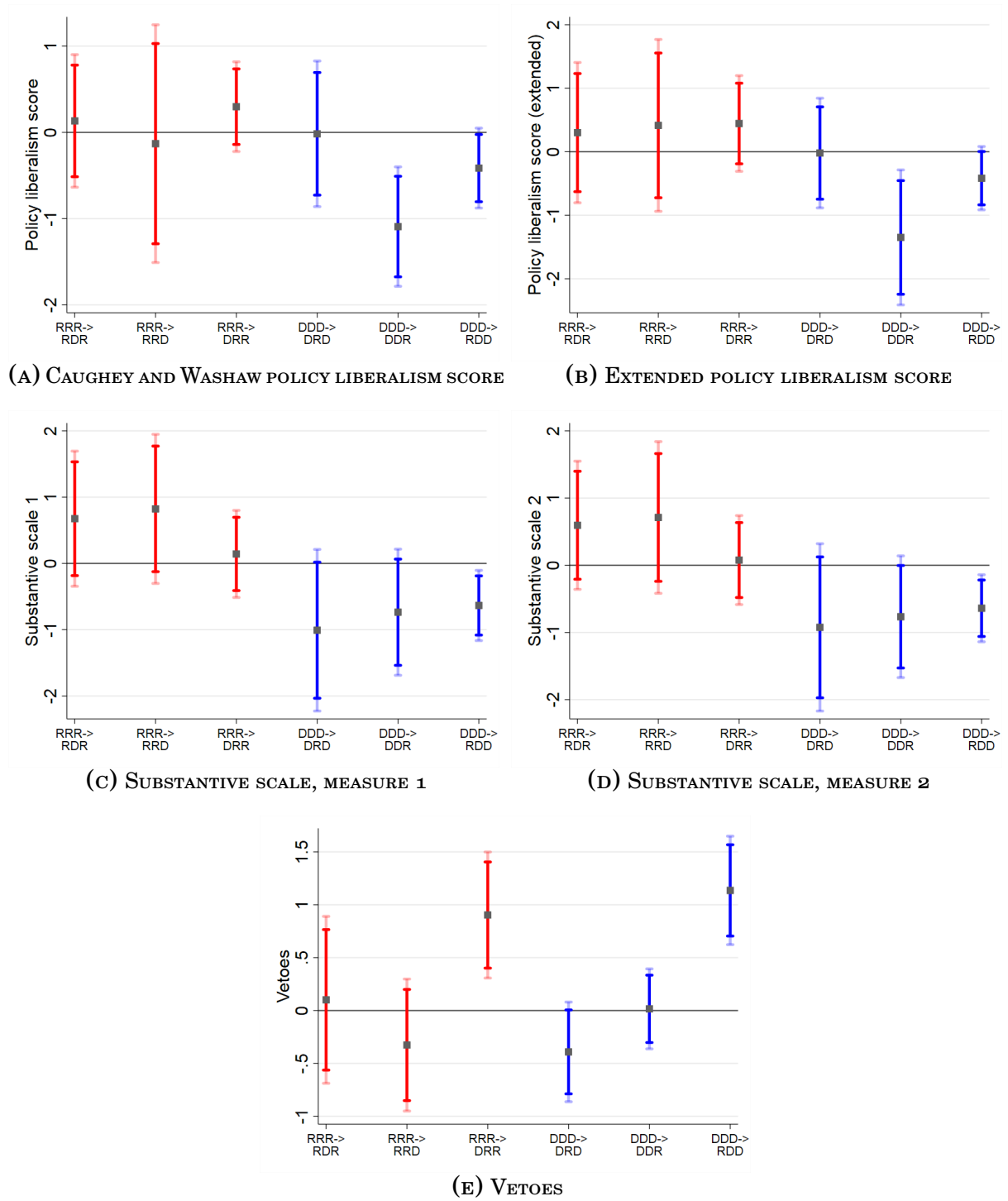
TABLE D.4
BALANCING CHECKS 2 - STATE-LEVEL DATASET

	RRR → RDR			RRR → RRD			RRR → DRR		
	$\hat{\beta}$	se($\hat{\beta}$)	N	$\hat{\beta}$	se($\hat{\beta}$)	N	$\hat{\beta}$	se($\hat{\beta}$)	N
Population	-1,591.28	2,258.10	77	5,066.68	4,373.47	75	-2,258.76	919.83	380
Elect year	-10.78	7.85	119	2.40	7.13	201	0.44	2.29	555
Income	2.81	10.40	26	-15.24	8.19	45	3.61	1.80	286
Elect S	0.20	0.25	96	-0.03	0.22	152	-0.02	0.07	764
Elect H	0.11	0.26	87	-0.01	0.22	152	-0.02	0.06	926
North	-0.31	0.15	102	0.04	0.19	141	-0.17	0.05	845
South	0.22	0.22	111	0.82	0.35	78	0.05	0.07	760
Midwest	0.02	0.17	169	-0.31	0.32	78	0.01	0.05	807
West	0.19	0.16	167	-0.17	0.21	141	0.11	0.05	851

