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Research

Politics driving efforts to reduce biodiversity conservation in the United States

Gwenole Le Velly[1], *Philippe Delacote*[2,3], *Rachel E. Golden Kroner*[4,5,6], *Derya Keles*[2] and *Alexander Pfaff*[7]

ABSTRACT. Despite global calls to raise protection for nature, efforts proliferate to reduce the extent of, and restrictions in, protected areas (PAs) via legal changes to downgrade, downsize, or degazette PAs (PADDD). Protected area downgrading, downsizing, and degazettement studies have considered the tropics, despite significant data and relevance for the Global North, and focused on fixed proxies for economic opportunity cost. Given important political dynamics, we focus instead on the U.S. and shifts in political representation. We examine 2001–2018 federal PADDD events in the U.S., using panel data to control for all fixed factors. We study how elections that shift representatives and senators affect U.S. PADDD. Indeed, shifts at district, state, and national levels appear to influence PADDD. Specifically, shifts that put Republicans into office raised risks for PADDD events, especially proposals. Our empirical results highlight shifts in political power as an ongoing challenge to conservation, even after the establishment of protected areas.

Key Words: *conservation policy; elections; political economy; protected areas; United States*

INTRODUCTION

Nature and all who depend upon it are facing overlapping biodiversity and climate crises (Pachauri et al. 2014, Brondizio et al. 2019). Interest in environmental protection has increased, in response, as have actions by state and non-state actors. Protected areas (PAs) are a leading conservation response, mostly by governments. Well-designed and managed PAs can safeguard biodiversity (Gray et al. 2016) and contribute to climate mitigation (Duncanson et al. 2023). Protected areas do not always reduce economic pressures (Ferraro et al. 2013, Geldmann et al. 2013, Robalino et al. 2017, Shah et al. 2021), but they remain a conservation cornerstone that is complemented by other measures as many actors try to implement a proposed "30 x 30" target of the Convention on Biological Diversity's post-2020 global framework, while also advancing protection efforts nationally (CBD 2022, U.S. DOI 2021).

However, PAs might not be permanent. Protected area downgrading, downsizing, and degazettement (PADDD) events are legal changes to reduce the type, number, and extent of activities in PAs, PAs' boundaries, or the number of PAs, respectively (Mascia and Pailler 2011). At least 3803 such PADDD events have been enacted in 73 countries since 1892, affecting 5,971,562 km², alongside 1159 proposals in 26 countries (Golden Kroner et al. 2019, CI and WWF 2021). Certain PADDD events restored land or resource rights to local communities, alleviating prior conflicts due to PA creation (Andrade and Rhodes 2012) and supporting communities, while having no ecological impact. For example, in 2016, a PADDD enabled local Indigenous tribes to harvest plants in PAs (NPS 2016). This can avoid adverse impact on biodiversity and restore relationships between communities that were severed during colonization. However, most PADDD events (62%) are linked to industrial-scale resource extraction and economic development related to infrastructure industrial agriculture, mining, or oil/gas development (Golden Kroner et al. 2019, Naughton-Treves and Holland 2019). This can have negative impacts on habitat and biodiversity (Golden Kroner et al. 2016). A majority (82%) of PADDD events are recent (2000–2020), suggesting mounting conservation concerns.

Protected area downgrading, downsizing, and degazettement arise from conflicts about PAs. Myriad factors drive their spatial and temporal incidence, across countries or within one landscape. Several studies link PAs' characteristics, i.e., distances, infrastructure, or slope, with PADDD risk (Tesfaw et al. 2018, Keles et al. 2020). However, results concerning such fixed factors leave unanswered questions concerning dynamics, including shifts in political representation from elections. The importance of elections in environmental policy is emphasized by List and Sturm (2006) and others. To our knowledge, political representation has never been analyzed in the context of PADDD and not within the Global North.

Study of the political economy of deforestation and environmental protection has demonstrated important roles for decentralization (Burgess et al. 2012) and elections (Pfaff et al. 2017, Pailler 2018, Ruggiero et al. 2021), in light of incentives to convert tropical forests to agricultural lands (Cisneros et al. 2021). Regarding governance, Bareille et al. (2023) emphasized potential impacts of democratization on PA implementation. The importance of ideology has also been highlighted (Chupp 2011). At a global level, Kammerlander and Schulze (2021) found centrist governments achieved better environmental performance than left or right oriented governments. For the U.S., research highlights roles of environmental and economic shocks within environmental voting (Herrnstadt and Muehlegger 2014, Elliot et al. 2023) and strategic behaviors by policy makers facing re-election (Brunell and Cease 2019), underlining the influence of competition, lobbies, and partisanship (McAlexander and Urpelainen 2020, Schulze 2021). We contribute to related literature by analyzing whether shifts in political representation influence the risks of PADDD.

[1]CEE-M, Université Montpellier, CNRS , INRAe, Institut Agro, Montpellier, France, [2]Université de Lorraine, Université de Strasbourg, AgroParisTech, CNRS, INRAE, Bureau d'Economie Théorique et Appliqué (BETA), Nancy, France, [3]Climate Economics Chair, Paris, France, [4]Conservation International, Betty and Gordon Moore Center for Science, Arlington, Virginia, USA, [5]George Mason University, Department of Environmental Science and Policy, Fairfax, Virginia, USA, [6]Ocean Conservation, World Wildlife Fund, Washington, D.C., USA, [7]Duke University, Sanford School of Public Policy, Durham, North Carolina, USA

Specifically, we examine how shifts in political representation affect the frequency of PADDD in political districts in the U.S., controlling for fixed differences through the use of a panel data set. The U.S. has significant biodiversity (Mittermeier and Mittermeier 1997) and is an historic leader in PAs (Richards 2018), though notably a recent PADDD hotspot (Golden Kroner et al. 2019). We use an exhaustive sample of PADDD events in terrestrial federally protected areas in the U.S., 2001 to 2018, to study the political economy of PADDD. The League of Conservation Voters (LCV) has a scorecard for elected officials' conservation-policy votes that shows how parties can be polarized regarding conservation issues. For 2000–2020, Republican (Democratic) Senators/Representatives averaged 14% (82%)/12% (85%). We show that shifting party in power also affects risks of PADDD. Shifting House Representative to Republican increases PADDD risk in any district, especially for proposals. Protected area downgrading, downsizing, and degazettement is also more likely if there is a shift from Democratic to Republican in the majorities for the House or Senate.

METHODS

Data

Units of observation

Our aim is to analyze the impacts of changes in political variables on the probability of PADDD. Most PADDD events are proposed as bills by members of Congress before being enacted, i.e., passed into law. From PADDDtracker, e.g., "Representative Tom McClintock introduced legislation (H. R. 934) that would roll back the boundary of the Wild and Scenic Merced River in order to allow Merced Irrigation District to increase the height of New Exchequer Dam." Protected area downgrading, downsizing, and degazettement events can also be directly enacted at the executive level by federal agencies through a process called rulemaking. Congressional elections occur every two years. The House of Representatives is made of 435 members, each representing a political district in a state, and each having to be re-elected every 2 years. The Senate is composed of 100 members, 2 for each of the 50 states, who serve 6-year terms such that ~1/3 must run again in each election.

