Abstract: This paper makes three contributions. First, it presents some US evidence that voters respond in different ways to positive and negative changes in economic outcomes. Second, we show that this asymmetric response can be modeled as voter loss-aversion relative to the status quo, and we study how this impacts on electoral competition. We show that it has effects which are qualitatively different from incumbency advantage, notably policy rigidity and platform moderation. One further distinct testable implication of loss-aversion is that incumbents adjust less than challengers to “partisan tides” i.e. shifts in voter preferences, and as a result, favorable (unfavorable) preference shifts, from the point of view of the incumbent, intensify (reduce) electoral competition. We find empirical support for these using data from US state legislatures.

KEYWORDS: electoral competition, loss-aversion, incumbency advantage, platform rigidity

JEL CLASSIFICATION: D72, D81
1 Introduction

There is now considerable evidence that citizens place greater weight on negative news than on positive when evaluating candidates for office, or the track records of incumbents. In the psychology literature, this is known as negativity bias.\footnote{See for example, the survey on negativity bias by Baumeister et al. (2001).} For example, several studies find that U.S. presidents are penalized electorally for negative economic performance but reap fewer electoral benefits from positive performance (Bloom and Price, 1975, Lau, 1985, Klein, 1991).

Similar asymmetries have also been identified in the UK and other countries. For example, for the UK, Soroka (2006) finds that citizen pessimism about the economy, as measured by a Gallup poll, is much more responsive to increases in unemployment than falls. Kappe (2013) uses similar data to explicitly estimate a threshold or reference point value below which news is “negative”, and finds similar results. Nannestad and Paldam (1997) find, using individual-level data for Denmark, that support for the government is about three times more sensitive to a deterioration in the economy than to an improvement.\footnote{Soroka and McAdams (2015) argue that this negativity bias on the part of voters is an example of a more general bias whereby suggest that humans respond more to negative than to positive information, and they link this bias to loss-aversion.} In this paper, to further motivate our study, we present new US evidence that there is voter negativity bias in Section 3.

We then show that voter negativity bias can be explained as arising from voter loss-aversion with a status quo reference point, and we explore the implications of voter loss-aversion for electoral competition. Specifically, we study a simple Downsian model with loss-averse voters. Voters care both about parties’ policy choices and their competence in office (valence). Moreover, they are loss-averse in the policy dimension. There are two parties which choose policy platforms, and which care about both policy outcomes and holding office. One of the parties is the incumbent, and their winning platform from the previous period, taken as fixed, is the voter reference point. The competence of the incumbent is common knowledge, but the competence of the challenger is determined by random draw.\footnote{This simple way of modeling incumbency advantage is based on Ashworth and Bueno de Mesquita (2008); other approaches are discussed in the literature surveyed below.}

Without loss-aversion, this setting is similar to the well-known one of Wittman (1983), where in equilibrium, parties set platforms by trading off the probability of winning the election against the benefits of being closer to their ideal points. Our model differs from Wittman’s in that in his model, this trade-off is generated by parties being uncertain about the position of the median voter, whereas in our model, it is generated by probabilistic voting, due to the challenger’s ability being unknown. As explained below, the latter is required for loss-aversion to have any bite.

We assume that the reference point is the status quo policy. This assumption is widely made in the literature on loss-aversion applied to economic situations, and seems realistic, since benefits and costs of political reforms are normally assessed relative to existing
policies.\footnote{For example, de Meza and Webb (2007) for a principal-agent problem, Freund and Özden (2008) in the context of lobbying on trade policy, and Alesina and Passarelli (2015) for direct democracy all assume a status quo reference point. We have investigated the case of a forward-looking reference point as in Köszegi and Rabin (2006) and results are available upon request.}

In this setting, once the median voter’s utility from a party’s policy platform falls below utility from the status quo policy, the re-election probability starts to fall more rapidly than without loss-aversion. This asymmetric response is therefore consistent with the empirical evidence on voter negativity bias.

We show that this asymmetric response has a number of implications for electoral competition. First, there is \textit{platform rigidity}; for a range of values of the status quo, one party will choose the status quo, and the other will choose a platform on the other side of the median voter’s ideal point to the status quo, and equidistant from the ideal point of the median voter, regardless of other parameters. In this case, the election outcome is insensitive to small changes in other parameters, such as the weight that political parties place on office, the level of uncertainty about the challenger’s competence, or shifts in the ideal points of the political parties. Note, however, that platform rigidity is \textit{not} the same as status quo bias, as the election outcome may be a long way from the status quo. Second, there is a \textit{moderation effect} of loss-aversion; generally, the gap between equilibrium party platforms is smaller than in the absence of loss-aversion.

One might argue that loss-aversion with a status quo reference point privileges the incumbent party, and thus is likely to have similar effects on electoral competition as incumbency advantage does. We show that this is not the case; rather, the effect of loss-aversion on electoral competition are quite distinct from the effects of incumbency advantage. In particular, as incumbency advantage increases, the two equilibrium platforms move in the direction of the incumbent party’s ideal point, rather than towards each other, so there is no platform moderation, and there is no platform rigidity.

Third, we consider in detail, both theoretically and empirically, the effect of shifts in the distribution of voter preferences (sometimes called “partisan tides”). We suppose that once the status quo has been determined, i.e. between the previous election and the current one, there is a shift in either direction (left or right) in the ideal points of all voters, including those voters that make up the membership of political parties. Without loss-aversion, this has the same same effect on both incumbent and challenger parties - both move their equilibrium platforms in the direction of the preference shift by the same amount, even with incumbency advantage.

But, with loss-aversion, there is \textit{asymmetric adjustment} - the incumbent’s platform will adjust by less than the challenger’s platform. In other words, loss-aversion generates a particular kind of asymmetry, which is testable; incumbents adjust less than challengers to voter preference shifts. This prediction is potentially testable, given that we can identify preference shifts.

It also gives rise to a second testable prediction. Say that a preference shift is favorable (unfavorable) for the incumbent if it is in the same direction as the incumbent’s ideological
bias, i.e., a leftward (rightward) shift for the left (right) party. Then, following a “favorable” preference shift for the incumbent, the gap between platforms decreases, but following an “unfavorable” preference shift for the incumbent, the gap between platforms increases. That is, favorable (unfavorable) preference shifts intensify (reduce) polarization.

These predictions are both new, and we take them to data on elections to US state legislatures. We employ a new data-set introduced by Bonica (2014b) which contains estimates of the platforms of all candidates, winners, and losers, in elections to state legislatures, based on the campaign donations they received. We combine these with detailed election results to identify shifts to the distribution of voter preferences and changes in party platforms at the state level over a 20 year period. These data have the important advantage of representing a large sample of institutionally and politically homogeneous elections, with which to take the theory to the data. Using these data we find, as predicted by the theory, that incumbent parties are significantly less responsive to shifts. We also find, as predicted, that following a “favorable” (resp. “unfavorable”) preference shift for the incumbent, the gap between platforms decreases (increases).

The remainder of the paper is organized as follows. Section 2 reviews related literature, and Section 3 provides some suggestive evidence of asymmetric responses by voters for the US. Section 4 lays out the model, and Section 5 has the main results for voter loss-aversion. Section 6 compares loss-aversion to incumbency advantage, and Section 7 explains how loss-version gives a distinctive prediction about how incumbents and challengers respond to preference shifts. Section 8 discusses the US data we use to test our main hypotheses. Section 9 describes our empirical strategy and our empirical findings, and finally Section 10 concludes.

2 Related Literature

1. Electoral competition with behavioral and cognitive biases.\(^5\) The closest paper to ours is a recent important contribution by Alesina and Passarelli (2015), henceforth AP. This studies loss-aversion in a direct democracy setting, where citizens vote directly in a referendum on the size of a public project or policy.\(^6\) However, to our knowledge ours is the first paper to study the effect of loss-aversion in a representative democracy setting.\(^7\)

In AP, citizens vote directly on a one-dimensional policy describing the scale of a project, which generates both costs and benefits for the voter. In this setting, for loss-aversion to play a role, the benefits and costs of the project must be evaluated relative

\(^5\)There are also a number of recent papers that consider the effects of voter biases in non-Downsian settings, either where party positions are fixed, or where policy can be set ex post e.g. political agency settings. However, these papers are clearly less closely related to what we do. For example, Ashworth and Bueno De Mesquita (2014) and Lockwood (2015) consider deviations from the full rationality of the voter in a political agency setting. Ortoleva and Snowberg (2013), show theoretically that the cognitive bias of correlation neglect can explain both voter overconfidence and ideological polarization. Levy and Razin (2015), find that the cognitive bias of correlation neglect can improve outcomes for voters.

\(^6\)Their paper is contemporaneous with the working paper version of our paper (?).

\(^7\)For an informal discussion of the role of loss-aversion in politics, see Jervis (1992).
to separate reference points. This is because if loss-aversion applies to the net benefit from the project, the status quo cannot affect the ideal point of any voter. We do not need this construction, because in our setting, the voters compare the utility from policy positions to party valences. So, loss-aversion has “bite” in our model via an entirely different mechanism to theirs - that is, via the voters’ comparison of utility from policy and party valence, rather than via multiple reference points.\(^8\)

In their setting, AP show the following. First, there is status quo bias of the usual kind: for a range of values of the median voter’s ideal point, the policy outcome is equal to the status quo. Second, there is policy moderation with loss-aversion; an increase in loss-aversion compresses the distribution of ideal points of the voters, and in particular, increases the number of voters who prefer the status quo. Finally, if there is a shift to the median voter’s preferences, this only has an effect on the outcome if the shift is sufficiently large.

Several of our results are similar in spirit to these, although the details differ substantially.\(^9\) Finally, our main empirical prediction, that incumbents adjust less than challengers to voter preference shifts, has no counterpart in their analysis.

A small number of other papers study electoral competition with voter behavioral biases. Callander (2006) and Callander and Wilson (2008) introduce a theory of context-dependent voting, where for example, for a left wing voter, the attractiveness of a left wing candidate is greater the more right wing is the opposing candidate, and apply it to the puzzle of why candidates are so frequently ambiguous in their policy.

More recently, Razin and Levy (2015) study a model of electoral competition in which the source of the polarization in voters’ opinions is “correlation neglect”, that is, voters neglect the correlation in their information sources. Their main finding is that polarization in opinions does not necessarily translate into platform polarization by political parties compared with rational electorates. This contrasts with our result that loss-aversion always reduces platform polarization.

Matějka and Tabellini (2015) studies how voters optimally allocate costly attention in a model of probabilistic voting. Voters are more attentive when their stakes are higher, when their cost of information is lower and prior uncertainty is higher; in equilibrium, extremist voters are more influential and public goods are under-provided, and policy divergence is possible, even when parties have no policy preferences.

Finally, Bisin et al. (2015) consider Downsian competition between two candidates in a setting where voters have self-control problems and attempt to commit using illiquid assets. In equilibrium, government accumulates debt to respond to individuals’ desire

\(^8\)One way of seeing this is to note that if we introduce political parties and electoral competition into the AP model, then, absent any other changes, the classic Downsian result would emerge i.e. parties would converge to the median voter’s ideal point. In other words, a switch from direct to representative democracy would have no effect on the policy outcome in their setting. In contrast, we show that direct and representative democracy have quite different outcomes in our setting, with loss-aversion affecting the latter but not the former.

\(^9\)The relationship between our notions of platform rigidity and platform moderation and theirs is discussed in more detail below.
to undo their commitments, which leads individuals to rebalance their portfolio, in turn feeding into a demand for further debt accumulation.\textsuperscript{10}

2. \textit{Incumbency Advantage}. There is a large theoretical and empirical literature on incumbency advantage. As Peskowitz (2017) says, “The standard conception of incumbency advantage is that the effect is purely valence”, and our modeling of it is in this tradition. This is not the only possible explanation of incumbency advantage; other explanations include advantages in media coverage, fund-raising, and deterrence of high-quality challengers. Indeed, recently empirical work, which explicitly controls for quality of challengers and incumbents finds that incumbency per se has a causal effect on election outcomes (Ansolabehere et al., 2000, Lee, 2008, Levitt and Wolfram, 1997, Fouirnaies and Hall, 2014). Recent theoretical models that capture some of these advantages tend to focus on either the signaling advantages of incumbents (Caselli et al., 2014, Peskowitz, 2017), endogenous choice of fund-raising effort (Meirowitz, 2008), or deterrence of challengers (Ashworth and Bueno de Mesquita, 2008).

