How Do Legislators Adapt to New Electorates? Evidence from Redistricting in Congress and U.S. State Legislatures

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Abstract

A central question about democracy is whether elected officials adapt to their constituents' preferences, yet existing research yields conflicting answers. This paper leverages redistricting in Congress and ninety-eight American state legislatures for the years 1990 to 2024 to systematically evaluate how incumbents adapt to changes in their electorate. Pairing a continuous-treatment difference-in-differences design with roll call- and interest group-based measures of ideology, I find that reelected incumbents adapt their ideological representation to their reapportioned districts, but this effect is only 15% the size of the change in representation that accompanies the replacement of an incumbent with a new legislator. Building a new dataset of legislators' home addresses, I instead find that incumbents' decisions to seek reelection are highly sensitive to the ideological composition of their presumptive electorate, and voters regularly replace remaining out-of-step incumbents. These findings imply that policy change in Congress and state legislatures is primarily facilitated by legislator replacement, rather than adaptation, matching the theoretical expectations of citizen-candidate models as opposed to models of Downsian convergence.

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1 Introduction

A central question about democracy is whether elected officials adapt to their electorate, yet existing research yields conflicting answers. For example, as their electorate changes, canonical models of electoral competition alternatively predict that incumbents will converge to their district's updated preferences (Black, 1958; Downs, 1957; Hotelling, 1929) or steadfastly maintain a fixed ideal point (Alesina, 1988; Besley and Coate, 1997; Osborne and Slivinski, 1996). Empirical work reaches a similar set of conflicting conclusions, with one strand of literature suggesting that politicians "die in their ideological boots" (Poole, 2007, pp. 1), while another reports that incumbents fluidly adapt to their electorate (Bertelli and Carson, 2011; Glazer and Robbins, 1985; Leveaux-Sharpe, 2001; Stratmann, 2000).

In this paper, I address this longstanding debate by exploiting a series of natural experiments produced by the decennial and court-initiated reapportionment of the U.S House, 1990-2024, and ninety-eight state legislatures, 2000-2024, and first studied by Glazer and Robbins (1985). Leveraging a continuous-treatment difference-in-differences design, I systematically evaluate how redistricting-initiated constituency change affects reelected incumbents' ideological representation, the representation of newly-elected legislators, and incumbents' probability of seeking and winning reelection.

To implement my study, I compile two datasets on redistricting-initiated constituency change. First, drawing on a massive geolocated precinct-level election dataset, I construct a standardized measure of the change in district partisan composition caused by redistricting. And second, I collect a comprehensive new dataset of incumbents' home addresses, allowing me to impute the districts that exiting legislators would plausibly have represented had they run for office. Combined with roll call- and interest-group-based scalings, my analysis constitutes the most comprehensive analysis to date of how individual legislators adapt to their electorate.

My findings reveal three important patterns. First, incumbents who are reelected following redistricting do adapt their representation to their new electorate, and these results hold

across multiple measures of representation. Second, however, this within-legislator adaptation effect is dwarfed by the change in representation that accompanies the replacement of an incumbent with a new legislator, even after accounting for the well-documented divergence in parties' ideological representation. And third, incumbents are highly strategic in their decision to run for reelection, and voters often replace remaining out-of-step incumbents.

The paper proceeds as follows: In section two, I review the relevant literature and motivate my focus on Congress and state legislatures. Section three outlines my empirical strategy, including my measures of constituency change and legislator ideology. In section four, I present the results of my analysis of roll call voting and constituency change. Next, in section five, I introduce a new dataset on legislators home addresses and present the results of an analysis of strategic retirement and electoral selection following constituency change. Section six summarizes and concludes.

2 Using Redistricting to Study Legislative Adaptation

This study builds upon a long-running literature examining the ideological positioning of incumbents in American elections following constituency change. In this section, I review previous theoretical and empirical work that evaluates how legislators adapt to their electorate and motivate my focus on Congress and state legislatures.

Despite widespread interest in the responsiveness of politicians to the preferences of their electorate, canonical models of electoral competition disagree on how legislators will respond to changes in their electorates' preferences. For example, Downsian logic predicts that electoral competition will force incumbents to tailor their ideological representation to their electorate or risk being thrown out of office (Black, 1958; Downs, 1957; Hotelling, 1929). Alternatively, "citizen-candidate" models suggest that legislators maintain fixed ideal points and are insensitive to changes in the composition of their electorate (Alesina, 1988; Besley and Coate, 1997; Osborne and Slivinski, 1996).

Empirical research mirrors these dissenting theoretical perspectives. Using a regression discontinuity design, Lee, Moretti, and Butler (2004) estimate the effect that an increase in electoral security produced by the incumbency advantage has on U.S. House members' roll call voting records for the years 1946-1995. The authors find that changes in electoral strength have no effect on legislators' subsequent roll call representation, and conclude that representatives are not constrained by the preferences of their electorate. Fowler and Hall (2017) extend these results through 2010 while further documenting the long-term consequences of election outcomes for roll call representation.

Another strand of literature leverages congressional redistricting to evaluate how reelected incumbents adapt to changes in the ideological composition of their electorate. Glazer and Robbins (1985), for example, study the 1980-82 redistricting cycle and find that reelected legislators fluidly adapt their roll call voting to their new electorates. Subsequent work by Bertelli and Carson (2011); Leveaux-Sharpe (2001); Stratmann (2000) replicate this design for redistricting cycles up to 2000-02, reporting similar results.

While these redistricting-based studies are foundational, they face three key limitations. First, it is challenging to interpret the magnitude of the within-legislator adaptation effects these studies identify. Without reference to some meaningful benchmark, it is not clear whether the within-legislator adaptation effects they report are meaningful. Second, because previous research has focused exclusively on legislators who were reelected following redistricting, they are unable to examine legislators who strategically retire and, hence, the resulting changes in representation. Since legislators who face larger changes in their constituency may be more likely to exit office, previous work may have systematically missed effects where the "treatment" is largest. And third, previous studies are limited in scope, generally studying a single redistricting cycle and focusing exclusively on redistricting in the U.S. House.

To address these gaps, I assemble the most comprehensive dataset on redistricting-initiated constituency change to date. This dataset includes redistricting in the U.S. House

for the years 1990-2024 and state legislatures for the years 2000-2024. I supplement this dataset with new data on the home addresses of members of Congress and state legislatures, allowing me to study legislators' decisions to seek reelection or exit office. By studying reelected and replaced incumbents, I am able to benchmark within-legislator adaptation effects. And by studying the House and state legislatures, I am able to provide the most comprehensive evidence to date on how legislators respond to changes in their constituency.