As explained in Appendix 1, we focus on protected areas managed by federal agencies that meet the international definition of a PA (Dudley 2008) as in Golden Kroner et al. (2019). For those protected areas, PADDD events are either congressional decisions (i.e., legislation) or executive decisions (e.g., executive orders or regulations through federal agencies). Legislation is proposed by a member of Congress. Any proposal undergoes review and potential modifications by a committee before being voted on by the chamber. If approved by both chambers and signed by the president, the PADDD is enacted. Executive orders are ultimately decided upon by the President. Regulations are promulgated by federal agencies, whose leaders are appointed by the President. Specific processes to promulgate such regulations vary by agency but usually involve a proposal, public comment, and finalization.

To estimate the impact of elections on reductions in protection, we restrict our study to land within federal PAs in 2001 (PAD-US, USGS 2018). We overlapped each PA's boundaries with districts' boundaries. Because some districts shifted during 2001–2018, we construct spatial units of observation by intersecting all successive shapefiles for district boundaries (Lewis et al. 2013). Thus, a PA in only one district is considered as one unit while a PA in two districts, 1 and 2, is two units; then, if during our period a share of district 1 is redefined as being in district 2, a 3rd unit is distinguished. This helps ensure units do not split during our period of analysis. We know in which district a protected area is in each year. Finally, we drop all resulting observations under 100 ha, due mainly to mis-overlaps.

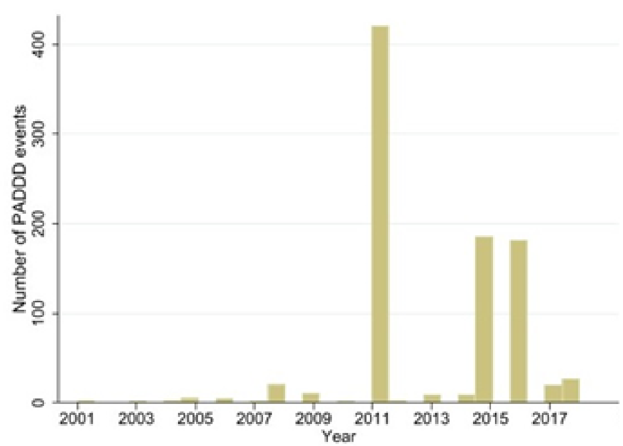
Our panel for the period 2001–2018 has 1413 observations. Each unit is a portion of one of 435 U.S. districts that was in a protected area in 2001. On average, each district has just over three such spatially distinct sub-districts which, for us, function as distinct units of observation. For each of those observations, we can determine whether a PADDD event occurred in the area at any point in time, as well as identify the elected congressmen then, at the district and state levels.

PADDD: dependent variable

We use the available data on U.S. PADDD events from PADDDtracker (CI and WWF 2021), updated with refinements from Olsson et al. (2021). We focus on the 97% of post-2000 PADDD events for which polygons are available to be able to spatially locate them in our observational units. Thus, we can locate PADDD events in districts. We consider any attempt to modify PAs' sizes or characteristics, both modifications already enacted and those just proposed. Our database includes 1094 PADDD events between 2001 and 2018 (233 enactments and 861 proposals), as seen over time in Figure 1 and over space in Figure 2 (with more details on the PA and PADDD data in Appendix 1).

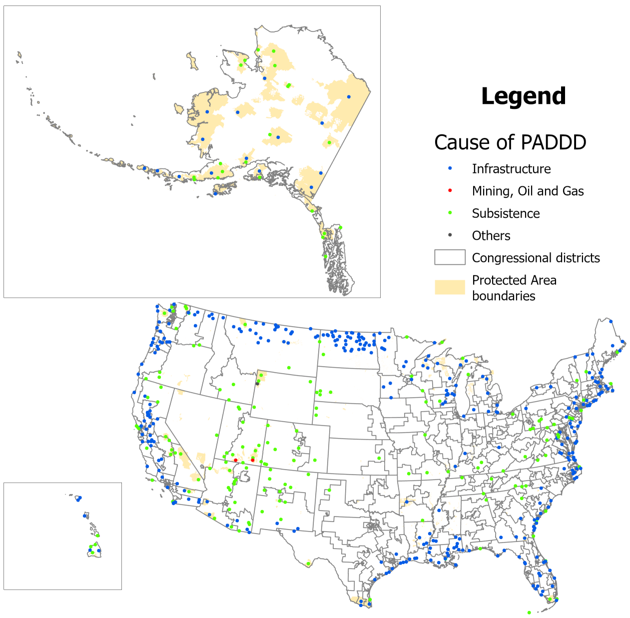
Figure 1 reveals clusters of PADDD events in specific years, highlighting that a single decision can result in multiple PADDD events, i.e., for more than one PA, perhaps even throughout the U.S. Approximately 95% of events exhibit this characteristic.

Fig. 1. Timing of protected area downgrading, downsizing, and degazettement (PADDD) events in the U.S., 2001–2018.



Source: authors, based on PADDDtracker data (CI and WWF 2021)

Fig. 2. Congressional districts, protected areas (PAs), and federal protected area downgrading, downsizing, and degazettement (PADDD) events in the U.S., 2001–2018.



Source: authors, based on PADDDtracker and PAD-US data

Protected area downgrading, downsizing, and degazettement events list proximate causes, i.e., reasons why events are proposed or enacted. Table 1 summarizes the listed proximate causes for the post-2000 PADDD events that we study. Most of the non-enacted proposals are related to infrastructure, others to mining, or to oil-and-gas, whereas the enacted events mostly list subsistence. For example, restoring rights for local tribes to harvest plants; notably these events are not a conservation concern for biodiversity conservation because they specify that the authorization can only be made if there is no ecological impact, and also because they restore rights to Indigenous peoples, offering positive cultural and social values. Other listed causes for these U.S. PADDD events include access for snowmobiles, off-road vehicles, hovercrafts for hunting, grazing, backcountry stock, and paddling. Some events are proposed but not enacted.

Table 1. Listed proximate causes of protected area downgrading, downsizing, and degazettement (PADDD) events.

	Infrastructure	Subsistence	Mining/Oil-Gas	Other	Total
# proposed	583	1	94	183	861
# enacted	5	222	2	4	233
Total	588	223	96	187	1094

In our data, each proposal or enactment is an event. If the proposal is enacted, it becomes a new event. Our dependent variable is that PADDD has been proposed or enacted in a given unit in a given year. Overall, 32% of our units experienced at least one PADDD event. Among those, 48% experienced PADDD only once. For 2% of units, PADDD occurred more than three times during 2001–2018. For most of the units with more than one event in total, the events did not happen in the same year.

Independent variables

We gathered complete information concerning the elected representatives' political parties from the League of Conservation Voters (LCV 2021). In a given year, we know at the district level if the Representative is Republican and, at a state level, how many of the (two) Senators are Republicans.

We can also control for several potentially relevant economic conditions using data from the Bureau of Economic Analysis (US BEA 2020) at the county level. Then using the counties' centroids, we place each county in a district to aggregate the data up to district level. We compute the district's GDP, as well as the shares of GDP in land-intensive sectors: agriculture, mining, or oil and gas.