Rather than model these sources of advantage, we take a reduced-form approach, by supposing that incumbency advantage is due to greater competence. This reduced-form approach is helpful given that our main focus is on voter loss-aversion. However, our model could be extended to allow for other sources of incumbency advantage. The main thing required for our results is that the source of incumbency advantage is separable from the platform choice.\textsuperscript{11}

3. \textit{Related empirical work}. Our empirical work in Sections 8 and 9 is related to that of Adams et al. (2004) and Fowler (2005). In particular, both study party platform responses to changes in the position of the median voter. (Adams et al., 2004) is a purely empirical study, which pools national election results for political parties in eight West European countries over the period 1976-1998, to relate parties’ manifesto positions to the preferences of the median voter. On the basis of this analysis they argue that parties only respond to disadvantageous moves in the median voter.

Fowler (2005) considers elections to the US Senate over the period 1936-2010. His theoretical model shows that parties learn about voter preferences from election results, and consequently predicts that Republican (Democratic) victories in past elections yield candidates who are more (less) conservative in subsequent elections, and the effect is proportional to the margin of victory. This is a rather different hypothesis to the one we test, which concerns the effects of shifts in voter preferences before elections.

Also related is the substantial empirical literature on incumbency advantage. This\textsuperscript{10} Passarelli and Tabellini (2013) is also somewhat related; there, citizens belonging to a particular interest group protest if government policy provides them with utility that is below a reference point that is deemed fair for that interest group. In equilibrium, policy is distorted to favour interest groups who are more likely to protest or who do more harm when they riot. However, in their setting, there is no voting, so the main point shared feature between that paper and ours is that we both consider the role of reference points in social choice.

\textsuperscript{11}For example, suppose the incumbent can raise campaign funds \( f(e) \) by exerting effort \( e \) at some cost. Then, as long as the marginal impact of the funds \( f \) on the re-election probability of the incumbent is independent of the party platforms, our results go though unchanged.
is related because in our empirical work, we control for incumbency either through an incumbency or state-year fixed effect. This is somewhat different to the conventional Regression Discontinuity (RD) design to identify incumbency advantage (Lee, 2008). This is because we are not concerned with explaining the probability that the incumbent wins, but how incumbents change their platforms relative to non-incumbents.

3 Are Voters Loss-Averse?

We first provide suggestive evidence that US voters may be loss-averse. In particular, we study how voters’ support for governors depends on state and county macroeconomic performance, using two different datasets. The first is quarterly state-level data on governors’ approval ratings and state macroeconomic performance, and the second is, county-level data on governors’ vote shares and county macroeconomic performance. Thus the first dataset captures changes in voter sentiment, while the second measures changes in voter behavior. We measure macroeconomic performance using the change in the unemployment rate, as well as growth in personal income per capita for the county data. While other alternatives are available, the unemployment rate (income per capita) has the advantage of being visible to voters, uniformly disliked (liked), and comparable across time and place in a straightforward way. Details of the data are in Section B of the Online Appendix.

The standard, non-behavioral, theory of economic or retrospective voting would suggest that approval ratings respond similarly (but oppositely) to a small reduction in unemployment as they would to a small rise. Loss-aversion implies that improvements relative to a given reference point will improve approval ratings less, than an equivalent fall relative to the same reference point. We test this implication and show that public opinion does indeed respond to shifts in macroeconomic performance in a manner consistent with voter loss-aversion.

We assume that the voters’ reference point is the status-quo, as in our model in Section 4 and Alesina and Passarelli (2015). Thus the status-quo is maintained if there is no change in the unemployment rate. So, while we always expect an reduction in unemployment to improve support, loss-aversion implies that this relationship will be stronger for negative changes than for positive changes of equal magnitude.

For both datasets we test this with the following simple bivariate fixed-effects regression, where we allow for a piecewise linear functional form with a discontinuity at 0 in the relationship between the level of Support, defined as either the governor’s job approval rating JAR (vote share of the incumbent) in state (county) a in quarter (election) t and the change in the unemployment rate ∆a in state (county) a and quarter (election) t. As the theory does not specify a linear relationship we consider the log of

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12So, we are following the literature on economic voting, which dates back to Downs (1957) and subsequently extended by Fiorina (2016). Important recent work includes Lewis-Beck and Paldam (2000), Wolfers (2007), Lewis-Beck and Nadeau (2011).
the unemployment rate, meaning that the coefficients describe the effect of a percentage rather than a percentage point change. We include state (county) fixed-effects to allow for the fact that average support levels may vary by state, other things equal.

\[
\text{Support}_{ta} = \alpha_a - \beta \max[\Delta_{ta}, 0] - \gamma \min[\Delta_{ta}, 0] + \varepsilon_{ta} \quad (1)
\]

If voters reduce support for the incumbent as unemployment increases, then $\beta, \gamma > 0$. If voters are not loss-averse then $\beta = \gamma$, whereas if they are, then we expect them to be more sensitive to unemployment when the unemployment rate is above the status quo level i.e. $\beta > \gamma$. The results for the JAR data are depicted in Figure 1 which overlays the estimated regression line and associated confidence intervals on a binned scatter plot which summarizes the data. Figures 2 depicts the equivalent results using the county-level data for the unemployment rate. Each point in the binned-scatter plots represents the mean of $\text{Support}_{ta}$ and $\delta_{ta}$ conditional on $\alpha_a$ for each ‘vingtile’ of $\Delta_{ta}$ and provides a simple non-parametric representation of the conditional expectation function as in Friedman et al. (2014). The binned-scatter plot makes clear that, in both cases, there is not any particularly strong relationship to the left of the vertical dashed red line that depicts the reference point. To the right of the reference point there is a relatively clear downwards relationship consistent with the idea that voters are loss averse. Looking now at the (solid blue) regression line we see that, for both datasets, while both portions of the line slope downwards as expected, the slope to the right of 0 is steeper, that is $\beta > \gamma$.

The (blue dotted) confidence intervals show that while we cannot reject the hypothesis that $\gamma \geq 0$ we can reject the same hypothesis for $\beta$. Figure 3 shows that we obtain similar results using repeating the county-level analysis for incomes per capita.\footnote{There are relatively few state-level absolute declines in income per capita in our data, and this precludes an analogous analysis using the JAR data.} In this case the domain of gains is now to the right of the reference point and so we expect that while support will be increasing in the rate of growth of income per capita, it will do so more strongly to the left of the reference point. Looking at Figure 3 we see that this is indeed the case. While the regression line is monotonically increasing in income, it is indeed steeper to the left of the reference point.\footnote{The model (1) imposes, consistent with the Kahneman and Tversky (1984) model of loss-aversion that there is no separate effect of an increase in unemployment per se, no matter the size, but only a larger response to a change of a given size. We can relax this assumption, by additionally including a binary variable taking positive values for $\Delta > 0$ that allows for a different intercept term for increases in the unemployment rate. This variable is significant and negative, as expected, but the magnitude is relatively small, suggesting that while we cannot rule out other effects loss-aversion seems to be quantitatively most important.}
Figure 1: Governors’ Popularity Responds Asymmetrically to Deteriorations in Macroeconomic Performance

Figure 2: Incumbents’ Vote Share Responds Asymmetrically to Deteriorations in Macroeconomic Performance
4 The Model

4.1 The Environment

There are two parties $L$ and $R$, and a finite set of voters $N$ who interact over two periods $t = 0, 1$. The number of voters, $n$, is odd. We take the interaction in the first period as predetermined. Specifically, we suppose that at $t = 0$, one of the parties $I \in L, R$ won the election and set a platform $x_0$ in the feasible set $[-1, 1] \equiv X$, where $I, x_0$ are exogenously fixed. Thus, party $I$ is the incumbent at $t = 1$. At $t = 1$, the two parties, $L$ and $R$, choose platforms $x_L, x_R$ in the policy space $X = [-1, 1]$. They are assumed to be able to commit to implement these platforms. Thus, the basic framework is Downsian competition.

Each voter $i \in N$ has preferences over policy and also a party characteristic $v$. Our primary interpretation of this will be as valence, although it could capture other things such as the charisma of the candidate, etc. The preference of voter $i$ over a party with valence $v$ and policy position $x$ is given by

$$v + u_i(x; x_0)$$ (2)

Here, the voter’s policy payoff $u_i(x; x_0)$ is allowed to depend not only on the current platform $x$, but also on the previous platform $x_0$. This allows for voter loss-aversion relative to a reference point $x_0$, as explained in more detail below.
4.2 Order of Events and Information Structure

The valence of the incumbent \( v_I = \alpha \) is assumed to be common knowledge at the beginning of period 1. The idea is that all agents have had a chance to observe this incumbent party performance in office in the previous period.\(^{15}\) So, \( \alpha \) measures the degree of incumbency (dis)-advantage. We assume for concreteness that \( \alpha \geq 0 \) although the analysis could easily be extended to the case with incumbent disadvantage.

Within period 1, the order of events is as follows. First, parties \( L, R \) simultaneously choose their platforms. Then, \( v_C \) is drawn from a mean zero distribution. The idea here is that once party manifestos are written (i.e. \( x_L, x_R \) are fixed) an election campaign and scrutiny by the media give voters additional information about the competence or fitness for office of the challenger before the election. We assume for convenience that \( v_C \) is uniformly distributed on \( \left[ -\frac{1}{2\rho}, \frac{1}{2\rho} \right] \). So, as we will see, the parameter \( \rho \) represents the salience of the valence characteristic in the voters’ decision.

Finally, all voters vote simultaneously for one party or the other. We will assume that voters do not play weakly dominated strategies; with only two alternatives, this implies that they vote sincerely.

This timing of course implies that the valence of the challenger party \( C \) is not even known to this party at the point when platforms are chosen. This is quite plausible; parties may not fully know their competence in office when they have been out of office for some time. Moreover, relaxing this assumption by allowing party \( C \) to know \( v_C \) before platforms are set creates a game of asymmetric information, where the challenger might use their platform \( x_C \) to signal their type. This introduces considerable additional complexity, and is not the main focus of our attention.

Finally, note that from a modeling point of view, the purpose of this timing assumption a standard one; it makes the outcome of the election uncertain for the two political parties, thus preventing complete convergence in equilibrium to the median voter’s ideal point.

4.3 Voter Policy Payoffs

Following Osborne (1995), we assume that “ordinary” or intrinsic utility over alternatives \( x \in X \) for voter \( i \) is given by \( u_i(x) = -|x - x_i| \). Voters are ranked by their ideal points; i.e. \(-1 < x_1 < x_2 < \cdots < x_n < 1\). To ensure existence of symmetric equilibrium, we assume that the median voter \( m = \frac{n+1}{2} \) has an ideal point \( x_m = 0 \), equidistant between the two party ideal points.

Following Kőszegi and Rabin (2006, 2007, 2009), we specify the gain-loss utility over policy for voter \( i \) as:

\[
u_i(x; x_0) = \begin{cases} 
    u_i(x) - u_i(x_0), & u_i(x) \geq u_i(x_0) \\
    \lambda(u_i(x) - u_i(x_0)), & u_i(x) < u_i(x_0)
\end{cases}
\]  

\(^{15}\)This assumption is also made, for example, by Bernhardt et al. (2011).
The parameter $\lambda > 1$ measures the degree of loss-aversion, and the previous platform $x_0$ is the reference point, defined below. The empirical evidence suggests a value for $\lambda$ of around 2 (see, Abdellaoui et al., 2007). The assumption that $\lambda$ is the same for all voters is made just for convenience, and could be relaxed. Observe, finally, that if $\lambda = 1$, the policy-related payoff is, up to a constant, just $u_i(x)$, so our specification of policy preferences nests the standard model with absolute-value preferences as a special case.

Note that we have assumed that that voters are “backward looking” in that the reference point is the status quo, $x_0$. The main reason for this, of course, is to ensure that voter behavior is consistent with the findings of Section 3 i.e. that voters evaluate positive and negative changes asymmetrically. However, there are also other reasons why this is a case of interest. For example, in a recent experiment, (Heffetz and List, 2014) finds there is little evidence for a forward-looking reference point of the Koszegi-Rabin kind.

Note, finally, from (2) that the two dimensions of utility are additively separable and the voter does not (fully) integrate gains and losses across dimensions. That is, preferences satisfy, in the language of Tversky and Kahneman, decomposability. This implies that the relative trade-off between the two dimensions changes discontinuously if the outcome in the policy dimension passes the reference point. This creates the relative change in the tradeoff which is responsible for all the interesting results.