Having motivated the need for a comprehensive analysis of how legislators respond to changes in their constituency, I now transition to outlining my empirical design.

3 Empirical Strategy

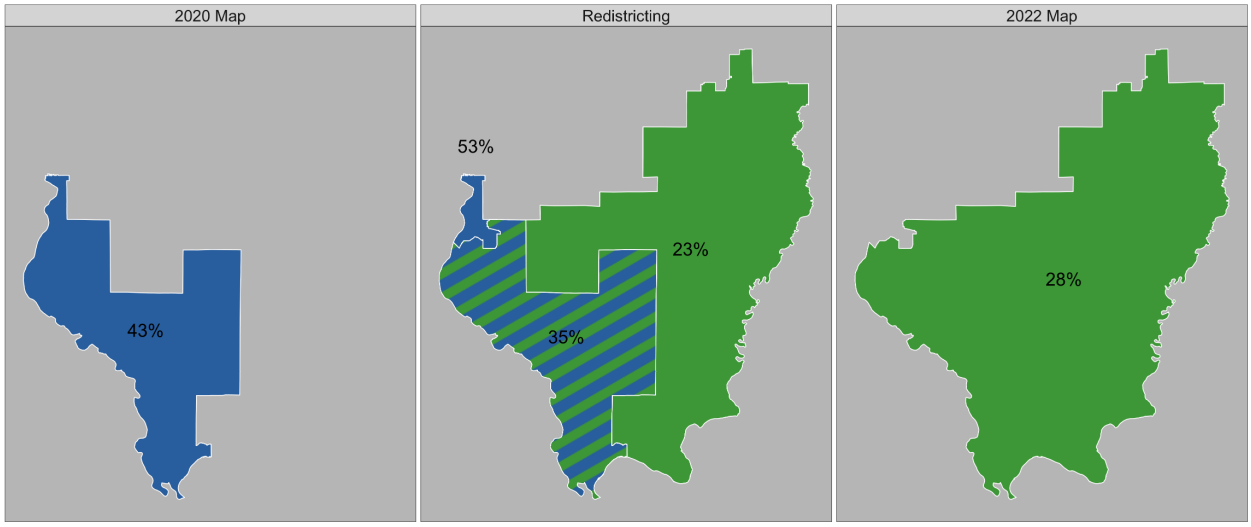
Evaluating how legislators respond to the changing preferences of their electorate is challenging because shifts in district composition are generally correlated with other district-level political and economic trends. I address this concern by leveraging a series of natural experiments induced by redistricting. By instantaneously altering the boundaries of districts, redistricting in the U.S. House and American state legislatures produces easily-measurable variation in the composition of incumbents' constituency.

3.1 Measuring District Partisanship

To exploit the natural experiment induced by redistricting, I require a measure of the change in legislators' constituency induced by redistricting. While the aggregated preferences of districts may vary along numerous dimensions, I focus on the partisan composition of a district as measured by the two-party presidential vote share because it is simultaneously easily measurable and readily visible to members of Congress following redistricting.[1] To isolate the instantaneous change in district partisanship induced by redistricting–and omit over-time and candidate-specific fluctuations in vote shares–I reallocate the two-party presidential vote

[1] Previous work notes that the presidential vote share can serve as a good measure of constituency preferences (Brady, Canes-Wrone, and Cogan, 2000; Jacobson, 2000).

Figure 1 – Example of Presidential Vote Share Composition Calculation. For each redistricting plan, presidential vote share is calculated by reallocating the precinct-level election returns from the same election to pre- and post-redistricting district boundaries. The figure below depicts this process for Illinois Representative Mike Bost during the 2022 decennial reapportionment. Democratic presidential vote shares in 2020 are reported in black, pre-redistricting boundaries are colored blue while post-redistricting boundaries are colored green.



from the presidential election before each redistricting cycle to both incumbents' pre- and post-reapportionment district boundaries.

Consider, for example, the calculation of presidential vote share for Illinois Representative Mike Bost depicted in Figure 1. The left facet of Figure 1 plots Bost's district before the 2022 decennial redistricting in blue, with the democratic candidate's (i.e., Joe Biden's) two-party vote share (43%) in 2020 reported in black. Again using the 2020 presidential election returns, the middle facet of Figure 1 shows that, following redistricting, Bost gained the Republican-heavy area plotted in solid green, maintained the area in striped green and blue, and lost the Democratic stronghold in solid blue. As the right facet of Figure 1 shows, following redistricting, the two-party democratic presidential vote share in Bost's district was 28%. The change in presidential vote share in Bost's district calculated *using the same 2020 presidential election returns* is thus 15 percentage points (43% - 28%).

For every set of district maps in my sample, I repeat the process described in Figure

1–reallocating the same presidential election returns to "old" and "new" district boundaries.[2] Because the process of obtaining and standardizing the geo-located election results necessary for this calculation is quite time consuming, I focus on congressional redistricting between the years 1990 and 2024 and redistricting in state legislatures for the years 2000 to 2024. My sample includes decennial reapportionment (i.e., in 1992, 2002, 2012, and 2022) and court-initiated redistricting. Table 1 reports the presidential election used for each redistricting cycle. Data on the 1988 presidential vote comes from various editions of *Politics in America*, the 2000 presidential vote was provided by Bertelli and Carson (2011), geo-located data for the 2008 election is from the Harvard Election Data Archive, and geo-located data for the 2020 election is from the U.S. Elections Project and supplemented by the author from the various secretaries of states' websites.[3] In total, my analysis dataset includes 501 sets of district maps.[4,5]

Using these district-level presidential vote shares, it is straightforward to calculate the change in district composition induced by redistricting for legislators who are reelected after redistricting. This is because we observe the district a given legislator represents both before and after redistricting and, hence, the composition of their two electorates. For cases where the incumbent legislator is not reelected after redistricting, a within-legislator comparison is not possible.[6] This is unfortunate, because legislative replacement is a potentially important source of change in representation.

[2]Throughout this paper, I exclude Nebraska's non-partisan state legislature from my analysis. As a result, my analysis sample is comprised of 98 state legislatures and the U.S. House.

[3]Geo-located data for a small number (11) of state legislatures were not available in 2010 and are excluded from my analysis.