Empirical analysis

We estimate a fixed-effect model to identify the impacts of political dynamics, i.e., changes over time in political representation, on probabilities of PADDD. We developed the following equation:

$$PADDD_{ijst} = \alpha + \beta D_{jst} + \gamma S_{st} + \sum_{m=1}^{2}\delta_m M_{mt} + \sum_{k=1}^{2}\varphi_k X_{kjst} + \sum_{n=1}^{4}\theta_n W_{nt} + \vartheta_i + \varepsilon_{ijcst} \quad (1)$$

In Equation 1, *PADDijst* dependent variable equals one if at least one PADDD event occurred in unit *i* in district *j* in state *s* in year *t*, else it equals zero. It equals 1 for 779 observations. Our dependent variable equals one even if multiple events occur during a year. This explains why our variable is equal to one for only 779 observations, despite 1094 total PADDD events in our sample, while its mean value is 0.031, and standard deviation is 0.172. D_{jst} equals one if the elected House Representative for district *j* in state *s* is Republican at time *t*. S_{st} equals one if at least one of the Senators in state *s* is Republican at time *t*. M_{mt} is a set of $m = 2$ variables for political majorities in the Senate and House of Representatives, each equal to one for years *t* in which Republicans have majorities. Control variables X_{kjst} include GDP and its shares in land-intensive sectors. W_{nt} are the Presidential time periods, equal to one for all the years in question (We assign G. W. Bush's first term as the reference period to which all the other presidential time periods are compared).

In (1), ϑ_i are fixed effects to control for all the time-unvarying confounding factors at unit level. Those include the distance to nearest metropolis and average level of explanatory variables such as the share of the economy in land-intensive sectors (agriculture, mining, oil-and-gas sectors) or the average share of Republican voters. Our standard errors are always clustered at the state level. Given that some PADDD events result from a single decision, one might suggest clustering the results at the protected area level. However, we have chosen to cluster at the state level for two reasons. Firstly, decisions leading to multiple PADDDs can impact several protected areas based on their location (e.g., proximity to borders) rather than a single area. Second, Abadie et al. (2023) recommended clustering standard errors at the treatment level. Since our paper examines the impact of elections at the district and state level, it is appropriate to cluster the standard errors at the state level. Note that clustering at the state level is more conservative than clustering at a district level.

Our estimated coefficients are impacts of changes in political representation on risk of PADDD. Political shifts are common in our study period. For the House of Representatives, at district level the overall standard deviation is 0.49, with between and within variation of 0.39 and 0.31, respectively. For Senate, overall standard deviation is also 0.49 and the between and within variation are 0.39 and 0.30, respectively. M_{mt} and W_{nt} vary only over time. θ_n does not identify impacts of presidencies, per se, but helps to control for time trends, including political circumstances. Therefore, δ_m captures the impact of changes in majorities within any presidential period. There have been majority shifts during three out of the five presidential time periods, for both Senate and House, although occurring under different presidencies for those two bodies.

Equation (1) includes a comprehensive set of controls. With fixed effects for units of observation and presidential periods, coefficients capture the effects on PADDD of changes within a specific unit of observation and presidency. For instance, coefficient B captures the impact of a change in the party affiliation of a specific district on the risk of experiencing a PADDD while holding the president constant. Similarly, coefficient δ_m captures the impact of a change in a majority in a political body on the risk of PADDD within specific units of areas, while holding the president fixed.

Despite extensive controls, a concern could arise if year-specific events impact both our drivers of interest (majorities and the parties of House and Senate incumbents) and the incidence of PADDD events. This is relevant because many PADDD events follow common decisions in specific years (Fig. 1). That said, our inclusion of each of the presidency periods as controls account for one timescale of specific events, i.e., every four years, which could affect our political variables and decisions to propose or enact PADDD in multiple areas.

Still, we added two kinds of robustness tests. First, we exclude 2011 from our regression analyses. Second, we include year fixed-effects in our estimation to control for potential year-specific events that may influence drivers of interest and occurrences of PADDD. The latter approach effectively accounts for time varying factors that may influence our results. However, it constrains our ability to estimate coefficients for drivers that vary solely over time. For instance, the inclusion of year effects prevents us from estimating the impact of majorities in political bodies. This is the rationale behind our decision to prioritize the specification presented in Equation (1) for our main findings.

We also add six alternative specifications and estimators in the supplementary materials (Appendix 2). First, we examine proposals alone. Second, we estimate the model using conditional logit, which excludes units that never had PADDD. Third, we use an estimator, developed by de Chaisemartin and D'Haultfœuille (2024), robust to switches in treatment status and heterogeneities in treatment effects. Fourth, we look at the size and number of PADDD. Fifth, we separate state and district level. Sixth, we focus on contested elections whose results are supposedly more random.

RESULTS

Table 2 presents our main estimations considering all PADDD events, with columns adding independent variables, noting that when R-squared rises and the value of information criterion falls. Column (1) presents our minimal specification, simply using district and state representation plus some controls. Columns (2) and (3), respectively, add majorities and controls for the presidencies.

Table 2. Political and economic determinants of protected area downgrading, downsizing, and degazettement (PADDD). Column (1) presents our minimal specification, using simply district and state representation plus some controls. Columns (2) and (3), respectively, add majorities and controls for the presidencies. Column (4) displays our favored specification, in which we include all variables in Equation 1. Note: AIC = Akaike's information criterion; BIC = Bayesian information criterion.

	(1)	(2)	(3)	(4)
Representatives				
House Representative of given district is Republican	0.039***	0.027**	0.037***	0.026**
	(0.011)	(0.011)	(0.010)	(0.010)
At least one Senator of corresponding state is Republican	0.013	0.010	0.016	0.011
	(0.015)	(0.014)	(0.012)	(0.011)
Local Economics				
Real GDP (US$100b 2012)	0.000***	0.000***	0.000**	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
% GDP in Land-Intensive Sectors	0.109	0.187	-0.144+	-0.036
	(0.148)	(0.141)	(0.093)	(0.099)
Majorities				
Republican majority in the House		0.031***		0.042***
		(0.005)		(0.008)
Republican majority in the Senate		0.010		0.035***
		(0.007)		(0.011)
Presidencies				
G. W. Bush 2nd term			0.004	0.004
			(0.004)	(0.009)
B. Obama 1st term			0.068***	0.085***
			(0.009)	(0.010)
B. Obama 2nd term			0.059***	0.040***
			(0.011)	(0.007)
D. Trump only term			0.015	-0.020
			(0.011)	(0.016)
Constant	-0.042**	-0.064***	-0.021	-0.065***
	(0.023)	(0.022)	(0.015)	(0.018)
Observations	25,434	25,434	25,434	25,434
Number of groups	1413	1413	1413	1413
AIC	-20272	-20469	-21043	-21512
BIC	-20239	-20420	-20978	-21431
R-squared	0.009	0.017	0.039	0.057

Robust standard errors are in parentheses.
*** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$, + = $p < 0.15$.

Column (4) displays our favored specification, in which we include all variables in Equation 1. Explanatory power, as reflected by the R^2, remains relatively low, even within Column 4 (5%). However, these magnitudes are relatively common in micro-econometric analyses. Many factors can idiosyncratically affect PADDD, such as local or national political shocks or natural hazards.

Shifting to having a Republican as a district's House Representative significantly and positively increases the risk of PADDD in that district, all else being equal. As we include fixed effects for units, we are finding that even though some decisions are formally made at the national level, if a district switches from Democratic to Republican, PADDD risk increases in that specific area. This result is consistent with the influence of lobbying by district representatives, within national institutions, or at least their importance if other politicians interpret having local Republicans as a favorable signal to propose PADDD in a district. However, this is not the case for local senators.