### 4.4 Party Payoffs

As is standard, parties have a payoff to holding office, denoted $M$. Parties are also assumed to have policy preferences, with the $L$ party having an ideal point of $-1$, and party $R$ an ideal point of 1. In fact, payoffs of the $L$ and $R$ party members are $u_L(x) \equiv -l(|x + 1|)$, $u_R(x) \equiv -l(|x - 1|)$ respectively, where $l$ is twice differentiable, strictly increasing, symmetric and convex in $|x - x_0|$, and $l(0) = l'(0) = 0$. This specification allows for parties to be risk-neutral ($l'' = 0$) or strictly risk-averse ($l'' > 0$) over policy outcomes. Note that parties (or rather, their members) are assumed not to be loss-averse; party loss aversion raises a number of new issues which are not addressed in this paper.

So, expected payoffs for the parties are calculated in the usual way as the probability of winning, times the policy payoff plus $M$, plus the probability of losing, times the resulting policy payoff. For parties $R$, $L$ respectively, this gives

$$\pi_R = p(u_R(x_R) + M) + (1 - p)u_R(x_L)$$
$$\pi_L = (1 - p)(u_L(x_L) + M) + pu_L(x_R)$$

where $p$ is the probability that party $R$ wins the election and is defined below. As we shall see, $p$ depends not only on the platforms $x_L$, $x_R$, but also on the voter reference point $x_0$ and incumbency advantage $\alpha$. 

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4.5 Win Probabilities

From now on, without loss of generality, we assume that the incumbent party is party R. Here, we characterize the probability $p$ that party R wins the election. For voting behavior, all that matters is the difference $\varepsilon = v_C - v_I$; $\varepsilon$ measures the competence hurdle that party R needs to overcome in order to be elected. Under our assumptions, the distribution and support of $\varepsilon$ is

$$F(\varepsilon) = 0.5 + \rho(\varepsilon + \alpha), \quad \varepsilon \in \left[\frac{-1}{2\rho} - \alpha, \frac{1}{2\rho} - \alpha\right]$$

We have assumed that all voters do not use weakly dominated strategies, implying that they vote sincerely. So, from (2), any voter $i$ will vote for party R, given platforms $x_L, x_R$, if and only if

$$u_i(x_R; x_0) \geq \varepsilon + u_i(x_L; x_0)$$

Now note that even with loss-aversion, the policy payoffs $u_i(x; x_0)$ are single-peaked in $x$ for a fixed $x_0$. It follows immediately that the median voter is decisive.\(^{16}\) So, from now on, we can focus only on the median voter, and we can therefore drop the “m” subscripts, so $u_m(x; x_0) \equiv u(x; x_0)$.

The probability that party R wins the election is the probability that the median voter votes for R, which from (5),(7), is

$$p = 0.5 + \rho(u(x_R; x_0) - u(x_L; x_0) + \alpha)$$

Then, given (7), we can explicitly calculate the win probabilities as required.

4.6 Assumptions and Discussion

We will characterize equilibrium by first-order conditions for the choice of $x_L, x_R$ by the parties. For this to be valid, we require that the expected party payoffs $\pi_L, \pi_R$ defined above in (4) are strictly concave in $x_L, x_R$ respectively. For convenience, we assume $\rho$ is small enough that $p$ is strictly between 0 and 1 for all $x_R, -x_L \in [0, 1], \ x_0 \in [-1, 1]$. Given $\alpha \geq 0$, this requires $1 - p(-1, 0) > 0$, or:

**A1.** $1 > 2\rho(\lambda + \alpha)$.

Secondly, we require, for non-trivial results, that the return to office, $M$, is not so large that parties compete to full convergence of platforms. The following assumption ensures this.

**A2.** $0.5u_R'(0) = -0.5u_L'(0) = 0.5l'(1) > \lambda \rho M$.

\(^{16}\)To see this, let $\varepsilon_m$ be such that $m$ is indifferent between voting for $L$ and $R$ i.e. $u_m(x_R; x_0) - u_m(x_L; x_0) = \varepsilon_m$. So, assuming $x_R > x_L$, single-peakedness implies immediately that (i) $\varepsilon < \varepsilon_m$, all $i > m$ will vote for $R$; (ii) if $\varepsilon > \varepsilon_m$, all $i < m$ will will vote for $L$. So, when $\varepsilon < \varepsilon_m$, a majority vote for party $R$, and when $\varepsilon > \varepsilon_m$, a majority vote for party $L$. 

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This says that at \( x = 0 \), each party prefers to move \( x \) slightly in the direction of their ideal point (with expected benefit of e.g. \( 0.5u_R'(0) \) for party \( R \)), even at the cost of reducing the probability of victory slightly, and thus foregoing some office-related rent \( M \). Finally, without loss of generality, given the other assumptions, we restrict \( x_R \) to be non-negative, and \( x_L \) to be non-positive.\(^{17}\)

Note now that we have two “pure” special cases of the model. The pure voter loss-aversion case has \( \lambda > 1, \alpha = 0 \). The pure incumbency advantage case has \( \lambda = 1, \alpha = 1 \). In what follows, we consider only these two pure cases; interactions between incumbency advantage and loss-aversion are of course interesting, but are not our main focus, and are left for further work.

5 Loss-Aversion

We begin with the case of loss-aversion. We set \( \alpha = 0 \), eliminating pure incumbency advantage, and let \( \lambda \) be greater than unity, allowing for loss-aversion. Then, from (7) and (3), we can compute

\[
p(x_L, x_R) = 0.5 - \begin{cases} 
\frac{\rho(x_R + x_L)}{\rho(x_R + \lambda x_L - (\lambda - 1) |x_0|)} & x_L, -x_R \leq |x_0| \\
\frac{\rho(x_R + \lambda x_L - (\lambda - 1) |x_0|)}{\rho(x_R + x_L + (\lambda - 1) |x_0|)} & x_R \geq |x_0| > -x_R \\
\frac{\rho(\lambda x_R + x_L)}{\rho(x_R + x_L)} & -x_L \geq u(x_0) > x_R \quad -x_R > |x_0| \\
\end{cases}
\]

So, \( p \) is continuous and differentiable in \( x_L, x_R \) except at the points \(-x_R = |x_0|, x_L = |x_0|\). Figure 4 shows the win probability for party \( R \) as \( x_R \) rises from 0 to 1, for a fixed \( x_L = 0 \).

So, loss-aversion induces a kink in the slope of \( p \) in either \( x_R \) or \( x_L \) at \( |x_0| \). For example, to the left of this point, a small increase \( \Delta \) in \( x_R \) decreases \( p \) by \( \Delta \), and to the right, a small increase in \( x_R \) decreases \( p \) by \( \Delta \lambda > \Delta \). This kink in the win probability function drives our results on the effect of loss-aversion. It is also broadly consistent with the empirical findings about asymmetric voter responses to macroeconomic shifts; in our model, where an economic policy platform yields the voter a lower utility than the status quo, he responds by “punishing” that party.

We begin with the following intermediate result, proved in the Appendix.

**Lemma 1.** Given \( A1,A2 \), there exist unique solutions \( x^+, x^-, x^+ > x^- > 0 \) to the equations

\[
0.5u_R'(x^+ - \rho (u_R(x^+) - u_R(-x^+) + M) = 0 \quad (9)
\]

\[
0.5u_R'(x^- - \lambda \rho (u_R(x^-) - u_R(-x^-) + M) = 0 \quad (10)
\]

It is easily checked that these solutions \( x^+, x^- \) describe the symmetric Nash equilibria

\(^{17}\)In particular, \( A2 \) ensures that party \( R \) (resp. \( L \)) will not wish to set \( x_R < 0 \) (resp. \( x_L > 0 \)).
in the games where party $R$’s re-election probability is $p = F((u(x_R) - u(x_L))$ and $p = F(\lambda(u(x_R) - u(x_L)))$ respectively. For example, $-x^+, x^+$ is the Nash equilibrium in the first case, which is the benchmark case without loss-aversion. To see this, note that $0.5u'_R(x) > 0$ is the utility gain for party $R$ from moving away from the moderates’ ideal point, 0. In equilibrium, this is offset by the lower win probability i.e. the term in $\rho$. Note that $x^+ > x^- > 0$, as there is a stronger incentive to converge to 0 when $\lambda > 1$.

We are now in a position to characterize the equilibrium with loss-aversion.

**Proposition 1.** If $x^+ < |x_0|$, then $x_R = -x_L = x^+$ is the unique symmetric equilibrium. If $x^- > |x_0|$, then $x_R = -x_L = x^-$ is the unique symmetric equilibrium. If $x^+ \geq |x_0| \geq x^-$, then $x_R = -x_L = |x_0|$ is the unique symmetric equilibrium. The value $x^-$ is decreasing in $\lambda$, so the interval $[x^-, x^+]$ is increasing in voter loss-aversion, $\lambda$.

This baseline result is best understood graphically. Figure 5 below shows how the initial status quo maps into the equilibrium platforms. For convenience of exposition, the figure shows how the absolute value of the status quo, which is also minus the median voter’s utility from the status quo, maps into the absolute value of the equilibrium policy platforms. The latter is of course, the actual equilibrium platform of the $R$ party and minus the actual equilibrium platform of the $L$ party.

Note, from Proposition 1 and Lemma 1, that in the absence of loss-aversion and incumbency advantage, the equilibrium platforms are simply $x_R = -x_L = x^+$. So, bearing this in mind, Proposition 1 shows that there are two important impacts of loss-aversion. First, there is platform rigidity; for a range of values of the status quo in the interval $[x^-, x^+]$, the outcome is insensitive to changes in other parameters, such as the weight $M$ that political parties place on office, or the responsiveness of the median voter to
policy, $\rho$. However, note that platform rigidity is not the same as simple status quo bias; at a given $x_0$ in the interval $[x^-, x^+]$, the election outcome can either be $x_0$ or $-x_0$.

Second, there is a reduced polarization effect of loss-aversion; the equilibrium platforms are both closer to the median voter’s ideal point than in the absence of loss-aversion.

It is clear from the fact that the equilibrium is symmetric that loss aversion per se does not convey any advantage on the incumbent party; that is, the win probability is 0.5 for both parties, and the incumbent platform is exactly the same distance from the incumbent party’s ideal point as the challenger platform is from its ideal point. Thus, as we will see in Section 6, the effect of loss-aversion of electoral competition is quite different to the effect of incumbency advantage.\textsuperscript{18}

The following example shows these effects more explicitly. If political parties have absolute value preferences $u_R(x) = -|1-x|$, $u_L(x) = -|1+x|$, then it is easily checked that that (9),(10) solve to give

$$x^+ = \frac{1}{4\rho} - \frac{M}{2}, \quad x^- = \frac{1}{4\lambda\rho} - \frac{M}{2}$$

By assumption A2, $M < \frac{1}{2\rho}$, so these lie between zero and one. So, for

$$|x_0| \in \left[ \frac{1}{4\lambda\rho} - \frac{M}{2}, \frac{1}{4\rho} - \frac{M}{2} \right]$$

there is platform rigidity i.e. $x^* = |x_0|$. Note that as claimed in Proposition 1, the length of the interval in (11) is increasing in $\lambda$.

\textsuperscript{18}Finally, it is worth noting that although voter loss-aversion does not give the incumbent an advantage, it does create a dynamic linkage between periods. Specifically, the platform chosen by the election winner in the current period will be next-period’s status quo. So, with multiple elections, forward-looking parties have an incentive to strategically manipulate the future status quo to their advantage. A dynamic version of the model is available on request: it can be shown that for a $T$ period version of the model, the qualitative features of the equilibrium (policy rigidity and moderation) remain unchanged in each period.
6 Electoral Competition with Incumbency Advantage

One might argue that if voters take the incumbent’s platform as their reference point, this privileges the incumbent party, and thus may have similar effects on electoral competition as incumbency advantage. In this section, we investigate this in detail, by setting $\lambda = 1$ and allowing incumbency advantage $\alpha$ to vary. Assume without loss of generality that $R$ is the incumbent. From (8), we have:

$$p(x_L, x_R; x_0) = 0.5 + \rho \alpha - \rho (x_L + x_R)$$ (12)

As expected, incumbency advantage raises the intercept of $p$ i.e. raises $p$ at any given $(x_L, x_R)$. Unlike loss-aversion, it does not induce a kink in $p$.

Then given (4), the first-order conditions for choice of $x_R, x_L$ respectively are

$$p u_R'(x_R) - \rho (u_R(x_R) + M - u_R(x_L)) = 0$$ (13)

$$p u_L'(x_L) - \rho (u_L(x_R) - M - u_L(x_L)) = 0$$ (14)

Then, it is easy to show:

**Proposition 2.** The incumbent (party $R$) has an advantage in either the win probability or platform or both. That is, either $p \geq 0.5$, or $x_R \geq -x_L$, with at least one equality holding strictly.