[4]This number includes 182 congressional maps (4 decennial redistricting cycles $\times$ 43 states without at-large House districts plus 10 non-decennial maps) and 319 state legislative maps (3 decennial redistricting cycles $\times$ 98 legislative chambers plus 36 non-decennial maps minus 10 legislatures with missing data in 2010).

[5]As a robustness check, I also construct a measure of district partisanship for 2020 using a 100% sample of voter files from the commercial data vendor L2. Specifically, I geocode the address of every registered voter in the country as of August 2022 and allocate the same voters to pre- and post-reapportionment districts. Since party registration is imputed by L2 for the 31 states that do not report partisan affiliation, I prefer the presidential election vote measure of partisanship. However, my substantive results remain unchanged when using the voter file-based measure of partisanship for the most recent redistricting cycle.

[6]For example, it is not possible to directly compare the pre-redistricting district numbered A and represented by legislator X to the post-redistricting district numbered B and represented by legislator Y, because district B may have been relabeled or eliminated entirely following redistricting.

Table 1 – Presidential Vote Reference Years. This table reports the year of the presidential vote used to calculate district partisanship for each decennial redistricting cycle included in the analysis along with the data sources. I use the vote share from the most-recent prior presidential election in cases of court-initiated redistricting.

Redistricting Cycle	Presidential Vote Reference Year	Data Source(s)
1990	1988	*Politics in America 1990 & 1996.*
2000	2000	Bertelli & Carson (2011); Ansolabehere & Snyder (2011).
2010	2008	Harvard Election Data Archive.
2020	2020	U.S. Elections Project; various secretaries of states' websites.

To address this issue, from the subset of districts where the incumbent is not reelected, I construct pairs of matched pre- and post-redistricting districts that most closely represent the same legislative seat. Using census tract-level population data, I calculate the population-weighted overlap between the set of pre- and post-redistricting districts in a given state. I then record a given pair of districts as the same seat if both districts have the maximum overlap with the other relative to all other possible districts. The result is a unique pairing of pre- and post-redistricting districts for every set of maps in my sample.

For cases where an incumbent is reelected after redistricting, it is possible to validate this matching process. I find that this matching process correctly pairs the same districts as reelected incumbents ultimately represent more than 99% of the time. For the remainder of the paper, I define the unit of analysis to be the "seat." For reelected incumbents, the seat is the pairing of districts they represented, while for cases where the incumbent is replaced, the seat is the pairing of districts produced by the process described above.[7]

3.2 Measuring Legislator Ideology

Second, my design requires a measure of legislators' ideological representation before and after they are assigned new districts. A key methodological challenge is that reelected legis-

[7]Note, however, that my analysis is substantively identical if I use the overlap-based pairings for reelected incumbents in addition to replaced incumbents.

lators become aware of the treatment (i.e., the new set of district maps they will represent) before the start of the post-redistricting legislative session. In my sample of redistricting cycles, the final set of district maps were signed into law an average of 191 days before the start of the next legislative session. Given this fact, it is possible that incumbents–having observed the composition of their future electorate–may adapt their representation before they officially represent their new constituency (Boatright, 2004). Hence, measures of legislators' pre-redistricting ideological representation that include data from the period between the date new district maps are signed into law and the beginning of the next legislative session (henceforth the "interim period") may underestimate the degree of incumbents' ideological adaptation.[8]

To address these concerns about post-treatment bias, I construct a measure of legislators' ideological representation using roll call data, allowing me to precisely control which periods of legislators' representation are classified as pre- and post-redistricting. I begin by collecting the dates that all 501 redistricting plans in my sample became law.[9] I also assemble roll call data from Vote View and Legiscan.com for Congress and state legislatures, respectively. I then generate measures of candidates' roll call ideology using two standard scaling algorithms. First, I scale candidates using the Conservative Vote Probability (CVP) methodology from Fowler and Hall (2012). CVP scores measure the probability that a legislator will vote in the conservative direction on any given bill relative to the chamber's median legislator. These scalings run from -1 (most liberal) to 1 (most conservative) and have been previously employed in similar empirical settings (Fowler and Fu, 2023; Fowler and Hall, 2017, 2016). Second, I employ the literature-standard W-NOMINATE algorithm from Carroll et al. (2009) and Poole and Rosenthal (1985).[10] Since CVP scores are highly

[8]This is because, if incumbents adapt to their electorate during the interim period, that adaptation would make their pre-redistricting representation look closer to their post-redistricting adaptation.

[9]Roughly 65% of this data comes from All About Redistricting (`https://redistricting.lls.edu/`) and reports the institution that drew a given map (e.g., state legislature, courts, redistricting commission) and the date the map became law (typically the date a map was signed into law by the governor, decided by a court, or finalized by a redistricting commission). I collect data on the remaining 35% of maps from governmental and journalistic sources.

[10]Note that I do not study common-space NOMINATE or DW-NOMINATE scalings because the former

correlated with W-NOMINATE scalings, and CVP scores are easier to directly interpret than W-NOMINATE scalings, I focus my analysis of CVP scores. I show in the appendix that my results are substantively identical when using W-NOMINATE scalings.

For both the CVP and W-NOMINATE scaling methods, I generate two measures of candidates' roll call ideology. The first scaling uses all roll call votes from the session before redistricting to scale legislators in office pre-redistricting, and all roll call votes from the session after redistricting to scale legislators in office post-redistricting. Since, as outlined above, this approach may mask ideological adaption during the interim period, I construct a second scaling where I use only legislators' roll call voting before the new district maps became law to scale pre-redistricting legislators, and only their roll call voting after the new district maps became law to scale post-redistricting legislators.

For analyses of reelected incumbents, I use the second scaling, while I employ the first scaling for analyses of replaced legislators. These two roll call-based scalings, however, are highly highly corrected ($r = .97$), and all results are qualitatively identical and quantitatively similar when I use the first set of scalings for all candidates.