Robustness checks (Appendix 2) support our findings. First, including year fixed effects confirms our results for local determinants, while making it impossible to assess the effect of congressional majorities. Second, we also re-estimate this model using an estimator, developed by de Chaisemartin and D'Haultfœuille (2024), robust to switches in treatment status and heterogeneities in treatment effect. This also allows us to estimate the lagged impact of our variable of interest on the risk of PADDD and to demonstrate that the parallel trend assumption holds for our estimation. Our results are confirmed and suggest that proposals would particularly occur shortly after the election, in the next year, rather than in later years of the mandates. Third, we excluded observations from 2011 because there were multiple PADDD events that year, which could have introduced specific biases. This does not affect the overall pattern of our results.

Fourth, restricting our sample to proposals, i.e., essentially to non-subsistence-related events (as per Table 1), reveals that our results are driven by the proposals. It would be highly relevant to also closely examine the political factors that influenced these enacted PADDD events related to subsistence in the U.S. context. They primarily restored rights to Indigenous populations displaced by PA establishment. Their political dynamics are likely to differ significantly from those of non-subsistence PADDD events. However, approximately 80% of these events occur in the same year (2016), which poses a challenge to identification because we cannot control for potential confounding factors specific to that year. Consequently, we are unable to address this particular question.

Fifth, using conditional logit confirms our results while restricting the sample to units that at some point experienced PADDD. Sixth, we look at the impact of our explanatory variables on the number of PADDD events, as well as on their sizes, which both also confirm our results. Seventh, we run the estimations of Table 2 separately for the House Representative and the Senators to make sure that our results are not driven by multicollinearity. Finally, building on insights from Pacca et al. (2021) and others, we re-examine the impact of Senators and House Representative using only tight (close, highly contested) elections. Their outcomes are likely to be more random, allowing for the identification of an unbiased causal impact. Due to the limited numbers for both PADDD events and tight elections, in our sample, estimates cannot indicate significant impacts.

DISCUSSION

Unlike PADDD studies to date (e.g., Symes et al. 2016), which focused on the spatially varying opportunity costs of PAs as drivers, empirically using fixed proxies, we focus on the political shifts over time that are generated by elections. For the U.S., we find that shifts in the party in power matter. Specifically, Republican majorities and local Republican leaders increase risks of PADDD events.

Our results drive off PADDD proposals more than enactments. Enactments require considerably more legislative effort, which limits our ability to detect the influence of elections on those events. Although PADDD proposals do not always result in an enacted legal change, they are consequential and, more generally, they clearly represent pressures and signal political stances on environmental efforts. The PADDD proposals may affect political discourse and the perceived political acceptability of such changes, i.e., can move "the Overton window" of policies worth discussing (Russell 2006).

Many PADDD events may be correlated because multiple events can stem from one decision. Those triggering multiple PADDD events can impact extensive areas across multiple states. Such decisions carry considerable weight within our results, which reinforces the relevance and significance of our findings in the context of environmental conservation policies.

Two possible mechanisms that could underlie the results we have found complement each other. First, Republicans may be intrinsically less inclined toward environmental conservation, increasing their likelihood of proposing PADDD. Second, it is also possible that unobservable confounding factors, such as shocks to voter preferences toward the environment, increase PADDD and the election of Republican congressmen. This second story suggests that Republicans tend to propose PADDD events more easily as a response to any such shifts in voters' preferences. Following either of those mechanisms, such election results contribute to a higher risk of PADDD.

It is noteworthy that we observed significant influence of local political factors, despite many of our events resulting from relatively few national decisions. This suggests that alignment of interests at local levels can create opportunities for proposals that then resonate at the national level. Conversely, it is likely PADDD is not proposed at the national level if local Congress members are against it. This interpretation aligns with our results for majorities in the House and Senate, highlighting the substantial influence of political circumstances on political discourse and resulting proposals.

Many PADDD events, both enacted and simply proposed, were observed during a Democratic administration, that of President Obama. At first glance, those seem contrary to our overall story about the political economy of PADDD. However, details for this set of events support our story. Most of these enacted events resulted from a regulation that enabled local tribes to harvest plants in national parks, under the condition that authorizations have no negative ecological impacts. They advanced social justice per restoration of rights to original inhabitants. In significant contrast, not enacted during this period were proposals advanced by Congress that attempted to open the Arctic National Wildlife Refuge to oil-and-gas development. Such downgrading did not pass until Trump's administration. Finally, multiple proposals waived environmental laws on land 100 miles from the U.S. border, for national security-related infrastructure, but they too were not passed.

Other political mechanisms (executive orders by presidents, regulations, and court decisions) also play important roles in conservation policy. For instance, given that most of the American public supports environmental protection (https://news.gallup.com/poll/1615/environment.aspx, Gallup 2022), it is worth understanding why increases in new protection of land have stalled since 2000 (Richards 2018). The PADDD trends in the U. S. are also relevant to the Biden Administration's commitment to expanding protected lands and waters to 30% by 2030 (US DOI 2021), maybe including recognition of governance beyond traditional PAs.

Our analyses found key roles for political dynamics in shaping conservation in the U.S., home to the world's first modern PA (Yosemite Land Grant in 1864, Yellowstone National Park in 1872). National parks have been called America's best idea and expanded by both Democratic and Republican Presidents during the 20th and 21st centuries. However, since 2000, there has been a notable shift, with 94% of PADDD proposals and enactments occurring during a period of heightened political polarization on environmental issues, as documented by Milman (2019) using data from the League of Conservation Voters. Such political tensions rose during the COVID-19 pandemic (Casola et al. 2022), alongside rollbacks of environmental policy within the U.S. and globally (Golden Kroner et al. 2021). Our results show that Democratic and Republican policy makers seemingly took up polarized views on environmental issues in the case of conservation policies.

Contextual elements including timing and causes of PADDD events are essential to understand. Early PAs in the U.S. involved displacement and eviction of Native peoples (Dowie 2009) and some recent PADDD subsistence events have restored tribes' rights to natural resources, enhancing social justice without degrading conservation (Naughton-Treves and Holland 2019). However, most proposed events in our data (and globally) are for infrastructure, industrial-scale resource extraction, and development. Similar development-related PADDD events, largely in the tropics, have negatively impacted forests, challenging conservation efforts (Forrest et al. 2015, Golden Kroner et al. 2016, Pack et al. 2016, Keles et al. 2020, 2023).

Our results suggest non-subsistence rather than social-justice motivations dominated the two parties' perceptions of conservation-development trade-offs, such that rationales other than such conservation orientation could drive negative environmental outcomes (Forrest et al. 2015). For example, many U.S. events pertained to security infrastructure near the border with Mexico. The construction of physical barriers across protected lands in these areas clearly would negatively affect conservation outcomes there, such as habitat loss and fragmentation (Peters et al. 2018).

Continued attention to the political economy of protection, along with alternative conservation approaches such as Indigenous, community-led, and private systems, is crucial (S. Qin, Y. He, R. E. Golden Kroner, S. Shrestha, B. H. Coutinho, M. Karmann, J. C. Ledezma, C. Martinez, V. Morón-Zambrano, R. Ulloa, E. Yerena, C. Bernard, J. W. Bull, E. Mendoza, N. de Pracontal, K. Reytar, P. Veit, C. L. Matallana-Tobón, L. Alden Wily, and M. B. Mascia, *unpublished manuscript*). The ongoing occurrence of PADDD and other challenges in expanding conservation protection underscores the need for significant adjustments in economic, social, and political functioning, including in production and consumption, to mitigate humans' impacts on nature (Brondizio et al. 2019).