**Proof.** Suppose not. Then $p \leq 0.5$, $x_R < -x_L$, or $x_R + x_L < 0$. But then

$$p = 0.5 + \rho \alpha - \rho (x_R + x_L) > 0.5$$

a contradiction. □

The condition $x_R \geq -x_L$ says that $R$’s equilibrium policy platform is weakly closer to $R$’s ideal point, 1, than is $x_L$ to party $L$’s ideal point, $-1$.

We illustrate with two examples. Our first example is where parties have absolute-value preferences i.e. $u_R(x) = -|1 - x|$, $u_L(x) = -|1 + x|$. In this case, it is easy to compute that in equilibrium,

$$x_R = \frac{1}{4 \rho} - \frac{M}{2} + \frac{\alpha}{2}, \quad x_R = -\left( \frac{1}{4 \rho} - \frac{M}{2} \right) + \frac{\alpha}{2}, \quad p = 0.5$$ (15)

In this case, the incumbent party $R$ chooses to take all of his “advantage” by moving towards his ideal point, up to the point where the win probabilities are equal for the two parties. So, unlike the case of voter loss-aversion, there is no platform moderation effect of incumbency advantage. Specifically, from (15), $x_R, x_L$ are sensitive to changes in parameters $\rho, M$, and the absolute difference between equilibrium platforms is constant at $\frac{1}{4 \rho}$, independently of $x_0$.

The second example is where parties have quadratic preferences i.e. $u_R(x) = -(1 - x)^2$, $u_L(x) = -(1 + x)^2$. Here in the asymmetric case with $\alpha > 0$ we cannot obtain an
analytical solution. However, the Figure below shows that as incumbency advantage $\alpha$ increases, there is no systematic tendency for the equilibrium platforms to converge; both the platforms increase approximately linearly with the level of incumbency advantage, similarly to the absolute value case.

Figure 6: Electoral Competition with Quadratic Preferences

All results for the case $\rho = 0.5$ and $M = 0$.

7 Partisan Tides and Platform Adjustment

In this Section, we show study the effect of short-run changes in public opinion (so called “partisan tides”) on the outcomes with incumbency advantage, and loss-aversion. We will see that we can make a sharp empirical prediction that distinguishes loss-aversion from incumbency advantage.

The timing is now as follows. At period 0, the two parties compete as described in Proposition 1 (for loss-aversion) or in Proposition 2 (for incumbency advantage). They set platforms $x_{R,0} = x_0$, $x_{L,0} = -x_0$. One of these parties wins the election and is thus the incumbent at the beginning of period 1.

But now, we assume that at the beginning of period 1, there is a “partisan tide” i.e. a shift in the ideal point of both the median voter and the two parties. We allow the partisan tide to affect both voters and parties equally. That is, the ideal points of both the median voters and the parties shift by $\Delta$. That is, the median voter’s policy payoff shifts from $-|x|$ to $-|x - \Delta|$, and the $L$ and $R$ party preferences shift from $-|x + 1|$, $-|x - 1|$ to $-|x + 1 - \Delta|$, $-|x - 1 - \Delta|$, respectively. This shift is common knowledge. Without loss of generality, we assume that the shift is positive i.e. $\Delta > 0$.

When it has occurred, the parties then set equilibrium platforms $x_{R,1}$, $x_{L,1}$ as described above. The question of interest is how the two platforms change with $\Delta$. Let $x_{I,0}$ be the outcome at period 0, so $I \in \{R, L\}$ is the incumbent. We are interested in $\Delta_I = x_{I,1} - x_{I,0}$ relative to $\Delta_C = x_{I,C} - x_{C,0}$. 

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There are several reasons for allowing the ideal points of political parties to shift, not just voters. First, partisan tides will affect the views of party members as well as uncommitted voters. Second, this ties in with our empirical approach, where we construct the preferences of the median voter from the preferences of candidates for office (see Section 8.2 below). Finally, without this assumption we obtain the same intuition at the cost of considerable additional complexity.

7.1 Incumbency Advantage

With pure incumbency advantage i.e. $\alpha > 0, \lambda = 0$, it is clear that the period 0 equilibrium has no effect on the period 1 equilibrium. Specifically, at period 1, the parties play the same game before the shift, but the point of origin is moved from 0 to $\Delta$. So, it is obvious that the new equilibrium will be the same, but with all variables translated by $\Delta$. In other words, we have shown:

**Proposition 3.** Assume pure incumbency advantage i.e. $(\alpha > 0, \lambda = 1)$. Then, there is symmetric adjustment in platforms; that is, party platforms both move to the right by $\Delta$. Specifically, $\Delta_I = \Delta_C = \Delta$.

7.2 Loss-Aversion

With loss-aversion, the effect of the partisan tide will be very different than with incumbency advantage: the incumbent will generally adjust less than the challenger. To develop intuition for this, consider the following figure.

**Figure 7: Partisan Tides and Party Adjustment**

The top part of Figure 7 shows the initial equilibrium, which will be at some $x_0 \in [x^-, x^+]$ if $R$ won the last election (and thus is the incumbent) or at some $-x_0$ if $L$ won the last election. The bottom line indicates that the ideal points of the median voter and the two parties all move rightward by $\Delta$. We assume for purposes of illustration that this
rightward shift is small enough so that \( x_0 \in (x^- + \Delta, \ x^+ + \Delta) \). Then, the new equilibrium must be as shown in the bottom line of the figure.

Specifically, when \( x_0 > 0 \), so that \( R \) is the incumbent, the status quo platform has effectively moved inwards towards the new ideal point of the median voter. Moreover, as \( x_0 \in (x^- + \Delta, \ x^+ + \Delta) \) from Proposition 1, there must be platform rigidity in equilibrium i.e. \( x_{R,1} = x_0 \). Also, the new platforms must be centered around \( \Delta \), meaning that party L’s new equilibrium platform is \( x_{L,1} = -x_0 + 2\Delta \). So, it is clear from the red dotted lines that the incumbent’s platform does not move at all, whereas the challenger’s platform moves by double the amount of the partisan tide \( \Delta \) i.e. \( 2\Delta \).

The argument is reversed when party \( L \) is the incumbent. Now, the the status quo platform effectively moves outwards away from the new ideal point of the median voter. Moreover, as \( x_0 \in (x^- + \Delta, \ x^+ + \Delta) \) from Proposition 1, there must be platform rigidity in equilibrium i.e. \( x_{L,1} = x_0 \). Again, the new platforms must be centered around \( \Delta \), meaning that party R’s new equilibrium platform is \( x_{R,1} = x_0 + 2\Delta \). So, it is again clear from the blue dotted lines that the incumbent’s platform does not move at all, whereas the challenger’s platform moves by double the amount of the partisan tide \( \Delta \) i.e. \( 2\Delta \).

In the same way, we can compute what happens to equilibrium platforms for all shifts, not just small ones, which leads to the following characterization of the effects.

**Proposition 4.** Assume that the status quo is \( x_0 \) if \( R \) is the incumbent, and that the status quo is \( -x_0 \) if \( L \) is the incumbent. Following a preference shift \( \Delta > 0 \), the equilibrium outcome is the following:

(a) If the shift is small, i.e. \( \Delta \leq \min \{x_0 - x^- , x^+ - x_0\} \equiv \Delta_{\text{min}} \), then if \( R \) is the incumbent, the equilibrium is \( x_R = x_0, \ x_L = -x_0 + 2\Delta \). If \( L \) is the incumbent, then the outcome is \( x_R = x_0 + 2\Delta, \ x_L = -x_0 \).

(b) If the shift is large i.e. \( \Delta > \max \{x_0 - x^- , x^+ - x_0\} \equiv \Delta_{\text{max}} \), then if \( R \) is the incumbent, the outcome is \( x_R = \Delta + x^-, \ x_L = \Delta - x^- \). If \( L \) is the incumbent, then the outcome is \( x_R = \Delta + x^+, \ x_L = \Delta - x^+ \).

(c) If the shift is intermediate, with \( x^+ - x_0 < \Delta \leq x_0 - x^- \), if \( R \) is the incumbent, the outcome is \( x_R = x_0, \ x_L = -x_0 + 2\Delta \), and if \( L \) is the incumbent, \( x_R = \Delta + x^+, \ x_L = \Delta - x^+ \).

(d) If the shift is intermediate, with \( x_0 - x^- < \Delta \leq x^+ - x_0 \), if \( R \) is the incumbent, the outcome is \( x_R = \Delta + x^-, \ x_L = \Delta - x^- \), and if \( L \) is the incumbent, the outcome is \( x_R = x_0 + 2\Delta, \ x_L = -x_0 \).

To give an easier interpretation to these results, consider the amount of adjustment in platforms \( x_L, x_R \) made by either party as \( \Delta \) varies i.e. the change in equilibrium platforms form their initial values \( x_L = -x_0, \ x_R = x_0 \). The adjustment is \( \Delta x_R = x_R - x_0, \ \Delta x_L = x_L - (-x_0) = x_L + x_0 \) for parties \( R, \ L \) respectively. Then, from Proposition 4, it is possible to graph \( \Delta x_R, \ \Delta x_L \) against \( \Delta \). These reactions are shown on the two panels of Figure 8 below.

The first (second) panel shows the case where \( R \) (\( L \)) is the incumbent, and the reactions of incumbent and challenger platforms to the shift are denoted by solid and dotted lines.
respectively. Colors are chosen for US readers; in Figure 8, red and blue lines denote party R and party L respectively.

Note that when $\Delta_{\min} \leq \Delta \leq \Delta_{\max}$, the adjustment of both the incumbent and challenger can take on two values, depending on the exact value of $x_0$; both are shown on the Figure. For example, if $R$ is the incumbent, when $\Delta_{\min} \leq \Delta \leq \Delta_{\max}$, from Proposition 4, then the $L$ party either does not adjust at all (case (c) of the Proposition) or adjusts by $\Delta + x^- - x_0$ (case (d)).

It is easily verified from Proposition 4 that in the case where $R$ is the incumbent, party R’s adjustment, shown by the solid red line, must be less than party L’s adjustment, shown by the dotted blue line, in the left panel. Looking at the right panel, the reverse must be true. Note also that if the shift were a leftward relative to the mean voter i.e. $\Delta < 0$, Figure 8 would continue to apply with the $L$ and $R$ indices reversed. So, we have shown:

**Proposition 5.** (Asymmetric Adjustment) Assume that the status quo is $x_0 \in [x^-, x^+]$ if $R$ is the incumbent, and that the status quo is $-x_0$ if $L$ is the incumbent. With loss-aversion, the incumbent party always has a smaller platform adjustment to the shift than the challenger i.e. $\Delta_I < \Delta_C$. Moreover, the adjustment to the shift is non-linear for both the incumbent and challenger.

This result, combined with our observation that there is symmetric adjustment to the shift without loss-aversion, shows that loss-aversion generates a particular kind of
asymmetry, which is testable; incumbents adjust less than challengers.

We now turn to consider how a shift affects the equilibrium gap between the platforms i.e. \( \Delta_{RL} = x_R - x_L \). The initial gap is of course, \( x_0 - (-x_0) = 2x_0 \). So, the gap between the platforms increases (decreases) iff \( x_R - x_L > 2x_0 \) (\( x_R - x_L < 2x_0 \)). Say that a preference shift is favorable (unfavorable) for the incumbent if it is in the same direction as the incumbent’s ideological bias e.g. \( \Delta > 0 \) is favorable for \( R \), and unfavorable for \( L \). Then, we can show:

**Proposition 6.** (Changes in Party Polarization) Following a “favorable” preference shift for the incumbent, the gap between platforms, \( \Delta_{RL} = x_R - x_L \) decreases. Following an “unfavorable” preference shift for the incumbent, the gap between platforms, \( \Delta_{RL} = x_R - x_L \) increases.

A formal proof is in the Appendix, but the result is also clear looking at Figure 8 above. In the first panel, a favorable shift for \( R \) is shown, and clearly \( R \) adjusts less than \( L \), meaning that the difference between their platforms must become smaller. In the second panel, an unfavorable shift for \( R \) is shown, and clearly \( R \) adjusts more than \( L \), meaning that the difference between their platforms must become larger. This is a second testable prediction.

## 8 Data and Measurement

The previous section makes two robust theoretical predictions; incumbents adjust less than challengers to changes in voter preferences, and parties become less (more) polarized following a “favorable” (“unfavorable”) preference shift for the incumbent. In the remainder of the paper, we take these predictions to US data on elections to the lower houses of state legislatures over the period 1990-2012. As noted by Besley and Case (2003), the US states are a natural laboratory for empirical exercises of this kind, for a number of reasons.