While W-NOMINATE and CVP-based scalings are popular, they require a number of important technical assumptions. Most importantly, previous work demonstrates that changes in the underlying agenda of legislatures may limit comparisons of roll call-based ideology scalings over time (Bateman, Clinton, and Lapinski, 2017; Handan-Nader, 2023; Tausanovitch and Warshaw, 2017). To relax these assumptions, I collect more than 70,000 ratings by special interest groups from Project Vote Smart and supplemented by data from the various groups' websites. By selecting a subset of bills and scoring legislators based on their votes on these bills, special interest groups help bridge legislators' ideology across legislative ses-

are static over a legislator's career while the latter are constrained to evolve linearly (or according to some other smooth function) over a legislator's career. The Nokken-Poole period-specific NOMINATE scaling takes a hybrid approach, first estimating roll call locations via a constant ideal point model to estimate session-specific legislator ideal points. Unfortunately, Nokken-Poole period-specific NOMINATE scalings are not readily available for state legislatures. My results are, however, substantively identical when using Nokken-Poole period-specific NOMINATE scalings for Congress throughout this paper.

sions.[11] Previous research suggests that interest groups carefully select the bills they include in their ratings with an eye towards continuity over time (e.g., Fowler, 1982). The downside of interest group ratings for my design is that legislators' ratings–which are typically chunked by legislative session by interest groups–may include votes cast during the interim period in legislators' pre-redistricting ratings. However, since my roll call-based results are highly similar regardless of whether I account for interim adaptation effects, concerns about interim adaptation are likely outweighed by the value of the consistent legislative agenda that interest group ratings provide.

Since the polarity of interest groups' ratings are set relative to their agenda, rather than according to partisanship (as is the case for CVP and W-NOMINATE), movement along raw interest group ratings is inherently ideologically ambiguous. I implement two complementary methods to fix the polarity of these ratings. In the first method, I calculate the average rating that every interest group assigns to Democratic and Republican candidates. When the average rating for Democrats (Republicans) is at least two times greater than the average rating for Republicans (Democrats), I label that interest group as liberal (conservative).[12] The advantage of this method is I am able to study roughly 81% of all ratings in my sample, but the downside is some interest groups I classify as liberal or conservative may not be explicitly ideological interest groups. My second method addresses this concern by focusing on interest groups that Project Vote Smart identifies as primarily ideological and further classifies as either "Liberal" or "Conservative." Drawing on these sets of interest group classifications, I construct two polarity-adjusted ratings using the rule

$$Interest\ Group\ Rating_{igt} = \begin{cases} 100 - RawRating_{igt} & \text{if } g \text{ is labeled Liberal} \\ RawRating_g & \text{if } g \text{ is labeled Conservative,} \end{cases}$$

[11] Interest group ratings have been previously used to measure state legislators' ideology in Fouirnaies and Hall (2022).

[12] To ensure I am making meaningful comparisons, I omit interest groups where the inter-party rating differential is less than this threshold. The results are robust to a variety of cutoff values.

where $RawRating_{igt}$ is the unadjusted rating assigned by interest group d to legislator i in session t. Hence, $Interest\ Group\ Rating_{igt}$ runs from 0 (most liberal) to 100 (most conservative) for every interest group.[13]

4 Replacement Effects Dominate Adaptation Effects Following Constituency Change

In this section, I use my data on district partisan composition and legislator ideology to evaluate whether incumbents adapt their representation to match their new electorate. My analysis in this section focuses on roll call- and interest group-based measures of legislator representation.

4.1 Roll Call Evidence

I begin by analyzing the roll call outcomes employed in previous studies. To estimate the effect of constituency change on legislators' ideological representation, I adopt a within-district continuous-treatment difference-in-differences design, where "treatment" is defined by the change in district partisan composition induced by redistricting. Specifically, I estimate OLS regressions of the form

$$Ideology_{swt} = \beta PresVoteShare_{swt} + \alpha_{sw} + \delta_t + \varepsilon_{swt}, \tag{1}$$

[13]Interest groups' ratings may not be immediately comparable across time due to shifts and stretches in scales (Groseclose, Levitt, and Snyder, 1999). For example, an interest groups' rating may shift by 25 points for all members in a given year, or the distance between ratings may stretch by a common factor. By including interest group-by-session fixed effects, my design differences out shifts in scales. Unfortunately, fixed effects will not address concerns about stretched scales, although changes of this nature should be small over the two-period comparisons I examine. As a robustness check, in Appendix Table A.1, I replicate my main analysis after applying the correction procedure outlined by Groseclose, Levitt, and Snyder (1999). My results are substantively identical. Because the Groseclose, Levitt, and Snyder correction constrains the way legislators' ratings change across time, I prefer the unadjusted ratings, matching Canes-Wrone, Brady, and Cogan (2002).

where $Ideology_{swt}$ is a measure of ideology for the legislator representing seat s in redistricting cycle $w \in \{2000, 2010, 2020\}$ (referred to as *Redistricting* in regression tables for brevity) in legislative session $t \in \{before, after\}$. $PresVoteShare_{swt}$ is the presidential vote share (either for the Democratic presidential candidate or for the copartisan presidential candidate of the incumbent in district s) in district d in session t in redistricting cycle w.[14] The term α_{sw} represents district-redistricting cycle fixed effects and δ_t is a redistricting cycle fixed effect. In short, this design leverages within-seat comparisons of ideology before and after redistricting.

Before presenting the estimates, it is important to outline potential threats to my identification strategy. In many states, redistricting is a highly-strategic process, with the majority seeking to draw the most favorable maps possible for their party. Although these tendencies–or gerrymandering–are non-random, they do not generally threaten my estimates. By including legislator fixed effects, I difference out all static idiosyncratic factors specific to each legislator that affects their roll call voting. My design does, however, require that changes in legislators' electorates are independent of trends (existent or anticipated) in their voting records. For example, a scenario in which legislators whose voting records are trending in a conservative direction are targeted for redistricting would violate my identification assumption. In Table A.3, I test whether the effects I identify vary depending on whether partisan or non-partisan actors drew the new district maps. The results are highly similar.

Further, while concerns with binary-treatment two-way fixed effect (TWFE) models are well-documented, recent methodological work suggests that the traditional linear TWFE specification reported above can be difficult to interpret when treatment is continuous (Callaway, Goodman-Bacon, and Sant'Anna, 2024). Unlike binary-treatment TWFE specifications, continuous-treatment TWFE models may suffer from negative weighting problems even when there are only two time periods. To address this concern, I show that my results are robust to a non-parametric estimate of these effects as well.

[14]Note that, as described in Section 3.1, I use the term "seat" to denote a pair of matched pre- and post-redistricting districts.

Table 2 – Effect of Constituency Change on Roll Call Voting. Reelected legislators whose districts become more liberal (conservative) vote more liberally (conservatively) in the subsequent legislative session, but this effect is small in comparison to the change in roll call representation when the incumbent is replaced.