Notes: Regression-discontinuity estimates of the discontinuity in each of the covariate specified in the each row. Data at the state-year level. Population is in thousand inhabitants, whereas income is in thousands of USD per capita. *Elect S* and *Elect H* are indicators for the state having a senate or house election in a given year. The last four variables are indicators for the state belonging to a given region. Standard errors clustered at the state-year level. Local linear regressions using Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth. Bandwidth measured in standard deviations. Standard errors for optimal bandwidth selection clustered at the state level.
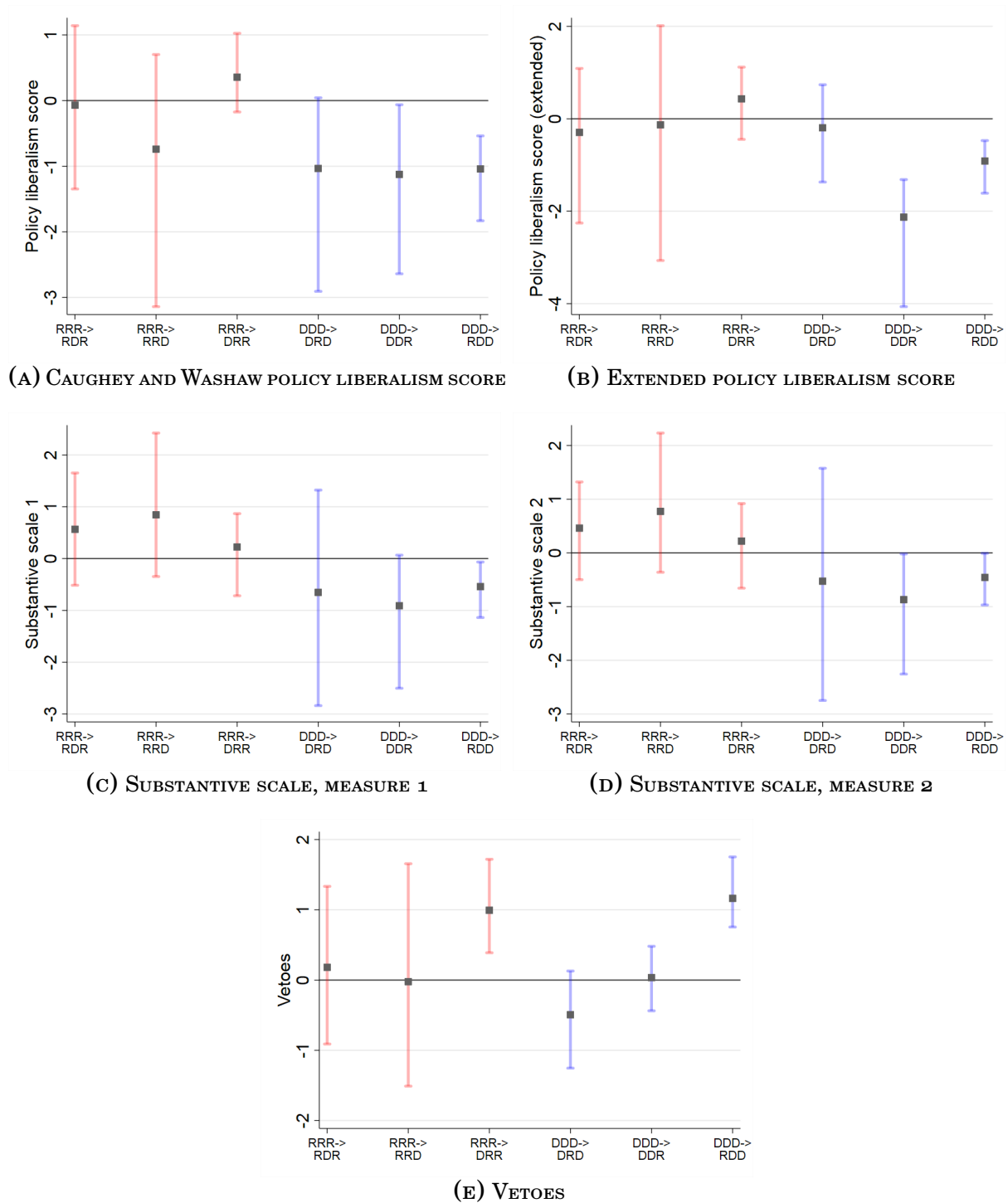
ROBUSTNESS − EFFECT OF DIVIDED GOVERNMENT − RESULTS WITH FIXED BANDWIDTH SELECTION.

(A) CAUGHEY AND WASHAW POLICY LIBERALISM SCORE

(B) EXTENDED POLICY LIBERALISM SCORE

(C) SUBSTANTIVE SCALE, MEASURE 1

(D) SUBSTANTIVE SCALE, MEASURE 2

(E) VETOES

Notes: Regression-discontinuity estimates of the effect of divided government on different outcomes. Each coefficient corresponds to a different configuration of divided government. S.e. are clustered at the state level. Point estimates are shown together with 90% and 95% confidence intervals. Local linear regressions using a fixed bandwidth of 0.5 standard deviations.

Robustness – Effect of divided government – Results with *rdrobust* estimator and robust C.I.