First, at the state level, consistent with the theory, there are effectively only two parties, Democratic and Republican; we do not study the ideological positions of independent candidates, who in any case, attract very few votes.\(^{19}\) Second, compared to the European elections studied by e.g. Adams et al. (2004), and the US Congress, studied by Fowler (2005), this is a large sample. Moreover, the states have common electoral rules; each state holds general elections every two years.\(^{20}\)

We begin by arguing that the theoretical results obtained above apply to this setting, under certain assumptions. To make the argument clear, assume for the moment that

\(^{19}\)Where information is available, we do include the ideological positions of independent candidates in the calculation of the median voter’s ideology, but their positions have a very small effect on the calculation, as these candidates attract very few votes.

\(^{20}\)Most electoral districts are single-member, but some states have multi-member electoral districts, and while we exclude these states in our baseline specification this does not impact upon the results; see below.
there is complete party discipline i.e. that in each electoral district, the candidates of a given party stand on the same platform. To see this, suppose that there are an odd number of districts \( d = 1, \ldots, D \) of equal size. We suppose that each of the parties \( R, L \) field candidates in all districts. Moreover, following Callander (2005) and Ansolabehere et al. (2012), who also study multi-district elections, we assume that there is party control over candidate positions in the sense that each of the candidates for every district of a given party \( p = R, L \) stands on the same platform \( x_p \). Let the median voter \( m \) in district \( d \) have ideal point \( x_m \). Rank the districts so that \( x_1 \leq x_2 \leq \cdots \leq x_D \). Continue to assume that voter preferences are given by (2), and that there is a common shift to preferences \( \varepsilon \), in all districts. Then, by an argument similar to Section 4.5, conditional on any realization of \( \varepsilon \), the median voter in the median district \( q = (D + 1) / 2 \) is decisive and so both parties will compete for this voter. So, to make the model symmetric, we assume \( x_m^{q} = 0 \). Then, all the results above apply to this setting.

However, it should be noted that complete party discipline is stronger than needed. Suppose that candidate positions in districts can vary, so that the position of candidate of party \( p \) is district \( d \) is \( x_p^d \). Suppose also that if party \( p \) is elected, its platform is decided by the median party \( p \) platform across districts, say, \( x_p^{med} \). This would arise, for example, if the party voted internally on the position once having gained power, and then forced sufficient legislative cohesion in the legislature. Then, assuming that the voters understand this, parties \( R, L \) are effectively competing for votes by choosing \( x_R^{med}, x_L^{med} \), and then all previous results would apply.

There is some evidence of party cohesion in this sense for US state legislatures. For example, Cox et al. (2010) and Jenkins and Monroe (2016) argue that in US state legislatures, parties do in fact act cohesively, as revealed by the rarity of a majority party losing a vote. Also, Shor and McCarty (2011), who use roll call voting data for all state legislatures from the mid-1990s onward, finds that ‘[state] party medians correlate strongly with the preferences of moderates’ and also as predicted that ‘ideal points of state legislators correlate highly with presidential vote [shares] in their districts’.21

We use new data collected by Bonica (2014b) which allow us to estimate separately the distribution of voter preferences in each electoral district in each state in each election. In particular, Bonica’s data are based on a new method which recovers the platforms of all candidates, not just the winner, for election to state legislatures, based on the campaign donations they received. This is important as it means that we are not forced to make assumptions about the preferences of candidates who lost. We then combine Bonica’s data with election results at the district level to construct estimates of the preferences of the median voter in each district at each election as described below.

In this way, we can measure changes to the distribution of voters’ preferences, and parties’ responses to these changes for all state legislatures over a 20 year period. The details of this procedure are in Section 8.1. Using these data we find, as predicted by the theory, that incumbent parties are less responsive to shifts.

21 Rodden (2010) provides an excellent review of the literature on multiple-district elections.
8.1 Data Description

Our data are for elections to the lower chamber of all state legislatures for the period 1990–2012. Data describing the number of voters for each candidate in each district for every election are taken from Klarner et al. (2013). These are then matched by candidate, district, and election to the DIME database (Bonica, 2014a) that accompanies Bonica (2014b). These data are constructed using publicly available campaign finance information, collated by the National Institute on Money in State Politics and the Sunlight Foundation, and they are remarkable in that they provide estimates of the ideological position of almost every candidate in every election over the period we study. Crucially, as donors donate to losing candidates we observe the ideological position of all candidates.

8.2 Measuring Voter Preferences and Party Platforms

To test our two hypotheses, we need a measure of each party’s position and that of the median voter at a given election in a given state. Given a set of candidates \( c = 1, \ldots, C_d \) in each district \( d = 1, \ldots, D_s \) of state \( S \), \( \text{Platform}_{ct} \) is the platform of candidate \( c \) at election \( t \), as measured by Bonica and \( \text{Votes}_{ct} \) is the number of votes they received. The \( t \) variable is the set of even years \( \{1990, \ldots, 2012\} \), as elections are held in all states every even year. \( \text{Platform}_{ct} \) is normalized such that \(-1\) is the most left-wing position observed and \(1\) is the most right-wing observed in any election.

As a first step, we define the preference of the mean voter in each district \( d \) as the voter-weighted average position of the candidates:

\[
\mu_{dt} = \frac{\sum_{c=1}^{C_d} \text{Platform}_{ct} \times \text{Votes}_{ct}}{\sum_{c} \text{Votes}_{ct}}
\]  

(16)

Our baseline estimate of the ideology of the median voter at the state level, \( \mu_{st} \), is then simply \( \mu_{st} = \mu_{Mt} \), where districts are ordered by means \( \mu_d \) and \( M = \frac{D_s+1}{2} \). In other words, our estimate of the ideology of the median voter at the state level, \( \mu_{st} \) is defined as the ideology of the mean voter in the median district at time \( t \). Given that typically there are a large number of districts, this is likely to be close to the true median, even though within a district, without making distributional assumptions, we cannot identify the median voter and thus we work with the mean voter. Formula (16) highlights why an estimate of the platform of both candidates is so important – it allows us to consistently estimate \( \mu_{st} \) without recourse to additional assumptions or additional information (see, Kernell, 2009).

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22 This includes the single Nebraskan chamber, but excludes New England, Massachusetts, and Vermont.

23 Bonica (2014b) uses a correspondence analysis procedure that exploits the fact that many politicians receive funds from multiple sources and many sources donate to multiple politicians to recover estimates for the positions of both politicians and donors. As this procedure is applied simultaneously at the federal and state level, estimates for candidates in state-level elections are in a common space, and comparable over time and between states.
Our variable measuring changes, or shifts, to voter preferences is then simply:

\[ \text{Shift}_{st} \equiv \Delta \mu_{st} = \mu_{st} - \mu_{s,t-1} \]  

(17)

Figure C.1 in the Appendix describes how the median voter of each state has varied over time. We can see that, as would be expected, voters in New York or Oregon are to the left of voters in Georgia or Oklahoma. We can also see that for some states, such as California or Texas, \( \mu_{st} \) has varied less over time than others such as Arizona or Idaho.

This measure (17) has the advantage of corresponding directly to our theoretical definition of a preference shift. It does not necessarily use all of the available information, however. As a robustness test we will repeat our analysis using the state-wide mean voter position, \( \mu'_{st} \). We calculate the mean voter in state \( s \) in year \( t \) as

\[ \mu'_{st} = \frac{1}{D_s} \sum_{d=1}^{D_s} \mu_{dt} \]  

(18)

i.e. the average of the district mean ideologies. Inspection of Figure C.2 in the Appendix suggests that the choice between \( \mu_{st} \) and \( \mu'_{st} \) may not be that important as there is little empirical difference in the distributions across states in a given year of the mean and median voters.

The other main explanatory variable is a dummy \( Inc_{pst} \) recording whether the party \( p \) holds a majority of seats in the legislature in state \( s \) in the period prior to election \( t \). The dependent variable is a (state) party’s position, \( \text{Position}_{pst} \). We define this as the median of the positions of all candidates of that party in the election at \( t \) including both incumbent and challengers i.e. the median of all the values of \( \text{Platform}_{ct} \), for all candidates belonging to party \( p \) in state \( s \).\(^{24}\) The decision to treat incumbents and challengers equally is made for both statistical and substantive reasons.

Firstly, the substantive reason is that it is well known (see, Poole, 2007, Poole and Rosenthal, 2006) that individual politicians’ positions are relatively stable over time and that most of the change in the views of representatives is due to electoral turnover. Thus, the response of incumbents to an electoral shift is likely to be relatively small. The second, statistical, reason relates to this. If we were to focus only on those who were elected we would introduce a substantial composition effect – for a given shift those still in office are those more isolated from changes in the median voter. Thus, a leftward move in the median voter, might mean the average Republican incumbent moves rightward. In the context of our model the dynamic implications of this would create a substantial econometric problem. By considering both incumbents and challengers we not only

\(^{24}\)Our measure \( \text{Position}_{pst} \) is a party’s median representative rather than the mean as this corresponds both better to standard theory, and is less likely to be distorted by the preferences of extreme representatives. It is possible however that in the presence of a large number of uncompetitive seats, perhaps due to gerrymandering, a party’s median representative will not have changed position despite large changes in its platform in competitive districts. However, as shown in the Appendix, all of our results are robust to using the mean representative instead.
avoid the composition effect, but also observe better a party’s response to changes in
the distribution of voters.

In Appendix E, as an example, we introduce the data for California for 2004 and 2006,
that illustrates the construction of these variables and how they relate to one another.
Table 1 contains summary statistics for the key variables $\text{Position}_{pst}$, $\text{Shift}_{st}$ for all US
states, by party. We also show $\Delta \text{Position}_{pst}$, the change in $\text{Position}_{pst}$ for party $p$ in state
$s$ between elections at $t$ and the previous election $t - 1$. The Table shows, as expected, that
$\text{Position}_{pst}$ for the republicans is to the right of that for Democrats. Note however, that
the difference between the Democrat and Republican mean values on the $[-1, 1]$ scale are
small – only 0.142 – as the endpoints of this scale are determined by the most ideologically
extreme candidates in the sample.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>Min</th>
<th>Max</th>
<th>P1</th>
<th>P10</th>
<th>P50</th>
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<td>-.025</td>
<td>-.012</td>
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<td>.018</td>
<td>.034</td>
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<table>
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Table 2: Cross-correlation table

<table>
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<th>Variables</th>
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<th>$\text{Shift}_{st}$</th>
<th>$\text{Inc}<em>{pst} \times \text{Shift}</em>{st}$</th>
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</thead>
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<td>$\text{Shift}_{st}$</td>
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<td>1</td>
<td></td>
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<td>0.70</td>
<td>1</td>
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</tbody>
</table>

Looking now at the values for $\Delta \text{Position}_{pst}$ over the sample period, we see, not
surprisingly, that there has been polarization; the Republicans have moved to the right,
and the Democrats to the left. Reflecting this, there are also relatively few large party
moves with the 90th percentile of $\Delta \text{Position}_{pst}$ also being 0.02 for the Republican party.
Comparison of the 1st and 99th percentiles suggests shifts are symmetrically distributed.

We can also see that, consistent with the literature (see, Erikson et al., 1993), that voter
preferences are relatively stable – for example, for voter preferences in districts contested
by the Republicans, the 90th percentile of the $\text{Shift}_{st}$ distribution is 0.018 compared to a
theoretical maximum move of 2.

A final issue is the following. Using the same underlying ideology data to measure
both party and voter positions is important because it ensures that both \( \text{Shift}_{st} \) and \( \Delta \text{Position}_{pst} \) are defined on the same space and thus directly comparable. However, a possible concern is that they might be mechanically positively correlated. In fact, it can be shown that because \( \text{Shift}_{st} \) and \( \text{Position}_{pst} \) derive from different parts of the state distribution of representatives’ preferences, any mechanical relationship is always small and converges to zero as the number of state representatives grows large. We provide a formal statement of this in Appendix F.\(^{25}\)

9 Empirical Strategy and Results

9.1 Asymmetric Adjustment

9.1.1 Empirical Strategy

Proposition 5 suggests that parties that lost the previous election will respond more to any change in voters’ preferences than the winner. We take this prediction to the data by relating the change in the position of party \( p \) in state \( s \) and year \( t \), to whether the party won the previous election and what changes there have been in voters’ preferences. In other words we estimate an equation of the form:

\[
\Delta \text{Position}_{pst} = \lambda \text{Shift}_{st} + \gamma \text{Inc}_{pst} + \beta_1 \text{Inc}_{pst} \times \text{Shift}_{st} + \\
\beta_2 \text{Inc}_{pst} \times \text{Shift}_{st}^2 + \varepsilon_{pst}
\]

Our key prediction from Proposition 5 is that \( \beta_1 \) is negative, while \( \lambda > 0 \). Note that the term in \( \beta_2 \) allows for a non-linear impact on the effect of incumbency on the response to the shift.