	Reelected Legislators		Replaced Legislators	
	Congress	State Leg.	Congress	State Leg.
Democratic Pres. Vote Share	-0.05	-0.07	-0.45	-0.56
	(0.02)	(0.02)	(0.10)	(0.25)
Democrat			-0.49	-0.60
			(0.01)	(0.02)
N	2,594	9,057	616	1,474
Seat-Redistricting FEs	Y	Y	Y	Y
Chamber-Redistricting-Session FEs	Y	Y	Y	Y

Note: Robust standard errors are clustered by seat-redistricting in parentheses. In all columns, the outcome is a legislator's CVP scaling and is scaled to run from -1 (most liberal) to 1 (most conservative) in each chamber. The unit of analysis is the seat-redistricting-session. Sample restrictions in headers indicate whether the same legisaltor was in office before and after redistricting (columns one and two), or a different legislator was elected following redistricting (columns three and four). In columns one and two, seat-redistricting fixed effects are equivalent to legislator-redistricting fixed effects.

Table 2 presents my estimates of the effect of constituency change on legislators' roll call representation. The outcome in all columns is a legislator's CVP; as discussed previously, this scaling measures the probability that a legislator will vote in the conservative direction on any given bill relative to the chamber median. First, in columns one and two, I restrict my sample to seats where the incumbent legislator is reelected after redistricting. As a result, these columns evaluate whether individual legislators adapt to changes in the partisan composition of their constituency. I find precise evidence that members of Congress and state legislators adapt their representation in the theorized direction. The negative sign on the coefficients on *Democratic Pres. Vote Share* in columns one and two indicates that, as an incumbent's electorate becomes more Democratic (Republican), they vote more liberally (conservatively) in office. Specifically, for a 10 percentage point increase in Democratic composition of a district, I estimate that an incumbent legislator will be .5 and .7 percentage points more likely to cast a liberal roll call vote relative to their chamber median in Congress and state legislatures, respectively.

Columns one and two of Table 2 indicate that individual legislators adapt their repre-

sentation in response to shifts in the partisan composition of their electorate. In addition to within-legislator adaptation, shifts in the composition of an electorate may also affect roll call representation through the replacement of sitting incumbents with new legislators. Columns three and four of Table 2 probe this possibility by focusing on seats where the incumbent was replaced with a new legislator following redistricting. In addition to *Democratic Pres. Vote Share*, my specification includes an indicator for whether the incumbent was a Democrat in order to account for the possibility that, on average, Democrats and Republicans represent the same district with different levels of roll call conservatism.

Looking at the results, the coefficients on *Democrat* are negative and significant, indicating that, on average, Democratic legislators represent the same constituency with more liberal roll call voting than Republicans. Specifically, Democratic members of Congress and state legislators are 49 and 60 percentage points more likely to cast a liberal roll call vote than their Republican counterparts, respectively. This finding matches previous work documenting divergence in the ideological representation of each party (Lee, Moretti, and Butler, 2004; Fowler and Hall, 2016). More directly relevant for my study are the coefficients on *Democratic Pres. Vote Share*, which capture the change in roll call representation that accompanies constituency change, after accounting for the different representation provided by Democratic and Republican legislators. The coefficients are -.45 and -.56 in Congress and state legislatures, respectively. These estimates imply that, if a seat became 10 percentage points more liberal, the succeeding legislator would be 4.5 and 5.6 percentage points more likely to vote in the liberal direction.

By comparing estimates across the two sets of columns, we can evaluate the extent to which changes in representation following constituency change are driven by within-legislator adaptation and between-legislator replacement. For Congress, the within-legislator adaptation effect is 11% of the between-legislator adaptation effect ($-.05/-.45 \approx .11$). For state legislatures, the within-legislator adaption effect is 13% of the between-legislator adaptation effect ($-.07/.-.56 = 125$).

In sum, the evidence presented so far suggests that, while incumbents adapt their roll call representation in the direction of their new electorate, these effects are dwarfed by the change in representation accompanying the replacement of the sitting incumbent.

4.2 Evidence from Interest Group Ratings

As noted above, due to changing legislative agendas, raw roll call measures of legislator ideology may not be well-tooled to measure legislator ideology across legislative sessions. To address this concern, in this subsection I use interest group ratings to help obtain estimates of legislator ideology that are comparable across time. Previous research suggests that interest groups carefully select the bills they include in their ratings with an eye towards continuity over time (e.g., Fowler, 1982).

To evaluate incumbents' ideological positioning following redistricting, I reshape my data such that the unit of observation is an individual rating given by group g to legislator i serving in session t during redistricting cycle w. I then estimate OLS equations of the form

$$InterestGroupRating_{giwt} = \beta PresPartyVoteShare_{iwt} + \alpha_{giw} + \gamma_{gcwt} + \varepsilon_{giwt}, \qquad (2)$$

where $InterestGroupRating_{giwt}$ is the polarity-adjusted rating given by group g to incumbent i in redistricting cycle w and session t. $PresPartyVoteShare_{iwt}$ is the vote share for candidate i's copartisan presidential candidate in the election directly preceding redistricting in wave w and session t. The term α_{giw} is a fixed effect for each interest group-legislator-redistricting cycle and γ_{gcwt} is a fixed effect for each interest group-chamber-redistricting cycle-time. In short, this design makes within-interest group comparisons of an incumbent's ideology over time, after accounting for each interest groups' average ratings of their peers in the same chamber.

Table 3 reports my estimates of Equation 2. For brevity, I pool data on Congress and state legislatures, although the results are substantively similar when disaggregated by office.

Table 3 – Effect of Constituency Change on Interest Group Ratings. Reelected legislators whose districts become more liberal (conservative) receive more liberal (conservative) interest group ratings in the subsequent legislative session, but this effect is small in comparison to changes in representation stemming from legislative replacement.

	Reelected Legislators		Replaced Legislators	
	All SIGs	Ideological SIGs	All SIGs	Ideological SIGs
Dem. Pres. Vote Share	-8.34	-4.21	-27.44	-62.34
	(2.35)	(2.70)	(9.38)	(12.23)
Democrat			-56.24	-55.61
			(1.41)	(1.41)
N	141,042	38,691	24,974	7,394
Seat-Redistricting FEs	Y	Y	Y	Y
Chamber-Redistricting-Session FEs	Y	Y	Y	Y

Note: Robust standard errors are clustered by seat-redistricting in parentheses. In all columns, the outcome is a legislator's interest group rating and is scaled to run from 0 (most liberal) to 100 (most conservative). The unit of analysis is the group-seat-redistricting-session. Sample restrictions in headers indicate whether the same legisaltor was in office before and after redistricting (column 1), or a different legislator of either the same (column 2) or opposite party (column 3) was elected following redistricting.