Protected area downgrading, downsizing, and degazettement studies for other countries could also consider shifts in political representation and other political factors. Results in Pailler (2018) and Ruggiero et al. (2021) on effects of elections in Brazil, for instance, suggest extensions to tropical countries given the deforestation risks implied by PADDD (Keles et al. 2023). Moreover, per List and Sturm (2006) or Elliott et al. (2023), one could study how the intensity of competition in those elections, or natural shocks, affect impacts. Protected area downgrading, downsizing, and degazettement may also vary with governance including rule of law, political stability, and corruption.

CONCLUSION

We shed light on the effects on environmental policies of shifts in political representation. We reveal a strong association between PADDD events (in particular, proposals) and the political landscape. We focus on shifts to Republican representation in districts and Republican majorities in the House and Senate. Thus, the political affiliation of elected officials and the composition of legislative bodies help to shape proposals that could potentially undermine conservation efforts. We confirm that when considering the fate of PAs, alongside their opportunity costs (Tesfaw et al. 2018, Keles et al. 2020), changes in key political determinants can be very important factors.

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Data Availability:

The data and code that support the findings of this study are available on request from the corresponding author, GLV.

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APPENDIX A1: DATABASE DESCRIPTION

PA Data

We drew all the polygon data in this analysis from the Protected Area Database of the United States (PAD-US) version 1.4. The PAD-US database contains polygon information for protected areas and other managed lands in the United States including lands owned and managed by federal, state and private entities. The complete database contains information for 198,774 PAs. All PAs in PADUS are coded with a GAP Status code ranging from 1 to 4. Analogous to the IUCN protected area categories, the GAP Status codes indicate PA's management approach especially regarding the management of biodiversity.

The four GAP Status codes are described as follows:

1. Managed for biodiversity – disturbance events proceed or are mimicked
2. Managed for biodiversity – disturbance events suppressed
3. Managed for multiple uses – subject to extractive (e.g. mining or logging) or OHV (off highway vehicle) use
4. No known mandate for protection

Because of this broad array of management interventions with respect to biodiversity, we limited our sample to the protected areas categorized as GAP Status codes 1 and 2. This is the same approach taken by the IUCN when defining "protected areas" for inclusion into the World Database of Protected Areas. In addition, the IUCN definition for "protected area" ("A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means to achieve the long-term conservation of nature with associated ecosystem services and cultural values" [Dudley 2008]) is consistent with the definition used by previous work on PADDD (Mascia *et al.*, 2020).

To focus the analysis, we included only terrestrial protected areas owned by federal agencies. Therefore, we filtered the PADUS database using three criteria:

1. Protected areas are classified as GAP Status 1 or 2
2. Protected areas are owned by a federal agency
    1. We focused on federal PAs as consistent with the available PADDD data which focused on PADDD events in federal PAs (Golden Kroner et al. 2019)
2. Protected areas are terrestrial

Following from these criteria, we applied a three-step filtering process:

- Filter out protected areas that are not GAP Status 1 or 2 (using the field GAP_Sts). There were 147,432 PAs that were not GAP status code 1 or 2. This step reduced the database from 198,774 to 51,342.
- Filter out PAs that are not owned by a federal agency (using the field d_Own_Type), there were 49,876 PAs (in this filtered database) that were not owned by a federal agency. This step reduced the database from 51,342 to 1,466 PAs.
- Filter out marine protected areas by clipping the PAD-US layer to the extent of the terrestrial coverage of the United States [GADM]. This ensured that the terrestrial

portions of protected areas which straddle land and sea were included in the analysis. This step reduced the database from 1,466 to 1,334 PAs.

Overall, this three-step filtering process reduced the PADUS database from 198,774 PAs to 1,334 PAs. We also identified protected areas in the PADUS database that were represented by multiple polygons. Using ArcGis for Desktop 10.3., we used the dissolve tool to consolidate these protected areas to create one polygon per protected area to avoid double counting. We dissolved the PADUS database based on the name of the protected area (Unit_Nm field). This step reduced the PADUS database from 1,334 PAs to 959 PAs. We drew polygons for PADDD events from this filtered PADUS database. We also used several of the fields in PADUS database to populate fields in our final table of PADDD events as needed including IUCN Category, Establishment Date, PA Designation, Federal Agency Owner and State. The version we use of PAD-US corresponds to the boundaries of protected areas in 2020. In order to reconstitute the boundaries of 2000, we added the polygons of all enacted downsizing events using PADDD data by adding areas downsized between 2000 and 2018 from the 2020 PAD-US polygon.

PADDD Data

Our database of PADDD events in the United States includes data from a prior study (Golden Kroner *et al.*, 2019) enhanced with updates and refinements described in Olsson *et al.*, (2021). Our data are all available for download (on PADDtracker.org) and provide full attribute information concerning the location, timing, status, proximate causes, and other contextual information about each PADDD event, along with spatial data. As this study focused on the majority of PADDD events for which the precise boundary was known (i.e. polygon data), we omitted PADDD events for which we only had point data. The database of PADDD events is the best available compilation of information to-date, has emerged from exhaustive searches of legal archival documents and databases but may not be comprehensive. Because of exhaustive searches for data, we believe that these data are representative of the full universe of enacted and proposed PADDD events in the US.

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APPENDIX A2: ROBUSTNESS ANALYSIS

The main issue that could reduce the validity of our identification strategy is related to the existence of time-specific confounding factors biasing our estimations. As stated in the main manuscript, the inclusion of W_{nt} controls for specific political circumstances that may impact both elections and PADDD. However, one might assume that time-specific confounding factors still could affect our identification strategy, especially given the temporal distribution of PADDD shown in Figure 1. To deal with this issue, we display the results including year fixed effects in our estimations. This Two-way fixed effect estimation allows better controlling for time specific factors but prevents us from estimating the impact of variables that are constant over space such as majorities at House and Senate. The results displayed in Column (1) of Table 3 confirms the results of our main estimation regarding the impact of having a Republican house Representative at district level, although the statistical significance level is only at 15%.

The results presented in Table 3 may be susceptible to bias due to time-varying unobservable confounding factors, such as shocks affecting voter preferences and Republican election outcomes, as discussed in the manuscript. To identify an unbiased impact, Pacca et al. (2021), among others, focus on elections with tight margins, which are more likely to yield random results. In Table 4, we introduce a dummy variable indicating tight elections, defined as those with less than a 5-percentage-point difference between the two leading candidates in the most recent elections. We also include an interaction term between Republican representation and tight elections to capture the impact of Republican congressmen elected after close elections. Note that the number of tight elections won by a Republican in our sample is limited, comprising only 9% of House elections and 22% of Senate elections. To avoid multicollinearity, we separately estimate the effects for Senators and House representatives. Columns (1) and (3) of Table 4 show results without year fixed effects but including presidential mandates and majorities, similar to Table 2, while Columns (2) and (4) include year fixed effects as in Table 3. None of the estimations yield significant results for the interactive variable. This may suggest that our findings are influenced by unobservable confounding factors, as discussed in the manuscript. However, the lack of significance could also be attributed to the limited number of tight elections and PADDD incidents in our sample, making it difficult to detect a statistically significant impact.