Give the data at hand, a key challenge in estimating (19) is to adequately control for any common factor, captured by \( \varepsilon_{pst} \), that may be jointly driving changes in parties’ platforms and changes in voters’ preferences. These are likely myriad and will include both local political and economic factors in the districts of individual representatives (see, Healy and Lenz, 2014), the spillover effects of other elections (see, Campbell, 1986), the characteristics of the representatives themselves (see, Buttice and Stone, 2012, Kam and Kinder, 2012), or media-bias (see, Chiang and Knight, 2011). As well as endogeneity due to external events, there is also the possibility of simultaneity due to the campaigning efforts or persuasive powers of state-parties or individual politicians.

Our identification strategy is simple. Given our data are indexed by state, party,

\(^{25}\)The key intuition is as follows. Consider an individual district; in (16) we estimate the mean ideology of this district as the vote weighted average of the candidates’ positions. Yet, if candidates change their positions, in the absence of a change in the preferences of voters, then the vote shares for the parties might plausibly change in an offsetting way so that such that \( \mu_{st} \) may not change much. For example, suppose both parties were initially located either side of the median voter, and both parties move to the right. Given that the distribution of voter preferences is single-peaked, then support for the Republicans will fall, and that for the Democrats will rise. As shown in Table 2, something like this seems to be occurring; the correlation between \( \text{Shift}_{st} \) and \( \Delta \text{Position}_{pst} \), while positive as should be expected, is in fact quite small at 0.37.
and year we include fixed effects for each of the pair wise combinations of the three. Our preferred model includes state $\times$ party (henceforth, SP), state $\times$ year (SY), and party $\times$ year (PY) fixed effects. In other words, we assume
\[ \varepsilon_{pst} = \xi_{sp} + \phi_{st} + \delta_{pt} + \zeta_{pst} \] (20)
where $\xi_{sp}, \phi_{st}, \delta_{pt}$ are SP, SY, and PY fixed effects, and the error term $\zeta_{pst}$ is assumed to be $\zeta_{pst} \sim N(0, \Sigma)$ where we allow for $\Sigma$ to be clustered by both SP and SY. This is because one can imagine that as well as errors being correlated within an individual state party, that state parties’ behavior may be correlated across states within an election. For example, because Republican voters may be nationally affected by the Republican nominee for US President.

So, we have partialled out all variation associated with particular, states, parties, and years. Importantly, as well as addressing short-term variation this strategy also controls for secular trends in U.S. politics over the period we study, such as changes in the degree of voter polarization.\(^{26}\) We assume that, conditional on the fixed effects, the covariates in (19) are orthogonal to the error $\zeta_{pst}$. This implies three substantive claims, that conditional on the fixed effects; the change in the median voter is random; which party is incumbent does not alter voters’ votes given their preferences; and conditioning on this incumbency that the change in the median voter is still random. It is hard to think of processes which, given these fixed effects, would give rise to some unaccounted for systematic bias in our results.\(^{27}\)

To relax these assumptions, and for the avoidance of doubt, we also present instrumental variable estimates. Here, our identification strategy relies on the premise that nearby states are likely to be subject to similar social forces and economic shifts, but that these shifts in other states should not depend on the incumbency or position of the parties in the state in question. Thus, we instrument $\text{Shift}_{st}$ and $\text{Inc}_{pst} \times \text{Shift}_{st}$ with the average shift in that state’s census division, excluding state $s$, $\text{Shift}_{-s,t}$, and its interaction with incumbency $\text{Shift}_{-s,t} \times \text{Inc}_{pst}$.\(^{28}\) As is standard, identification now requires $E[\text{Shift}_{-s,t}\text{Shift}_{st}] \neq 0$ and $E[\text{Shift}_{-s,t}\zeta_{pst}] = 0$. As well as addressing any

\(^{26}\)Ansolabehere et al. (2006) provide evidence that, contrary to popular perception, the key trend has been increased centrism in the U.S. electorate and that the differences between states are smaller than commonly supposed.

\(^{27}\)To be precise, here, our identification assumptions are:

$$E[\text{Shift}_{st}\zeta_{pst}] = E[(\text{Inc}_{pst}\zeta_{pst})] = E[(\text{Inc}_{pst} \times \text{Shift}_{st})\zeta_{pst}] = 0$$

endogeneity bias, a further advantage of this specification is that by construction there can no longer be any concerns about a mechanical relationship between $\text{Shift}_{st}$ and $\text{Position}_{pst}$. Of course, if as we argue, concerns about endogeneity are satisfactorily addressed by our fixed-effects strategy then our OLS estimates are to be preferred. In fact, it turns out that the results in both cases are similar.

A final concern is that there may be alternative explanations for asymmetric platform adjustment. In particular, one may be concerned that our results reflect incumbency advantage. The recent literature has focused on three key sources of incumbency advantage – that incumbents receive more campaign contributions which improve their chances of re-election; that high quality challengers avoid contesting elections against incumbents meaning incumbents run against relatively poor challengers on average; or that incumbents are themselves higher quality politicians.\footnote{Uppal (2010) applies the approach of Lee (2008) to provide evidence for state legislatures. He finds that incumbency is associated with an average electoral advantage of around 5.3%, similarly Fowler and Hall (2014) find it to be 7.8%. The results of Fouirnaies and Hall (2014) suggests a substantial portion of this advantage is due to the additional campaign funding received by incumbents. Ban et al. (2016) using term-limits as an instrument suggests that the choice of high quality opponents to avoid competing against incumbents accounts for around 40% of incumbents’ advantage. While, Hall and Snyder (2015) using an RDD approach finds much smaller effect of around 5%.

}\footnote{For example, suppose it is the case that in a state, one party’s representatives are on average wealthier than the other’s. Then, it is quite plausible, that following a shock to preferences, that party may seek to persuade the voters by increased advertising, rather than changing its platform, and so may respond less to the shock. Assuming that this differential does not change much over time, it will be picked up by the state-year fixed effect. Alternatively, to the extent that wealth differences between parties are at the national level, but vary over time, they will be picked up by the party-year fixed effect, and so on.} It is possible that any of these three advantages could cause, in equilibrium, the incumbent to adjust less in response to a voter preference shift; however, there are to our knowledge, no theoretical predictions to this effect in the literature.

Our response to this is as follows. The first point here is that almost all states have term limits during our sample period. As a result, almost 27% of seats are open i.e. not contested by the incumbent. A second point is that the vast majority of the empirical literature has identified incumbency advantage at the individual level, whereas our analysis is at the party level, and so we are concerned with the average advantage across individuals in a given party. Our fixed effects will control for this.

A final concern is the so-called Partisan Incumbency Advantage discussed by Fowler and Hall (2014), which describes the beneficial effect to individual candidates of belonging to the party currently in office, over and above any individual incumbency advantage. If such an advantage exists, it will be a component of $\text{Inc}_{pst}$. This, however, is of limited concern for two reasons. First, Fowler and Hall (2014) shows that this effect is in practice close to zero. Second, even it is present, it should not bias the estimation of the parameter of interest $\beta_1$.\footnote{29}
9.1.2 Results

We now report estimates of (19). As a first step, column 1 of Table 3 reports results from a simplified version of (19) where $\beta_2 = 0$, and in which there are only SP and PY fixed effects. We see that, as expected, parties react to movements in the median voter, with the coefficient on $\text{Shift}_{st}$ positive and significant. We also find, as the theory suggests, that parties with a majority react less. This coefficient is negative and significant and around 80% as large as for $\text{Shift}_{st}$. However, a more meaningful comparison is obtained by calculating standardized coefficients, which are 0.56 and $-0.33$ for $\text{Shift}_{st}$ and $\text{Inc}_{pst} \times \text{Shift}_{st}$ respectively, revealing that the magnitude of the former is nearly twice that of the latter. Here, a one standard deviation move rightwards would move the incumbent party only 0.23 standard deviations rightwards, but a party not in power 0.56 standard deviations to the right. This is clearly as predicted by the theory as it shows that the party that lost (won) the previous election tend to make large (small) policy changes in the pursuit of future power. Given that we include $\text{Inc}_{pst} \times \text{Shift}_{st}$, $\gamma$ gives the effect of $\text{Inc}_{pst}$ given no shift. Perhaps unsurprisingly, given the shift will almost always be non-zero, the estimated effect is small, although positive and significant at the 1% level.

Column 2 maintains the restriction that $\beta_2 = 0$ but now includes the full battery of fixed-effects. Now $\lambda$ is not identified but the addition of the SY fixed-effects simplifies the interpretation of the $\beta_1$ coefficient, given a shift, it is now the difference in the response of parties in power from those that are not. Importantly, $\beta_1$ remains of the same magnitude and significance.

This effect may not be linear however, parties may respond disproportionately to smaller or larger shifts. In columns 3 and 4 we therefore relax the constraint that $\beta_2 = 0$. Column 3 reports results omitting the SY fixed-effects while column 4 includes them. With and without the SY fixed-effects, we find that $\beta_2$ is imprecisely measured and not significant at any conventional level, suggesting we can reject a non-linear effect of larger shifts.

We now move on to show that we obtain similar, indeed stronger, results using our IV estimator. These results are reported in columns 5-9 of Table 3. Column 5 reports a simple IV specification without fixed-effects. We can see that again we find that both parties respond to a shift, but that the incumbent party moves less. Columns 6 and 7 additionally include the fixed-effects used in columns 1-5 to progressively weaken the identification assumptions of our estimator from $E[\text{Shift}_{-s,t}\zeta_{pst}] = 0$ to $E[\text{Shift}_{-s,t}\zeta_{pst}|\text{SY}, \text{PY}, \text{SP}] = 0$. Column 7 includes only SP fixed-effects, and we can see that the magnitudes of $\lambda$ and $\beta_1$ are slightly lower but that the main difference from column 5 is that the coefficient on incumbency $\gamma$ is now significant. Column 7 includes the full-set of fixed-effects and now, as before, $\lambda$ is not identified but we again find that $\beta_1$ is negative and significant. Taken together these results provide strong evidence for the effects of loss-aversion predicted by the theory.

One might be concerned that shifts to the identity of the median voter maybe only
weakly correlated with those in neighboring states. If this were the case then the relevance assumption, \( E[\text{Shift}_{s,t}] \neq 0 \), maybe questionable. This is of particular concern given that our fixed-effects are designed to capture state and national trends. To allay such concerns we report the generalized LM test of under-identification test proposed by Kleibergen and Paap (2006). Inspection of the associated p-values shows that we can reject under-identification and thus the violation of the relevance assumption in all cases. But, if \( E[\text{Shift}_{s,t}] \approx 0 \) then our estimates may still be substantially biased. Thus, we also report the associated Wald test of weak-identification and we are able to reject this at all levels in all specifications.

As discussed in Section 8.1 our preferred measure of shifts is the change in the median voter. However, whilst this represents a natural choice, not least because it is in line with the theory, we may be concerned that this measure, focusing on the median district, disregards important information. To verify that this is not the case columns 8 and 9 report results using the same specification as in columns 6 and 8 except now using \( \Delta \mu'_{st} \), the change in location of the mean voter. The only difference is an increase in the estimated magnitude of the coefficients, all of the estimates remain statistically significant. We provide further evidence of the robustness of our results in Appendix D which shows that these results are not affected by including states with multimember districts or defining parties’ positions as given by their mean representative.

### 9.2 Testing for Changes in Polarization

We now turn to our second empirical prediction, Proposition 6. This Proposition implies that at an election the gap between two parties \( \Delta_{st} = \text{Position}_{Rst} - \text{Position}_{Dst} \) should be smaller if the shift was favorable for the incumbent. Recall that positive (negative) changes in \( \Delta_{st} \) measure rightward (leftward) shifts in voter preferences. So, our measure of favorable shifts for Republicans and Democrats respectively are:

\[
F_{Rst} \equiv \max\{\Delta_{st}, 0\}, \quad F_{Dst} \equiv \max\{-\Delta_{st}, 0\}.
\]

We then estimate the following model:

\[
\Delta_{st} = \alpha_R(\text{Inc}_{Rst} \times F_{Rst}) + \alpha_D(\text{Inc}_{Dst} \times F_{Dst}) + \beta_R(\text{Inc}_{Rst} \times F_{Dst}) + \beta_D(\text{Inc}_{Dst} \times F_{Rst}) + \epsilon_{pst} \quad (21)
\]

where now, as \( \Delta_{st} \) is defined at the state–year level, we are unable to control for state–year fixed effects and thus \( \epsilon_{pst} = \xi_s + \delta_t + \zeta_{pst} \).