In columns one and three, I include all available interest group ratings while columns two and four are restricted to ideological interest groups. Overall, the results when using interest group ratings are highly similar to the roll call-based results reported in Table 2.

Focusing on legislators who were reelected following redistricting in columns one and two, I find that incumbents whose districts become more Democratic (Republican) receive more liberal (conservative) interest group ratings following redistricting. These results hold when using ratings from all interest groups (column one) and only ideological interest groups (column two). Next, the third and fourth columns of Table 2 examine how representation changes when the incumbent is replaced following redistricting. For both sets of interest group ratings, I again find large negative coefficients on *Democratic Pres. Vote Share*, indicating that seats that become more Democratic receive more liberal representation following redistricting. I also find evidence of a large and meaningful divergence in ideological representation between Democrats and Republicans as evidenced by the coefficients on *Democrat*.

Finally, by comparing the estimates in columns one and two with columns three and four, we can evaluate whether within-legislator adaptation or between-legislator replacement

effects are larger. When using all interest groups to scale candidates, I find that within-legislator adaptation is 30.6% the size of the effect of replacing the incumbent with a new legislator, after controlling for party divergence. When restricting the analysis to ideological interest groups, that share becomes a substantially smaller at 5.9%.

Taken together, the evidence presented in this section suggests that, while legislators may respond to constituency changes by modifying their representation in small amounts, this effect is substantively small. However, the analysis so far has not incorporated incumbents' decisions to seek reelection and their reelection rate. I turn to evaluating this pathway in the next section.

5 Strategic Retirement and Electoral Selection

So far, my analysis has focused on the relative size of within-legislator adaptation effects and between-legislator substitution effects. The results indicate that changes in representation following constituency change are typically largest when the incumbent is replaced, rather than when individual legislators adapt to their new electorate. While the decision to re-elect or replace legislators is clearly consequential for electorates' ideological representation, it is unclear how constituency change affects legislators' decisions to seek reelection and, conditional on running, whether they win reelection.

A rich literature dating back to Jacobson and Kernell (1981) predicts that incumbents' decisions to seek reelection are strategically related to their electoral prospects. However, direct empirical evidence on strategic retirement due to changes in electoral prospects is sparse. Studying aggregate-level data, Jacobson and Kernell (1981) find that parties' retirement rates are negatively correlated with the swing in their national congressional vote share. Subsequent work using individual level data finds evidence of strategic retirement as incumbents' electoral prospects decline, although these studies are unable to rule out alternate causal pathways (Stone et al., 2010; Highton, 2017). Groseclose and Krehbiel's (1994)

analysis of strategic retirement following the House banking scandal provides the most direct evidence on this question by including a control for the variation in constituency caused by congressional redistricting in 1992. However, since their analysis focuses on the absolute value of the change in district partisanship, they are unable to differentiate favorable and unfavorable shifts in district partisan composition. In short, while previous work suggests that incumbents' electoral prospects shape their decisions to seek reelection, to the best of my knowledge, there is no definitive evidence of such an effect.

Drawing on a new dataset of legislators' home addresses and my difference-in-differences design, in this section I evaluate how changes in legislators' electoral prospects affect their probability of seeking reelection and, conditional on running, whether they win reelection.

5.1 Observing Counterfactual Electorates Using Legislators' Home Addresses

The key challenge for studying legislator replacement following reapportionment is that, for legislators who choose to retire or seek higher office, the counterfactual district in which they would have run is unobservable. For example, if a legislator who was in office before redistricting chooses not to run in the election following redistricting, with traditional data sources we are unable to identify the new district in which the legislator would have run. This is particularly problematic because the results presented in the previous section suggest that legislators' reelection decisions significantly shape districts' ultimate ideological representation.

To address this gap, I leverage the unique set of residency requirements in place for all ninety-eight state legislative chambers included in my sample. Unlike members of Congress who face no formal residency requirements, all fifty states require state legislative candidates to reside in the district they would potentially represent. While the length of these requirements vary widely, they all generally rule out the possibility of state legislators strate-

gically selecting new districts to represent following redistricting.[15] Hence, in almost every case, a state legislator's home address determines the post-redistricting district they would represent. While the strict conditions that limit strategic district selection do not hold in Congress, I include members of the U.S. House in the following results for reference.

This design requires data on the home addresses of legislators. I implement a three-part strategy to identify the home addresses of state legislators and members of Congress.

First, my preferred source on legislator addresses are the official voter registration files for all fifty states.[16] Using the R package *reclin2*, I built a machine learning algorithm that probabilistically matches the candidates from my elections returns dataset[17] to the appropriate state's voter file. To minimize the possibility of false matches, I block on state, last name, and district (i.e., state house, state senate, or U.S. House district) and drop matches with less than a 95% match probability.

Second, for cases where I cannot confidently match a legislator to the voter file, I use the addresses collected by the commercial data vendor Know Who. Finally, for legislators who are not included in the Know Who data, I obtain legislators' addresses from the FEC (for members of Congress) and secretary of states' disclosure forms (for state legislators). I prefer the voter file addresses because in some cases (particularly for members of Congress) the Know Who data and state campaign finance data sources report addresses for legislators' campaign offices instead of homes.

Using this dataset of legislator addresses, I impute the districts in which retiring legislators would have run had they decided to pursue office again. The final step is to merge the appropriate presidential election returns into the imputed district.

In this section, I focus on two outcomes: whether a legislator ran for reelection and

[15]The logic is as follows. By requiring legislative candidates to reside in the districts they would represent, state legislative candidates generally cannot move and establish residency in a new district in time for the next election. One potential exception is that incumbents may strategically retire early from their "old" district in order to establish residency in a "new" district. However, the length of the residency requirements rule out this possibility in all but small number of state legislatures.

[16]Voter file data are from the commercial data vendor L2.

[17]When missing from official election returns, data on candidates' middle names were supplemented by their Wikipedia page wherever possible.

Table 4 – Effect of Constituency Change on Incumbents' Retirement and Win Probabilities. Legislators whose districts become less friendly are less likely to win reelection, run for office, and win conditional on running for office.