(A) Caughey and Washaw policy liberalism score

(B) Extended policy liberalism score

(C) Substantive scale, measure 1

(D) Substantive scale, measure 2

(E) Vetoes

Notes: Regression-discontinuity estimates of the effect of divided government on different outcomes. Each coefficient corresponds to a different configuration of divided government. S.e. are clustered at the state level. Point estimates and 95% robust confidence intervals are obtained using *rdrobust* command in Stata 17 (Calonico et al., 2019; Calonico, Cattaneo and Titiunik, 2014).

TABLE D.5

EFFECT OF DIVIDED GOVERNMENT (LOSING THE SENATE) ON SENATORS' IDEOLOGY SCORE - RD ROBUST

	DDD → DDR		RRR → RRD	
	(1) Ideology Score	(2) Ideology Score	(3) Ideology Score	(4) Ideology Score
RD estimate β	0.378**	0.073	0.256**	-0.364**
	(0.186)	(0.214)	(0.109)	(0.167)
Party	Republicans	Democrats	Republicans	Democrats
Robust c.i.	[-.055 ; .934]	[-.474 ; .742]	[.148 ; .904]	[-.908 ; .164]
Bandwidth	0.31	0.44	0.27	0.31
Mean of dep.var.	0.67	0.67	0.76	-0.91
Obs.	4473	6805	9805	5197

Notes: Regression-discontinuity estimates of the effect of losing the senate on individual state senators' ideology scores. Columns 1 and 2 compare unified Democratic governments to divided governments where Republicans won the senate, for Republican (col. 1) and Democratic (col. 2) senators respectively. Similarly, columns 3 and 4 compare unified Republican governments to divided governments where Democrats won the senate. Bias-corrected estimates obtained using *rdrobust* command with Stata 17, with bandwidth chosen using Calonico, Cattaneo and Titiunik (2014)'s criterion. Bandwidth measured in standard deviations. Cluster-robust standard errors at the state level in parentheses.
***$p < 0.01$,** $p < 0.05$,* $p < 0.1$

TABLE D.6

EFFECT OF DIVIDED GOVERNMENT (LOSING THE HOUSE) ON HOUSE REPRESENTATIVES' IDEOLOGY SCORE - RD ROBUST

	DDD → DRD		RRR → RDR	
	(1) Ideology Score	(2) Ideology Score	(3) Ideology Score	(4) Ideology Score
RD estimate β	0.001	-0.108	0.290*	0.030
	(0.115)	(0.199)	(0.165)	(0.243)
Party	Republicans	Democrats	Republicans	Democrats
Robust c.i.	[-.25 ; .28]	[-.523 ; .401]	[-.066 ; .737]	[-.529 ; .688]
Bandwidth	0.71	0.66	0.43	0.28
Mean of dep.var.	0.79	-0.75	0.83	-0.81
Obs.	11376	18094	26812	16738

Notes: Regression-discontinuity estimates of the effect of losing the house on individual state house representatives' ideology scores. Columns 1 and 2 compare unified Democratic governments to divided governments where Republicans won the house, for Republican (col. 1) and Democratic (col. 2) house representatives, respectively. Similarly, columns 3 and 4 compare unified Republican governments to divided governments where Democrats won the house. Bias-corrected estimates obtained using *rdrobust* command with Stata 17, with bandwidth chosen using Calonico, Cattaneo and Titiunik (2014)'s criterion. Bandwidth measured in standard deviations. Cluster-robust standard errors at the state level in parentheses.
***$p < 0.01$,** $p < 0.05$,* $p < 0.1$

TABLE D.7

EFFECT OF DIVIDED GOVERNMENT (LOSING THE GOVERNOR) ON HOUSE AND SENATE
REPRESENTATIVES' IDEOLOGY SCORE - RD ROBUST

	DDD → RDD		RRR → DRR	
	(1) Ideology Score	(2) Ideology Score	(3) Ideology Score	(4) Ideology Score
RD estimate β	0.089	-0.039	0.334***	0.079
	(0.085)	(0.168)	(0.105)	(0.094)
Party	Republicans	Democrats	Republicans	Democrats
Robust c.i.	[-.037 ; .315]	[-.335 ; .423]	[.159 ; .629]	[-.094 ; .332]
Bandwidth	0.41	0.43	0.34	0.45
Mean of dep.var.	0.68	-0.71	0.81	-0.85
Obs.	22388	42152	46542	26011

Notes: Regression-discontinuity estimates of the effect of losing the governorship on individual state legislators' ideology scores. Columns 1 and 2 compare unified Democratic governments to divided governments where Republicans won the governorship, for Republican (col. 1) and Democratic (col. 2) house representatives, respectively. Similarly, columns 3 and 4 compare unified Republican governments to divided governments where Democrats won the governorship. Bias-corrected estimates obtained using *rdrobust* command with Stata 17, with bandwidth chosen using Calonico, Cattaneo and Titiunik (2014)'s criterion. Bandwidth measured in standard deviations. Cluster-robust standard errors at the state level in parentheses. .
***$p < 0.01$,** $p < 0.05$,* $p < 0.1$