Recent articles have questioned the validity of two-way fixed effects estimators, suggesting potential bias in the presence of heterogeneous treatment effects and when units switch from treated to untreated over time. This scenario is particularly relevant here, as districts and states may switch political affiliations over time. To address this issue, we re-estimated the model from Table 3 using the estimator developed by De Chaisemartin and d'Haultfoeuille (2024). This estimator is well-suited for handling switchers in our estimation and allows us to accurately assess the impact of our variable of interest on the risk of PADDD. Given our 18-year period of analysis, we focused on the impact over a 4-year period (two terms for representatives and ⅔ of a term for Senators). The results are presented in Figure 3 for House Representatives and Figure 4 for Senators. Upon examination of Figure 3, we observe that a switch from Democrat to Republican induces an immediate shift in the risk of PADDD, which diminishes over time. This suggests that proposals tend to occur shortly after elections. The impact at the Senate level is more nuanced, with a positive effect observed in the first year followed by non-significant or negative impacts in subsequent periods. This complex and uncertain pattern may explain the lack of significant impact of Republican Senators in our main specification presented in Table 2. Figures 3 and 4 test the impact of switches -- from Democrats to Republicans -- on PADDD over the previous three years, in order to assess the assumption of parallel trends. To validate our empirical strategy, we should not observe significant impacts before the switches, else our results could be driven by unobserved factors. In Figure 3, impact is not statistically significant for House representatives, pre-switch, which supports our identification strategy. For the Senate in Figure 4, we find a statistically significant impact only in the first previous period, potentially due to an anticipation effect (as has been common in the literatures using these estimators). No significant impacts are found for the other two pre-switch time periods. Overall, then, these tests confirm that the parallel-trends assumption holds in our estimations.

To deal with time-specific factors, we also display the results of our main model presented in Equation (1) but excluding year 2011, a year with many events mostly related to a proposal to authorize infrastructure on lands within 100 miles of the US border. Looking at Figure 1, one might assume that most of our results are driven by this specific year. These results, displayed in Table 5, mostly confirms that political variables at multiple levels can influence PADDD events. However, dropping such a large set of events with specific timing could remove some of the bases for some of the findings above. For instance, Republican House Majority becomes negative in Column (4). That point does not affect the relevance of the preferences of the district's House Representative. Moreover, the party of the local senator gains significance in those estimations as having at least one Republican senator increases the risk of PADDD.

Table 6 repeats two of the four specifications in Table 2, once each for two subsets of the PADDD events. Its initial repeat in columns (1) and (2) is for only proposed PADDD events, coding 0 those actually enacted (losing on the order of 20% of the observations). These results generally look a lot like their analogous columns in Table 2 which confirms the robustness of our results. It seems that our results are mainly driven by the proposed PADDD events. Table 6's last two columns repeat the same specifications but with our explained variables coded 0 for PADDD events for which the listed cause is 'local subsistence'. The local mechanisms underlying such events seem likely to differ from mechanisms for events with other commonly listed proximate causes like industrial-scale development and infrastructure. What stands out is that the results are extremely similar to those in Table 6's initial two columns. This makes sense given that, as highlighted in Table 1, the proximate cause of the vast majority of the enactments is subsistence.

Our estimation using a fixed effect model does not take into account the binary nature of our explained variable. In order to do so, we provide a robustness test using conditional logit. However, the conditional logit estimation automatically excludes from our sample the observations that did not experience PADDD between 2001 and 2018[1]. Table 7 displays the results using conditional logit and confirms the robustness of our results regarding the importance of majorities at House and Senate. Regarding local representation, the fact that the House Representative is Republican does not significantly impact PADDD on this sub-sample. This Table confirms the influence of national but not local representation on PADDD risk.

We also examine to what extent our explanatory variables also explain the number of PADDDs in a given year or the area affected by these PADDDs. To do this, we choose to focus on the units that experienced at least one PADDD during the period of analysis to address potential censoring of our explained variable at zero and to concentrate on the magnitude of these PADDDs rather than their occurrence. For information, retaining the entire sample does not affect the significance of our results. Table 8 presents the results of our estimations. In columns (1) and (2), the explained variable corresponds to the number of PADDDs in that year in this observation unit. In columns (3) and (4), the explained variable is the sum, in km2, of all areas affected by a PADDD this year and located at least partially in this unit. We consider that elected officials consider the scale

[1] Note that Protected area units which experienced at least one PADDD event do not differ significantly from the units that did not experience any PADDD. The average number of years where there was at least one Republican Senator in office in districts with and without PADDD events is similar (61% and 58% of years, respectively). Values are also similar for having Republican representatives (56% vs. 60% − again close, and in the opposite direction). Shares of district GDP in more land intensive sectors also are similar when comparing political-districts units with and without PADDD (14.1% and 14.6%).

of the PADDD project as a whole and not only within their constituency. The explanatory power is very low for those estimations so they should be interpreted with caution. Although it is possible that our results are particularly driven by the years of PADDD occurrence, most of our results also hold here. The presence of a Republican majority is associated with more numerous and larger PADDDs. Furthermore, the number of PADDDs increases if the representative in the chamber is Republican.

Finally, one might be concerned that the results presented in Table 2 could be influenced by multicollinearity due to the correlation between the party affiliation of Senators and House representatives. To address this concern, Table 9 presents separate estimations of our main model for each treatment. The estimations confirm our findings, showing very similar coefficients for all variables of interest.

Table 3: Including year fixed effects

	(1)
LOCAL ELECTED REPRESENTATIVES	
House Representative of given district is Republican	0.014+
	(0.009)
At least 1 Senator of corresponding state is Republican	0.008
	(0.010)
LOCAL ECONOMIC CONDITIONS	
Real GDP ($100b 2012)	-0.000
	(0.000)
% GDP in Land-Intensive Sectors	-0.049
	(0.098)
Observations	25,434
Number of groups	1,413
AIC	-24521
BIC	-24350
R-squared	0.163

Robust standard errors *are in parentheses*
**** = p < 0.01, ** = p < 0.05, * = p < 0.1, + = p < 0.15*

Table 4: Tight elections (Selected variables)