	$Pr(Reelected_{t+1})$		$Pr(Run_{t+1})$		$Pr(Reelected_{t+1}\|Run_{t+1})$	
	Congress	State Leg.	Congress	State Leg.	Congress	State Leg.
Δ Party Pres. Vote Share	0.93	0.87	0.63	0.59	0.45	0.49
	(0.26)	(0.15)	(0.23)	(0.15)	(0.20)	(0.12)
N	1,105	3,916	1,105	3,916	951	2,681
Chamber-Redistricting FEs	Y	Y	Y	Y	Y	Y

Note: Robust standard errors are clustered by legislator in parentheses. Data are at the legislator-wave level. Δ *Party Pres. Vote Share* is the change in a candidate's copartisan presidential vote share induced by redistricting between election t and $t+1$. *Party Pres. Vote Share*$_{t+1}$ is imputed using legislators' home addresses for legislators who do not seek reelection in time $t+1$.

whether they won reelection following redistricting in their original chamber.

5.2 Formal Estimates of Strategic Retirement and Electoral Selection Following Redistricting

The specification I employ in this section is as follows

$$ElectionOutcome_{iw,t+1} = \beta[PresPartyVS_{iw,t+1} - PresPartyVS_{iw,t}] + \delta_s + \varepsilon_{iwt}, \qquad (3)$$

where $ElectionOutcome_{iw,t+1}$ is an indicator for whether legislator i either ran for office or won office in $t+1$ (i.e., the "after" period) during redistricting cycle w. The term $[PresPartyVS_{iw,t+1} - PresPartyVS_{iw,t}]$ measures the change in the two-party vote share that candidate i's copartisan presidential candidate received between the district maps in session t and $t+1$. Finally, δ_{cw} is a chamber-by-redistricting fixed effect. Intuitively, this design makes within-chamber-redistricting cycle comparisons of probabilities of running and winning following constituency change.

My estimates of Equation 3 are reported in Table 4. I begin in the first two columns by considering the probability that a legislator wins reelection in the election cycle directly following redistricting. In state legislatures (where the residency requirement is binding), I

find large and relatively precise effects of constituency change on reelection rates. Specifically, if a state legislator's district becomes 10 percentage points less friendly, I estimate that their probability of winning reelection in either legislative chamber declines by 10.9 points–that is, a more than one-for-one decline in reelection probability. For members of Congress, the effect is a slightly-smaller 7.5 point decline in win probability for every 10 percentage point decline in copartisan presidential vote share among their potential electorate.

The effects identified in columns one and two, however, mask two underlying mechanisms. First, facing a new and less-friendly constituency, legislators may choose to not run for office at all. Incumbents are commonly thought to be highly strategic when making their reelection decisions (e.g., Jacobson and Kernell, 1981), so this mechanism seems likely to be at play following redistricting. Second, conditional on running for office, legislators may fail to win reelection because they are voted out of office by their new constituency. Given the high rates of straight-ticket voting, this possibility also seems quite likely.

The third and fourth columns of Table 3 investigate the first possibility. For state legislators, I find a substantively large effect of constituency change on legislators' retirement decisions. For every 10 points a legislator's potential new district becomes less friendly, I estimate their probability of running for office declines by 7.9 points. For members of Congress, this effect is smaller, or about 4.8 points for every 10 percentage points change in district composition.[18]

Finally, in columns five and six of Table 3, I consider whether voters systematically evict remaining legislators who have lost electoral support. To do so, I restrict my dataset to legislators who choose to run for reelection following redistricting. My estimate for state legislators in column six indicates that, for every 10 percentage points an incumbent's district becomes less friendly, their probably of winning reelection conditional on running declines by 5.2 points. This effect is substantially smaller than the overall effect of constituency change on win probability, indicating that legislators retain an incumbency advantage, but

[18]That the effect for Congress is comparatively small suggests that, facing a large shift in district composition, members of Congress search for new districts (i.e., districts in which they do not reside).

are nevertheless removed from office by their new electorate it becomes less friendly.

Overall, the evidence presented in this section suggests that an important piece of the picture has been missing in previous analyses of redistricting and responsiveness. A key way legislators respond to a constituency change is by retiring, and voters often systematically evict remaining incumbents.

6 Discussion

That legislators represent the preferences of their constituency is a cornerstone of democracy. However, due to data and design limitations, how policy comes to represent constituents' preferences is unclear. Previous work suggests that, as an electorate's preferences change, legislators will maintain a fixed ideal point or adapt to the median vote. Combining the decennial reapportionment of incumbents' districts with data on legislators' roll call- and interest group-based ideology and their home addresses, this paper systematically examines how incumbents adapt to their constituency in the 1990s, 2000s, 2010s, and 2020s.

My evidence suggests that, while legislators may moderately adjust their ideology in response to a change in constituency, this effect is quantitatively small and is dwarfed by the effect of electing a new representative, even within party. Hence, my analysis suggests that a key part of the picture that has been missing from previous research on redistricting-initiated constituency change is legislator replacement. When constituencies change, the vast majority of the change in representation flows through the replacement of incumbents with new legislators, rather than within-incumbent adaptation.

These results are not a fluke of a single redistricting cycle or set of district maps. By studying redistricting in Congress for the past four decades and redistricting in ninety-eight state legislatures over the past three decades, my analysis provides a systematic evaluation of how legislators across time and levels of government adapt to changes in their constituency.

At a broader level, this paper also contributes to the long-standing debate over whether

incumbent legislators are Downsian entrepreneurs (Downs, 1957; Hotelling, 1929; Black, 1958) or steadfast ideologues (Osborne and Slivinski, 1996; Besley and Coate, 1997; Alesina, 1988). While the Downsian paradigm marshals powerful insights in other electoral contexts, my paper suggests that–even when presented the opportunity to adapt–incumbents' ideology is best understood as static.

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A.1 Analyses Using Alternative Scaling Methods

In this section I consider two complications that arise when making inter-temporal comparisons of legislators' ideology. First, I review concerns about shift and stretch effects in ideological scalings (Groseclose, Levitt, and Snyder, 1999). Second, I consider the potential for post-treatment bias resulting from the fact that legislators typically become aware of their new district boundaries before the start of the post-redistricting legislative session.

Finally, while I prefer CVP scores for their ease of interpretation, I show that my results are highly similar when using the literature-standard W-NOMINATE algorithm to scale candidates (Carroll et al., 2009; Poole and Rosenthal, 1985).