To interpret this, consider first the variable \( \text{Inc}_{Rst} \times F_{Rst} \) which records the presence and size of the favorable shift when the Republican party is the incumbent. Given Proposition 6, we expect this to have a negative impact on the dependent variable i.e. \( \alpha_R < 0 \). By the same argument, we expect \( \alpha_D < 0 \). Next, the variable \( \text{Inc}_{Rst} \times F_{Rst} \) which records the presence and size of an unfavorable shift when the incumbent is the
Republican. Following Proposition 6, we expect this to have a positive impact on the dependent variable i.e. $\beta_R > 0$. By the same argument, we expect $\beta_D > 0$.

The results of estimating (21) are reported in columns 1 and 2 of Table 4. As a first step in column 1, to maximize power, we restrict that $\alpha_R = \alpha_D$ and likewise $\beta_R = \beta_D$. The results are as predicted: $\alpha$ is negative and $\beta$ is positive and both are significant. $\beta$ is larger in magnitude than $\alpha$ and more precisely measured. Column 2 estimates 21 without additional restrictions. We see that, as predicted, both $\alpha_R < 0$ and $\alpha_D < 0$ while $\beta_R > 0$ and $\beta_D > 0$. Whilst of the expected sign the estimates of $\alpha_D$ and $\alpha_R$ are not significant, but more importantly we are able to reject the joint hypothesis that $\alpha_R + \alpha_D = \beta_R + \beta_D$ at the 1% level. Columns 3 and 4 repeat these two analyses but now the model is estimated using IV with an analogous identification strategy to that in the previous section. We again instrument shifts to the identity of the median voter using shifts in nearby states. That is, we instrument $F_{Rst}$ with $\max\{\Delta\mu_{Rs,t}, 0\}$ and so on. The results in column 3 again restrict $\alpha_R = \alpha_D$ and $\beta_R = \beta_D$, to preserve power. The coefficients are now larger in magnitude and as precise, and we can again reject $\alpha = \beta$ at all conventional levels. Column 4 reports the results of the unrestricted model and as in column 2 some estimates are no longer statistically significant, but are still of the expected sign. Crucially, however, we can still reject the hypothesis that $\alpha_R + \alpha_D = \beta_R + \beta_D$ at the 1% level. Taken together the results of all four specifications provide strong evidence for the theory – all suggest that loss aversion means that unfavorable shifts lead to platform divergence.

10 Conclusions

This paper studied how voter loss-aversion affects electoral competition in a Downsian setting. We provided evidence that US voters may be loss-averse assuming, consistent with the body of previous evidence, a reference point of the status quo. We then showed theoretically that such loss-aversion has a number of effects on electoral competition that are distinct from the effects of incumbency advantage. First, for some values of the status quo, there is policy rigidity both parties choose platforms equal to the status quo, regardless of other parameters. Second, there is a moderation effect when there is policy rigidity; the equilibrium policy outcome is closer to the median voter’s ideal point than in the absence of loss-aversion.

Finally, we made two empirical predictions. First, with loss-aversion, incumbents adjust less than challengers to changes in voter preferences. Second, we showed that following a “favorable” preference shift for the incumbent, the gap between platforms decreases, whereas the reverse is true following an “unfavorable” preference shift.

We test both of these predictions using elections to US state legislatures. We find robust support for both. The results are as predicted: incumbent parties respond less to shifts in the preferences of the median voter. Also as predicted, “unfavorable” shifts lead to platform divergence.
### Table 3: Asymmetric Adjustment

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<td>(1.29)</td>
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<td>0.20</td>
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<tr>
<td>UnderID LM</td>
<td>26.83</td>
<td>28.00</td>
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<td>3.52</td>
<td>3.52</td>
<td>3.52</td>
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<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
<td>2SLS</td>
<td>2SLS</td>
<td>2SLS</td>
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<td>2SLS</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Party × Year Fixed-Effects</td>
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<tr>
<td>State × Year Fixed-Effects</td>
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<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Shock Measure</td>
<td>( \Delta \mu_{st} )</td>
<td>( \Delta \mu_{st} )</td>
<td>( \Delta \mu_{st} )</td>
<td>( \Delta \mu_{st} )</td>
<td>( \Delta \mu_{st} )</td>
<td>( \Delta \mu_{st} )</td>
<td>( \Delta \mu_{st} )</td>
<td>( \Delta \mu_{st} )</td>
<td>( \Delta \mu_{st} )</td>
</tr>
</tbody>
</table>

All data are for elections to the lower-houses of state legislatures. The dependent variable is the change in a party’s platform as measured by that of the median candidate. \( Shift_{st} \) measures the change in the median voter’s preferences as defined in Equation 17, except which employ the change in the position of the mean voter, \( \Delta \mu_{st}' \). \( Inc_{pst} \) is a binary variable that is equal to 1 if a party won more than 50% of the seats at the previous election. All columns except 5 and 8 include State × Party and Party × Year fixed-effects. Columns 2, 4, 7, and 9 additionally include State × Year fixed-effects. Standard errors are in parentheses and are clustered by both State × Party and Party × Year except in columns 5 and 8 where they are not clustered, and column 6 where they are clustered by State × Party. \( p < 0.10, ^* p < 0.05, ^{***} p < 0.01 \) UnderID LM refers to the generalized Under-identification test of Kleibergen and Paap (2006) and P(UnderID) the associated p-value. WeakID Wald refers to the Kleibergen and Paap (2006) generalized test of Weak-identification and we are able to reject this at all levels in all specifications.
Table 4: Platform Convergence

<table>
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<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Inc_{Dst} \times F_{Dst} + Inc_{Rst} \times F_{Rst}$</td>
<td>-0.25*</td>
<td>-0.56**</td>
<td>(0.13)</td>
<td>(0.27)</td>
</tr>
<tr>
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<td>0.53***</td>
<td>0.53***</td>
<td>(0.10)</td>
<td>(0.20)</td>
</tr>
<tr>
<td>$Inc_{Rst} \times F_{Rst} + Inc_{Dst} \times F_{Rst}$</td>
<td>-0.24</td>
<td>-1.47*</td>
<td>(0.17)</td>
<td>(0.76)</td>
</tr>
<tr>
<td></td>
<td>-0.26</td>
<td>-0.20</td>
<td>(0.21)</td>
<td>(0.24)</td>
</tr>
<tr>
<td>$Inc_{Rst} \times F_{Dst}$</td>
<td>0.44***</td>
<td>0.59**</td>
<td>(0.13)</td>
<td>(0.24)</td>
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<tr>
<td></td>
<td>0.68***</td>
<td>0.41</td>
<td>(0.13)</td>
<td>(0.41)</td>
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<th>OLS</th>
<th>2SLS</th>
<th>2SLS</th>
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<tr>
<td>$\chi^2(H_0)$</td>
<td>27.91</td>
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<td>$Pr(H_0)$</td>
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<tr>
<td>$N$</td>
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<td>636</td>
<td>636</td>
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The dependent variable is the absolute distance between the Republicans and the Democrats, $|Position_{Rst} - Position_{Dst}|$. Columns 1 and 2 report OLS estimates, and Columns 3 and 4 report 2SLS estimates. $Inc_{Rst}$ (alternatively, $Inc_{Dst}$) is a binary variable that is equal to 1 if the Republican (Democratic) party won more than 50% of the seats at the previous election. $F_{Rst}$ (alternatively, $F_{Dst}$) report the size of any favourable shock, taking a value of zero if the shock was unfavourable. All specifications include State and Year fixed effects. Standard errors are clustered by State. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
References


Ansolabehere, Stephen, James M. Jr. Snyder, and Charles Iii Stewart, “Old voters new voters, the personal vote: using redistricting to measure the incumbency advantage,” American Journal of Political Perspe... 2000, 44 (1), 17–34.


Hall, Andrew B. and James M. Snyder, “How Much of the Incumbency Advantage is Due to Scare-Off?,” *Political Science Research and Methods*, 2015, 3 (03), 493–514.


A Proofs of Propositions and Other Results.

Conditions for Concavity of $\pi_L, \pi_R$ in $x_L, x_R$. W.l.o.g., we consider only $\pi_R$. First, from (4), at all points of differentiability

$$\frac{\partial \pi_R}{\partial x_R} = \frac{\partial p}{\partial x_R} (u_R(x_R) + M - u_R(x_L)) + p(x_L, x_R)u'_R(x_R)$$

(A.1)

So, differentiating (A.1), we get;

$$\frac{\partial^2 \pi_R}{\partial x_R^2} = 2 \frac{\partial p}{\partial x_R} u'_R(x_R) + p(x_L, x_R)u''_R(x_R) + \frac{\partial^2 p}{\partial x_R^2} (u_R(x_R) + M - u_R(x_L))$$

(A.2)

Now, by inspection of (8) we see that $\frac{\partial p}{\partial x_R} = -\phi < 0$ where $\phi = \lambda > 1$ or $\phi = 1$, depending on the values of $x_R, x_0$. So, from (A.2), as $u'_R(x_R) > 0$, and also $u''_R(x_R) \leq 0$ from Assumption A2, strict concavity follows as long as $\frac{\partial^2 p}{\partial x_R^2} \leq 0$. But from (8), it is clear that $p$ is linear in $x_R$, so this will hold. \(\square\)

Proof of Lemma 1. (a) To prove uniqueness of solutions to (9), (10), define

$$g(x; \phi) = 0.5u'_R(x) - \phi p(u_R(x) + M - u_R(-x))$$

(A.3)

where $\phi = \lambda > 1$ or $\phi = 1$, depending on the values of $x_R, x_0$. Then, suppose to the contrary that $g(x; \phi) = 0$ has two solutions, say $x^*$ and $x^{**} > x^*$. Then, as $g$ is differentiable, by the fundamental theorem of calculus,

$$g(x^{**}; \phi) - g(x^*; \phi) = \int_{x^*}^{x^{**}} g_x(x; \phi)dx = 0.$$  

(A.4)

But, by differentiation of (A.3):

$$g_x(x; \phi) = 0.5u''_R(x) - \phi p(u'_R(x) + u'_R(-x)) < 0, \ x \in [-1, 1]$$

(A.5)

So, $\int_{x^*}^{x^{**}} g_x(x; \phi)dx < 0$, which contradicts (A.4).

(b) To prove $x^+ > x^-$, note that we can generally set $\phi = \lambda$, and also note that $g(x; \lambda) = 0,$

$$\frac{dx}{d\lambda} = \frac{g_x(x; \lambda)}{-g_x(x; \lambda)} = -\frac{\rho(u_R(x) + M - u_R(-x))}{-g_x(x; \lambda)} < 0$$

So, as $g(x^+; \lambda) = 0, g(x^-; 1) = 0$, and $\lambda > 1$, the result follows.

(c) To prove that $x^- > 0$, note that at $x \leq 0, u_R(x) - u_R(-x) \leq 0$, so

$$g(0; \lambda) = 0.5u'_R(x) - \lambda \rho (u_R(x) + M - u_R(-x))$$

$$\geq 0.5u'_R(x) - \lambda \rho M$$

$$\geq 0.5u'_R(0) - \lambda \rho M$$

$$> 0$$

A.1
where the third inequality follows from concavity of $u_R(\cdot)$, and the last by Assumption A2. So, $g(x; \lambda)$ cannot have a negative or zero solution. □

**Proof of Proposition 4.** (a) Assume $\Delta \leq \Delta_{\text{min}}$. Assume first that $R$ is the incumbent, so that the status quo is $x_0$. Then, from Proposition 1, if $x_0 \in [\Delta + x^+, \Delta + x^-]$, the equilibrium is $x_R = x_0$, $x_L = -x_0 + 2\Delta$. So, we require

$$x_0 \in [\Delta + x^+, \Delta + x^-] \Leftrightarrow x_0 - x^+ \leq \Delta \leq x_0 - x^- \quad (A.6)$$

But as $x_0$ is an initial equilibrium, from Proposition 1, $x_0 \leq x^+$ and so $x_0 - x^+ \leq 0$, so $x_0 - x^+ \leq \Delta$ always holds. Thus, as $\Delta \leq x_0 - x^-$, (A.6) certainly holds.