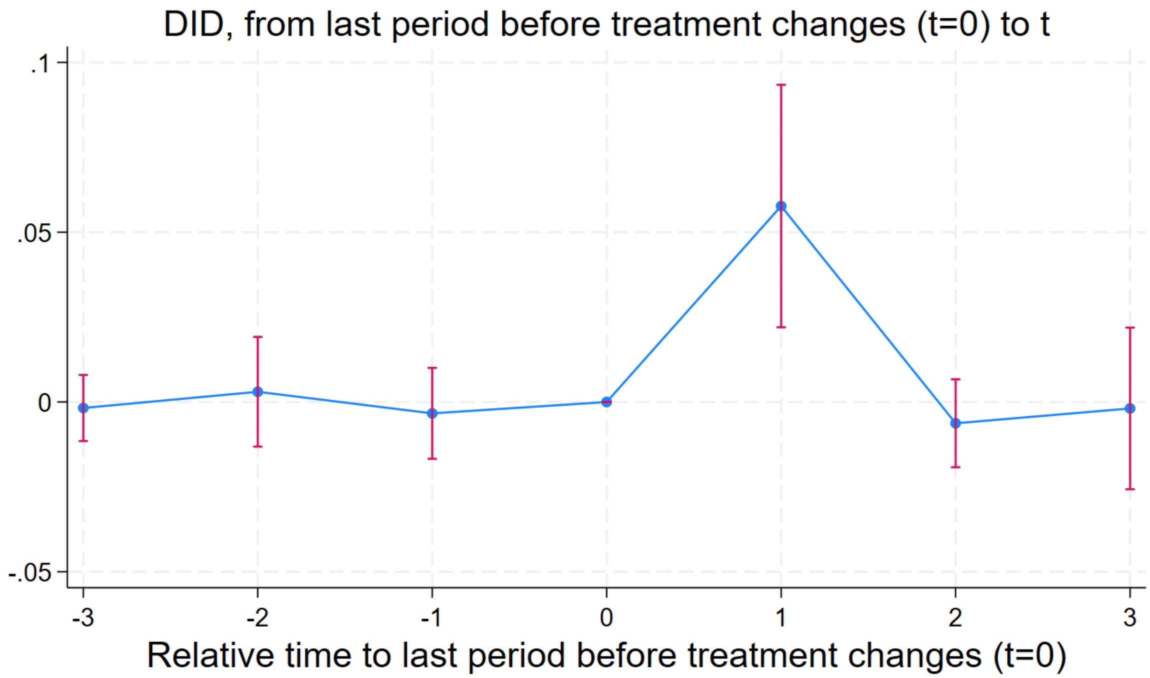
	(1) House	(2) House	(3) Senate	(4) Senate
LOCAL ELECTED REPRESENTATIVES				
House Representative of given district is Republican	0.026***	0.014*		
	(0.009)	(0.008)		
Election difference for representative lower than 5pp	0.006	-0.001		
	(0.010)	(0.010)		
Elect. diff. lower than 5pp x Republican representative	0.011	0.009		
	(0.023)	(0.017)		
At least 1 Senator of corresponding state is Republican			0.017	0.011
			(0.014)	(0.012)
Election difference for senators lower than 5pp			-0.014*	-0.004
			(0.008)	(0.006)
Elect. diff lower than 5pp x At least one Republican Senator			0.007	0.001
			(0.011)	(0.010)
CONGRESSIONAL MAJORITIES				
Republican majority in the House	0.043***		0.044***	
	(0.008)		(0.008)	
Republican majority in the Senate	0.035***		0.036***	
	(0.011)		(0.010)	
Constant	-0.062***	-0.001	-0.060***	-0.000
	(0.018)	(0.016)	(0.019)	(0.016)
Year Fixed effects	No	Yes	No	Yes
Observations	25,434	25,434	25,434	25,434
Number of groups	1,413	1,413	1,413	1,413
AIC	-21521	-24518	-21469	-24503
BIC	-21432	-24338	-21380	-24324
R-squared	0.057	0.163	0.055	0.162

All estimations also include dummies for presidencies, real GDP and % in land-intensive activities.

Robust standard errors are in parentheses

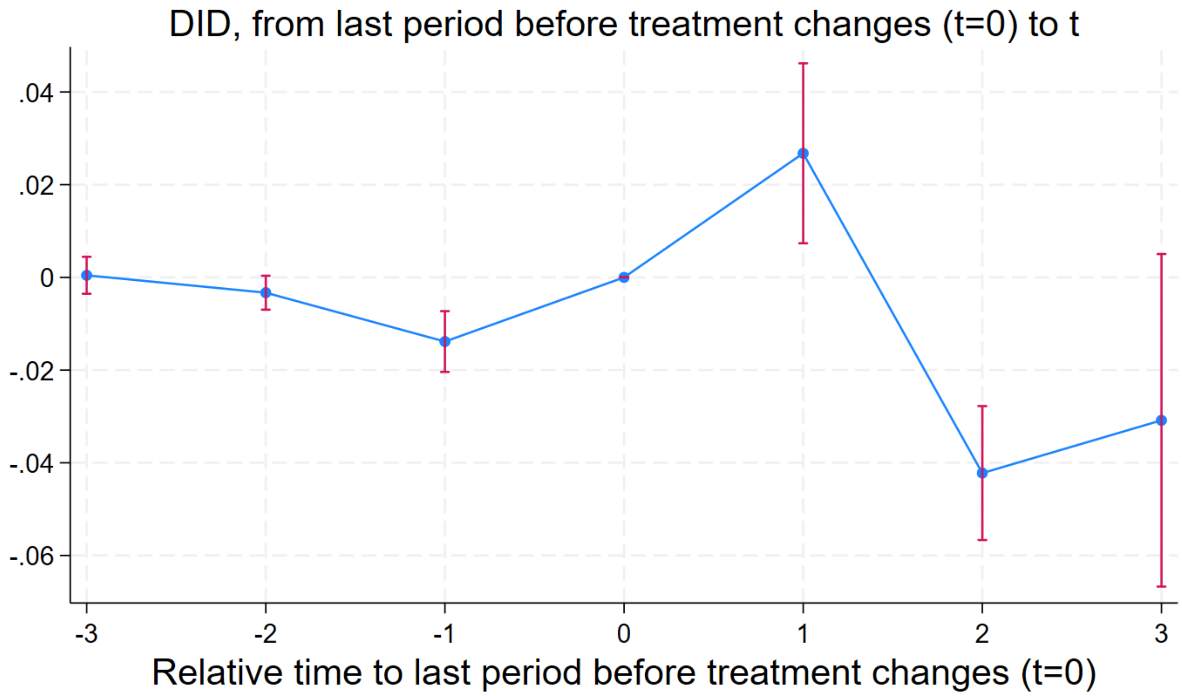
*** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$, + = $p < 0.15$.

Figure 3: Impact of having a Republican House Representative of given district



Legend: 95% Confidence interval. Standard errors clustered at state-level.

Figure 4: Impact of having at least one Republican Senator in corresponding state



Legend: 95% Confidence interval. Standard errors clustered at state-level.

Table 5: Dropping 2011 Events

	(1) Without 2011	(2) Without 2011	(3) Without 2011	(4) Without 2011
LOCAL ELECTED REPRESENTATIVES				
House Representative of given district is Republican	0.026***	0.018**	0.015**	0.012**
	(0.008)	(0.008)	(0.006)	(0.005)
At least 1 Senator of corresponding state is Republican	0.013	0.009	0.014+	0.012*
	(0.011)	(0.009)	(0.009)	(0.007)
LOCAL ECONOMIC CONDITIONS				
Real GDP ($100b 2012)	0.000***	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
% GDP in Land-Intensive Sectors	-0.157	-0.127	-0.295***	-0.079
	(0.120)	(0.111)	(0.069)	(0.116)
CONGRESSIONAL MAJORITIES				
Republican majority in the House		-0.003		-0.051***
		(0.003)		(0.009)
Republican majority in the Senate		0.043***		0.081***
		(0.007)		(0.014)
PRESIDENCIES				
G. W. Bush 2nd term			0.007	-0.064***
			(0.005)	(0.014)
B. Obama 1st term			0.009*	-0.031***
			(0.005)	(0.008)
B. Obama 2nd term			0.066***	0.020***
			(0.011)	(0.007)
D. Trump only term			0.023**	-0.063***
			(0.010)	(0.019)
			0.007	-0.064***
Constant	-0.015	-0.005	0.014	0.044***
	(0.019)	(0.018)	(0.011)	(0.014)
Observations	24,021	24,021	24,021	24,021
Number of groups	1,413	1,413	1,413	1,413
AIC	-32301	-32890	-33215	-34058
BIC	-32269	-32842	-33150	-33977
R-squared	0.010	0.034	0.048	0.081