A.1.1 Accounting for Stretch and Shrink Factors

Groseclose, Levitt, and Snyder (1999) show that, since legislators vote on a changing set of bills across sessions, roll call-based ideological scalings may not be immediately comparable across time due to shifts and stretches in scales. For example, an interest groups' rating may shift by 25 points for all members in a given year, or the distance between ratings may stretch by a common factor. By including interest group-by-session fixed effects, my design differences out shifts in scales. Unfortunately, fixed effects will not address concerns about stretched scales, although changes of this nature should be small over the two-period comparisons I examine.

As a robustness check, Appendix Table A.1 replicates my main analyses after applying the correction procedure outlined by Groseclose, Levitt, and Snyder (1999). My results are substantively identical. Because the Groseclose, Levitt, and Snyder correction constrains the way legislators' ratings change across time, I prefer the unadjusted ratings, matching Canes-Wrone, Brady, and Cogan (2002).

Table A.1 – Effect of Constituency Change on Groseclose, Levitt, and Snyder-Adjusted Interest Group Ratings. Reelected legislators whose districts become more liberal (conservative) receive more liberal (conservative) interest group ratings in the subsequent legislative session, but this effect is small in comparison to changes in representation stemming from legislative replacement.

	Reelected Legislators		Replaced Legislators	
	All SIGs	Ideological SIGs	All SIGs	Ideological SIGs
Dem Pres. Vote Share	-7.89	-6.00	-27.40	-43.08
	(2.11)	(2.19)	(8.63)	(9.49)
Democrat			-51.80	-48.33
			(1.26)	(1.17)
N	140,978	38,675	24,968	7,392
Seat-Redistricting FEs	Y	Y	Y	Y
Chamber-Redistricting-Session FEs	Y	Y	Y	Y

Note: Robust standard errors are clustered by seat-redistricting in parentheses. In all columns, the outcome is a legislator's interest group rating and is scaled to run from 0 (most liberal) to 100 (most conservative). The unit of analysis is the group-seat-redistricting-session. Sample restrictions in headers indicate whether the same legisaltor was in office before and after redistricting (column 1), or a different legislator of either the same (column 2) or opposite party (column 3) was elected following redistricting.

A.1.2 Addressing Post-Treatment Anticipatory Effects

As discussed in the main text, a key methodological challenge when comparing legislators' roll call representation before and after redistricting is that reelected legislators become aware of the treatment (i.e., the new set of district maps they will represent) before the start of the post-redistricting legislative session. In my sample of redistricting cycles, the final set of district maps were signed into law an average of 191 days before the start of the next legislative session. If incumbents adapt to their electorate after their new districts are announced before the start of the post-redistricting session but, a naive comparison of representation in pre- and post-redistricting legislative sessions may underestimate the degree of incumbents' ideological adaptation.

In the main text, I accounted for this possibility by measuring incumbents' ideological representation relative to the date their new districts were announced. In Table XXX below, I replicate Table 2 but employ the naive measure of incumbents' representation that uses legislative sessions (rather than the date district maps became law) to distinguish pre- and

post-redistricting representation.[19]

A.1.3 Results Using W-NOMINATE Scalings

Table A.2 replicates Table 2 using W-NOMINATE scalings. My conclusions remain unchanged.

Table A.2 – Effect of Constituency Change on Roll Call Voting. Reelected legislators whose districts become more liberal (conservative) vote more liberally (conservatively) in the subsequent legislative session, but this effect is small in comparison to the change in roll call representation when the incumbent is replaced.

	Reelected Legislators		Replaced Legislators	
	Congress	State Leg.	Congress	State Leg.
Democratic Pres. Vote Share	-0.19	-0.20	-1.31	-0.99
	(0.08)	(0.07)	(0.25)	(0.46)
Democrat			-0.88	-1.23
			(0.02)	(0.03)
N	1,978	6,926	616	2,662
Seat-Redistricting FEs	Y	Y	Y	Y
Chamber-Redistricting-Session FEs	Y	Y	Y	Y

Note: Robust standard errors are clustered by seat-redistricting in parentheses. In all columns, the outcome is a legislator's *W-NOMINATE* scaling and is scaled to run from -1 (most liberal) to 1 (most conservative) in each chamber. The unit of analysis is the seat-redistricting-session. Sample restrictions in headers indicate whether the same legisaltor was in office before and after redistricting (columns one and two), or a different legislator was elected following redistricting (columns three and four). In columns one and two, seat-redistricting fixed effects are equivalent to legislator-redistricting fixed effects.

[19] I am still in the process of generating these scalings. I will update this draft when they are finished running on Sherlock.

A.2 Variation in Ideological Responsiveness

Table A.3 – Effect of Constituency Change on Roll Call Voting. Reelected legislators whose districts become more liberal (conservative) vote more liberally (conservatively) in the subsequent legislative session, but this effect is small in comparison to the change in roll call representation when the incumbent is replaced.

	Reelected Legislators			Replaced Legislators	
Dem. Pres. Vote Share	-0.09	-0.10	-0.11	-0.48	-0.30
	(0.05)	(0.02)	(0.03)	(0.18)	(0.12)
Democrat				-0.58	-0.57
				(0.01)	(0.01)
Dem Pres. Vote Share · Politican Drawn	0.01			0.40	
	(0.07)			(0.26)	
Dem Pres. Vote Share · Competitive Dist.		-0.01			0.06
		(0.01)			(0.07)
Dem Pres. Vote Share · Seniority			0.00		
			(0.00)		
Seniority			-0.00		
			(0.00)		
Competitive Dist.		0.00			-0.02
		(0.01)			(0.03)
N	8,861	10,437	10,437	1,940	2,262
Seat-Redistricting FEs	Y	Y	Y	Y	Y
Chamber-Redistricting-Session FEs	Y	Y	Y	Y	Y

Note: Robust standard errors are clustered by seat-redistricting in parentheses. In all columns, the outcome is a legislator's CVP scaling and is scaled to run from -1 (most liberal) to 1 (most conservative) in each chamber. The unit of analysis is the seat-redistricting-session. Sample restrictions in headers indicate whether the same legisaltor was in office before and after redistricting (columns one and two), or a different legislator was elected following redistricting (columns three and four). In columns one and two, seat-redistricting fixed effects are equivalent to legislator-redistricting fixed effects.