Now assume that $L$ is the incumbent, so that the status quo is $-x_0$. Then, from Proposition 1, if $-x_0 \in [-\Delta + x^+, -\Delta + x^-]$, the equilibrium is $x_L = x_0$, $x_L = -x_0 + 2\Delta$. So, we require

$$x_0 \in [\Delta - x^+, -\Delta + x^-] \Leftrightarrow x^- - x_0 \leq \Delta \leq x^+ - x_0 \quad (A.7)$$

But as $-x_0$ is an initial equilibrium, from Proposition 1, $x_0 \geq x^+$ and so $x^- - x_0 \leq 0$, so $x^- - x_0 \leq \Delta$ always holds. Thus, as $\Delta \leq x_0 - x^-$, (A.7) certainly holds.

(b) Now suppose that the shift is large i.e. $\Delta > \Delta_{\text{max}}$. Then, if $R$ won the election, so that the status quo is $x_0$, from Proposition 1, as $x_0 < \Delta + x^-$, the outcome is $x_R = \Delta + x^-$, $x_L = -x_0$. If $L$ won the election, i.e. is the incumbent, so that the status quo is $-x_0$, then from Proposition 1, as $-x_0 < -\Delta + x^-$, the outcome is $x_R = \Delta + x^-$, $x_L = -x_0 + 2\Delta$. On the other hand, if $L$ won the election, so that the status quo is $-x_0$, then by the argument in part (b) of the proof, the outcome is $x_R = \Delta + x^-$, $x_L = -x_0 + 2\Delta$.

(c) Now suppose that the shift is intermediate, with $x^+ - x_0 < \Delta \leq x_0 - x^-$. Then if $R$ won the election, so that the status quo is $x_0$, by the argument in part (a) of the proof, the outcome is $x_R = x_R = x_0$, $x_L = -x_0 + 2\Delta$. On the other hand, if $L$ won the election, so that the status quo is $-x_0$, then by the argument in part (b) of the proof, the outcome is $x_R = \Delta + x^+$, $x_L = -x_0 + 2\Delta$.

(d) Now suppose that the shift is intermediate, with $x_0 - x^- < \Delta \leq x^+ - x_0$. Then if $R$ won the election, so that the status quo is $x_0$, by the argument in part (a) of the proof, the outcome is $x_R = x_0$, $x_L = -x_0 + 2\Delta$. If $L$ won the election, so that the status quo is $-x_0$, then by the argument in part (b) of the proof, the outcome is $x_R = \Delta + x^-$, $x_L = -x_0 + 2\Delta$. □

**Proof of Proposition 6.** From inspection of the results in Proposition 4, the following table can be constructed, where cases (c) and (d) refer to cases in the Proposition, and $I = R, L$ denotes the incumbent:

<table>
<thead>
<tr>
<th>$\Delta$</th>
<th>$I$</th>
<th>$x_R$</th>
<th>$x_L$</th>
<th>$x_R - x_L - 2x_0$</th>
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<tbody>
<tr>
<td>small</td>
<td>$R$</td>
<td>$x_0$</td>
<td>$-x_0 + 2\Delta$</td>
<td>$-2\Delta$</td>
</tr>
<tr>
<td>small</td>
<td>$L$</td>
<td>$x_0 + 2\Delta$</td>
<td>$-x_0$</td>
<td>$2\Delta$</td>
</tr>
<tr>
<td>large</td>
<td>$R$</td>
<td>$\Delta + x^-$</td>
<td>$\Delta - x^-$</td>
<td>$2(x^- - x_0)$</td>
</tr>
<tr>
<td>large</td>
<td>$L$</td>
<td>$\Delta + x^+$</td>
<td>$\Delta - x^+$</td>
<td>$2(x^+ - x_0)$</td>
</tr>
<tr>
<td>case (c)</td>
<td>$R$</td>
<td>$x_0$</td>
<td>$-x_0 + 2\Delta$</td>
<td>$-2\Delta$</td>
</tr>
<tr>
<td>case (c)</td>
<td>$L$</td>
<td>$\Delta + x^+$</td>
<td>$\Delta - x^+$</td>
<td>$2(x^+ - x_0)$</td>
</tr>
<tr>
<td>case (d)</td>
<td>$R$</td>
<td>$\Delta + x^-$</td>
<td>$\Delta - x^-$</td>
<td>$2(x^- - x_0)$</td>
</tr>
<tr>
<td>case (d)</td>
<td>$L$</td>
<td>$x_0 + 2\Delta$</td>
<td>$-x_0$</td>
<td>$2\Delta$</td>
</tr>
</tbody>
</table>

In the case of a small shift, we then see that if $R$ is the incumbent, then $x_R - x_L < 2x_0$, but if $R$ is the incumbent, then $x_R - x_L > 2x_0$. The same is clearly true if the shift is large, as

A.2
\( x^- \leq x_0 \leq x^+ \). In case (c), we require \(-2\Delta \leq 2(x^+ - x_0)\), or \(\Delta \geq x_0 - x^+\), which is always true, as \(x_0 \leq x^+\). In case (d), we require \(x^- - x_0 \leq \Delta\), which is always true, as \(x_0 \geq x^-\). \(\square\)
Governors’ support and Macroeconomic performance data

For the quarterly state-level data, as our measure of public support we use governors’ job-approval ratings (JARs) taken from the U.S. Officials’ Job Approval Ratings (JARs) Database compiled by Thad Beyle, Richard Niemi, and Lee Sigelman (2010). Specifically, we focus on the percentage who ‘approve’, that is answer positively to questions of the form: Do you approve or disapprove of the way [insert governor] is handling his job as governor?”. Polls are not always conducted on a regular basis and thus we average approval ratings by quarter.\textsuperscript{31}

We use quarterly data from the U.S. Bureau of Labor Statistics (2017) database. Voters may be inattentive and not update their impressions of macroeconomic performance instantly à la Sims (2010) and so we use a two quarter moving average to allow for this. Combining these data provides an unbalanced panel covering the period 1976-2009, with a total of 2,433 observations.

The county level data uses the level of support for the party of the incumbent governor at the subsequent gubernatorial election in each county. These data are taken from Leip, Dave (2018) and cover the period 1990-2016. Unemployment data are taken from Bureau of Labor Statistics (2018) and the personal income per capita data from U.S. Bureau of Economic Analysis (2018), for a total of 13,159 observations.

C Additional Figures

Figure C.1: Distribution of State Median Voters

Each state is represented by a box-plot. The more heavily shaded area represents the inter-quartile range, and the whiskers represent the upper and lower adjacent values. These are the values \( x_i \) such that \( x_i > 1.5 \times \text{IQR} + x_{75} \) and \( x_i < 1.5 \times \text{IQR} + x_{25} \) respectively. Where, \( x_{75} \) and \( x_{25} \) denote the 75\textsuperscript{th} and 25\textsuperscript{th} percentiles respectively and IQR is the Inter-Quartile Range, \( x_{75} - x_{25} \). (see, Tukey (1977)).

\textsuperscript{31}In particular, the frequency with which such polls are conducted varies by state, and also tends to be higher in the run up to elections.
Figure C.2: Comparison of Mean and Median Voters
D Robustness Tests

As discussed above, one important advantage of studying state legislative elections is that there is a large sample of elections in an institutionally homogeneous setting. Thus, our preferred sample excludes all elections with multi-member districts.\textsuperscript{32} As well as making the states we study as similar as possible, a second advantage of restricting the sample is so that the setting we study empirically is as close as possible to that analyzed theoretically. However, it is nevertheless important to check that our results are not an artefact of this choice. Columns 1-4 of Table D.1 report fixed-effects and IV estimates. Columns 1 and 3 include only SP fixed-effects, while columns 2 and 4 also include SY, and PY effects. The coefficients are largely unchanged, and remain statistically significant suggesting that our results are not being driven by the choice of states.

Columns 5-8 of Table D.1 report results for our preferred sample, but now defining party positions on the basis of their mean, rather than median, representative. As in columns 1-4 the first two columns report OLS estimates and the latter two IV estimates. Also similarly, columns 5 and 7 report results only including SP effects, while 6 and 8 additionally include SY and PY effects. The coefficients are now in fact a little larger, and mostly precisely measured. However, the IV estimates in column 8 including the full-set of fixed-effects, while of the expected sign, are not significant at conventional levels. We interpret this as reflecting the demanding nature of the specification. In sum, we argue that tables D.1 provides further evidence that the empirical support for the predictions of the theory is robust to a wide range of alternative modelling assumptions.

\textsuperscript{32}These are Arkansas, Arizona, Georgia, Idaho, Maryland, North Carolina, North Dakota, New Hampshire, South Dakota, Washington, and West Virginia.
Table D.1: Robustness Tests

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<tr>
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<tr>
<td>Inc&lt;sub&gt;pst&lt;/sub&gt; × Shift&lt;sub&gt;st&lt;/sub&gt;</td>
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<td>-0.65***</td>
<td>-0.53***</td>
<td>-0.52***</td>
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<td>0.00***</td>
<td>0.00</td>
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<td>0.01***</td>
<td>-0.00</td>
<td>0.01***</td>
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<td>(0.00)</td>
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<td>552</td>
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</tbody>
</table>

The dependent variable is the change in party position measured either by each party’s median representative (columns 1-4) or alternatively its mean representative (columns 5-8). OLS estimates are reported in columns 1,2,5, and 6 and corresponding 2SLS estimates are reported in columns 3,4,7, and 8. Columns 1-4 additionally include observations from states which have at least one multi-member district. All columns other than 3 and 6 include SP fixed effects. Columns 2,4,6, and 8 additionally include SY, and PY fixed effects. Columns 3 and 7 report robust standard errors, columns 1 5 report standard errors cluster by SP, columns 2,4,6, and 8 report standard errors clustered by SP and PY. UnderID LM refers to the generalized Under-identification test of Kleibergen and Paap (2006) and P(UnderID) the associated p-value. WeakID Wald refers to the Kleibergen and Paap (2006) generalized test of Weak-identification and we are able to reject this at all levels in all specifications. Other details as for Table 3.
E  The example of California

We take California as our example as it has a large population, and a relatively large state-legislature, in which neither party is overly dominant. Figure E.1 describes the results of the Californian State Legislature elections in 2004 and 2006. Panel E.1a plots kernel density estimates of voters’ preferences in 2004 and 2006 i.e. the kernel of the distribution of $\mu_{dt}$. We can see that the solid 2004 curve is to the right of the dashed 2006 curve. This represents a leftward move in the position of the average voter between the two elections. The prediction of the theory is that this move, given the Democrats had a majority in 2004 should have led the Republican party to move to the left.

The kernel density estimates of representatives positions for each party in Panel E.1b show that this is precisely what happens. The distribution of Democrats changes little – there is a slight move to the left, particularly in the left-wing of the party – but as predicted the Republican party moves markedly to the left. The nature of this move is revealed by looking at the histograms in panels E.1c and E.1d. We can see again that there are no pronounced changes in the Democratic representatives. The Republican representatives, however, tend to move closer to the centre – there is now more overlap with the Democrats and the main body of the party can be seen to be more centrist.\textsuperscript{33}

\textsuperscript{33}Notably, however there are a small number of comparatively extreme representatives. This highlights that districts and their representatives are extremely heterogeneous – the variation in the positions of Republicans is much larger than the distance between the two party means. This is why we pay close attention to our measures of the average voter, and party position.
Figure E.1: Californian State Legislature Elections 2004 and 2006

(a) Changes in Voter Positions

(b) Changes in Party Positions

(c) Representatives 2004

(d) Representatives 2006
Party Shifts and Median Voter Shifts

One concern is that there may be a correlation between the position of the median representative and the mean voter in the median district solely due to both variables being derived from the same underlying data. In the following we show that whilst the covariance is necessarily always weakly positive, it grows small rapidly as the number of districts in a state grows and may be disregarded.

We consider a state, in which there are two parties $L$ and $R$ with $L + R = N$ districts: $i \in \{1, ..., L, L + 1, ..., L + R\}$. Where $L$ and $R$ are both odd. Median Representative of $L$ is the $(L + 1)/2$ representative. And the Median Representative of $R$ is the $L + (R + 1)/2$ representative. The mean voter in the median district, because of the assumption that all districts are ranked in terms of their representatives is then then (a vote weighted) mean of $L$ and $L + 1$. Thus, assuming approximately equal vote shares the automatic correlation is given by the covariance between the $(L + 1)/2$ order statistic and the $L$ order statistic, or symmetrically, the $L + 1$ order statistic and the $L + (R + 1)/2$ order statistic.

Arnold et al. (2008) show that this covariance may be expressed approximately as series expansion in terms of powers of $\frac{1}{n^2}$, which thus converges to 0 as $n$ grows large. Thus, we need not be concerned about any mechanical correlation.