Robust standard errors are in parentheses

**** = p < 0.01, ** = p < 0.05, * = p < 0.1, + = p < 0.15.*

Table 6: Proposed and non-subsistence PADDDs

	(1) Only proposed PADDD	(2) Only proposed PADDD	(3) Excluding subsistence PADDD	(4) Excluding subsistence PADDD
LOCAL ELECTED REPRESENTATIVES				
House Representative of district is Republican	0.025***	0.020**	0.026***	0.021**
	(0.009)	(0.009)	(0.009)	(0.009)
At least one Senator for the state is Republican	0.011	0.010	0.011	0.010
	(0.012)	(0.011)	(0.012)	(0.011)
LOCAL ECONOMIC CONDITIONS				
Real GDP ($100b 2012)	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
% GDP in Land-Intensive Sectors	0.331***	0.174**	0.329***	0.168**
	(0.100)	(0.069)	(0.100)	(0.069)
CONGRESSIONAL MAJORITIES				
Republican majority in the House		0.060***		0.061***
		(0.008)		(0.008)
Republican majority in the Senate		-0.001		-0.002
		(0.009)		(0.009)
PRESIDENCIES				
G. W. Bush 2nd term		0.026***		0.027***
		(0.008)		(0.008)
B. Obama 1st term		0.087***		0.088***
		(0.011)		(0.011)
B. Obama 2nd term		0.022***		0.022***
		(0.004)		(0.004)
D. Trump only term		-0.007		-0.004
		(0.012)		(0.012)
Constant	-0.053***	-0.102***	-0.053***	-0.102***
	(0.015)	(0.013)	(0.014)	(0.013)
Observations	25,434	25,434	25,434	25,434
Number of groups	1,413	1,413	1,413	1,413
	-29080	-30407	-28538	-29859
	-29047	-30325	-28506	-29778
R-squared	0.012	0.062	0.012	0.062

Robust standard errors are in parentheses.
**** = p < 0.01, ** = p < 0.05, * = p < 0.1, + = p < 0.15.*

Table 7: Conditional logit

	(1)	(2)	(3)	(4)
LOCAL ELECTED REPRESENTATIVES				
House Representative of district is Republican	1.430***	0.947**	1.411***	0.287
	(0.445)	(0.433)	(0.286)	(0.387)
At least one Senator for the state is Republican	0.323	0.032	1.950***	0.634
	(0.487)	(0.486)	(0.395)	(0.455)
LOCAL ECONOMIC CONDITIONS				
Real GDP ($100b 2012)	0.000***	0.000***	0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
% GDP in Land-Intensive Sectors	1.248	5.709*	-10.397***	-3.667+
	(3.153)	(3.328)	(3.023)	(2.403)
CONGRESSIONAL MAJORITIES				
Republican majority in the House		4.635***		5.506***
		(0.876)		(0.742)
Republican majority in the Senate		0.330*		3.845***
		(0.182)		(0.486)
PRESIDENCIES				
G. W. Bush 2nd term			1.224	1.071
			(1.445)	(20.291)
B. Obama 1st term			7.616***	10.613
			(1.215)	(19.913)
B. Obama 2nd term			7.060***	6.636
			(1.179)	(19.985)
D. Trump only term			5.566***	4.583
			(1.306)	(20.180)
Observations	8,100	8,100	8,100	8,100
Number of groups	450	450	450	450
AIC	3682	3358	2645	1850
BIC	3710	3400	2701	1920
Pseudo R-squared	0.0494	0.134	0.320	0.526

Robust standard errors are in parentheses

**** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$, + = $p < 0.15$.*

Table 8: Number and size of PADDDs

	(1) Number of PADDD	(2) Number of PADDD	(3) PADDD Area	(4) PADDD Area
LOCAL ELECTED REPRESENTATIVES				
House Representative of district is Republican	0.044***	0.030**	15.163	-24.454
	(0.014)	(0.012)	(27.402)	(53.182)
At least one Senator for the state is Republican	0.014	0.012	-18.108	-21.650
	(0.017)	(0.013)	(23.260)	(38.796)
LOCAL ECONOMIC CONDITIONS				
Real GDP ($100b 2012)	0.000***	0.000***	0.024*	-0.006
	(0.000)	(0.000)	(0.013)	(0.034)
% GDP in Land-Intensive Sectors	0.500***	0.371***	1,953.259**	1,722.736**
	(0.103)	(0.127)	(898.552)	(806.885)
CONGRESSIONAL MAJORITIES				
Republican majority in the House		0.051***		113.679
		(0.010)		(99.071)
Republican majority in the Senate		0.046***		80.126**
		(0.013)		(31.903)
PRESIDENCIES				
G. W. Bush 2nd term		-0.003		3.017
		(0.009)		(37.577)
B. Obama 1st term		0.098***		189.466
		(0.013)		(157.173)
B. Obama 2nd term		0.035***		63.433
		(0.007)		(68.207)
D. Trump only term		-0.042**		20.544
		(0.016)		(97.136)
Constant	-0.094***	-0.129***	-216.261*	-273.332+
	(0.017)	(0.019)	(120.963)	(172.649)
Observations	25,434	25,434	25,434	25,434
Number of groups	1,413	1,413	1,413	1,413
AIC	4134	3455	455296	455261
BIC	4167	3537	455329	455342
R-squared	0.009	0.035	0.001	0.003

Robust standard errors are in parentheses.
**** = p < 0.01, ** = p < 0.05, * = p < 0.1, + = p < 0.15.*

Table 9: House representatives and Senators separately

	(1)	(2)	(3)	(4)
REPRESENTATIVES	Senate only	Senate only	House only	House only
House Representative of given district is Republican			0.041***	0.029**
			(0.014)	(0.012)
At least 1 Senator of corresponding state is Republican	0.021	0.016		
	(0.019)	(0.013)		
LOCAL ECONOMICS				
Real GDP ($100b 2012)	0.000***	0.000	0.000***	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
% GDP in Land-Intensive Sectors	0.161	0.007	0.122	-0.025
	(0.175)	(0.114)	(0.153)	(0.103)
MAJORITIES				
Republican majority in the House		0.044***		0.042***
		(0.008)		(0.008)
Republican majority in the Senate		0.036***		0.035***
		(0.011)		(0.011)
PRESIDENCIES				
G. W. Bush 2nd term		0.002		0.005
		(0.009)		(0.009)
B. Obama 1st term		0.085***		0.085***
		(0.011)		(0.010)
B. Obama 2nd term		0.041***		0.040***
		(0.007)		(0.007)
D. Trump only term		-0.019		-0.020
		(0.016)		(0.016)
Constant	-0.031	-0.059***	-0.037+	-0.062***
	(0.027)	(0.020)	(0.022)	(0.019)
Observations	25,434	25,434	25,434	25,434
Number of groups	1,413	1,413	1,413	1,413
AIC	-20153	-21459	-20261	-21504
BIC	-20128	-21385	-20236	-21431
R-squared	0.005	0.055	0.009	0.056

Robust standard errors are in parentheses.
**** = p < 0.01, ** = p < 0.05, * = p < 0.1, + = p < 0.15.*